Demand Side Management

Final Collaborative Report

DSM Programming Plan 2008-2010 and Framework to 2013

Volume III of III

A Joint Report of NSPI, UARB Staff and Consultants

January 31, 2008

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

1.1 Overview

This Demand Side Management (DSM) plan has been drawn up by Nova Scotia Power for consideration by the Utility and Review Board (UARB). It proposes significant investment, extensive collaboration and partnership, and sustained effort.

In 2007, NSPI participated in an integrated resource planning (IRP) analysis which showed DSM to be a cost-competitive alternative when compared to the construction of new generation for meeting future customer load requirements. This DSM plan is designed to achieve the important and necessary energy and demand savings presented in the IRP.

Properly designed and implemented DSM programs, with the appropriate rate recovery system, provide the best opportunity for success. Benefits include:

- Customer energy and demand savings
- Improved system reliability
- Reduced need for generation
- Reduced emissions

It is important to begin investing in DSM programs now, but in a manner that provides optimum potential for both success and sustainability. This means starting with a portfolio of programs whose goals are achievable. NSPI proposes a program starting in 2008 that will achieve the fifth year energy and demand savings in the 2007 IRP; the six year period for this plan is from 2008 to 2013.

This 2008 DSM Plan projects savings that achieve the goals identified in the 2007 IRP. It forecasts cumulative annual energy and demand savings at generator through 2013 of

978 GWh and 148 MW, respectively, comparable to the 2007 IRP forecast of 872 GWh and 147 MW in savings through 2012.

Table 1-1 compares energy savings from the 2008 DSM Plan and the 2007 IRP.

Table 1-1. Projected Cumulative Annual MW Demand and GWh Energy Savings

Proposed DSM Plan		
Year	Cumulative Annual Demand Savings at Generator (MW)	Cumulative Annual Energy Savings at Generator (GWh)
2008	1.7	15.2
2009	8.8	66.0
2010	23.8	174.7
2011	50.8	327.8
2012	92.3	606.6
2013	147.8	978.4

2007 IRP		
Year	Cumulative Annual Demand Savings at Generator (MW)	Cumulative Annual Energy Savings at Generator (GWh)
2008	11.4	77.8
2009	29.6	202.4
2010	60.2	389.2
2011	100.8	622.8
2012	147.0	871.9

Total net present value lifetime electric benefits in 2008$ are projected to be approximately $22 million in 2008, $67 million in 2009, and $144 million in 2010. Since power company costs, as approved by the UARB, are passed on to customers, implementation of all proposed measures between 2008 and 2010 would save customers about $233 million.

This revised plan, which reflects stakeholder input, is similar in many respects to the plan NSPI filed with the Board in September 2006. Overall program goals and budgets in this plan are higher, which is consistent with the findings of the 2007 IRP. This plan specifies details regarding program design, implementation, strategies, and tactics. Additional program development work is required before all of the DSM programs outlined in this document are ready to be implemented.

Upon approval of the plan, additional program development tasks will be carried out, including the following:

- Developing detailed program design, implementation, and marketing plans
- Issuing requests for proposals (RFPs) for third party professional implementation contractors/partners to deliver selected programs
- Developing detailed program materials such as rebate schedules, brochures, web content, and application forms
- Developing technical requirements for the eligible DSM measures

1.2 Implementation

An appropriate strategy for implementation of DSM in Nova Scotia at this time is primarily a combination of resource acquisition and, to a lesser extent, market transformation (investing in long term partnerships, education, and training). This plan builds upon existing programs already offered in Nova Scotia and introduces new programs.

Nova Scotia Power proposes to pursue competitive bidding for specific implementation and delivery of various aspects of DSM programs. These requests for proposals (RFP's) would be open to experienced, qualified, professional for-profit and not-for profit entities that demonstrate success in the marketplace and competence to design and implement high quality, effective DSM programs.

Achieving results depends on partnerships with customers, trade allies, trade associations, non-profit organizations, and local, provincial, and federal government agencies dedicated to mutual and complementary goals of conservation and energy efficiency.

To simplify program design and marketing, NSPI plans to work with groups such as Conserve Nova Scotia (Conserve NS), Natural Resources Canada, Nova Scotia Homebuilders Association, Clean Nova Scotia, Ecology Action Centre, ACAP Cape

Breton, Affordable Energy Coalition, and other provincial organizations that are involved with energy conservation. Partnerships can enable a province-wide DSM program, available to all residents, and support and leverage other programs, such as those offered by Conserve NS, for additional efficiency opportunities.

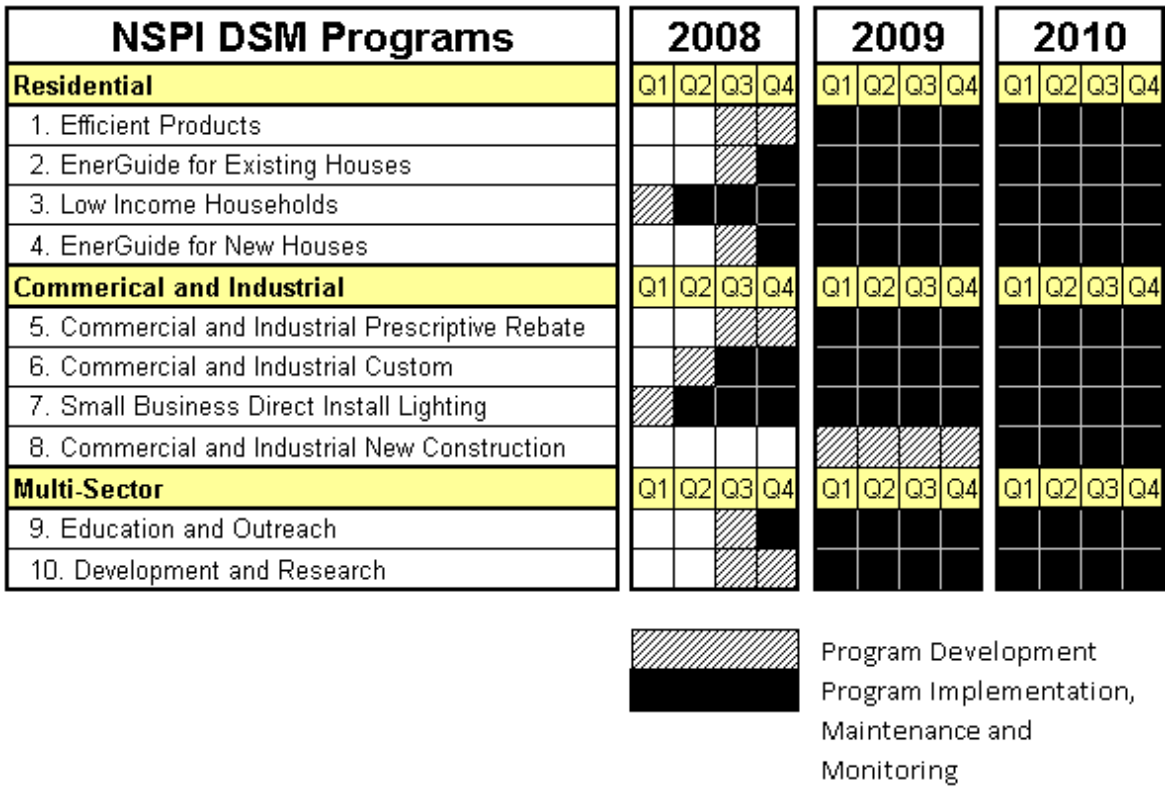
A new DSM Advisory Council of interested stakeholders would solicit input and feedback on DSM programs on an on-going basis. Stakeholders have indicated their interest in participating in a collaborative effort to support the design, development, implementation, and evaluation of DSM programs. This DSM Advisory Council is an important element in what is being proposed. It would provide input to a DSM Steering Committee, to be comprised of NSPI and UARB staff.

1.3 Implementation Timeline

This section provides an introduction to the overall program plan for the first full two years of the proposed programs, 2009 – 2010. Nova Scotia Power also proposes to initiate programs in 2008. Program development would begin in 2008 for all programs (except for the C&I New Construction Program). This DSM Plan includes program descriptions for the early action efforts.

Table 1-2 presents a rollout schedule for each program for 2008, and the first two full years of programming, 2009-2010. All programs are targeted to be fully implemented in 2009, except for the Commercial & Industrial New Construction Program, which would be implemented in 2010.

Table 1-2. 2008-2010 Implementation Schedule for NSPI's DSM Portfolio



1.4 Overview of Goals, Budgets, and Benefit-Cost Ratios

Table 1-3 is an implementation schedule for the six year period from 2008-2013, and projected cumulative annual GWh energy and MW demand savings at generator for each program through 2010. The proposed implementation schedule will be modified as required to maximize program and budget effectiveness.

Table 1-4, Table 1-5 and Table 1-6 present program budgets, the number of program participants or units, the incremental annual GWh energy and the MW demand savings at generator, total resource cost test ratio, and the lifetime GWh energy savings at generator from measures installed in each year, for 2008, 2009, and 2010, respectively.

Table 1-3. 2008-2013 DSM Plan Implementation Schedule and Projected Savings

ROLLOUT SCHEDULE FOR NSPI'S DSM PORTFOLIO

NSPI DSM Programs	2010 Cumulative Annual Energy Savings at Generator (GWh)	2010 Cumulative Annual Demand Savings at Generator (MW)	2008-2010 Number of Participants or Units	2008-2010 Budget (2008$ million)	2008-2010 Total Resource Benefit/Cost Ratio	2008-2010 Net Total Resource Benefits (2008$ million)	Lifetime Energy Savings from 2008-2010 Installations at Generator (GWh)	2008				2009 (Year 1)				2010 (Year 2)	2011 (Year 3)	2012 (Year 4)	2013 (Year 5)
Residential								Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
1. Efficient Products	18.72	4.71	22,500	$7.631	2.3	$8.657	131.69												
2. EnerGuide for Existing Houses	13.98	2.07	1,400	$3.739	2.7	$18.121	268.60												
3. Low Income Households	7.93	1.55	1,025	$3.420	3.6	$10.519	127.97												
4. EnerGuide for New Houses	4.10	0.84	975	$1.564	2.1	$3.354	57.70												
Commerical and Industrial								Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
5. Commercial and Industrial Prescriptive Rebate	42.19	5.19	1,125	$4.691	4.6	$54.989	671.66												
6. Commercial and Industrial Custom	53.62	6.32	265	$7.698	8.7	$87.237	941.87												
7. Small Business Direct Install Lighting	23.43	1.92	450	$2.686	6.7	$33.898	389.90												
8. Commercial and Industrial New Construction	10.69	1.22	100	$1.410	8.0	$16.719	182.92												
Multi-Sector								Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
9. Education and Outreach	N/A	N/A	N/A	$0.723	N/A	N/A	N/A												
10. Development and Research	N/A	N/A	N/A	$0.589	N/A	N/A	N/A												
TOTALS	**174.66**	**23.82**	**27840.00**	**$34.151**	**4.9**	**$233.494**	**2772.29**												
Cumulative Annual Energy Savings at Generator (GWh)								**15.15**				**66.05**				**174.66**	**327.81**	**606.65**	**978.43**
Cumulative Annual Winter Peak Demand Savings at Generator (MW)								**1.75**				**8.80**				**23.82**	**50.85**	**92.34**	**147.75**
Annual Program Budgets (2008$ million)								**$2.676**				**$10.245**				**$21.230**	**$39.035**	**$58.630**	**$78.226**

Notes:
Cumulative Annual Savings = savings through that year
Lifetime Savings = savings over the period that a measure is operating

Program Development
Program Implementation, Maintenance & Monitoring

Table 1-4. 2008 DSM Budget, Participants, and Savings

NSPI DSM Programs	2008				Budget ($2008 million)	Percent of Budget	Number of Participants or Units	Incremental Annual Energy Savings at Generator (GWh)	Incremental Annual Demand Savings at Generator (MW)	Total Resource Benefit/Cost Ratio	Net Total Resource Benefits ($2008 million)	Lifetime Energy Savings at Generator (GWh)
Residential	Q1	Q2	Q3	Q4								
1. Efficient Products					$0.050	2%	0	0	0	-	$0.000	0.0
2. EnerGuide for Existing Houses					$0.207	8%	75	0.55	0.10	2.9	$0.822	11.5
3. Low Income Households					$0.511	19%	150	1.67	0.23	3.9	$1.638	19.8
4. EnerGuide for New Houses					$0.126	5%	75	0.33	0.07	2.1	$0.270	4.7
Commerical and Industrial	Q1	Q2	Q3	Q4								
5. Commercial and Industrial Prescriptive Rebate					$0.050	2%	0	0	0	-	$0.000	0.0
6. Commercial and Industrial Custom					$1.229	46%	40	8.56	1.01	8.7	$13.929	150.4
7. Small Business Direct Install Lighting					$0.253	9%	75	4.03	0.33	6.7	$5.837	67.1
8. Commercial and Industrial New Construction					$0.000	0%	0	0.00	0.00	-	$0.000	0.0
Multi-Sector	Q1	Q2	Q3	Q4								
9. Education and Outreach					$0.050	2%	N/A	N/A	N/A	N/A	N/A	N/A
10. Development and Research					$0.200	7%	N/A	N/A	N/A	N/A	N/A	N/A
	Totals				**$2.676**			**15.15**	**1.75**	**6.5**	**$22.496**	**253.5**

Notes:

Incremental Annual Savings = savings in that year

Lifetime Savings = savings over the period that a measure is operating

Program Development

Program Implementation, Maintenance & Monitoring

Table 1-5. 2009 DSM Budget, Participants, and Savings

NSPI DSM Programs	2009 (Year 1)	2009 Budget (2008$ million)	Percent of Budget	Number of Participants or Units	2009 Incremental Annual Energy Savings at Generator (GWh)	2009 Incremental Annual Demand Savings at Generator (MW)	Total Resource Benefit/Cost Ratio	Net Total Resource Benefits (2008$ million)	Lifetime Energy Savings at Generator (GWh)
Residential	Q1 Q2 Q3 Q4								
1. Efficient Products		$2.455	24%	7,500	5.7	1.54	2.2	$2.616	40.7
2. EnerGuide for Existing Houses		$1.210	12%	450	4.5	0.67	2.7	$5.863	86.9
3. Low Income Households		$1.009	10%	300	2.6	0.46	3.6	$3.133	38.1
4. EnerGuide for New Houses		$0.479	5%	300	1.3	0.26	2.1	$1.028	17.7
Commerical and Industrial	Q1 Q2 Q3 Q4								
5. Commercial and Industrial Prescriptive Rebate		$1.547	15%	375	14.1	1.73	4.6	$18.330	223.9
6. Commercial and Industrial Custom		$2.156	21%	75	15.0	1.77	8.7	$24.436	263.8
7. Small Business Direct Install Lighting		$0.973	9%	150	7.8	0.64	6.7	$11.224	129.1
8. Commercial and Industrial New Construction		$0.047	0%	0	0.0	0.00	-	$0.000	0.0
Multi-Sector	Q1 Q2 Q3 Q4								
9. Education and Outreach		$0.231	2%	N/A	N/A	N/A	N/A	N/A	N/A
10. Development and Research		$0.136	1%	N/A	N/A	N/A	N/A	N/A	N/A
	Totals	**$10.245**			**50.90**	**7.06**	**4.7**	**$66.630**	**800.2**

Program Development
Program Implementation, Maintenance & Monitoring

Notes:

Incremental Annual Savings = savings in that year

Lifetime Savings = savings over the period that a measure is operating

Table 1-6. 2010 DSM Budget, Participants, and Savings

NSPI DSM Programs	2010 (Year 2)	2010 Budget (2008$ million)	Percent of Budget	Number of Participants or Units	2010 Incremental Annual Energy Savings at Generator (GWh)	2010 Incremental Annual Demand Savings at Generator (MW)	Total Resource Benefit/Cost Ratio	Net Total Resource Benefits (2008$ million)	Lifetime Energy Savings at Generator (GWh)
Residential	Q1 Q2 Q3 Q4								
1. Efficient Products		$5.126	24%	15,000	13.0	3.18	2.3	$6.042	91.0
2. EnerGuide for Existing Houses		$2.322	11%	875	8.9	1.30	2.7	$11.436	170.2
3. Low Income Households		$1.900	9%	575	3.7	0.86	3.5	$5.748	70.1
4. EnerGuide for New Houses		$0.959	5%	600	2.5	0.52	2.1	$2.055	35.4
Commerical and Industrial	Q1 Q2 Q3 Q4								
5. Commercial and Industrial Prescriptive Rebate		$3.094	15%	750	28.1	3.46	4.6	$36.659	447.8
6. Commercial and Industrial Custom		$4.313	20%	150	30.0	3.54	8.7	$48.872	527.7
7. Small Business Direct Install Lighting		$1.460	7%	225	11.6	0.95	6.7	$16.837	193.7
8. Commercial and Industrial New Construction		$1.363	6%	100	10.7	1.22	8.0	$16.719	182.9
Multi-Sector	Q1 Q2 Q3 Q4								
9. Education and Outreach		$0.442	2%	N/A	N/A	N/A	N/A	N/A	N/A
10. Development and Research		$0.252	1%	N/A	N/A	N/A	N/A	N/A	N/A
	Totals	**$21.230**			**108.61**	**15.02**	**4.9**	**$144.368**	**1535.8**

Notes:
Incremental Annual Savings = savings in that year
Lifetime Savings = savings over the period that a measure is operating

Program Development
Program Implementation, Maintenance & Monitoring

2.0 EVALUATION, MONITORING AND VERIFICATION

2.1 Overview

This section presents the approach to evaluation, monitoring and verification (EM&V), which is an integral component of the proposed DSM Plan. Four percent of program costs will be allocated to the following EM&V activities:

- EM&V Related Activities
- Process and Impact Evaluation
- Annual Savings Verification

Each of these activities is discussed in the following sections, followed by the EM&V plan.

2.2 EM&V Related Activities

Implementation and/or evaluation support contractors will assist in the development of key program and evaluation related components. These include:

- Development and documentation of deemed savings estimates for prescriptive measures in a Technical Reference Manual (TRM). The TRM will detail all measure savings assumptions including base efficiency, high efficiency, measure size, measure life, free ridership, and spillover estimates.
- Development of a DSM program tracking system database integrated within program implementation that captures measure and/or project data, develops initial estimates of savings, and retains participant information.
- Direct market baseline research and market characterization to support improved DSM implementation.
- Review assumptions and cost-effectiveness.

- Engagement with DSM Advisory Council and DSM Steering Committee on issues related to savings verification and process and impact evaluations.

The program tracking system is an important element of the evaluation framework. It helps ensure the on-going accountability of the demand-side resource investments by providing the best-available estimates of DSM program accomplishments on a quarterly basis. This information can then be reviewed by program managers, regulators and other interested parties. The tracking system also serves as the foundation for developing samples and initial impact estimates used in realization-rate evaluation methods. To support these applications, the tracking system is subject to planned continuous improvement based on both in-field delivery experiences by implementers, and through the periodic in-depth evaluation efforts. This allows the tracking system to provide the best information on current program accomplishments throughout each year.

2.3 Process and Impact Evaluation

Evaluation, Monitoring and Verification is defined as follows:

Evaluation encompasses three types of activities; process, market, and impact evaluation. Each is defined below:

Process evaluations are typically directed at addressing whether the programs were implemented as designed, examining perceived market barriers and opportunities, measuring participant satisfaction, documenting the program process, and exploring opportunities for efficiency improvements. Process evaluations are generally performed by using a combination of interviews with program managers, implementation contractors, trade allies, participants, program drop-outs, and non-participants. They often include a detailed review of program documents, application forms, and policies and procedures, including record keeping and data collection. Sometimes they include surveys with non-participants to examine program awareness and market barriers to participation. Process evaluations often document each significant component of the

programs including program accomplishments, administrative processes, participant experiences, customer satisfaction, and successes and failures.

Market evaluations examine program and market assessment "indicators" developed for each program and assess how these indicators change over time. The indicators are typically derived from a program logic formulation developed during program design and early implementation. The **program logic model** is a simple representation of the program and the underlying hypotheses that are expected to account for the program's success in the market. Typically, program logic models are organized around the program inputs, processes and outputs. From this formulation, a set of key market indicators that can be tracked over time is developed (and modified over time, as needed). These indicators are designed to measure the progress of a program across specified time periods in terms of affecting key touch points in the market. This might include the change over time in the number of qualified contractors. The indicators are designed to reflect significant changes in how the market operates, the information absorbed and used by the market, choices key market actors make on a routine basis, and the attitudes and beliefs of key market actors. Data to support market evaluations are typically gathered through surveys with trade allies, manufacturers, participants and nonparticipants. Data from secondary sources like Natural Resources Canada databases are often used to support market evaluation efforts. An example of a program logic model for a NYSERDA program similar to the proposed residential Efficient Products program is shown in Appendix C.

Impact evaluations validate the energy and demand savings produced by a program. These evaluations validate program-reported savings by verifying the type, quantity, and efficiency of measures installed, examining the measures replaced by the program for retrofit applications, or estimating the normal or standard baseline equipment for new construction applications. Impact evaluations calculate net savings by adjusting program-reported savings to account for measures that would have been installed even if the program had not existed (defined as **free ridership**) and for measures that were inspired by the program but not captured by the tracking system (typically called **spillover**). These evaluations use data from program tracking databases, interviews with

participants, on-site inspection and monitoring and, occasionally, secondary sources such as program evaluations done for similar programs. Methods for impact evaluations include engineering calculations, simulation modeling calibrated to site billing data, and statistical/regression analysis of energy use data.

Monitoring includes developing a program data tracking system to support the evaluation effort, i.e., monitoring of results and verifying the installation and retention of measures and equipment promoted by the DSM program where appropriate.

Verification includes a review, audit, and verification of claimed program savings and recommendations for improvement.

Framework for Evaluation

Appropriate EM&V requires that a framework be established that encompasses both planned EM&V efforts and data collected as part of program implementation. This section provides an overview of the monitoring, verification and evaluation efforts recommended for years one and two of the DSM programs to illustrate the infrastructure needed to support appropriate EM&V. The basic requirements and approaches for planning program-specific evaluations, including the allocation of funds across evaluation efforts are also discussed in this section. Importantly, EM&V efforts evolve over time and change as programs move from initial roll-out with few participants to full-scale implementation.

NSPI proposes that an evaluation schedule whereby all programs with annual budgets exceeding $500,000 per year are evaluated at least once every three years. The key components of the process and impact evaluations will be:

- Evaluations conducted by an independent nationally recognized DSM evaluation consultant obtained through an RFP process
- Verification, by an appropriate sample, that energy-efficiency measures are installed as expected

- In-field measure performance measurement and data collection
- Energy and demand savings analysis to compute the results that are being achieved
- Total resource cost-effectiveness analysis by program and overall DSM portfolio
- Process evaluation to indicate how well programs are working to achieve objectives
- Identification of important opportunities for improvement

Final conclusions from the process and impact evaluations will be reviewed and discussed closely with the UARB, DSM Advisory Council, and implementation contractors to implement changes that continue to improve DSM program design and delivery.

2.4 Annual Savings Verification

A savings verification contractor will be hired and directed by the UARB staff and directed to engage with NSPI at least annually to review, audit, and verify claimed savings for the previous program year and make recommendations.

The verification contactor will be directed to:

- Review savings estimates, including free ridership and spillover estimates
- Review savings based on a file review and potentially targeted field verification
- Review data tracking system for consistency and accuracy
- Prepare a draft and final report for the UARB regarding suggested revisions to annual savings claims and progress toward DSM program goals

Nova Scotia Power envisions the annual savings verification process to be an independent and collegial endeavor, with an opportunity for NSPI to comment and discuss items of concern identified by the savings verification contractor prior to the final savings verification report being issued to the UARB. Ultimately, the UARB will decide on progress toward attaining established performance goals.

2.5 The EM&V Plan

This section discusses the evaluation, monitoring and verification (EM&V) efforts that would support implementation of DSM programming and expands upon EM&V concepts. An overview of program-specific EM&V methods is included within each DSM program section.

2.5.1 Overview of Initial EM&V Efforts

This section outlines the focus for initial EM&V efforts, which include both monitoring and verification, and a description of the types of evaluation activities that are recommended. Often programs progress at different rates as customers choose to participate in different programs. It is important to recognize that planning targets are just that, i.e., targets. When programs are rolled out into the market, some program messages resonate with customers better than others and the infrastructure to support certain programs may turn out to be more (or less) developed that expected. Introducing a new energy efficiency program is essentially the same as introducing a new consumer product into the market. Invariably, some programs do better than others, and the market always holds some surprises. That is why initial efforts typically focus on the process-side and market-side of the evaluation effort. This helps ensure that any changes in message or program focus that are needed to make a program successful can be made.

2.5.2 Focus for Initial Efforts

Evaluation adapts to the programs as they are being rolled out, and first year EM&V efforts have a different focus than second year efforts. The initial year should focus on

monitoring and verification as new programs are being rolled out, ensure that that program delivery processes are as efficient as possible, identify issues in program implementation, and develop recommendations/adaptations (if needed) regarding program implementation. The initial work will address:

- Process evaluations to assess the effectiveness of program design and delivery;
- Verification that program implementation is proceeding as planned, i.e., the technologies are installed and working as expected; and
- Development of initial estimates of energy savings that are incorporated into the real-time tracking system. This allows the utility and stakeholders to obtain early feedback on how well the program is tracking its goals. These estimates are usually based upon deemed savings estimates for simple technologies (e.g., CFLs), and engineering estimates that use some site data for more complex estimates (such as savings estimates for Custom DSM measures). Inputting the necessary data and maintaining the tracking system is a key component of DSM program implementation. A quality tracking system supports evaluation efforts by allowing for the development of program-wide estimates at targeted levels of confidence and precision.
    - Most evaluation efforts use the initial estimates in the tracking systems to develop samples for monitoring and evaluation at periodic intervals. These M&V efforts validate the initial tracking estimates or, if there are differences between the initial tracking estimates and in-field estimates, ratio or difference estimates are developed to calculate a **realization rate**.
    - The realization rate is defined as the percentage of the assumed savings as represented by the initial tracking system estimates that can be verified by the in-field studies. A realization rate of 100 percent indicates that the initial savings estimates are verified by the in-field estimates. A realization rate of 90 percent indicates

that the initial estimates were overstated by 10 percent. This may be due to any number of reasons including fewer equipment operating hours than expected (e.g., the hours of use of high efficient lighting) to having participant characteristics be different than those assumed in the initial tracking system estimates.

- The Year 2 will focus more intently on producing these more robust, in-field estimates of energy savings and determining the program savings net of both free riders (what would have happened in the absence of a program), and spillover (the impact of the program on savings that were not tracked).

2.5.3 Integrated Data Collection

Timing of EM&V activities and reporting can have a significant effect on the accuracy and usefulness of findings. Data collection done months or years after a program intervention can be weakened by fading memories, lost data, and confounding events that have happened in the intervening time. EM&V reports that come well after program intervention can arrive too late to provide input at key program implementation stages.

EM&V plans are designed to mitigate these problems. The process by which this is done is to integrate select data collection within the program implementation process and to provide near real-time feedback on key indicators of program progress. EM&V processes that take an "integrated data collection" (IDC) approach to planning seek out opportunities in the program implementation process where evaluation data can be collected efficiently, cost-effectively, and accurately and produce timely results. One example is program application forms. Other interactions with customers where important data can be collected include; initial customer contact (questions on where the customer heard about the program), during implementation (where data on the equipment baseline can be collected) and payment of incentives (questions on what measures were installed due to the program may best be collected at this time). Of course, this approach will be highly dependent on the program design and the points where the program interacts with the customer or trade ally.

The IDC approach requires the EM&V and implementation staff to work closely together to develop a protocol for collecting data as part of the standard program implementation practices and customer correspondence associated with the program. It also is important for the program implementation staff to see successful M&V as part of their responsibility, i.e., the program will get credit for the savings that can be verified and program implementers can have a dramatic influence on how accurately this in-field verification can be accomplished.

This IDC protocol garners participant feedback in near real-time to support process, market, and impact analyses. Examples include exit surveys with training participants designed by evaluation staff but administered by program implementation staff, evaluation input to program application forms so key baseline data can be collected before the existing equipment is replaced, and regular transfer of program data to evaluators so follow-up surveys can be implemented soon after program participation.

2.5.4 Review of Budget Priorities

Initial planning budgets are derived using general guidelines and based on portfolios of DSM programs. Budgets for "detailed evaluation plans for each of the programs" will take the overall budget assigned to the portfolio and assess where the evaluation effort will provide the most useful information on the program processes and outcomes of the Year 1 efforts.

Assessing how best to use the EM&V budget to produce useful information is a key component of the evaluation effort. The following are the factors influencing the allocation of the portfolio evaluation budget to specific programs:

- Complexity of the program delivery process.
- Number of participants in the program delivery chain.
- Indications that the program is not meeting interim targets.

- Uncertainty and range of potential savings based on participating sites and technology characteristics – if actual participants have different characteristics than the "expected" participants used in initial program design then energy savings per site can be different.

Keys to successful EM&V include the program implementation personnel knowing that: to be successful, the savings claimed for that program needs to be able to be verified; and part of their role is to put in place the infrastructure needed to verify program accomplishments and improve the program over time.

2.5.5 Establish and Assess Evaluation Infrastructure

The tracking system for each program is one key to successful evaluation. Ensuring that the tracking system will support the evaluation of each program is a critical first task.

The tracking system should capture site or technology specific "initial" or rough cut estimates of energy and peak demand savings as they are installed or delivered. This should include:

- *Baseline:* An estimate of what is removed or would have been installed if the program did not encourage the installation of more efficient equipment.
- *Technology Installed:* Depending on program implementation, information on what is installed on a site basis (where possible depending upon delivery approach) is needed.
- *Initial Savings Estimates:* Based upon the assumed baseline and the attributes of the program technology or measure installed, an initial estimate of energy savings is made for that installation and recorded in the tracking system. The initial estimates should improve over time as verification is performed on the program. These estimates can be deemed savings estimates for simple technologies (e.g., CFLs or low flow shower

heads) or be based on select site characteristics for more complex DSM measures (new construction projects may depend on square footage and what is installed).

Other elements of the tracking system tend to be more specific to the delivery process in terms of the data collected on the customer or for the site. These will include (where appropriate):

- Participating customers account and location.
- Dates tied to participation – initial contact through to installation.
- Marketing efforts affecting the decision to participate.
- Customers' baseline estimate, i.e., the customers view on what they would have done had the program not been in place.
- Other program factors that can be tracked as part of the tracking system that is run in parallel with implementation.

It is important that the tracking system become an integrated part of on-going DSM program implementation. The responsibility for collecting the data required by the tracking system falls, by necessity, to program implementers. If the needed tracking data are not collected at the time of participation, it is often impossible to reconstruct the data six months to a year after participation as part of an independent evaluation effort.

2.5.6 Development of Program-Specific Evaluation Plans

The development of more detailed EM&V plans for each of the DSM programs will include the following elements:

- Develop EM&V budgets and priorities for each program based on the assessment contained in the portfolio overview (above in Section 2.5.4 on "Review of Budget Priorities").

- Conduct process evaluations for all programs given that early process and program delivery feedback is often most valuable during the early stages of program rollout to make changes to program implementation based on early feedback from participants, non-participants, and program staff input.
- Verify program technology and measure installation for each program: Market assessment will be based on tracking system information supplemented for key programs as needed. Market indicators defined in the program design phase of the overall effort will serve as key factors to be tracked over time in the market assessment evaluation tasks.
- Develop gross energy savings estimates starting with the initial estimates from the program tracking systems. These initial estimates are used in both engineering and statistical approaches. The initial tracking systems estimates will be validated using more sophisticated approaches for those programs that have had the most activity and highest expected savings.
- Initial energy savings evaluations will be conducted on all programs to enable the DSM cost recovery to be calculated including lost revenues and shared savings.
- Develop net program estimates including free ridership and spillover as appropriate. These will be developed in greater detail for those programs with the most activity and estimated energy savings. Other programs will be addressed in more detail in Year Two or at the end of Year Two.
- Overall, the program specific evaluation plans will focus on developing more precise information on energy savings for those programs that are having the greatest effect in the market and on development of process/market data for those programs where that information will have the greatest effect on program implementation. All EM&V plans face budget limitations and trade-offs. As a result, it is important to have the EM&V plans produce information that is most valuable to the UARB, to the power company and to stakeholders.

2.5.7 Roll-up of all Evaluation Results to the Portfolio Level

This effort will roll up the results of process, verification, market, and impact (energy savings both gross and net) to the portfolio level. A set of issues will be developed. This "issues" information will be used to develop recommendations regarding possible program modifications.

3.0 DSM PROGRAMS

The following section discusses the programs included in DSM plan and the key attributes of each program. These are general program descriptions with key highlights and are not meant to be the entire program implementation plans. It will require several months after receiving regulatory approval before DSM programs will be ready for implementation. Residential programs are presented first, followed by programs for commercial and industrial customers. Program managers will explore the potential for low-interest loan program components, as appropriate.

Specific EM&V approaches for individual programs are also presented. While it is appropriate to strive for consistency in EM&V across programs, the significant differences between programs will necessitate some significant differences in the EM&V approach, as will be explained below. Also, as discussed above, the primary focus of the program-specific evaluation discussion will be on near-term efforts, which should be more process-evaluation oriented.

3.1 Efficient Products

3.1.1 Description

Consumers throughout Canada already know the ENERGY STAR symbol. While standing in appliance stores, considering different makes of dishwashers, dryers or refrigerators, Canadians know the international sign guarantees a high level of energy efficiency. An Efficient Products Program will promote the availability and purchase of (primarily) ENERGY STAR® lighting and appliances to help consumers save money and energy. The goals of this program are to transform the lighting and appliance markets through the promotion of ENERGY STAR® qualified products.[1] To start, the program

[1] To ensure cost-effectiveness for ENERGY STAR® appliances, NSPI may tier incentives for appliances based on their efficiency tier ranking as determined by the Consortium for Energy Efficiency.

will focus on the promotion of compact fluorescent lamps (CFLs) with instant rebate coupons and retailer product buy-down agreements in supermarkets, hardware stores, and large retailers. NSPI also plans to initiate promotions for ENERGY STAR® appliances such as refrigerators and clothes washers, as well as LED holiday lights.

Once the CFL program component is firmly established, with implementation contractors and participating retailers in place, NSPI will conduct limited or year-round promotions such as instant rebates, mail-in rebates, or marketing only promotions for other ENERGY STAR® products which may include lighting fixtures, clothes washers, refrigerators, dehumidifiers, other appliances, windows, etc.

Additionally, NSPI will consider the introduction of an appliance early-retirement initiative; for example, a refrigerator replacement limited time offer promotion. The specifics of an early retirement/recycling initiative will be addressed in greater detail upon overall DSM portfolio approval.

The program will address the following market barriers:

- *Customer awareness* related to both the existence of the technology and applications
- *Higher prices* of efficient products relative to baseline
- *Quality of technology* - Past perceptions of the early generations of efficient products (e.g. CFLs) may be poor
- *Availability* - Programs will generate greater customer interest, which will result in increased retail stocking and selection of efficient products

3.1.2 Eligible Participants

All residential and small commercial electricity customers of Nova Scotia Power will be eligible for this program.

3.1.3 Eligible Measures

Compact Fluorescent Lamps (CFLs)

Compact fluorescent lamps (CFLs) typically offer significant energy savings potential in the residential sector. On average, lighting accounts for approximately 13 percent of a household's energy bill, and the average household has upwards of 30 light bulbs. Given that CFLs can use up to 75 percent less energy last up to eight times longer than standard incandescent bulbs, and that retail prices for CFLs lower each year, they are very cost effective. CFLs also provide peak demand savings, especially in winter.

Key program features include the following:

- CFL price reductions to about $1 per bulb, which has been found to be an acceptable price to consumers through many programs
- Consumer marketing and education regarding CFLs so that customers better understand the benefits of CFLs and also understand that the products have considerably improved in recent years
- Program support for hardware stores, grocery stores, large retailers, and other retail outlets that sell CFLs. These trade allies will act as the primary program sales force.

Second Refrigerator Recycling

The appliance recycling component can produce cost-effective long-term coincident peak demand reductions and long-term annual energy savings in residential and non-residential market sectors by removing operable, inefficient refrigerators and freezers. Given the continued market saturation for working refrigerators and freezers, the program offers significant opportunities for cost-effective long-term coincident peak demand reduction and long-term annual energy savings. The success of the program will be attributed to the accelerated retirement and removal from the potential secondary markets of the older

and less efficient refrigerators and freezers. Nonresidential customers will also be allowed to participate since a number of office complexes and industrial buildings have standard, residential size refrigerators and freezers.

3.1.4 Rebates and Incentives

The program will emphasize the energy-efficiency benefits associated with the disposal of spare refrigerators and freezers. It will also encourage the accelerated retirement of older and less efficient primary refrigerators and freezers, with more energy efficient (e.g., ENERGY STAR®) units. The program will disseminate energy efficiency information and collaborate with other DSM programs to educate customers on taking these actions.

Approximately ten percent of Nova Scotian households have a second refrigerator that is at least ten years old. We will target these inefficient appliances and partner with municipalities and waste resource agencies for proper environmental disposal. Incentives will be provided for the recycling of operating refrigerators or freezers that are old and inefficient. Recycling service may either be provided for free to program participants, or customers may be reimbursed any fees paid to the recycler for a to-be-determined amount. Customers will also be informed about incentives for the purchase of a new ENERGY STAR® appliance.

The program will encourage customers and property owners/managers to replace the older, inefficient appliances by offering bundled incentives/rebates for the turn in of the older inefficient units and the purchase of new ENERGY STAR® units. These promotions would be conducted through point-of-sale materials located at retail appliance stores and other cross promotional marketing activities.

3.1.5 Planning and Administration

The minimum required NSPI staff will plan and administer this program. Third parties will manage the program design and implementation as much as practicable.

3.1.6 Delivery and Implementation

The lighting component of this program will be delivered and implemented in collaboration with Conserve NS and other potential partners. NSPI staff will conduct program marketing and promotion, as discussed below, as well as specifying program requirements.

For appliance recycling services, Nova Scotia Power will work with municipalities and local waste resource agencies to obtain suggestions on ways to improve the program from both a program delivery and customer service perspective. The recycling vendor will be responsible for scheduling and collections of refrigerators and freezers, including "Pick Up Day Events". The vendor will also be responsible for the recycling process of dismantling the refrigerators and freezers, and removing oils and refrigerants. The vendor must meet the comprehensive toxic material recycling and disposal standards in conformance with Canadian environmental laws and regulations, along with relevant permitting requirements.

3.1.7 Marketing and Communications

For the lighting component, we will explore co-branding the initiative with the national "Switch and Save" Program sponsored by Natural Resources Canada. In addition, NSPI will seek to develop marketing, co-branding, and additional program promotion partnership opportunities with potential partners such as Conserve NS, Clean Nova Scotia, and other provincial organizations involved with energy efficiency and education.

A mix of website, direct mail, newspaper and/or TV ads will raise awareness. Retailer point-of-sale materials will also play a supporting role in informing customers about the program.

This program will coordinate marketing tactics with manufacturers, distributors, retailers, home improvement centers, contractors, and other energy efficiency and demand

response programs to achieve the desired levels of customer awareness and program participation.

Marketing activities may include, but are not limited to:

- Point of Sale collateral materials (clings, shelf talkers, counter stands, etc.) – at participating retail locations
- Advertisements in retail circulars (as available and appropriate)
- Bill inserts
- Community outreach (e.g. community-based organization outreach to low-income households, in conjunction with the delivery of utility- and government-funded efficiency programs; promotions at home shows, etc.)
- Direct mail (e.g. targeted program promotions to customers who may be most eligible or interested in recycling services). This may include cross-promotional direct mail with other DSM programs.
- E-mail to customers participating in home energy survey programs or other NSPI service offerings
- Province wide advertising campaigns

3.1.8 Evaluation, Monitoring and Verification Plan

This section describes first year EM&V efforts for this program. The following describes evaluation data collection approaches for the first year of the program:

Step 1: Establish Program Tracking Database

Tracking systems for retail products have been a challenge for many power companies that support these programs. Where possible, it is useful to obtain participant names. This can prove difficult for a rebate coupon program but, with the cooperation of retailers, it is possible. At a minimum, the place of redemption and number of products purchased should be collected. To the extent that the program captures participant names

from instant-rebate coupons, a database should be developed to track participants and any data collected on the coupons. Program records should also track agreements with manufacturers and retailers and promotional events. This is an area where NSPI can innovate and develop better tracking than has been the case with previous programs.

Step 2: Survey Participants

The objective of this survey is to gauge the program's effect on purchase patterns and to support the savings estimates.

Construct sample of participants. If the program captures participant names from the instant-rebate coupons, the program tracking database can provide samples. If the program does not, the alternatives for identifying participants include:

- Store intercepts where evaluation staff visually identify purchasers in participating stores and approach them to implement a short survey to capture contact information and some other data. This is viable but expensive (it can cost more than $100 for each valid participant name collected) and participating retailers may be reluctant to allow it.
- Random survey of the population. This suffers from two problems. First, a very large screening survey must be implemented to identify people who have purchased program-supported CFLs. For example, if 10 percent of the population purchases program-supported lamps, 3000 screening surveys would have to be implemented to capture 300 participants. Second, it can be difficult for respondents to understand the distinction between CFLs and other lamp types during a telephone survey, which can lead to inaccuracies.

Implement survey of participants. The survey will be implemented after the program has been fully operational for a few months to ensure that participants have had enough time to purchase and install the bulbs.

Topics to be addressed by the survey include:

- Previous purchases of CFLs
- Lamp installation information: Number purchased, number installed, location of installed lamps, and hours of operation[2]
- Satisfaction with CFLs
- Awareness of program involvement in the buy-down or discount
- Future purchase intentions

Step 3: Survey Retailers

The objective of this survey is to examine program procedures, identify program barriers, and obtain a view of the program from the retailer's perspective.

Construct survey sample of retailers. The sample can come from program records and from interviews with program managers.

Implement survey of retailers. The survey should be implemented after the major program promotions have been completed to ensure that the main components of the program can be examined.

Topics that would be covered in the survey include:

- Satisfaction with the program
- Interaction with the program and suggested improvements to the program
- Retailer's perspective on customer reaction to the program
- Willingness to continue participating

[2] Self-reported hours of operation tend to be inaccurate. A California study found self-reported hours were overestimated by one third (CFL Metering Study. KEMA Inc for PG&E, SDG&E, and SCE. February 25, 2005.)

Step 4: Interview Program Staff

It is important to obtain the feedback and insights of those individuals and contractors that are implementing the program to assess program processes and areas that might be improved upon. Most initial program roll-outs have some issues that need to be addressed.

Construct survey sample of program staff. In-depth interviews will be conducted with NSPI staff (or third parties such as consultants or partners) involved in program design and implementation, marketing, and tracking.

Implement survey of program staff. Some key staff will probably be interviewed more than once, with information exchanged as part of ongoing discussions about the program and evaluation effort. Interviews with key staff should start, at a minimum, within the first few months of the program to start to identify key issues.

Topics that might be covered in this survey include:

- Goals for evaluation
- Program goals and logic model
- Program methods and approaches
- Target retailers
- Target measures
- Program marketing design and implementation

Step 5: Process Evaluation

As with the other programs, process evaluation will be a key focus for the first year. The process evaluation should be done soon after the first major promotions have been completed in order to provide timely feedback for future program activities. It will use data from all three data collection activities.

Step 6: Market Evaluation

Market effects evaluation will require only a limited effort. The market effects evaluation will use results from all three data collection approaches. The results from the surveys can provide valuable evidence to support the program theory and hypothesis that the program interventions will eventually produce market effects. As a result, these surveys should be examined with an eye toward market effects shortly after they are implemented.

Step 7: Impact Evaluation and Validation

Impact Evaluation will likely focus on engineering estimates using information gained from the participant surveys (e.g., on number of products installed and hours of operation). Engineering calculations will be validated by using program tracking data and survey responses. If participant surveys can only be completed with a limited range of participants (e.g., instant rebate participants but not those who benefit from the buy-down), the survey responses will be of somewhat reduced value in the savings analysis as they cannot address the whole population of participants.

3.1.9 Timeline, Budget, and Projected Savings

The program could begin in January 2009. Table 3-1 projects program MW and GWh savings, program budgets, and estimated participation for 2008, 2009 and 2010.

Table 3-1. Efficient Products: Program Goals and Budget

Efficient Products	Incremental Impacts		Budget (million 2008$)	Units or Participation
	MW	GWh		
2008	0.0	0.0	$0.050	0
2009	1.5	5.7	$2.455	7,500
2010	3.2	13.0	$5.126	15,000

The program has an approximate benefit-cost ratio of 2.2 in 2009 and 2.3 in 2010 for the total resource cost test. The program benefits are estimated using NSPI's updated levelized avoided cost estimates of 9.5 cents per annual kWh saved, plus $63.39 per annual peak KW saved.

3.2 EnerGuide for Existing Houses

3.2.1 Description

Nova Scotia Power will seek to partner with Conserve NS and Natural Resources Canada (NRCan) to expand participation in the EnerGuide for Existing Homes Program (NRCan's ecoENERGY Retrofit-Homes Program). NSPI's Existing Homes Program will adopt EnerGuide NRCan ecoENERGY Retrofit-Homes Program platform and use their existing incentive schedule. We will invest in marketing and promoting the program to increase participation by electrically-heated homes and provide additional incentive funding.

3.2.2 Eligible Participants

The program will be available to owners of single-family homes including detached, semi-detached and low rise, multi-unit residential buildings in Nova Scotia Power's service area. For improvements to the building envelope, the program will target owners of existing, electrically-heated houses, including electric resistance, heat pump and Electric Thermal Storage (ETS) heated houses. For efficiency improvements of the end-use of electricity within the home, the program will target owners of existing houses regardless of the fuel source used for heating.

3.2.3 Eligible Measures

Typical retrofit measures are as follows:

- Air-leakage control - weather-stripping and sealants

- Moisture control and ventilation
- Attic insulation
- Basement insulation
- Insulating empty frame walls
- Replacing incandescent bulbs with CFLs
- Replacing old inefficient appliances, such as refrigerators, with energy efficient appliances

3.2.4 Rebates and Incentives

The program will increase participation and savings in the provincial and federal programs by:

- Helping to subsidize the initial energy audit
- Helping to provide for assessment of energy-efficient, end-use measures within the home
- Encouraging that the measures are implemented (e.g. help customers find contractors)
- Providing additional financial incentives for customers to install recommended measures

Thus the program seeks to stimulate the installation of energy-efficient measures in existing houses. Specifically, the program will:

- Encourage homeowners to improve the overall efficiency of the building envelope of their house through higher levels of insulation and air-sealing
- Encourage homeowners to install ENERGY STAR® labeled windows
- Encourage energy efficient water heater measures such as water heater blankets pipe insulation and low-flow devices
- Educate customers about the benefits of installing energy-efficient technologies in their homes and influence their buying decisions

Market Barriers that the program will seek to overcome include the following:

- Low customer awareness of the efficiency of their existing home
- Low builder and residential customer awareness of energy efficiency options in building renovation projects
- Low builder and residential customer awareness of some building envelope measures such as air sealing

Customers will benefit from the program by:

- Reducing energy usage
- Having a more comfortable home
- Improving resale value of the home

3.2.5 Planning and Administration

NSPI will partner with Conserve NS and the federal government in promoting the EnerGuide for Existing Homes/ecoENERGY Retrofit Program. We propose to work with Conserve NS to harmonize program designs into a uniform, province-wide program, where funding from the federal government is maximized.

3.2.6 Delivery and Implementation

At the provincial level, Conserve NS currently runs the EnerGuide for Existing Homes Program. NSPI plans to partner with Conserve NS and use the existing infrastructure including delivery agents (e.g., Clean Nova Scotia, ACAP Cape Breton and Sustainable Housing Education Consultants).

3.2.7 Marketing and Communications

Nova Scotia Power will promote the program by adding an element of educational information on the behavioral aspects of conservation and energy efficiency. This may take the form of written material as well as direction to web-based information on conservation and energy efficiency. Customers can combine information on house efficiency with that of simple and practical behavioral tips to maximize their potential energy savings. We will also promote the program also to renovators and contractors.

3.2.8 Evaluation, Monitoring and Verification Plan

This section describes the EM&V efforts for the first two years for this program. NSPI will seek to conduct this evaluation in partnership with Conserve NS to share costs and assess the full effect on the province by including results for all fuel types. The following describes the evaluation data collection approaches for the first year of the program:

Step 1: Establish Program Tracking Database

The database will track data on participants including their address, dates of program intervention such as the energy audit, and data on measures installed or actions taken including the timing of the actions, and the results of the follow up audit. The database will calculate initial estimates of savings by participant. NSPI will work with NRCan to understand the availability of data from their database and if any additional data requirements exist.

Step 2: Survey Participants

This survey will assess participants' satisfaction with the program and support savings estimates.

Construct survey sample of program participants. The participant sample will come from the program tracking database.

Implement survey of program participants. The survey should be implemented on a periodic basis to reach participants within two months of their participation. This will involve a link to the program tracking system that flags when customers should be surveyed, i.e., not later than three months after participation is complete to ensure appropriate recall on key questions addressing program attributes.

Topics that are likely to be covered include:

- Satisfaction with the audit and measures installed
- Verify actions recorded in the tracking database
- Actions taken in addition to those in the tracking database
- Reasons for participating
- Comfort
- Satisfaction with the effect of the actions on their energy bills
- Barriers to action
- Recommendations for program improvements

Step 3: Survey Nonparticipants

This survey will test awareness of program marketing materials and measure barriers to participation. Non-participants are included in this survey to determine what factors may be influencing or preventing home owners from participating in this program. Non-participants will include customers that entered but did not complete the program.

Construct sample of non-participants. Sample will come from our customer information system, screened for electric heated homes, and cross-checked with the program tracking database to eliminate participants.

Implement survey of non-participants. The survey should be implemented after program promotional efforts have been underway for six months or more.

Topics likely to be covered include:

- Awareness of program, marketing materials, and marketing messages
- Reasons for not participating in the program
- Actions taken to conserve energy
- Comfort

Step 4: Survey Energy Auditors

This survey will examine and document program processes and identify areas for improvement based on the experience of energy auditors.

Construct survey sample of program auditors. Sample will come from program records.

Implement survey of energy auditors. The survey should be implemented after the program has been underway for six months or more.

Topics to be covered include:

- Details of interacting with the program and program staff
- Satisfaction with program procedures
- Suggestions for program improvements
- Auditor's perspective on participation barriers
- Auditor's perspective on participants' issues with the program

Step 5: Interview Program Staff

This task will involve interviews with staff at the utility or agency responsible for implementing the EnerGuide for Existing Houses program.

Construct sample of program staff. In-depth interviews will be conducted with (or third parties such as consultants or partners) involved in program design and implementation, marketing, and tracking.

Implement survey of program staff. Some key staff will probably be interviewed more than once, with information exchanged as part of ongoing discussions about the program and evaluation effort. Interviews with key staff should start, at a minimum, within the first few months of the program to start to identify key issues.

Topics are likely to include:

- Goals for evaluation
- Program goals and logic model
- Program methods and approaches
- Target vendors
- Target homeowners and/or regions
- Program marketing design and implementation

Step 6: Process Evaluation

Process evaluation will be a key focus for the first year. The process evaluation will be done at about six to nine months after the program start date, and will use results from the first four data collection approaches. The participant surveys can provide periodic and timely feedback, as the surveys should be implemented close to the participation date. The other surveys can support a major process evaluation report late in the first year.

Step 7: Market Evaluation

Market effects evaluation will require only a limited effort. The market effects evaluation will use results from the first four data collection approaches. Given the house-by-house approach of this program, it is not likely that the evaluation can detect meaningful changes in the market in the near term and as a result, limited effort should be spent on this type of evaluation in the first year. However, the results from the surveys can provide valuable evidence to validate the program theory and hypothesis that the program interventions will eventually produce market effects. As a result, these surveys should be examined with an eye toward market effects shortly after they are implemented.

Step 8: Impact Evaluation and Validation

This effort will focus on estimating the savings of the program on participants in the first year of program activity. There are a number of ways in which this effort can be approached. Candidate approaches include:

- *Billing data analyses* – This may be a useful approach if there are enough participants and if the savings estimates are expected to be near or greater than 10 percent of the home's seasonal energy use, i.e., an effect large enough to be isolated by a regression model from other factors influencing energy use. If the effect is too small, billing data analyses can be unreliable. For billing analyses to work effectively, control variables on other factors that influence energy use will likely be required. These variables may include number of occupants, occupancy patterns (e.g., elderly stay-at-home individual, or a stay-at-home parent and child), and other major appliances. Also, control variables for weather are important if a pre-post participation analysis is to be performed. It may also require information on non-participating homes to allow participation in the program to be a variable in the regression equation and to allow for factors that vary across seasons to be addressed within a cross-sectional/time-

series model. Billing data analysis is best conducted after one full year of post-participation data are collected and can require relatively large sample sizes. Finally, the billing data analysis will use the initial estimate in the tracking system as a point of leverage within a statistically adjusted engineering (SAE) analysis method.

- *Engineering Simulation Analyses* – An engineering simulation model calibrated by billing and consumption data for a sample of participant homes can be conducted with and without the energy-efficiency measures. Advances in simulation methods have increased the use of this technique. These methods can also advance the accuracy of the estimates contained in the tracking system as they can model individual energy-efficiency measures.

The best approach to be applied for this project has not been determined at this time. Billing/statistical models that use a control group and address self-selection bias can provide direct estimates of net savings. Engineering methods provide estimates of gross savings from the measures installed and a second method must be used to address free ridership and spillover. This second method is usually conducted through a survey-based self report approach with an appropriate set of questions that support and cross-check responses. The best approach will be selected after some experience with the program implementation is obtained, the number of participants is determined, and the types of homes and measures installed.

It may also be the case that the first year produces savings that do not warrant additional effort beyond the engineering estimates developed for the tracking system. At some point, a billing analysis will likely be warranted, but it may be performed after two or three years of program operation.

At a minimum, the impact evaluation will perform validation of the measures installed to get an estimated gross savings realization rate. In this case, the effort will be placed on validation, i.e., insuring that the measures installed are working appropriately and have been installed correctly. Validation is a key EM&V activity.

3.2.9 Timeline, Budget, and Projected Savings

The program could begin in the fourth quarter of 2008. Table 3-2 projects program kW and kWh savings, program budgets, and estimated participation for 2008, 2009 and 2010.

Table 3-2. EnerGuide for Existing Houses: Program Goals and Budget

EnerGuide for Existing Houses	Incremental Impacts		Budget (million 2008$)	Units or Participation
	MW	GWh		
2008	0.1	0.6	$0.207	75
2009	0.7	4.5	$1.210	450
2010	1.3	8.9	$2.322	875

The program has an approximate benefit-cost ratio of 2.9 in 2008 and 2.7 in 2009 and 2010 for the total resource cost test. The program benefits are estimated using NSPI's updated levelized avoided cost estimates of 9.5 cents per annual kWh saved, plus $63.39 per annual peak KW saved.

3.3 Low Income Households

3.3.1 Description

The primary goal is to implement cost-effective, electrical, energy saving measures in residential low income households. Low income customers will not be required to pay for any of the cost of the DSM measures installed through this program.

NSPI proposes to partner with Conserve NS on their Low Income program. Funding will focus on those improvements that target cost-effective electrical savings opportunities.

The program's deliverables are to:

- Identify and implement electrical energy efficiency improvements. This would include direct installation of low-cost measures (CFLs, faucet aerators, etc.) to more significant actions such as refrigerator replacement, targeted thermal shell repair, insulation and air sealing, weather stripping etc., as appropriate.
- Achieve significant and cost effective electrical energy savings.
- Educate homeowners about behavioral actions they can take to further reduce their electricity consumption.

3.3.2 Eligible Participants

DSM program managers will seek a partnership arrangement with the department of Community Services to identify an appropriate method of identifying and prioritizing eligible households. Subject to detailed program design and partnership arrangements, the program will target low income customers who are owners of existing houses. For efficiency improvements to the building envelope, program funding will target owners of existing electrically-heated houses. For efficiency improvements of overall electrical end-use (CFLs, refrigerator replacement, etc.) within the home, we will target low income owners of existing houses regardless of the fuel source used for heating.

The program partnership will ensure that thermal shell improvements that reduce fossil fuel consumption will receive funding from Conserve NS, and electrical end uses are eligible for NSPI funding, all in a single coordinated message and program offering to the customer.

3.3.3 Eligible Measures

Typical retrofit measures are as follows:

- Air-leakage control - weather-stripping and sealants

- Attic insulation
- Basement insulation
- Insulating empty frame walls
- Replacing incandescent bulbs with CFLs
- Replacing old inefficient appliances, such as refrigerators, with energy efficient appliances

3.3.4 Rebates and Incentives

Participation in the low-income component will not require participant spending. Program funding per house could be in the range of $500 to $3,500.

Market Barriers that the program will seek to overcome include the following:

- Low income households often cannot afford upfront costs for energy efficiency, thermal shell improvements, or lighting and appliance upgrades
- Low builder and residential customer awareness of energy-efficiency options in equipment replacement markets
- Low builder and residential customer awareness of building envelope measures such as air sealing

Customers will benefit from the program by:

- Reducing energy usage
- Having a more comfortable home
- Improve resale value of the home

3.3.5 Planning and Administration

The program is envisioned to be a partnership between the DSM Program and Conserve NS. Actual field implementation will be completed by firms/agencies selected through

an RFP process. Efforts will be made in the program partnership so a uniform offering can be designed for low income households of all fuel types, with NSPI contributing to the electrical efficiency improvements of the homes.

3.3.6 Delivery and Implementation

Delivery and implementation is contemplated to be awarded through an RFP process, open to qualified for profit and not-for profit agencies, including community action agencies, with the demonstrated ability and expertise to conduct energy audits and oversee direct installation of energy efficiency measures and thermal shell improvements. Ideally, a single "umbrella" agency can then serve as the overall logistical coordinator and financial agent for sub-contracts to implementation agencies located throughout the province. Sub-contracted agencies will be responsible for completing the energy audit and using their professional judgment to identify measures/actions that will most economically realize electrical savings (e.g. air sealing or refrigerator replacement). NSPI and the evaluation contractors will be actively involved in quality control and periodic review of program design, implementation, and results.

3.3.7 Marketing and Communications

The bulk of program promotion will occur through the participating agencies. The participating agencies will be directed to promote the Low Income Households Program during presentations to community organizations, leave information at neighborhood community and recreation centers, and respond to customer calls directed from NSPI. As appropriate, NSPI will inform customers about the program during outreach presentations. NSPI's website will direct interested parties to call the participating agencies.

3.3.8 Evaluation, Monitoring and Verification Plan

This section describes the EM&V efforts and evaluation data collection approaches for the Low Income program. NSPI will seek to evaluate this program in partnership with

Conserve NS to share costs and assess the full effect on the province by including results for all fuel types.

Step 1: Establish Program Tracking Database

The database will track data on participants including their address, dates of program intervention, and detailed data on measures installed and actions taken. The database will calculate initial estimates of savings by participant.

Step 2: Survey Participants

The purpose of this survey effort will be to assess satisfaction with the program and support savings estimates.

Construct survey sample of participants. The sample will come from the program tracking database.

Implement survey of participants. The survey should be implemented on a periodic basis to reach participants within a couple months of their participation. This survey can be linked to program implementation in that the program tracking system can flag when participants should be surveyed, and the survey should be conducted no later than three months after participation to allow for appropriate customer recall.

Topics which will be included are:

- Satisfaction with the audit (if any) and measures installed
- Verify actions recorded in the tracking database
- Actions taken in addition to those in the tracking database
- Comfort
- Satisfaction with the effect of the actions on their energy bills
- Barriers to action

- Recommendations for program improvements

Step 3: Survey Contractors

The purpose of this survey is to examine and document program processes and identify areas for improvement from the viewpoint of contractors implementing the equipment or measure. This will likely take the form of a telephone survey and will include both contractors participating in the program and those not participating.

Construct survey sample of contractors. The sample can come from program records and from interviews with program managers.

Implement survey of contractors. The survey should be done after the program has been fully operational for a few months to ensure contractors have had the opportunity to get accustomed to program procedures and, where relevant, have had ample opportunity to market the program and gauge potential participant reaction to the program.

Topics likely to be covered in the survey include:

- Details of interactions with the program and program staff
- Satisfaction with working procedures
- Suggestions for improvements
- Perspective on participation barriers
- Perspective on participants' issues with the program

Step 4: Interview Program Staff

The task will involve interviews with utility staff and other key individuals responsible for implementing the low income program to assess barriers and issues that need to be addressed.

Construct sample of program staff. In-depth interviews will be conducted with NSPI staff (or third parties such as consultants or partners) involved in program design and implementation, marketing, and tracking.

Implement survey of program staff. Some key staff will probably be interviewed more than once, with information exchanged as part of ongoing discussions about the program and evaluation effort. Interviews with key staff should start at a minimum within the first few months of the program to start to identify key issues.

Topics likely to be covered include:

- Goals for evaluation
- Program goals and logic model
- Program methods and approaches
- Target low income population
- Target homeowners and/or regions
- Program marketing design and implementation

Step 5: Process Evaluation

As with the other programs, process evaluation will be the key focus for the first year. The process evaluation will be done about six months after the program start and will use results from all data collection approaches.

Step 6: Market Evaluation

Market effects evaluation will require only a limited effort. Due to the nature of this program, it is not expected that it will have significant market effects in the near term and limited evaluation activity will be planned.

Step 7: Impact Evaluation and Validation

The program is likely to involve direct installation of measures, and, if so, validation of installation and retention of measures would be a priority for impact evaluation. The impact analysis will be similar to that of the EnerGuide for Existing Houses program.

3.3.9 Timeline, Budget, and Projected Savings

NSPI proposes to begin detailed development work on this program in the first quarter of 2008, with implementation starting in the second quarter.

Following is a preliminary breakdown of the 2008 cost estimates for this program. These are total budget estimates and do not include the effects of potential funding partnerships.

Program Item	**Estimated 2008 Budget**
Delivery/Administration:	$35,000
Marketing:	$20,000
Customer Incentives:	$415,000
Technical Assistance:	$21,000
Monitoring and Evaluation:	$20,000
Total:	**$511,000**

Table 3-3 projects program kW and kWh savings, program budgets, and estimated participation for 2008, 2009 and 2010. The program savings estimates are based on the residential sector analysis previously completed by Summit Blue Consulting.

Table 3-3. Low Income Households: Program Goals and Budget

Low Income Households	Incremental Impacts		Budget (million 2008$)	Units or Participation
	MW	GWh		
2008	0.2	1.7	$0.511	150
2009	0.5	2.6	$1.009	300
2010	0.9	3.7	$1.900	575

The program has an approximate benefit-cost ratio of 3.9 in 2008, 3.6 in 2009 and 3.5 in 2010 for the total resource cost test. The program benefits are estimated using NSPI's updated levelized avoided cost estimates of 9.5 cents per annual kWh saved, plus $63.39 per annual peak KW saved.

3.4 EnerGuide for New Houses

3.4.1 Description

Each year, approximately 3,000 new homes are built in Nova Scotia, creating new demand for electricity. These new homes offer untapped opportunities to implement energy efficiency measures.

The primary objective of the program is to stimulate construction of more energy efficient new homes. The program will build on the existing EnerGuide for New Houses program. NSPI's plans to partner with Conserve NS and the Nova Scotia Home Builders' Association (NSHBA) to more widely market the program, assist with training contractors, educate prospective homeowners, and advance the adoption of highly efficient residential building practices throughout the province.

The EnerGuide for New Houses program provides home energy ratings and efficient construction practice design advice to builders prior to the completion of new homes. The program is delivered by the NSHBA, who collects data on a home's planned building envelope and heating system and then uses software to model the home's expected energy consumption. Suggested improvements are given to the builder and can be built

into the home's design to improve its expected energy performance. The home is then rated on a scale of 0-100 based on its modeled energy performance. Labeling the home provides homebuyers with a benchmark of how energy-efficient a home is relative to other homes. R-2000 is another program design of NRCan which promotes the construction of super efficient residential new construction homes. The features and benefits of an R-2000 home are presented in Figure 3-1.

Figure 3-1: Features and Benefits of an R-2000 Home[3]

Features: R-2000 Home	**Benefits: R-2000 Home**
Here are some of the features of an R-2000 home: • Continuous whole house ventilation • Environmentally friendly building products • A continuous building envelope to reduce drafts and cold spots • Energy-efficient appliances, lighting, doors and windows • Higher levels of insulation • Advanced heating and cooling systems • R-2000 receives a certificate from Natural Resources Canada	There are many benefits to owning an R-2000 home: • Healthier indoor air quality • Healthier building products and materials • Reduced energy bills • Reduced greenhouse gas emissions • Reduced water consumption • Increased thermal comfort • Backed by 20 years of research by the government and industry • Rigorous, third-party quality assurance • Built by licensed R-2000 professionals

3.4.2 Eligible Participants

The target market for the Residential New Construction (RNC) program will be purchasers, developers and builders of new houses in Nova Scotia. Participating

[3] Source: Nova Scotia Homebuilders' Association

customers who have builders upgrade the design of their new home utilizing the EnerGuide for New Houses software to achieve an EnerGuide rating of 80 or better or achieve R-2000 status will be eligible for the rebates and incentives described below.

3.4.3 Rebates and Incentives

A Heating System Incentive will be structured on an increasing scale to encourage builders of new homes (that are contemplating conventional electric resistance space heat) to upgrade to a heat pump or electric thermal storage system or a combination of these with either a forced air or hydronic distribution system. For example, a conventional electric resistance system would not be eligible for an incentive however a forced air or hydronic distribution using a heat pump system with electric thermal storage back-up would attract the top incentive.

An Appliance and Lighting Incentive package will offer additional incentives and be available to all eligible participants regardless of their choice of heating system.

The details of the incentive packages will be addressed further in the detailed program design phase and after consultation with anticipated partners, Conserve NS, NRCan and the NSHBA.

The program's deliverables are as follows:

- Encourage homebuilders to utilize the EnerGuide for New Houses (EGNH) labeling tool to build a more energy-efficient home and go beyond and complete the construction of an R-2000 home
- Encourage homebuilders to install Energy Star® labeled products including windows, heating systems, insulation, lighting, and appliances. Encourage homebuilders to include additional energy efficient products that are not captured within the EGNH or R-2000
- Educate customers about the benefits of having energy-efficient technologies in their homes and influence their buying decisions

- Continue to support the establishment and growth of a high performance residential new construction building community, promoting energy efficient products and high performance building materials

3.4.4 Planning and Administration

This program is best managed through partnerships and third party service providers. NSPI will propose a partnership with Conserve NS for coverage of cost-effective non-electric measures. In particular, NSPI would like to structure the partnership design with Conserve NS to minimize the possibility of the builder choosing one energy source over another, simply for a higher rebate amount.

3.4.5 Delivery and Implementation

NSPI plans to partner with Conserve NS, NRCan and the Nova Scotia Home Builders' Association and add value through additional program marketing and financial rebates.

3.4.6 Marketing and Communications

Advertising in targeted media to builders and new home buyers will be used to generate interest, understanding, and ultimately market demand. NSPI would work with developers to help enhance their knowledge and gain support for the program.

To launch the program, NSPI proposes to partner with Conserve NS in the promotion of efficient residential new construction and provide incentives for EnerGuide 80 and R-2000.

3.4.7 Evaluation, Monitoring and Verification Plan

This section describes the first year EM&V efforts for this program. NSPI will seek to work with Conserve NS on this evaluation to share costs and assess the full effect on the

province by including results for all fuel types. The following describes the evaluation data collection approaches for the first year of the program:

Step 1: Establish Program Tracking Database

The database which can be a spreadsheet will record data on participants including their address, dates of home occupancy, and data on measures installed and/or actions taken. The database will calculate initial estimates of savings by participant, using NRCan engineering estimates for measures where appropriate and developing such estimates for measures not included in the NRCan program.

Step 2: Survey Builders

Both participating and non-participating builders will be interviewed. It may be the case that most of the builders may be participants in the program. If this is the case, often the builders will build some homes that are included in the program and some homes that are not considered participating homes. Understanding the reasons for the participant/non-participant decision may be important. It might also be useful to contact other informed market actors. There may be other trade associations that should be contacted to see how the program is affecting their market. This might include the NSHBA, as well as providers of supplies to home builders (e.g., appliances, insulation, and/or building materials).

Construct samples for builder surveys. The samples will be developed from program records and interviews with program managers. If necessary, initial builders interviewed can be asked to name competitors most active in new construction. It is expected that most samples will be stratified into at least three strata boundaries defined by initial estimated savings. This approach is known a proportional stratification. For example, a census may be conducted for the builders that account for the most home construction, while builders that complete few homes may be sampled. As a general rule, the number of contacts in the top strata tiers include builders or home owners responsible for 1/3 of the savings (this may be a census), a second strata accounts for builders or home owners

that account for the next third of program savings, and the third strata accounts for the balance of the savings, i.e., the last third of program savings. Equal sample sizes are developed for each of the three strata. This approach has worked well in other applications, is intuitive in that it obtains more information on those applications that account for the largest savings while ensuring that all participants are represented in the sample, and this approach has been shown to be an efficient sampling approach when estimating savings for an entire program.

Implement builder surveys. The initial builder survey should be implemented after the program has been fully operational for a few months to ensure builders have had the opportunity to get exposed to the program and begin to market it. This first survey would focus on process issues. A second survey should be conducted approximately one year after the first survey that will include process questions, but will also focus on factors that may influence program savings and the validation of the initial estimates included in the program tracking system.

Topics to be covered in the survey are likely to include:

- Awareness of the program
- Satisfaction with the program
- Suggestions for program improvements
- Changes in building practices
- Changes in marketing practices

Step 3: Survey Homeowners

Surveys of homeowners (both program participants and non-participants) can be important in assessing reasons for selecting an energy efficient home and factors that the homeowners believe are important in this choice.

Construct sample for homeowner survey. Sample will include those who bought qualifying efficient homes, as well as those who did not. The sample can be selected from builder's records and/or from NSPI's billing system by pulling records that show new meter placements.[4] As was the case for the builder survey sample, a form of proportional sampling with three strata will be used if the information is available for such stratification. The survey will be performed on a sequential basis with the tracking system noting home owners that have been in their homes for three months after participation. This will ensure that the homeowners will have appropriate recall related to the reasons for participating and provide enough time to assess satisfaction with their home. Also, a one year follow-up may be needed to assess the home performance across all seasons.

Implement home owner survey. The survey should be implemented as soon as enough homes have been built under the program labels to support a valid sample; a sample from the first 25 to 50 homes would give adequate early feedback. A rolling survey could be implemented to interview new participants shortly after they move into their new homes.

Topics to be covered in the survey are likely to include:

- Awareness of the program and the labels
- Awareness of marketing of the program labels and energy efficiency from their builder
- Influence of program labels and energy efficiency on their purchase decision
- Satisfaction with the home
- Comfort level
- Satisfaction with the program

[4] Some secondary research may be needed to differentiate between those with replaced meters and those in new houses.

Step 4: Survey Contractors

This involves a survey of contractors who have been trained by the program. This could take the form of a printed survey handed out at the conclusion of training or a phone call shortly after. Sampling will be based on the most active contractors, but the sampling frame will include all contractors – both those trained by the program and those that have decided not to participate, in order to gather information of both participation and non-participation factors.

Topics likely to be covered in the survey include:

- Satisfaction with the training
- Recommendations for improvements
- Intention to change behaviour based on material covered in the training
- Differences between contractors that have undergone training and those that have not chosen to take the training

Step 5: Interview Program Staff

This task will involve interviews with personnel at the utility responsible for implementing the residential new construction program.

Construct sample for program staff interviews. In-depth interviews will be done with NSPI staff (or third parties such as consultants or partners) involved in program design and implementation, marketing, and tracking.

Implement survey of program staff. Some key staff will probably be interviewed more than once, with information exchanged as part of ongoing discussions about the program and evaluation effort. Interviews with key staff should start, at a minimum, within the first few months of the program to start to identify key issues.

Topics likely to be covered include:

- Goals for evaluation
- Program goals and logic model
- Program methods and approaches
- Target builders
- Target homeowners and/or regions
- Program marketing design and implementation
- Any issues pro or con that are effecting the delivery of the program

Step 6: Process Evaluation

Process evaluation will be a key focus for the first year. The process evaluation will be done about six to nine months after the program start and will use results from all four data collection approaches. The evaluation can provide ongoing feedback from the recent home buyer surveys as they should be implemented close to the move-in date to ensure accurate recall. The same concept applies to the contractor training surveys.

Step 7: Market Evaluation

Market effects evaluation will require only a limited effort. The market effects evaluation will use results from all four data collection approaches. Given the long lead time involved in marketing and building homes, it is not likely that the evaluation can detect meaningful changes in the market in the near term and, as a result, limited effort should be spent on this in the first year. However, the results from the builder's surveys can provide valuable evidence to support the program theory and hypothesis that the program interventions will eventually produce market effects. As a result, these surveys should be examined with an eye toward market effects shortly after they are implemented.

Step 8: Impact Evaluation and Validation

In this first year evaluation effort, it is not expected that many homes will be completed and registered as program participants. As a result, the work on impact evaluation will likely be based on the engineering estimates in the tracking system. This does pose a challenge to develop reasonable impact estimates for use in the tracking system that reflects the characteristics of each house. The impact evaluation for the first year likely will be largely based on the initial estimates in the tracking system for participants with new homes using electric heat pumps or thermal cool storage for each type of labeled home. These will be multiplied by engineering estimates of savings from NRCan sources or derived by program managers to determine gross program impacts. Data from the surveys of new home buyers will be used to assess the net savings of the program, i.e., net of participants who would have taken the actions without the NSPI incentive.

After the first year, it is likely the billing analyses and engineering simulation approaches calibrated to billing and consumption data will be used to estimate program savings along with the survey results. Evaluations of new home programs can pose difficulties in that there is no pre-program participation data that can be used to compare to the current consumption of the home. Billing analyses are used for new home programs when there are data available on both program participants and on homes that did not participate in the program, but the trend has been to move to engineering simulation analyses that model the home with and without the energy efficiency measures, supported by survey data and site-specific data. These simulations can also be used to update the engineering estimates used in the tracking system.

3.4.8 Timeline, Budget, and Projected Savings

The program could begin in the fourth quarter of 2008. Table 3-4 projects program MW and GWh savings, program budgets, and estimated participation for 2008, 2009 and 2010.

Table 3-4. EnerGuide for New Houses: Program Goals and Budget

EnerGuide for New Houses	Incremental Impacts		Budget (million 2008$)	Units or Participation
	MW	GWh		
2008	0.1	0.3	$0.126	75
2009	0.3	1.3	$0.479	300
2010	0.5	2.5	$0.959	600

The program has an approximate benefit-cost ratio of 2.1 for the total resource cost test. The program benefits are estimated using NSPI's updated levelized avoided cost estimates of 9.5 cents per annual kWh saved, plus $63.39 per annual peak KW saved.

3.5 Commercial and Industrial Prescriptive Rebate

3.5.1 Description

The Commercial and Industrial (C&I) Prescriptive Rebate Program promotes the purchase of qualifying high-efficiency equipment. Rebates serve to reduce the difference between the cost of high-efficiency versus standard equipment, thereby making the high-efficiency equipment a more attractive option for customers and trade allies promoting the products. Traditional prescriptive rebate programs have been successful across North America as a means of providing cost-effective energy savings for utilities and their customers.

Specifically, the program will offer customers pre-determined rebates for the installation of eligible equipment relating to: lighting, heating, ventilation, and air conditioning.

Key program features include the following:

- A single consolidated program design covers a wide range of common efficient C&I measures

- Clearly defined rebates and measure eligibility criteria reduce administrative costs while simultaneously encouraging customer participation
- Rebates and eligibility criteria are measure-specific. For example, lighting rebates may be per fixture while HVAC rebates may be defined per unit of equipment.
- Rebates are designed to overcome customer investment barriers
- Program provides support to trade ally firms in key delivery channels who act as the primary sales force

3.5.2 Eligible Participants

This program will target C&I customers purchasing new or replacement equipment in existing facilities. The program will also be available to customers installing efficient equipment in new facilities if the customer does not participate in the more comprehensive C&I New Construction Program.

3.5.3 Measures and Incentives

Measures will be defined through the program. Typical measures include the following:

- ***Lighting:*** high-performance fluorescent lighting systems, high-bay fluorescent lighting systems, compact fluorescent fixtures and lamps, day lighting controls, occupancy sensors, pulse start metal halide, and high pressure sodium systems, LED exit signs, LED traffic lights and signals
- ***HVAC:*** rooftop air conditioners, air-source heat pumps, water-source heat pumps, dual enthalpy economizer controls, ECM furnace fan motors, and chillers

The program will offer pre-determined rebates for qualified lighting and HVAC energy efficiency measures. Eligibility standards will also differ by end-use. For example, in

the case of lighting, the eligibility standard may be for a specific type of lamp, such as a four foot high performance T-8 fluorescent fixture; or in the case of a HVAC system, it may be a specific efficiency rating.

Rebates for high-efficiency equipment will be developed based on rebates offered elsewhere in effective North American DSM programs and a review of the specific market forces and characteristics for Nova Scotia. If the cost of a measure (such as a CFL) drops below the specified rebate, the rebate will be adjusted downward. NSPI will institute a process to screen measures for cost-effectiveness and revise incentive levels as needed to adjust to changing market demand and available budgets.

3.5.4 Planning and Administration

This program can be administered by NSPI staff together with program design and implementation support consultants. NSPI will explore possibilities for partnership opportunities to cover non-electric HVAC measures.

3.5.5 Delivery and Implementation

Staff will conduct program marketing and promotion, as discussed below, as well as specify program requirements. The program delivery model is straightforward: customers and/or trade allies fill out an application form. The information is then processed and paid by NSPI. NSPI may develop an on-line interface for the program that allows customers and trade allies to file applications through a web interface.

3.5.6 Marketing and Communications

Nova Scotia Power will promote this program primarily through a trade-ally support program. Since customers often rely on the advice of contractors and other local professionals, it is essential that the program identify and work closely with key market participants and trade allies. For the Prescriptive Rebate Program, trade-ally support will focus on the following:

- Point-of-sale brochures and other materials to target customers during their purchase decision
- Training on program requirements (qualifying equipment, rules, regulations, application requirements, etc.)
- Sales training covering the features and benefits of high efficiency equipment and techniques for "upselling" customers to high-efficiency models
- Ongoing communication and education through regular seminars, emails, and a dedicated trade ally web site
- Training and communications that promote general awareness of all programs

We will also seek to support the program through personal customer contacts. NSPI representatives will be trained on program operations and will be responsible for educating large customers on program features and helping customers identify qualifying projects. Call center and other customer service staff serving smaller customers will also be trained on general program features and can funnel customer inquiries to the NSPI energy efficiency web page for more information.

NSPI will also provide broad marketing support, which may include direct mail campaigns, bill inserts, web site, brochures, appearances at trade shows and other large-scale events, and broadcast advertising through radio, internet, newspaper, and television.

3.5.7 Evaluation, Monitoring and Verification Plan

This section describes the first year EM&V efforts and evaluation data collection approaches for this program.

Step 1: Establish Program Tracking Database

The database will track data on participants including their address, dates of program intervention including rebated measures, and detailed data on measures installed or actions taken. The database will calculate initial estimates of impacts by measure or project and participant and will have the ability to aggregate impacts by sector and measure type.

Step 2: Survey Participants

This survey will be designed to measure satisfaction of building owners with the program and support impact estimates.

Construct sample of participants. The sample will come from the program tracking database.

Implement survey of participants. The survey should be implemented on a periodic basis to reach participants within a couple months of their participation.

Topics to be included in the survey include:

- Satisfaction with the program and measures installed
- Verify actions recorded in the tracking database
- Actions taken in addition to those in the tracking database
- Reasons for participating
- Barriers to action
- Recommendations for program improvements

Step 3: Survey Nonparticipants

The survey will assess the awareness of the program and program marketing material of customers who have not participated in the program, and measure barriers to participation in the program.

Construct sample of non-participants. The sample will come from NSPI's customer information system cross-checked with the program tracking database to eliminate participants.

Implement survey of non-participants. The survey should be implemented after program promotional efforts have been underway for six months or more.

The following are topic areas which will be assessed:

- Awareness of program, marketing material, and marketing messages
- Reasons for not participating in the program
- Actions taken to conserve energy

Step 4: Survey Equipment Contractors

This task is a survey of contractors who have installed the DSM program measures in order to examine and document program processes and identify areas for improvement.

Construct sample of DSM contractors. The sample will come from program records of prescriptive measures and custom projects for commercial or industrial facilities.

Implement survey of DSM contractors. The survey should be implemented after the program has been underway for six months or more.

Topics likely to be covered include:

- Details of interacting with the program and program staff
- Satisfaction with working procedures
- Suggestions for improvements
- Contractor's perspective on participation barriers
- Contractor's perspective on participants' satisfaction with the program

Step 5: Interview Program Staff

This task will involve interviews with staff at the utility responsible for implementing the C&I Prescriptive Rebate program.

Construct sample of program staff. In-depth interviews will be conducted with NSPI staff (or third parties such as consultants or partners) involved in program design and implementation, marketing, and tracking participation.

Implement survey of program staff. Some key staff may be interviewed more than once, with information exchanged as part of ongoing discussions about the program and evaluation effort. Interviews with key staff should start at a minimum within the first few months of the program to start to identify key issues.

Topics are likely to include the following:

- Goals for evaluation
- Program goals and logic model
- Program methods and approaches
- Target trade allies/contractors
- Target buildings and/or sectors such as offices, small manufacturing, etc.
- Program marketing design and implementation

Step 6: Field Data Collection

This task will involve the collection of data from customer sites to support the impact analysis, particularly for large projects.

Data collection approach. Gather pre- and post-installation data to verify program tracking data and update assumptions used in the engineering impact algorithms. The on-site work will include simple walk-through inspections, counting installed equipment, collecting name-plate information, selected use of data loggers, spot monitoring, and the installation of metering and monitoring equipment.

Construct sample of field data sites. A sample of program participants from the program tracking database will be created to represent a cross section of customer types and measures installed.

Implement field data collection. Field work should be implemented after a sufficient quantity of participants has received their incentives to support adequate sampling.

Data to be collected will include:

- Identify or estimate baseline conditions
- Verify measures installed
- Spot monitoring
- Data logging (run-time hours, energy consumption)
- Characteristics of the building (size, insulation, age, etc.)
- Billing data for the site or building

Step 7: Process Evaluation

Process evaluation will be the key focus for the first year. The process evaluation will be done about six months after the program start and will use results from the first four data

collection approaches. The participant surveys can provide periodic and timely feedback as they should be implemented close to the participation date. The other surveys can support a major process evaluation report late in the first year.

Step 8: Market Evaluation

Market effects evaluation will require only a limited effort. Given the participant-by-participant approach of this program, it is not likely that the evaluation can detect meaningful changes in the market in the near term and as a result, limited effort should be spent on this in the first year.

Step 9: Impact Evaluation and Validation

Impact evaluation will use field data collection and survey data to modify initial engineering estimates, to verify program-reported measures, adjust baseline assumptions, and adjust other key assumptions in the engineering savings algorithms. This will be done both for prescriptive lighting measures such as Super T-8 lighting and for HVAC measures in both C&I facilities. For larger commercial facilities, simulation models based on prototypical samples of buildings that participate in the program will use field data collected and calibrated to utility billing data. For projects that involved an audit of facilities and/or processes to determine energy savings, the savings analysis will compare estimates of measure savings to actual site data; typically, with the support of an engineering simulation model that uses the audit information and is calibrated to billing and other consumption data.

In the first year of the program, it is likely that most projects will involve simpler prescriptive measures, and the impact evaluation will mainly address numbers of participants, verification of installation of measures, and review of calculations of engineering estimates. In following years, regression models calibrated to site energy data will be used to obtain more accurate estimates of savings.

3.5.8 Timeline, Goals, Budget, and Projected Savings

The program could begin in the first quarter of January 2009. Table 3-5 projects program kW and kWh savings, program budgets, and estimated participation for 2008, 2009 and 2010.

Table 3-5. C&I Prescriptive Rebate: Program Goals and Budget

C&I Prescriptive Rebate	Incremental Impacts		Budget (million 2008$)	Units or Participation
	MW	GWh		
2008	0.0	0.0	$0.050	0
2009	1.7	14.1	$1.547	375
2010	3.5	28.1	$3.094	750

The program has an approximate TRC benefit-cost ratio of 4.6. The program benefits are estimated using NSPI's updated levelized avoided cost estimates of 9.5 cents per annual kWh saved, plus $63.39 per annual peak KW saved.

3.6 Commercial and Industrial Custom

3.6.1 Description

Custom DSM programs for commercial businesses and industries have been successful across North America as a method of providing cost-effective demand and energy savings for power companies and their customers. These programs provide the flexibility to implement measures that are unique to large, complex customer facilities, but are not served by other, prescriptive DSM programs.

A C&I Custom Program will include following activities:

- C&I Custom Rebates: Will provide incentive funding for new equipment that does not have a prescriptive level of energy savings. Rebates will be

project-specific, based on the demand and energy savings from an energy efficient product compared to a similar standard efficiency product. For example, savings from installing adjustable speed drives vary considerably from application to application, even when installed on the same size motors.

- C&I Custom Partners: Will help larger NSPI customers to implement custom projects that are unique to their business. All projects submitted must pass the Total Resource Cost (TRC) test, and projects that can be completed sooner will get higher priority.

The key features of these programs are as follows:

- A single, consolidated service design.
- No-interest financing for eligible costs, with repayment through installments on the customer's electricity bills.
- Co-funding for energy engineering analyses by qualified professionals.
- A test equipment loan service to facilitate engineering analyses. This service will allow customers to borrow specialized test equipment for a predefined period, avoiding the associated purchase or rental costs. Examples include ultrasonic leak detectors for compressed air systems or data loggers for tracking electric motor loads. If a customer must rent specialized equipment to find opportunities and confirm savings, NSPI will pay a portion of the rental costs.
- NSPI will provide support to firms in key delivery channels who will act as the primary sales force.

3.6.2 Eligible Participants

The C&I Custom Program will target larger commercial, industrial and municipal customers. Incentives will be provided for improved efficiency in facilities,

manufacturing processes and infrastructure systems (such as municipal water treatment). Most participants will be existing customers, although new facilities will also be eligible.

Typical customers will have a monthly peak demand of at least 250 kW (kVA as applicable). Smaller customers in these classes will be eligible for the Small Business Direct Install Lighting Program or the C&I Prescriptive Rebate Program. Customers operating in more than one location may group measures from multiple sites into a single project, with the approval of the program manager.

Typical customers that can participate in the C&I Custom Program will include the following:

- Education (P-12, universities, colleges, specialty)
- Healthcare
- Resource-based industry (fisheries, aggregates, mining, lumber, agricultural and other)
- Manufacturing and processing industries
- Municipalities (facilities and municipal systems)
- Office
- Retail
- Military
- Sports complexes
- Others as applicable

3.6.3 Eligible Measures

NSPI was a co-sponsor of a recent study[5] that estimated the conservation potential for the

[5] "Energy Management Potential & Best Practices Benchmarking in the Nova Scotia Industrial and Manufacturing Sector"; Canadian Manufacturers and Exporters, Nova Scotia Division; December, 2007; Available for download at http://www.cme-ec.ca/ns/template2_ns.asp?p=999.

industrial customer sector. In general, the measures targeted by the C&I Custom Program are aligned with the electrical efficiency opportunities identified by that report. Eligible measures include:

- Process or system improvements as identified by customers or engineering analyses
- Control systems
- Compressed air system upgrades, leak detection and repair
- Refrigeration system controls and upgrades
- Advanced lighting systems and controls
- Variable Frequency Drives
- Heating, Ventilating and Air Conditioning (HVAC): Advanced system upgrades and controls not covered by the C&I Prescriptive Rebate Program

The C&I Custom Program will not fund fuel-switching measures or cogeneration projects.

3.6.4 Rebates and Incentives

The C&I Custom Program will provide incentives based on a standard amount per kW or kWh reduced by the measure.

Customer incentives will be defined during detailed program design, and may be adjusted through program experience. Typically, the funding is the lesser of:

- $0.05 to 0.15 per kWh (first year) saved or up to $200 per kW saved depending on the measure type
- Up to 60 percent of eligible costs

- Customer specific payback reduction requirement
- Maximum $500,000 per project[6]

Where an engineering analysis is required to identify costs and benefits, the program will provide an incentive of fifty percent of the study cost (to a maximum amount). In addition, the program will rebate the customer's portion (to a maximum amount) of these costs if that customer implements a certain percentage (to be defined) of the measures within one year after receiving the final engineering analysis. Eligible costs will include consultants, subcontractors, labour and materials directly associated with the study.

3.6.5 Planning and Administration

NSPI proposes to plan and administer the program. A combination of internal staff and external consultants will specify program requirements. NSPI will direct the program marketing and promotion activities.

NSPI will seek partnership agreements with other agencies that are funding similar programs in the Province. These arrangements will be finalized during program development. The program manager will retain responsibility for overall program strategy, authorization of rebate payments, and management of in-house or contracted program staff.

Key program development tasks include the following:

- Develop funding partnership agreement(s);
- Finalize eligible measures list;
- Finalize marketing approach;

[6] The proposed incentives are within the range of what other C&I Custom programs offer. The National Energy Efficiency Best Practices Study, Volume NR5 – Non-Residential Large Comprehensive Incentive Programs Best Practices Report provides a summary of incentive approaches. Available for download at http://www.eebestpractices.com/pdf/BP_NR5.PDF.

- Develop support and marketing materials;
- Finalize financing and payments processes;
- Establish monitoring and verification requirements, including data required for overall program evaluation;
- Train Technical Partners, vendors and Company staff.

3.6.6 Delivery and Implementation

NSPI proposes to deliver and implement this program primarily using our staff. They will conduct program marketing and promotion, as discussed below, as well as specifying program requirements. Applications for the C&I Custom Program will undergo additional review and analysis in comparison to the more standard measures covered by the C&I Prescriptive Rebate Program. NSPI pre-approval for custom measure applications will be required. Monitoring and evaluation will be undertaken for the larger and more complex applications, as the ability to accurately estimate energy savings is often dependent on establishing application-specific baseline information on customers' existing equipment before the replacement with high efficiency equipment is made.

A preliminary model of the delivery process includes the following steps:

- If required, the customer selects a Technical Partner (TP) from a pool of pre-qualified consultants or service providers. A customer may nominate a consultant or in-house staff as their TP, provided their qualifications are suited to the project.
- The customer and TP submit an application describing preliminary savings and cost estimates.
- NSPI reviews the application to confirm eligibility for either the Custom Rebate or the Custom Partners program components.
- Where required, the customer and TP complete an engineering analysis. NSPI may also accept the results of a recently-completed study if of an acceptable level of quality and detail.

- NSPI reviews the engineering analysis (if applicable).
- NSPI pays the customer a rebate of up to fifty percent of the feasibility study cost.
- NSPI and the customer sign a project agreement specifying the measures, expected savings and incentive amounts, which may be revised based on actual measure performance.
- If required, a pre-retrofit, baseline energy use profile will be established.
- The customer implements the measure(s).
- NSPI verifies costs and savings.
- NSPI provides the incentives or rebates.

3.6.7 Marketing and Communications

Many large customers have identified conservation opportunities for their sites. A common barrier to implementation of these measures is the inability to raise capital, as energy projects must compete with other investments that often yield a higher return. Custom programs are designed to overcome this barrier through incentives that reduce the project payback to a level where the investment is attractive to the customer. Although a need for a comprehensive marketing approach is defined below, NSPI will also work directly with these customers, through established relationships, to find opportunities that may be implemented in the early phase of the program. As the program develops, the ongoing marketing efforts are expected to find new opportunities.

We will promote these programs primarily through consulting engineers, design consultants, equipment vendors, and other local professionals. These trade allies are usually consulted by customers making equipment purchase decisions. Trade-ally support will focus on the following:

- Printed case studies of sample measure installation results.
- Point-of-sale brochures, online information and other materials to target customers during their purchase decisions.

- Training on program requirements, sales and delivery (qualifying equipment, rules, regulations, application requirements, etc.).
- Ongoing communication through regular seminars, emails, and possibly a dedicated trade ally web site.
- Training and communications that promote general awareness of all programs.

Other marketing efforts will include:

- Through established relationships, company representatives will educate large customers on program features and help them identify qualifying projects.
- Relevant NSPI Contact Centre and Customer Service staff will be trained on general program features and will forward customer inquiries to the appropriate contact.

A key component of similar DSM programs offered by other power companies is the availability of easily-accessible, low or no-interest project financing. NSPI will offer no-interest financing and on-the-bill repayment of eligible customer costs.

Additional marketing strategies will be defined during detailed program development and could include:

- Direct mail campaigns
- Bill inserts
- Advertising on the company website
- Printed brochures
- Broadcast advertising
- Appearances at trade shows and other large-scale events
- Others as required

3.6.8 Evaluation, Monitoring and Verification Plan

This section describes the first year EM&V efforts and evaluation data collection approaches for this program.

Energy and demand savings will be verified for each project. The Monitoring and Verification (M&V) approach will vary depending on the complexity of the measure(s) and the magnitude of the expected savings.

Simple measures will use industry-accepted savings estimates, which may be verified through on-site measurements. More complex measures will require an M&V plan, outlining added requirements such as a pre-retrofit baseline and/or sub-metering. NSPI will use the International Performance Measurement and Verification Protocol (IPMVP) as a guide when specifying the M&V approach for each project.

Customer costs associated with the M&V plan, such as sub-metering, will be considered eligible for incentive funds.

Estimating the savings associated with new facilities or processes will often require simulation of baseline and high efficiency scenarios by designated specialists. During program development, one or more consultants will be pre-qualified for this purpose. Other specialized consultants can be used where required due to the complexity or type of customer system being evaluated.

Step 1: Establish Program Tracking Database

The database will track data on participants including their address, dates of program intervention including energy audit and rebated measures, and detailed data on measures installed or actions taken. The database will calculate initial estimates of impacts by measure or project and participant and will have the ability to aggregate impacts by sector and measure type.

Step 2: Survey Participants

This survey will be designed to measure satisfaction of building owners with the program and support impact estimates.

Construct sample of participants. The sample will come from the program tracking database.

Implement survey of participants. The survey should be implemented on a periodic basis to reach participants within a couple months of their participation.

Topics to be included in the survey include:

- Satisfaction with the program and the measures installed
- Verify actions recorded in the tracking database
- Actions taken in addition to those in the tracking database
- Reasons for participating
- Barriers to action
- Recommendations for program improvements

Step 3: Survey Nonparticipants

The survey will assess the awareness of the program and program marketing materials of customers who have not participated in the program and measure barriers to participation in the program.

Construct sample of non-participants. The sample will come from NSPI's customer information system, cross-checked with the program tracking database to eliminate participants.

Implement survey of non-participants. The survey should be implemented after program promotional efforts have been underway for six months or more.

The following are topic areas which will be assessed:

- Awareness of program, marketing material, and marketing messages
- Reasons for not participating in the program
- Actions taken to conserve energy

Step 4: Survey Contractors and Trade Allies

This task is a survey of contractors who have audited sites and/or installed the DSM program measures in order to examine and document program processes and identify areas for improvement.

Construct sample of contractors. The sample will come from program records of custom projects for commercial or industrial facilities.

Implement survey of contractors. The survey should be implemented after the program has been underway for six months or more.

Topics likely to be covered include:

- Details of interacting with the program and program staff
- Satisfaction with program procedures
- Suggestions for improvements
- Contractor's perspective on participation barriers
- Contractor's perspective on participants' issues with the program

Step 5: Interview Program Staff

This task will involve interviews with staff at the utility responsible for implementing the C&I Custom Rebate program.

Construct sample of program staff. In-depth interviews will be conducted with NSPI staff (or third parties such as consultants or partners) involved in program design and implementation, marketing, and tracking participation.

Implement survey of program staff. Some key staff may be interviewed more than once, with information exchanged as part of ongoing discussions about the program and evaluation effort. Interviews with key staff should start at a minimum within the first few months of the program to start to identify key issues.

Topics are likely to include the following:

- Goals for evaluation
- Program goals and logic model
- Program methods and approaches
- Target trade allies
- Target buildings and/or sectors such as offices, manufacturing, etc.
- Program marketing design and implementation

Step 6: Field Data Collection

This task will involve the collection of data from customer sites to support the program impact or savings analysis.

Data collection approach. Gather pre- and post-installation data to verify program tracking data and update assumptions used in the engineering impact algorithms. The on-site work will include simple walk-through inspections, counting installed equipment,

collecting name-plate information, data loggers, spot monitoring, and the installation of metering and monitoring equipment.

Construct sample of field data sites. Program participants in the program tracking database, sampled to represent a cross section of customer types and measures installed.

Implement field data collection. Field work should be implemented after a sufficient quantity of participants has received their incentives to support adequate sampling.

Data to be collected will include:

- Identify or estimate baseline conditions
- Verify measures installed
- Spot monitoring
- Data logging (run-time hours, energy consumption)
- Characteristics of the building (size, insulation, age, etc.)
- Billing data for the site or building

Project-specific monitoring plans will be developed where considered necessary due to the size and complexity of the custom measures used. Each project-specific plan will be tailored to capture the performance data required for program evaluation.

Step 7: Process Evaluation

Process evaluation will be the key focus for the first year. The process evaluation will be done about six months after the program start and will use results from the first four data collection approaches. The participant surveys can provide periodic and timely feedback as they should be implemented close to the participation date. The other surveys can support a major process evaluation report late in the first year.

Step 8: Market Evaluation

Market effects evaluation will require only a limited effort. Given the participant-by-participant approach of this program, it is not likely that the evaluation can detect meaningful changes in the market in the near term and as a result, limited effort should be spent on this in the first year.

Step 9: Impact Evaluation and Validation

Impact evaluation will use field data collection and survey data to modify initial engineering estimates, to verify program-reported measures, adjust baseline assumptions, and adjust other key assumptions in the engineering impact algorithms. This will be done for custom projects in both commercial and industrial facilities. For larger commercial facilities, simulation models based on prototypical samples of buildings that participate in the program will use field data collected and calibrated to utility billing data. For projects that involved an audit of facilities and/or processes to determine energy savings, the impact analysis will compare estimates of measure savings to actual site data; typically, with the support of an engineering simulation model that uses the audit information and is calibrated to billing and other consumption data.

3.6.9 Timeline, Budget, and Projected Savings

Detailed development work on this program would begin in the second quarter of 2008, with implementation of the Custom Partners program component starting in the third quarter.

Following is a preliminary breakdown of the 2008 cost estimates for this program.

Program Item	Estimated 2008 Budget
Delivery/Administration:	$70,000
Marketing:	$50,000
Customer Incentives:	$1,000,000
Technical Assistance:	$59,000
Monitoring and Evaluation:	$50,000
Total:	**$1,229,000**

Table 3-6 projects program kW and kWh savings, program budgets, and estimated participation for 2008, 2009 and 2010.

Table 3-6. C&I Custom Rebate: Program Goals and Budget

C&I Custom	Incremental Impacts		Budget (million 2008$)	Units or Participation
	MW	GWh		
2008	1.0	8.6	$1.229	40
2009	1.8	15.0	$2.156	75
2010	3.5	30.0	$4.313	150

The program has approximate TRC benefit-cost ratios of 8.7. The program benefits are estimated using NSPI's updated levelized avoided cost estimates of 9.5 cents per annual kWh saved, plus $63.39 per annual peak KW saved.

3.7 Small Business Direct Install Lighting

3.7.1 Description

This program will provide energy efficiency lighting retrofit services to small commercial and industrial customers. Businesses in this market segment typically have little access to market-based expertise to identify energy savings opportunities or administer retrofit projects. The program will provide customers with a single point of contact that can deliver a complete energy efficient lighting retrofit service through

qualified, competitively-selected labour vendors. Materials will be procured from one or more suppliers, selected through a competitive process.

This direct install lighting program is modeled after the program that has been run successfully by National Grid for over 20 years. National Grid is a U.S. utility serving Rhode Island and parts of Massachusetts, New Hampshire and New York. The program has been identified as a "Best Practices" program[7] and has been successfully replicated in New Hampshire and Vermont.

3.7.2 Eligible Participants

The Small Business Direct Install Lighting Program will target businesses having a typical monthly peak demand of less than 100 kW, or a total annual electricity use of less than 300,000 kWh. Discretion is required in applying eligibility criteria. For example, a business may use more than 100 kW due to a particular piece of equipment, and still be an appropriate candidate given its lighting profile. These eligibility criteria may be adjusted during program development if considered necessary to meet program targets.

Participants will include small businesses, non-profit organizations, government facilities, schools and apartment buildings of six units or less.

Businesses operating multiple facilities in the Province will not be targeted for participation in the Small Business Direct Install Lighting Program. These customers will be served through the C&I Prescriptive Rebate Program.

[7] American Council for an Energy Efficient Economy "America's Best" Review of Efficiency Programs, Exemplary Program – 2003; Exemplary Program – 2007. See http://www.aceee.org/utility/bestpractoc.pdf

3.7.3 Eligible Measures

Experience in other jurisdictions has established the electric energy efficiency opportunities found in the target sector are primarily (82–89 percent) in lighting[8]. Therefore, the program will initially focus on electrician-installed lighting measures, and selected non-lighting measures that can be installed without involving another trade contractor (such as: set back thermostats, water heater wraps, freezer and cooler strips, etc.).

A full list of measures will be developed during program design. Typical lighting measures will include:

- Upgrade T12 fluorescent lamps and older technology ballasts to high performance T8 lamps and ballasts (and replacement fixtures where appropriate);
- Upgrade incandescent exit signs to LED;
- Install occupancy sensor lighting controls;
- Install T5 lamps in appropriate applications (e.g. high ceiling); and
- Replace incandescent lamps with compact fluorescent lamps.

Significant opportunities in other systems (such as refrigeration) will be recorded at the time of the audit for potential future targeted treatment.

3.7.4 Incentives

The Small Business Direct Install Lighting Program will provide financial incentives such that the eligible customer is required to pay 20 percent of the project cost. This amount paid by the customer is referred to as the customer co-pay amount and is typically in the range of 20 to 40 percent. US experience shows that the lower the project

[8] "Small Business Program Profiles" – NSTAR Electric and National Grid, October 23, 2006

incentive, the lower the market penetration and the higher the overall marketing and overhead costs.[9] Advice from National Grid is that program funds are better spent on customer incentives rather than on marketing.

For the customer co-pay, customers may choose between no-interest, on-the-bill financing or they can pay all relevant costs as a lump sum.

3.7.5 Planning and Administration

NSPI proposes to partner with Conserve NS on this program. The partnership arrangement will be developed as part of the detailed program design.

Key program development tasks include the following:

1. Solicit Program Input/Participation
   - Develop funding partnership agreement(s)
   - Develop potential labour vendor list
   - Contact potential labour vendors
   - Meet with potential labour vendors individually
   - Conduct "pre-bid" forum for potential labour vendors

2. Finalize Program Structure
   - Define eligible customer size class
   - Define initial scope (volume, geographic area) of offering
   - Finalize eligible measure list
   - Finalize marketing approach
   - Finalize financing and payment processes

[9] In Massachusetts, the National Grid and NSTAR Electric customer co-payment requirement is 20% (moving to 30% in 2008), in Rhode Island it is 25%, and in New Hampshire it is 50%.

- Establish monitoring and verification requirements, including data required for overall program evaluation
- Determine equipment procurement method
- Draft and issue tenders or Requests for Proposals
- Negotiate vendor contracts
- Train vendors

Tenders will be issued for labour and material vendors, with the initial contracts covering the first year of operation. Additional tenders will be issued over time, to incorporate lessons learned from early implementation into subsequent contracts, and allow a stronger business service infrastructure to develop in the province.

Material and labour vendor contracts will be transferable to another program administrator, should that be necessary in the future.

Selected labour vendors will serve defined geographic areas. These firms, which are anticipated to be local companies organized to respond to this specific service request, will manage the delivery and have in-house electricians or subcontract with electricians or electrical contractors for actual installations.

The labour vendors will have the following responsibilities:

- Market the program to eligible customers
- On-site assessment of efficiency opportunities
- Prepare job cost estimate
- Secure customer agreement
- Complete customer program application
- Obtain installation approval from the program administrator
- Develop installation work order
- Work with material vendors and contractors to coordinate material procurement and delivery

- Conduct/manage the installation
- Old material disposal/recycling
- Conduct post-installation inspection
- Assist in filing the customer's rebate application
- Administer material and labour warranties

Material pricing will be procured through a tendering process. Each vendor will be required to quote unit pricing for the materials associated with each prescriptive retrofit measure.

3.7.6 Delivery and Implementation

Outside contracts for services will be tendered over the first year of operation. Tenders will be issued in stages over time in order to: incorporate lessons learned from early implementation into subsequent contracts, and allow a business service infrastructure capable of delivering the full range of desired services to develop in the province.

3.7.7 Marketing and Communications

The marketing strategy for this program will use direct contact marketing, generally via mailings to targeted customers. Targeted mailings will include a detachable post card for the customer to complete and return. Returned cards will be verified for eligibility and then forwarded to the appropriate vendor for follow up. Alternatively, customers will be able to call a toll-free number or visit a web site to find the appropriate labour vendor for their geographic area.

Experience gained by National Grid confirms that financing programs improve the level of customer participation in direct install programs. NSPI will provide no-interest financing of eligible customer costs. Loans may be repaid through installments on the customer's electricity bills.

Other marketing strategies could include personalized letters from local businesses or community groups; introducing the program to customers and enclosing the business reply card. NSPI will provide or approve all marketing materials used in this program.

3.7.8 Evaluation, Monitoring and Verification Plan

This section describes the first year EM&V efforts and evaluation data collection approaches for this program.

Step 1: Establish Program Tracking Database

The database will track data on participants including their address, dates of program intervention including rebated measures, and detailed data on measures installed or actions taken. The database will calculate initial estimates of impacts by measure or project and participant and will have the ability to aggregate impacts by sector and measure type.

Step 2: Survey Participants

This survey will be designed to measure satisfaction of building owners with the program and support impact estimates.

Construct sample of participants. The sample will come from the program tracking database.

Implement survey of participants. The survey should be implemented on a periodic basis to reach participants within a couple months of their participation.

Topics to be included in the survey include:

- Satisfaction with the program and measures installed
- Verify actions recorded in the tracking database
- Actions taken in addition to those in the tracking database
- Reasons for participating
- Barriers to action
- Recommendations for program improvements

Step 3: Survey Nonparticipants

The survey will assess the awareness of the program and program marketing material of customers who have not participated in the program, and measure barriers to participation in the program.

Construct sample of non-participants. The sample will come from NSPI's customer information system cross-checked with the program tracking database to eliminate participants.

Implement survey of non-participants. The survey should be implemented after program promotional efforts have been underway for six months or more.

The following are topic areas which will be assessed:

- Awareness of program, marketing material, and marketing messages
- Reasons for not participating in the program
- Actions taken to conserve energy

Step 4: Survey Program Contractors

This task is a survey of contractors who have installed the DSM program measures in order to examine and document program processes and identify areas for improvement.

Construct sample of DSM contractors. The sample will come from program records for small commercial or industrial facilities.

Implement survey of DSM contractors. The survey should be implemented after the program has been underway for six months or more.

Topics likely to be covered include:

- Details of interacting with the program and program staff
- Satisfaction with program procedures
- Suggestions for improvements
- Contractor's perspective on participation barriers
- Contractor's perspective on participants' satisfaction with the program

Step 5: Interview Program Staff

This task will involve interviews with staff at the utility responsible for implementing the Small Business Direct Installation Lighting program.

Construct sample of program staff. In-depth interviews will be conducted with NSPI staff (or third parties such as consultants or partners) involved in program design and implementation, marketing, and tracking participation.

Implement survey of program staff. Some key staff will probably be interviewed more than once, with information exchanged as part of ongoing discussions about the program

and evaluation effort. Interviews with key staff should start at a minimum within the first few months of the program to start to identify key issues.

Topics are likely to include the following:

- Goals for evaluation
- Program goals and logic model
- Program methods and approaches
- Target trade allies/contractors
- Target buildings and/or sectors such as offices, small manufacturing, etc.
- Program marketing design and implementation

Step 6: Field Data Collection

This task will involve the collection of data from customer sites to support the savings analysis, particularly for larger projects.

Data collection approach. Gather pre- and post-installation data to verify program tracking data and update assumptions used in the engineering impact algorithms. The on-site work will include simple walk-through inspections, counting installed equipment, collecting name-plate information, and selected use of data loggers, spot monitoring, and the installation of metering and monitoring equipment.

Construct sample of field data sites. Program participants in the program tracking database, sampled to represent a cross section of customer types and measures installed.

Implement field data collection. Field work should be implemented after a sufficient quantity of participants has received their incentives to support adequate sampling.

Data to be collected will include:

- Identify or estimate baseline conditions
- Verify measures installed
- Spot monitoring
- Data logging (run-time hours, energy consumption)
- Characteristics of the building (size, insulation, age, etc.)
- Billing data for the site or building

Step 7: Process Evaluation

Process evaluation will be the key focus for the first year. The process evaluation will be done about six months after the program start and will use results from the first four data collection approaches. The participant surveys can provide periodic and timely feedback as they should be implemented close to the participation date. The other surveys can support a major process evaluation report late in the first year.

Step 8: Market Evaluation

Market effects evaluation will require only a limited effort. Given the participant-by-participant approach of this program, it is not likely that the evaluation can detect meaningful changes in the market in the near term and as a result, limited effort should be spent on this in the first year.

Step 9: Impact Evaluation and Validation

Impact evaluation will use field data collection and survey data to modify initial engineering estimates, to verify program-reported measures, adjust baseline assumptions, and adjust other key assumptions in the engineering savings algorithms.

In the first year of the program, it is likely that most projects will involve simpler prescriptive measures, and the impact evaluation will mainly address numbers of participants, verification of installation of measures, and review of calculations of engineering estimates.

3.7.9 Timeline, Budget, and Projected Savings

Detailed development work on this program would begin in the first quarter of 2008. Implementation could then begin in the second quarter of 2008.

Following is a preliminary breakdown of the 2008 cost estimates for this program.

Program Item	**Estimated 2008 Budget**
Delivery/Administration:	$50,000
Marketing:	$45,000
Customer Incentives:	$370,000
Technical Assistance:	$21,000
Monitoring and Evaluation:	$20,000
Total:	**$506,000**

With a 50 percent funding partnership arrangement, NSPI's program cost could be reduced to $253,000.

Table 3-7 projects program kW and kWh savings, program budgets, and estimated participation for 2008, 2009 and 2010.

Table 3-7. Small Business Direct Install Lighting: Program Goals and Budget

Small Business Direct Install Lighting	Incremental Impacts		Budget (million 2008$)	Units or Participation
	MW	GWh		
2008	0.3	4.0	$0.506	75
2009	0.6	7.8	$0.973	150
2010	1.0	11.6	$1.460	225

The program has an approximate TRC benefit-cost ratio of 6.7. The program benefits are estimated using NSPI's updated levelized avoided cost estimates of 9.5 cents per annual kWh saved, plus $63.39 per annual peak KW saved.

3.8 Commercial and Industrial New Construction

3.8.1 Description

When new buildings are designed and constructed, and when existing ones are renovated or expanded, there's an opportunity to achieve energy efficiency. At this stage we can make the biggest changes to building and equipment specification practices for the least cost. These early decisions affect a building's energy consumption for its full life.

3.8.2 Eligible Participants

The program will target all new C&I buildings, as well as substantial renovation, and expansion (including common areas in high-rise and multi-unit residential facilities) construction projects in Nova Scotia. Most program participants will likely be larger commercial facilities (such as office buildings and retail) and institutional facilities (such as schools, and health care).

3.8.3 Measures and Incentives

Program Option Paths

The program will have several participation options, depending where the building is in its design or construction schedule and the owner's preference. Customers will be able to participate in the program via three distinct avenues: Prescriptive Path, Custom Path, or a Comprehensive Building Design Path.

Prescriptive Path

Prescriptive Path allows customers to choose equipment from a pre-qualified list of measures and receive an incentive that averages a percentage of incremental, cost-based, best-practice programs, adjusted for consideration of market barriers, baseline construction practices, and market transformation objectives. This path is designed for customers who have projects that are beyond the design phase and are perhaps under construction. It may also include new construction, renovation, remodeling, and equipment replacement projects. Available technologies would include efficient lighting, HVAC and motors.

Often a Prescriptive Path serves as a customer's initial exposure to the program. Following an initial satisfactory experience, they may choose the more sophisticated Comprehensive or Custom Paths for subsequent projects.

Custom Path

A Custom Path allows customers to request technical assistance to qualify unique measures that are not on the prescriptive list. Measures identified receive an incentive that is based on the results of an independent cost and savings analysis. Custom path program incentives will be based on the practices of similar programs.

The Custom option encourages and rewards the customer and design team initiative and creativity. Because the savings generated by these measures are usually site and end use-specific, project viability, eligibility and incentives are assessed on a case-by-case basis through a technical study, which details energy and demand savings, and project costs.

The baseline standard practice against which each proposal is judged is determined on a case-by-case basis, using resources such as current baseline studies and other market research as well as utility or public program experience from other comparable jurisdictions.

Common Custom measures include lighting system designs and controls, HVAC systems, motor systems and drives, refrigeration measures, and a variety of industrial process end-uses. A comparison to baseline study will be conducted according to program specified procedures and is subject to review and approval.

Comprehensive Building Design Path

A Comprehensive Building Design Path allows the customer, the design team, and program-supported experts to work together from the conceptual, design stage of a new construction or substantial renovation project to consider holistic design and equipment options to improve the overall efficiency of a building. Under this approach customers are eligible for both program-sponsored technical assistance in defining and costing efficiency options, as well as reimbursement to the customer's design team for additional design work or analysis necessary to accommodate program recommendations. All such work must be pre-approved. The customer's financial incentive is calculated and awarded based on an analysis of the entire project design and the interrelationship between the various building energy-consuming systems. Customer incentives will be calculated based on similar best practice programs, and will require that the entire agreed-upon package of measures is installed.

Whole Building Simulations: As discussed below, a service available to Custom and Comprehensive Path participants and their designers is access to technical assistance provided as a program service by experts who have been prequalified. For Comprehensive building design Path participants, one key program service is modeling of anticipated energy performance with hourly, whole-building computer simulations (utilizing the U.S. Department of Energy's DOE2 modeling system or the NRCan's EE4 computer modeling tool that is designed to work with the Model National Energy Code for Buildings). Modeling first establishes a building-specific "pre-program" baseline,

and then generates combinations of different energy system strategies that are modeled independently, providing the design team with a choice of solutions. All such work must be pre-approved by NSPI.

Because a Comprehensive Building Design Path provides technical support and incentives which allow building owners and their design teams to pursue high efficiency options that integrate building envelope, lighting, and mechanical systems, the result is an efficient building. The combination of technical consultation and incentives provided by the program will cover a significant portion of the additional design, modeling, and equipment costs required to turn an average building into an exemplary one.

Ancillary Services

Participating customers will be offered ancillary and supportive services targeted to their specific needs, including: Building Commissioning, Technical Assistance Services, and Plan Review.

Building Commissioning

Building Commissioning for larger comprehensive or custom projects where both the customer and the program's investment can be substantial. A Building Commissioning service should have two objectives: to demonstrate the value of commissioning services to customers, thereby building a market-based demand for the service, and demonstrate quality control. The target market for Commissioning Services is larger new construction and renovation projects with controls or complex mechanical systems present.

Technical Assistance Services

Technical Assistance Services are provided either directly by program consultants or on a cost shared basis from a pool of province wide contractors that have been pre-qualified for subsequent competitive selection by program staff, or through a combination of these approaches. The Technical Assistance Services component of the program will provide technical support matched to the needs and capabilities of C&I customers, including detailed and comprehensive efficiency option studies for new buildings, as well as specialized technical studies, of potential industrial process improvements, chiller

optimizations, and compressed air projects. The purposes of this service are: to ensure effective customer participation in program; ensure the best utilization of core program services and incentives; and encourage energy efficient design, specification, installation and construction practices.

Plan Review

A plan review service, outsourced to third party contractors, will focus on the needs of smaller building owners and their design teams. It will target new construction and major renovation projects between 15,000 and 50,000 square feet that are in the early to mid-stages of design. The service will provide a professional review of existing construction documents and specifications within a two-week period. This review will allow the program to fit into the design-build model that is prevalent in smaller new construction projects and could be completed before major equipment goes out to bid. The review service would make recommendations for energy-efficient upgrades (most frequently prescriptive options, although there will be opportunities for changes in lighting design and controls). It would also promote their adoption during the design phase of new construction projects. The goal is to develop a partnership and teamwork relationship between the customer, their A&E firm, and NSPI's expert advice. Financial incentives will be provided to building owners for installed equipment above the baseline condition observed in the original plan set. NSPI will also complete a verification of the installed equipment.

Baseline Building Practice

Establishing accurate baselines and incentives is critical to program credibility and cost-effectiveness. In the absence of an energy code that reflects current market conditions, NSPI will conduct a detailed baseline study of new construction design and equipment specification practices in its market area. This study will provide an analytical and defensible basis to establish program eligible prescriptive and custom measures and to set appropriate incentive levels.

3.8.4 Planning and Administration

NSPI proposes to plan and administer this program primarily using internal staff and outside consultants. Teaming arrangements with other agencies will cover cost-effective, non-electric measures. Staff will conduct program marketing and promotion, as discussed below, as well as specifying program requirements and monitoring compliance.

3.8.5 Delivery and Implementation

NSPI will train and use its field staff to identify prospective projects and to make initial owner and/or design team contacts. For Custom and Comprehensive projects, after project review and management approval, field staff can manage implementation and conduct post-installation inspections. Applications can be developed and administered in the field after management approval of those projects.

The program would pre qualify a pool of third-party technical assistance service providers who can consult to the program and to building owners on specific projects.

3.8.6 Marketing and Communications

Successful new construction programs have relied on "relational" marketing for program launch and delivery. Once the target submarkets for the initial program introduction have been identified and selected, the following vehicles can be used to identify projects and potential design firm partners:

- *Lunch and Learn sessions with A&E firms*. A successful model has been to provide a brief training session that is CLU-eligible (lighting design, new technologies, etc.). This is followed by a program briefing and a roundtable discussion of current or future projects that might be program eligible and hypothetical services or incentives. The training vehicle not only encourages attendance (due to professional continuing education requirements), but it is also a demonstration of program staff expertise.

- *One-on-one meetings with developers and/or their design teams.* These require a brief, professional, overview of the program, followed by a case study discussion of a completed building project similar to the one being proposed. A general discussion follows of the technical services and incentives potentially available to the clients through the program. Prospects for these presentations are identified by reviewing a number of sources (media information, field staff referrals, referrals from various economic development agencies, etc.).
- *Presentations at professional association meetings.* Depending on the target markets selected, these would be organizations with broad representation, such as the Nova Scotia Association of Architects, Halifax ASHRAE, the Construction Association of Nova Scotia, etc.

Because of the nature of the professions involved, other programs have been successful by placing a design professional, usually an architect, under part time contract to present the program to his/her peers. If the program value proposition is presented by a peer, it is usually more readily accepted.

3.8.7 Evaluation, Monitoring and Verification Plan

This section describes the first year EM&V efforts and evaluation data collection approaches for the C&I New Construction program.

Step 1: Establish Program Tracking Database

The database will track data on participants including their address, dates of building occupancy, and data on measures installed or actions taken. The database will calculate initial estimates of impacts by participant and will have the ability to aggregate savings by sector and measure type.

Step 2: Survey Builders and Designers

Builders and designers, both program participants and non-participants, will be surveyed to test awareness of program marketing material and measure barriers to participation. These will likely be telephone interviews of the targeted group.

Construct sample of builders and designers. Sample can come from program records and from interviews with program managers. If it proves necessary, the first few builders and designers interviewed can be asked to name their competitors who are most active in new construction.

Implement survey of builders and designers. The survey should be implemented after the program has been fully operational for a few months to ensure that builders and designers have had the opportunity to get exposed to the program and begin to take advantage of its services. This survey should probably be repeated approximately one year after the first survey, by which time the builders and designers will have had more time to gauge consumer reaction to the program.

Topic areas which will be included are:

- Awareness of the program
- Satisfaction with the program
- Suggestions for program improvements
- Changes in building practices
- Changes in marketing practices

Step 3: Survey Participating Building Owners

This survey will be designed to measure satisfaction with the program and support impact estimates.

Construct sample of participating building owners. The sample will include those who built new buildings with assistance from the program. The sample will come from program records.

Implement survey of building owners. The survey should be implemented as soon as enough participants have been through the program to support a valid sample. A rolling survey could be implemented to interview new participants shortly after their program involvement.

Topics likely to be covered include:

- Awareness of the program and the assistance offered
- Awareness of the benefits of an energy efficiency design
- Influence of assistance on their equipment and design decisions
- Satisfaction with the new building
- Satisfaction with energy bills

Step 4: Interview Program Staff

This task will involve interviews with staff at the utility responsible for implementing the C&I program for new buildings.

Construct sample of program staff. In-depth interviews will be conducted with NSPI staff (or third parties such as consultants or partners) involved in program design and implementation, marketing, and tracking.

Implement survey of program staff. Some key staff will probably be interviewed more than once, with information exchanged as part of ongoing discussions about the program and evaluation effort. Interviews with key staff should start at a minimum within the first few months of the program to start to identify key issues.

Topics which will be covered include:

- Goals for evaluation
- Program goals and logic model
- Program methods and approaches
- Target builders, architects, and engineers
- Target buildings, sectors, and/or regions
- Program marketing design and implementation

Step 5: Field Data Collection

This task involves collecting data on new buildings to support the impact analysis.

Data collection approach. On-site data collection will be used to verify installations and provide direct monitoring input to savings calculations. The on-site work will include simple walk-through inspections, counting installed equipment, collecting name-plate information, data loggers, spot monitoring, and the installation of metering and monitoring equipment. Custom consulting projects will require the preparation and submission of M&V results and the site data will be compared to assess the accuracy of results.

Construct sample for field data collection. This will include program participants in the program tracking database, sampled to represent a cross section of customer types and measures installed.

Implement collection of field data. Field work should be implemented after a sufficient number of participants have received their incentives to support adequate sampling.

Data to be collected include:

- Identify or estimate baseline conditions

- Verify measures installed
- Spot monitoring
- Data logging (run-time hours, energy consumption)
- Characteristics of the building or industrial plant (size, insulation, processes, etc.)
- Billing data for the site
- M&V reports for custom projects

Step 6: Process Evaluation

Process evaluation will be the key focus for the first year. The process evaluation will be done about six months after the program start and will use results from the first three data collection approaches. The participant surveys can provide periodic and timely feedback as they should be implemented close to the participation date. The other surveys can support a major process evaluation report late in the first year.

Step 7: Market Evaluation

Market effects evaluation will require only a limited effort. Given the long lead time involved in designing and building commercial and industrial spaces, it is not likely that the evaluation can detect meaningful changes in the market in the near term and as a result, limited effort should be spent on this in the first year.

Step 8: Impact Evaluation and Validation

As with the other C&I programs, the impact evaluation will use field data and customer surveys to assess and modify engineering estimates of savings, to verify program-reported measures, adjust baseline assumptions, and adjust other key assumptions in the engineering impact algorithms.

Few projects will be expected to be completed in the first year of the program as the design and building community needs to be educated about the program, and new construction can have a long lead time. Building simulation models calibrated to site energy use would be used to assess actual savings achieved.

3.8.8 Timeline, Budget, and Projected Savings

The program could begin in the first quarter of 2010. Table 3-8 projects program kW and kWh savings, program budgets, and estimated participation for 2008, 2009 and 2010.

Table 3-8. C&I New Construction: Program Goals and Budget

C&I New Construction	Incremental Impacts		Budget (million 2008$)	Units or Participation
	MW	GWh		
2008	0.0	0.0	$0.000	0
2009	0.0	0.0	$0.047	0
2010	1.2	10.7	$1.363	100

The program has approximate TRC benefit-cost ratios of 8.0 for commercial customers and 10.1 for industrial customers. The program benefits are estimated using NSPI's updated levelized avoided cost estimates of 9.5 cents per annual kWh saved, plus $63.39 per annual peak KW saved.

3.9 Education and Outreach

3.9.1 Description

To meet performance targets for energy reductions, the concept of energy efficiency must be supported and embraced by customers. Messages that communicate the general concepts and importance of conservation and energy efficiency will be included through various communication channels. Education and outreach is an important undertaking to

help customers adopt these concepts and encourage higher levels of participation in DSM programs.

The Education and Outreach Program has the potential to deliver information that will result in higher levels of participation in DSM programs. The Education and Outreach Program provides the opportunity for Nova Scotians to hear supporting messages and become more knowledgeable about energy use and energy cost saving opportunities in their homes and businesses. This program also supports individual DSM program marketing and advertising efforts. The planned Classroom Education strategy offered to schools can lead to more aware energy consumers in the coming generation.

It is difficult to track the effectiveness, level of participation or demand and energy reduction created by educational and outreach programs. Utilities and regulatory agencies throughout North America recognize this limitation but understand the importance of the process. Savings resulting from the Education and Outreach Program will be captured via participation in the other NSPI programs.

3.9.2 Eligible Participants

The target market for NSPI's Education and Outreach Program are all Nova Scotians. This includes owners and renters living in all housing types, from single family to multi-family dwellings, as well as C&I customers. Additionally, education and outreach programs will be designed to introduce the importance of energy efficiency to school children in grades 4-8. Finally, NSPI will sponsor trade ally professional training seminars for architects, engineers, HVAC contractors, and facility managers on energy management, design, and high efficiency equipment options.

Customers may not be well informed on energy efficiency technologies and strategies and how different technologies and strategies might help reduce energy consumption in their home or business. Customers may not be well informed on the potential benefits from energy conservation in reducing greenhouse emissions and water use. The program's goal is to inform consumers on ways to conserve energy, lower their electric

utility bills, achieve cost effective energy savings, and reduce peak demand. The Education and Outreach Program is intended to help customers understand and embrace the concept of DSM to encourage higher levels of participation in DSM programs offered by NSPI. Further, the goal is to generate awareness among tomorrow's consumers about the value of energy and the reasons for conservation. The goal of Education and Outreach Program is to increase awareness of energy efficiency. The success of this program will lead to more participation in one of NSPI's conservation and energy efficiency programs and educate the NSPI customers of the future about the importance of energy and energy efficiency.

3.9.3 Planning and Administration

NSPI's approach to Education and Outreach is to create awareness and provide residential and C&I consumers with information on energy conservation. The goal is to encourage customers to incorporate conservation habits into their everyday lives and business practices. To reach and influence the diverse residential and C&I markets, energy conservation education needs to address different lifestyles, learning preferences, and areas of interest.

To appeal to these broad markets, the program will provide a wide array of educational programs and products including, but not limited to:

- *On-Line Free Energy Audit Software*. The goal of residential and C&I education is to inform residential consumers about how to conserve energy and lower their electric utility bills. Nova Scotia Power will increase the content of energy savings information available to residential and C&I customers on our website, www.nspower.ca. This will include the use of a free on-line residential or C&I energy audit. This will help customers profile the characteristics of their home/business and learn about suggested energy efficiency opportunities. Additionally, we will provide links to existing ENERGY STAR® calculators that allow customers to do

their own research on efficient appliances and lighting options prior to making a purchasing decision.

- *Bill Inserts.* Electricity bill-inserts will feature energy efficiency savings opportunities and available programs, raising awareness of the importance of energy efficiency and showing how residential, commercial, and industrial customers can participate.
- *Trade Ally Training.* NSPI will launch a trade ally training series to inform existing and the next generation of architects, engineers, HVAC contractors, facility managers, builders, etc. on best practices related to energy efficiency for their respective professional areas. NSPI will cover certain training event costs, including hiring the appropriate trade professional or instructor to deliver the training event, venue rental costs, etc. NSPI will charge a modest registration fee for program participants. Examples will likely include "Efficient Lighting for Commercial Facilities" or "R-2000 Builder Training". NSPI will market these training events jointly with participating efficiency partners such as Conserve NS, Nova Scotia Homebuilders' Association, etc. and seek input from efficiency partners on ideas for future training events.
- *Association Newsletters.* NSPI will develop targeted newsletter articles or case studies for incorporation in association newsletters. The purpose of the association articles or case studies is to raise awareness of existing programs, feature successful case studies, and generate increased participation in NSPI DSM programs.
- *Low Income Household Outreach.* NSPI will work with recognized low income housing and energy related organizations to provide energy efficiency related printed materials for inclusion in their newsletters and distribution during customer contact events. Details of the specific program material needs and best methods for reaching low income Nova Scotians will be identified following consultations with potential partner organizations such as the Affordable Energy Coalition and Conserve NS.

- *Classroom Curriculum.* NSPI proposes to work with the Nova Scotia Department of Education to enable classroom education, within their curriculum, on energy efficiency. The goal of is to educate school children, provide early understanding and appreciation for energy efficiency, and to encourage students to take the information home. NSPI proposes to issue a sub-contract to an education-focused organization with energy efficiency expertise. This will be done through an RFP process, for field delivery of a grade-school, energy efficiency program. This initiative will focus on the design and delivery of school-based science education on energy and energy efficiency, including demonstrations of in-home applications of simple energy conservation measures such as CFLs and weatherization. The target audience will be Nova Scotia school children in Grades 4-8, and their teachers. The program will be designed to offer 1-3 hours of classroom instruction. The emphasis will be on raising children's energy efficiency awareness. More specific details and implementation ideas will be generated through the request for proposals process.
- *Academic Initiative.* Seeking the support of the Nova Scotia Departments of Education and Energy, NSPI will contact elementary and high school teachers by mail or individual telephone contact to schedule appearances. In addition, direct mail to elementary schools will outline the programs offered and provide opportunities for teachers to order classroom sets of grade-appropriate energy conservation booklets and study guides for students grades Primary - 6.
- Broader efforts to work with schools to increase customers' energy knowledge and awareness will also be piloted in 2009 and 2010.

3.9.4 Delivery and Implementation

This program will be administered by in-house employees, but much of the program implementation will be integrated with and/or contracted out, where possible, to partner

organizations, such as Clean Nova Scotia's Towards a Brighter Future program. Nova Scotia Power will provide program administration, marketing, planning, and consumer education activities. We will seek to develop marketing, co-branding, and additional program promotion partnership opportunities with potential partners such as Conserve NS, Clean Nova Scotia, and other provincial organizations involved with energy efficiency and education.

3.9.5 Marketing and Communications

NSPI will communicate and educate residential and commercial customers through a variety of avenues:

- Bill messages will be used to provide information to current customers
- The NSPI website will display information to help web users identify the energy savings information
- NSPI customer representatives will be trained to address customer inquiries
- Brochures will be created to be mailed on demand. These will be provided through the call center and the NSPI website
- Inserts will be added to customer bills to provide information on ways to help lower their electricity costs
- Email newsletter article featuring energy savings tips will be sent to all NSPI customers.
- Radio, billboard and transit advertising may also be used communicate with customers

Electrical energy efficiency technologies will be promoted, including but not limited to:

- CFLs, T-5s, Super T-8s and other efficient lighting technologies
- High-efficiency HVAC equipment
- High-efficiency refrigerators

- Horizontal axis clothes washers
- Building envelope measures, (i.e. insulation and air sealing)
- Efficient motors and air compressors

Education material will be developed for the residential and C&I sectors separately since the applications of the energy-efficiency technology can vary by sector.

3.9.6 Evaluation, Monitoring and Verification Plan

This section describes the first year EM&V efforts and evaluation data collection approaches for the Education and Outreach Program.

Most of the data collection to analyze these efforts will be incorporated in data collection activities implemented under other programs. For example, the participant and nonparticipant surveys for the EnerGuide for Existing Houses program can include questions on awareness of the energy audit, recall of bill inserts, and exposure to classroom education information. As the individual education and outreach efforts are defined, the evaluation will work closely with the program team to define appropriate data collection activities. For example, any trade ally training may be concluded with a hand-out evaluation survey.

3.9.7 Timeline and Budget

The Education and Outreach Program is expected to begin in the last quarter of 2008. As an education and outreach program, there is no calculation for energy and demand savings. NSPI seeks approval to recover the cost of the program through DSM. NSPI believes that this program encourages participation in, and thus savings from, its other DSM programs.

NSPI also is proposing not to assess the cost effectiveness of educational programs. Savings are difficult to quantify and typically are not tracked. NSPI believes that the cost

effectiveness of its other DSM programs is enhanced by the Education and Outreach Program. Table 3-9 projects the program budget for 2008, 2009 and 2010.

Table 3-9. Education and Outreach: Program Budget

Education and outreach	Budget (million 2008$)
2008	$0.050
2009	$0.231
2010	$0.442

3.10 Development and Research

3.10.1 Description

NSPI will explore and evaluate opportunities for future DSM programming including rate design as well as use of emerging technologies in areas of lighting, smart metering, load monitoring, and load control. This may include activities such as studies, baseline evaluations, pilot programs or program design. NSPI will evaluate whether it is cost-effective to discourage adoption of electric heat sources in certain applications, including the life-cycle economics of electric heat in a range of new building types and the results will be used to inform program offerings.

3.10.2 Planning and Administration

NSPI proposes to plan and administer this program primarily using company staff and will seek partnership opportunities, when appropriate, with other entities. We will issue RFPs to hire contractors to conduct research and development, as appropriate.

3.10.3 Delivery and Implementation

NSPI will develop a research and development plan to focus attention on promising energy-saving technologies. Program activities will primarily include monitoring research on emerging DSM technologies in other jurisdictions.

Key results from research and development efforts will enable consideration and movement of new technologies into ongoing DSM program activities. NSPI will also evaluate new technology, to ensure that it does in fact do what it is intended to do and produces the projected energy and/or demand savings. Partnerships with local colleges and universities may also be explored to encourage interest and participation in energy efficiency research.

3.10.4 Marketing and Communications

Not applicable to this program.

3.10.5 Evaluation, Monitoring and Verification Plan

This program will not be evaluated in the same way that the other DSM programs will be evaluated, as this program will not have participating customers per se, except for pilot program efforts, which are not contemplated during the 2009-2010 program years. The program will rather be evaluated based on the results it produces in terms of new DSM programs and better understanding of the DSM markets in Nova Scotia.

3.10.6 Timeline and Budget

The Research and Development Program is expected to begin in 2009. As with education and outreach, savings are difficult to quantify and typically are not tracked in these types of programs. It is anticipated that the cost effectiveness of other DSM programs will be improved over time by implementing the learning gained through the Research and Development Program. NSPI is requesting approval to recover the cost of

the program through DSM but will claim no energy or demand savings. Table 3-10 projects the program budget for 2008, 2009 and 2010.

Table 3-10. Research and Development: Program Budget

Development and Research	Budget (million 2008$)
2008	$0.200
2009	$0.136
2010	$0.252

Appendix A

Glossary of Terms

Impact Evaluation – Impact evaluations are the estimation of gross and net effects from the implementation of one or more energy efficiency programs. Most program impact projections contain ex-ante estimates of savings. These estimates are what the program is expected to save as a result of its implementation efforts and are often used for program planning and contracting purposes and for prioritizing program funding choices. In contrast the impact evaluation focuses on identifying and estimating the amount of energy and demand the program actually provides.

Integrated Data Collection – An approach in which surveys of key market actors and end-use customers (EUCs) are conducted in "real time" as close to the key intervention points as possible; usually integrated as part of the standard program implementation or other program paperwork process.

Market Characterization – The market characterization evaluations focus on the evaluation of program-induced market effects when the program being evaluated has a goal of making longer-term lasting changes in the way a market operates. These evaluations examine changes within a market that are caused, at least in part, by the energy efficiency programs attempting to change that market.

Market Transformation – An approach in which a program attempts to influence "upstream" service and equipment provider market channels and what they offer end customers, along with educating and informing end customers directly. The emphasis is on influencing market channels and key market actors other than end customers.

Process Evaluation – The process evaluation is a systematic assessment of an energy efficiency program for the purposes of documenting program operations at the time of the examination and identifying improvements that can be made to increase the program's efficiency or effectiveness for acquiring energy resources.

Resource Acquisition – an approach in which end customers are the primary target of program offerings (e.g., using rebates to influence customers' purchases of end use equipment).

Total Resource Cost Test – The Total Resource Cost Test measures the net costs of a demand-side management program as a resource option based on the total costs of the program, including both the participants' and the utility's costs (from California Standard Practice Manual[10]).

[10] California Standard Practice Manual, Economic Analysis of Demand-Side Management Programs and Projects, http://www.energy.ca.gov/greenbuilding/documents/background/07-J_CPUC_STANDARD_PRACTICE_MANUAL.PDF

Appendix B

Technical Appendix

1.0 OVERVIEW

This section describes the DSM measure characterization analysis approach and methods. There are three primary aspects to the DSM measure analysis conducted: characterizing residential and commercial/industrial customers, characterizing applicable DSM measures for each customer sector, and estimating DSM measure characteristics from those two sets of inputs. The approach for the residential sector will be discussed first, then for the C&I sectors. Summit Blue did not analyze data on individual NSPI customers as part of this DSM measure analysis, since customer information beyond electricity billing histories was not readily available, and due to customer data confidentiality concerns.

1.1 Customer Energy Use

Energy use in NSPI's territory is balanced among customer classes, as 2005 data show in Table B-1 below. In the industrial sector, a small number of customers account for a large proportion of energy used: about 60 large C&I customers account for 30 percent of the total energy consumption.

Table B-1. NSPI 2005 Electricity Data by Customer Sector[11]

Customer Sector	Customers	Energy (GWh)	Demand (MW)[1]	Revenue ($million)	Percent Energy (%)	Percent Demand (%)	Percent Revenue (%)
Residential	420,462	4,000	1,056	411.4	35	43	42
Commercial	33,564	3,000	624	263.9	26	25	28
Industrial	2,470	4,200	734	235.1	36	29	25
Other[2]	8,848	300	66	44.9	3	3	5
TOTAL	**465,344**	**11,500**	**2,480**	**955.3**	**100**	**100**	**100**

[1] Non-coincident demand for 2005.

[2] Unmetered and municipal utilities.

[11] 2005 data reflects a more normal weather year in terms than does 2006.

Electricity demand has been increasing in use for space and water heating in Nova Scotia. Statistics Canada data show that in 2003, 52 percent of existing homes were oil heated but 62 percent of new home heating systems are electric and over 70 percent of new water heating is electric[12].

1.2 Residential DSM Analysis

1.2.1 Residential Customer Characterization

Summit Blue primarily used NSPI customer statistics and previously conducted market research, a Natural Resources Canada report on residential energy use and equipment,[13] and information from the Nova Scotia Statistical Review[14] to characterize NSPI's customer base. Information from these sources included:

- The average home's heated area in the Atlantic region of Canada was 1,245 sq. ft. in 2003.[15]
- In 2003, approximately 27 percent of Nova Scotia residents heated their homes principally with electricity, only 7 percent of residents own room air conditioners, and almost no residents own central air conditioners.[16]
- In 2003, about 19 percent of Atlantic Canada's residents had a second refrigerator in their household, and about 69 percent of Atlantic Canada's residents had a freezer in their household. [17]

[12] Although wood is estimated to be used to heat about 100,000 homes, it is usually not the primary fuel as it is not dependably available.
[13] Natural Resources Canada, "Survey of Household Energy Use" (Natural Resources Canada, Ottawa, ON, December 2005.)
[14] Nova Scotia Department of Finance, "Nova Scotia Statistical Review" (Nova Scotia Department of Finance, Halifax, NS, October 2005.)
[15] Natural Resources Canada: 2005, *op.cit.*, p.9.
[16] Nova Scotia Department of Finance: 2005, *op.cit.*, p. 40-41.
[17] Natural Resources Canada: 2005, *op.cit.*, p.22.

- In 2003, about 71 percent of Atlantic Canada's residents used electricity for water heating. [18] This estimate is similar to NSPI's internal estimate of 60 percent electric water heating for their customers, which is the statistic that Summit Blue used to estimate water heating DSM potentials.
- The average Canadian household owns about 26 light bulbs in 2003, of which 75 percent are incandescent lamps, or about 20 per household. [19]
- The average NSPI customer has installed about five compact fluorescent lamps as of late 2005. [20]

1.2.2 Characterizing Residential DSM Measures

Characterizing DSM measures requires: determining the list of DSM measures to evaluate, estimating the incremental savings from each measure - improving from the baseline to the new technology, and estimating the measure costs and lifetimes. In addition, the baselines must consider that different classes of homes have different penetrations of technologies, such as existing homes compared to new construction.

NSPI's project team first drew up a list of prospective measures from past experience and added to and subtracted from that list as necessary for the project. Additions included new technologies or improvements to existing technologies, while subtractions primarily involved central air conditioner measures, which have almost zero saturation in Nova Scotia's residential market. The goal was a comprehensive list of DSM measures applied in different segments of the residential market: new construction versus existing construction.

Once identified, the project team determined which measures would have a significant climate-dependent savings component. Those measures that were determined to be

[18] Natural Resources Canada: 2005, *op.cit.*, p.26.
[19] Natural Resources Canada: 2005, *op.cit.*, *p.28.*
[20] Corporate Research Associates, "Nova Scotia Power Energy Conservation Study Customer Research Highlights" (Corporate Research Associates, November 2005) p. 47. The five CFLs per household estimate was calculated from the percentages of customers reporting having installed various numbers of CFLs.

climate-*independent* (lighting, appliances, and domestic hot water) were characterized using engineering calculations and assumptions for energy savings. Climate-dependent measures (HVAC equipment, insulation, air-sealing, etc.) were simulated with a computer model (Energy 10) to estimate savings.

Climate-independent DSM measures are described in many resources, including: the ENERGY STAR website,[21] the California Database of Energy-efficient Resources (DEER),[22] various utility online audit services, and manufacturer data. These resources were particularly useful for appliances. Other end-uses were analyzed using engineering principles such as steady-state heat loss, rated power, and hours of operation. For climate-independent measures, savings were permitted to vary according to construction type, e.g., new homes versus existing construction.

Climate-*dependent* DSM measures were modeled using Energy-10 software, an hourly simulation tool designed specifically for small commercial and residential structures. The project team made two baseline models reflecting typical constructions of two building types: new single family homes and existing single family homes, for the Halifax climate zone.

Model input parameters, such as building size, installed equipment type and age, and insulation levels, were based on the sources previously discussed and model building code (new construction) information. The models were then calibrated to produce energy consumption that corresponded to NSPI's residential customer electricity consumption data.

Variations in DSM measure costs exist for certain higher cost measures such as HVAC equipment and insulation where labor costs factor in more heavily. Measure cost estimates for these measures were weighted by factors contained in industry sources such as the RS Means Mechanical Cost Data.

[21] http://www.energystar.gov/
[22] http://www.energy.ca.gov/deer/

The project team estimated measure lifetimes from a combination of resources including: manufacturer data, typical economic depreciation assumptions, the California DEER database, and various studies reviewed for this report.

1.2.3 Residential Measure Characterizations

Table B-2 lists measure characterizations for residential new single family homes.

Table B-2. Residential New Single Family Homes Measure Characterizations

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	Measure Life (Years)	Average Peak Demand Savings per Unit (kW)	Average Annual Energy Savings per Unit (kWh)	Incremental Measure Cost ($)	Incremental Measure Cost per kW ($/kW)	Avoided Cost Benefits per kW ($/kW)	Program Admin. Cost per kW ($/kW)	Total Program Cost per kW ($/kW)	Total Resource Cost
Lighting									
CFL, 6.0 hr/day	5	0.006	136.5	$3	$539	$11,968	$715	$1,430	9.5
CFL, 0.5 hr/day	7	0.004	11.4	$3	$674	$2,143	$715	$1,430	1.5
CFL, 2.5 hr/day	7	0.006	56.9	$3	$539	$7,240	$715	$1,430	5.8
LED nightlights	10	0.006	13.0	$3	$539	$2,853	$715	$1,430	2.3
LED holiday lights	10	0.050	14.5	$9	$180	$908	$715	$1,430	1.0
Heating/HVAC and Building Envelope									
ENERGY STAR or better Air Source Heat Pump, SEER=18; HSPF=9.4	18	0.00011	2,199.3	$900	$8,086,253	$33,790,949	$1,430	$2,860	4.2
Duct Sealing and insulation	15	0.382	1,335.6	$540	$1,415	$5,938	$1,430	$2,860	2.1
Ceiling insulation (R-20 improved to R-40)	30	0.269	941.4	$1,900	$7,064	$11,877	$1,430	$2,860	1.4
High Efficiency Windows, Low-e; U=0.35	30	0.349	1,220.9	$800	$2,295	$11,885	$1,430	$2,860	3.2
Floor insulation (R-10 to R-20)	30	0.110	502.1	$1,425	$12,914	$14,869	$1,430	$2,860	1.0
Wall insulation (R-10 to R-20)	30	0.205	716.8	$1,800	$8,789	$11,877	$1,430	$2,860	1.2
Programmable thermostat	15	0.111	178.1	$30	$270	$3,231	$1,430	$501	1.9
ENERGY STAR or better Air Source Heat Pump, SEER=14; HSPF=8.5	18	0.00011	1,402.3	$800	$7,187,781	$21,546,152	$1,430	$2,860	3.0
Water Heating									
HE Water Heater (EF=0.95)	15	0.023	292.9	$80	$3,423	$18,808	$715	$1,430	4.5
Energy Star Dish Washer (EF=0.58)	13	0.035	111.3	$126	$3,652	$4,808	$715	$1,430	1.1
Horizontal-Axis Clothes Washer: Energy Star CW (EF=2.5)	14	0.122	534.2	$500	$4,084	$6,691	$715	$1,430	1.4
Faucet Aerators	15	0.030	37.8	$5	$166	$2,745	$715	$1,430	3.1
Hot water pipe insulation	15	0.029	84.6	$2	$69	$5,116	$715	$1,430	6.5
Drain water heat recovery	20	0.118	1,033.4	$570	$4,832	$17,912	$715	$1,430	3.2
Solar Assisted Water Heating	15	0.318	2,782.5	$2,500	$7,871	$13,434	$715	$1,430	1.6
Refrigeration and Miscellaneous									
High Efficiency Dryer With Moisture Sensor	14	0.012	102.4	$60	$5,133	$12,538	$1,430	$1,430	1.9
ENERGY STAR or better Refrigerator	15	0.009	82.4	$68	$7,232	$13,434	$1,430	$4,290	1.6

Table B-3 lists results for residential new single family homes for 2009 and 2010.

Table B-3. Residential New Single Family Homes – Results for 2009 and 2010

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2008 Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
Lighting							
CFL, 6.0 hr/day	3.4	82,171	410,855	$4,791	$40,093	$4,201	$35,892
CFL, 0.5 hr/day	12.1	30,804	215,626	$17,240	$25,834	$16,744	$9,090
CFL, 2.5 hr/day	3.3	33,822	236,751	$4,732	$23,960	$4,150	$19,810
LED nightlights	1.9	4,329	43,292	$2,650	$5,287	$2,324	$2,963
LED holiday lights	8.3	2,409	24,092	$11,926	$7,575	$7,461	$114
Subtotal	**28.9**	**153,535**	**930,615**	**$41,339**	**$102,750**	**$34,881**	**$67,868**
Heating/HVAC and Building Envelope							
ENERGY STAR or better Air Source Heat Pump, SEER=18; HSPF=9.4	0.0	23,475	422,541	$3	$40,143	$9,608	$30,535
Duct Sealing and insulation	6.9	24,235	363,520	$19,803	$41,118	$19,700	$21,418
Ceiling insulation (R-20 improved to R-40)	4.6	16,078	482,336	$13,138	$54,558	$39,017	$15,541
High Efficiency Windows, Low-e; U=0.35	6.0	20,851	625,517	$17,023	$70,743	$22,174	$48,569
Floor insulation (R-10 to R-20)	1.9	8,574	257,230	$5,390	$28,020	$27,031	$990
Wall insulation (R-10 to R-20)	3.5	12,241	367,226	$10,003	$41,538	$35,741	$5,796
Programmable thermostat	7.6	12,165	182,473	$3,805	$24,564	$12,922	$11,643
ENERGY STAR or better Air Source Heat Pump, SEER=14; HSPF=8.5	0.0	4,989	89,807	$1	$8,532	$2,847	$5,685
Subtotal	**30.5**	**122,607**	**2,790,650**	**$69,166**	**$309,216**	**$169,039**	**$140,177**
Water Heating							
HE Water Heater (EF=0.95)	0.5	6,378	95,663	$728	$9,572	$2,106	$7,466
Energy Star Dish Washer (EF=0.58)	0.9	2,879	37,421	$1,276	$4,290	$3,897	$394
Horizontal-Axis Clothes Washer: Energy Star CW (EF=2.5)	1.6	6,843	95,798	$2,242	$10,492	$7,525	$2,967
Faucet Aerators	0.8	961	14,420	$1,092	$2,096	$673	$1,423
Hot water pipe insulation	0.7	2,149	32,232	$1,051	$3,761	$576	$3,185
Drain water heat recovery	2.9	25,480	509,602	$4,159	$52,100	$16,134	$35,966
Solar Assisted Water Heating	0.6	5,049	75,733	$824	$7,743	$4,948	$2,794
Subtotal	**8.0**	**49,738**	**860,869**	**$11,373**	**$90,054**	**$35,859**	**$54,195**
Refrigeration and Miscellaneous							
High Efficiency Dryer With Moisture Sensor	0.2	1,874	26,230	$306	$2,682	$1,404	$1,278
ENERGY STAR or better Refrigerator	0.3	2,989	44,834	$1,464	$4,584	$2,956	$1,628
Subtotal	**0.6**	**4,863**	**71,065**	**$1,770**	**$7,265**	**$4,359**	**$2,906**
Single Family -- New Total	**67.9**	**330,742**	**4,653,199**	**$123,648**	**$509,285**	**$244,139**	**$265,146**

Table B-4 lists measure characterizations for residential existing single family homes.

Table B-4. Residential Existing Single Family Homes Measure Characterizations

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2009 Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
Lighting							
CFL, 6.0 hr/day	12.7	312,249	1,561,247	$18,204	$152,353	$15,965	$136,388
CFL, 0.5 hr/day	45.8	117,054	819,378	$65,514	$98,170	$63,629	$34,541
CFL, 2.5 hr/day	12.6	128,522	899,655	$17,983	$91,047	$15,771	$75,277
LED nightlights	7.0	16,451	164,508	$10,071	$20,092	$8,832	$11,261
LED holiday lights	31.7	9,155	91,550	$45,317	$28,786	$28,353	$433
Subtotal	**109.9**	**583,431**	**3,536,338**	**$157,089**	**$390,449**	**$132,549**	**$257,900**
Heating/HVAC and Building Envelope							
ENERGY STAR or better Air Source Heat Pump, SEER=18; HSPF=9.4	0.0	89,203	1,605,656	$13	$152,542	$36,510	$116,032
Duct Sealing and insulation	26.3	92,092	1,381,376	$75,252	$156,249	$74,860	$81,389
Ceiling insulation (R-20 improved to R-40)	17.5	61,096	1,832,878	$49,924	$207,319	$148,264	$59,056
High Efficiency Windows, Low-e; U=0.35	22.6	79,232	2,376,963	$64,687	$268,824	$84,260	$184,564
Floor insulation (R-10 to R-20)	7.2	32,582	977,472	$20,480	$106,478	$102,716	$3,761
Wall insulation (R-10 to R-20)	13.3	46,515	1,395,460	$38,010	$157,843	$135,817	$22,026
Programmable thermostat	28.9	46,226	693,397	$14,460	$93,344	$49,102	$44,242
ENERGY STAR or better Air Source Heat Pump, SEER=14; HSPF=8.5	0.0	18,959	341,265	$4	$32,422	$10,818	$21,604
Subtotal	**115.7**	**465,906**	**10,604,468**	**$262,831**	**$1,175,022**	**$642,348**	**$532,674**
Water Heating							
HE Water Heater (EF=0.95)	1.9	24,235	363,520	$2,766	$36,373	$8,002	$28,371
Energy Star Dish Washer (EF=0.58)	3.4	10,938	142,200	$4,849	$16,303	$14,808	$1,496
Horizontal-Axis Clothes Washer: Energy Star CW (EF=2.5)	6.0	26,002	364,033	$8,521	$39,871	$28,596	$11,275
Faucet Aerators	2.9	3,653	54,795	$4,148	$7,964	$2,557	$5,407
Hot water pipe insulation	2.8	8,165	122,482	$3,995	$14,292	$2,190	$12,102
Drain water heat recovery	11.1	96,824	1,936,486	$15,806	$197,979	$61,308	$136,671
Solar Assisted Water Heating	2.2	19,186	287,787	$3,132	$29,422	$18,804	$10,618
Subtotal	**30.2**	**189,004**	**3,271,303**	**$43,216**	**$342,205**	**$136,265**	**$205,940**
Refrigeration and Miscellaneous							
High Efficiency Dryer With Moisture Sensor	0.8	7,120	99,676	$1,162	$10,190	$5,334	$4,856
ENERGY STAR or better Refrigerator	1.3	11,358	170,370	$5,562	$17,418	$11,232	$6,186
Subtotal	**2.1**	**18,478**	**270,045**	**$6,725**	**$27,608**	**$16,566**	**$11,043**
Single Family -- New Total	**257.9**	**1,256,819**	**17,682,155**	**$469,861**	**$1,935,284**	**$927,728**	**$1,007,557**

Table B-5 lists results for residential new single family homes for 2010.

Table B-5. Residential New Single Family Homes – Results for 2010

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2010 Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
Lighting							
CFL, 6.0 hr/day	25.5	624,499	3,122,494	$36,409	$304,707	$31,930	$272,777
CFL, 0.5 hr/day	91.6	234,108	1,638,756	$131,027	$196,340	$127,257	$69,083
CFL, 2.5 hr/day	25.2	257,044	1,799,310	$35,966	$182,095	$31,542	$150,553
LED nightlights	14.1	32,902	329,017	$20,141	$40,185	$17,663	$22,522
LED holiday lights	63.4	18,310	183,100	$90,635	$57,572	$56,706	$865
Subtotal	**219.7**	**1,166,863**	**7,072,677**	**$314,177**	**$780,897**	**$265,098**	**$515,799**
Heating/HVAC and Building Envelope							
ENERGY STAR or better Air Source Heat Pump, SEER=18; HSPF=9.4	0.0	178,406	3,211,312	$26	$305,085	$73,020	$232,065
Duct Sealing and insulation	52.6	184,183	2,762,752	$150,504	$312,499	$149,720	$162,779
Ceiling insulation (R-20 improved to R-40)	34.9	122,192	3,665,756	$99,848	$414,639	$296,527	$118,112
High Efficiency Windows, Low-e; U=0.35	45.2	158,464	4,753,926	$129,375	$537,648	$168,520	$369,128
Floor insulation (R-10 to R-20)	14.3	65,165	1,954,945	$40,961	$212,956	$205,433	$7,523
Wall insulation (R-10 to R-20)	26.6	93,031	2,790,921	$76,019	$315,685	$271,634	$44,051
Programmable thermostat	57.8	92,453	1,386,793	$28,920	$186,688	$98,205	$88,484
ENERGY STAR or better Air Source Heat Pump, SEER=14; HSPF=8.5	0.0	37,918	682,531	$9	$64,844	$21,636	$43,208
Subtotal	**231.5**	**931,813**	**21,208,936**	**$525,662**	**$2,350,044**	**$1,284,695**	**$1,065,348**
Water Heating							
HE Water Heater (EF=0.95)	3.9	48,469	727,040	$5,531	$72,747	$16,004	$56,742
Energy Star Dish Washer (EF=0.58)	6.8	21,877	284,401	$9,698	$32,607	$29,615	$2,991
Horizontal-Axis Clothes Washer: Energy Star CW (EF=2.5)	11.9	52,005	728,066	$17,042	$79,743	$57,193	$22,550
Faucet Aerators	5.8	7,306	109,589	$8,297	$15,928	$5,114	$10,814
Hot water pipe insulation	5.6	16,331	244,964	$7,989	$28,584	$4,381	$24,203
Drain water heat recovery	22.1	193,649	3,872,972	$31,612	$395,958	$122,616	$273,342
Solar Assisted Water Heating	4.4	38,372	575,573	$6,264	$58,844	$37,608	$21,237
Subtotal	**60.4**	**378,008**	**6,542,605**	**$86,433**	**$684,410**	**$272,530**	**$411,880**
Refrigeration and Miscellaneous							
High Efficiency Dryer With Moisture Sensor	1.6	14,239	199,351	$2,324	$20,381	$10,668	$9,713
ENERGY STAR or better Refrigerator	2.6	22,716	340,739	$11,125	$34,836	$22,463	$12,373
Subtotal	**4.2**	**36,955**	**540,091**	**$13,449**	**$55,217**	**$33,131**	**$22,086**
Single Family -- New Total	**515.8**	**2,513,639**	**35,364,309**	**$939,721**	**$3,870,569**	**$1,855,455**	**$2,015,113**

Table B-6 lists results measure characterizations for residential existing single family homes.

Table B-6. Residential Existing Single Family Homes Measure Characterizations

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	Measure Life (Years)	Average Peak Demand Savings per Unit (kW)	Average Annual Energy Savings per Unit (kWh)	Incremental Measure Cost ($)	Incremental Measure Cost per kW ($/kW)	Avoided Cost Benefits per kW ($/kW)	Program Admin. Cost per kW ($/kW)	Total Program Cost per kW ($/kW)	Total Resource Cost
Lighting									
CFL, 6.0 hr/day	5	0.006	136.5	$3	$539	$11,968	$715	$1,430	9.5
CFL, 0.5 hr/day	7	0.004	11.4	$3	$674	$2,143	$715	$1,430	1.5
CFL, 2.5 hr/day	7	0.006	56.9	$3	$539	$7,240	$715	$1,430	5.8
LED nightlights	10	0.006	13.0	$3	$539	$2,853	$715	$1,430	2.3
LED holiday lights	10	0.050	14.5	$9	$180	$908	$715	$1,430	1.0
Heating/HVAC and Building Envelope									
ENERGY STAR or better Air Source Heat Pump, SEER=14; HSPF=8.5	18	0.000	1,541.0	$800	$7,187,781	$23,676,977	$1,430	$2,860	3.3
Duct Insulation and Sealing	30	0.382	1,335.6	$540	$1,415	$11,877	$1,430	$2,860	4.2
Ceiling insulation (R-20 improved to R-40)	30	0.207	724.2	$1,900	$9,183	$11,877	$1,430	$2,860	1.1
High Efficiency Windows, Low-e; U=0.35	30	0.349	1,220.9	$800	$2,295	$11,885	$1,430	$2,860	3.2
Ceiling insulation (R-0 improved to R-20)	30	2.179	7,627.0	$1,900	$872	$11,877	$1,430	$2,860	5.2
Floor insulation (R-0 to R-20)	30	0.307	1,073.7	$1,425	$4,645	$11,877	$1,430	$2,860	2.0
Wall insulation (R-0 to R-20)	30	1.475	5,163.2	$1,800	$1,220	$11,877	$1,430	$2,860	4.5
Programmable thermostat	15	0.111	178.1	$30	$270	$3,231	$250	$501	6.2
ENERGY STAR or better Air Source Heat Pump, SEER=18; HSPF=9.4	18	0.000	2,403.6	$900	$8,086,253	$36,929,893	$1,430	$2,860	4.6
Water Heating									
HE Water Heater (EF=0.95)	15	0.023	292.9	$80	$3,414	$18,808	$715	$1,430	4.6
Energy Star Dish Washer (EF=0.58)	13	0.035	111.3	$126	$3,656	$4,808	$715	$1,430	1.1
Horizontal-Axis Clothes Washer: Energy Star CW (EF=2.5)	14	0.122	534.2	$500	$4,084	$6,691	$715	$1,430	1.4
Faucet Aerators	15	0.030	37.8	$5	$166	$2,745	$715	$1,430	3.1
Hot water pipe insulation	15	0.029	84.6	$2	$69	$5,116	$715	$1,430	6.5
Drain water heat recovery	20	0.118	1,033.4	$570	$4,832	$17,912	$715	$1,430	3.2
Low flow showerheads	7	0.030	227.1	$7	$233	$5,468	$715	$1,430	5.8
Solar Assisted Water Heating	15	0.318	2,782.5	$2,500	$7,871	$13,434	$715	$1,430	1.6
Refrigeration and Miscellaneous									
High Efficiency Dryer With Moisture Sensor	14	0.012	102.4	$60	$5,133	$12,538	$1,430	$1,430	1.9
ENERGY STAR or better Refrigerator	15	0.009	82.4	$68	$7,275	$13,434	$1,430	$4,290	1.5
Remove secondary refigerator/freezer	10	0.152	1,335.6	$225	$1,476	$8,956	$1,430	$4,290	3.1

Table B-7 lists results for residential existing single family homes for 2008 by program.

Table B-7. Residential Existing Single Family Homes – Results for 2008 by Program

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2008 Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
Efficient Products							
CFL, 6.0 hr/day	0.0	0	0	$0	$0	$0	$0
CFL, 0.5 hr/day	0.0	0	0	$0	$0	$0	$0
CFL, 2.5 hr/day	0.0	0	0	$0	$0	$0	$0
LED nightlights	0.0	0	0	$0	$0	$0	$0
LED holiday lights	0.0	0	0	$0	$0	$0	$0
High Efficiency Dryer With Moisture Sensor	0.0	0	0	$0	$0	$0	$0
ENERGY STAR or better Refrigerator	0.0	0	0	$0	$0	$0	$0
Remove secondary refigerator/freezer	0.0	0	0	$0	$0	$0	$0
Efficient Products Subtotal	**0.0**	**0**	**0**	**$0**	**$0**	**$0**	**$0**
EnerGuide for Existing Houses							
ENERGY STAR or better Air Source Heat Pump, SEER=14; HSPF=	0.0	64,653	1,163,749	$13	$110,561	$33,571	$76,991
Duct Insulation and Sealing	4.5	15,883	476,497	$12,979	$53,897	$12,911	$40,986
Ceiling insulation (R-20 improved to R-40)	0.7	2,297	68,898	$1,877	$7,793	$6,964	$829
High Efficiency Windows, Low-e; U=0.35	16.6	58,078	1,742,327	$47,416	$197,050	$61,763	$135,286
Ceiling insulation (R-0 improved to R-20)	6.9	24,187	725,617	$19,764	$82,076	$15,908	$66,168
Floor insulation (R-0 to R-20)	9.7	34,049	1,021,468	$27,823	$115,540	$59,102	$56,438
Wall insulation (R-0 to R-20)	9.4	32,748	982,431	$26,760	$111,124	$24,796	$86,328
Programmable thermostat	16.7	26,668	400,022	$8,342	$53,850	$8,664	$45,187
ENERGY STAR or better Air Source Heat Pump, SEER=18; HSPF=	0.0	8,600	154,809	$1	$14,707	$3,221	$11,486
HE Water Heater (EF=0.95)	1.8	23,022	345,328	$2,627	$34,553	$7,586	$26,967
Energy Star Dish Washer (EF=0.58)	2.2	7,125	92,629	$3,159	$10,620	$9,655	$965
Horizontal-Axis Clothes Washer: Energy Star CW (EF=2.5)	7.8	34,229	479,202	$11,217	$52,485	$37,643	$14,842
Faucet Aerators	1.8	2,267	34,002	$2,574	$4,942	$1,587	$3,355
Hot water pipe insulation	2.2	6,334	95,005	$3,099	$11,086	$1,699	$9,387
Drain water heat recovery	15.0	131,398	2,627,967	$21,450	$268,674	$83,200	$185,474
Low flow showerheads	2.6	19,287	135,007	$3,650	$13,958	$2,420	$11,539
Solar Assisted Water Heating	6.9	60,746	911,191	$9,916	$93,157	$59,537	$33,620
EnerGuide for Existing Houses Subtotal	**104.8**	**551,570**	**11,456,150**	**$202,667**	**$1,236,074**	**$430,225**	**$805,849**
Low Income							
CFL, 6.0 hr/day	29.7	728,352	3,641,759	$42,463	$355,379	$37,240	$318,139
CFL, 2.5 hr/day	29.4	300,145	2,101,015	$41,997	$212,628	$36,830	$175,798
Duct Insulation and Sealing	10.0	35,015	1,050,459	$28,613	$118,819	$28,463	$90,356
Ceiling insulation (R-20 improved to R-40)	1.4	5,063	151,889	$4,137	$17,180	$15,352	$1,829
High Efficiency Windows, Low-e; U=0.35	36.5	128,035	3,841,040	$104,531	$434,405	$136,160	$298,245
Ceiling insulation (R-0 improved to R-20)	15.2	53,322	1,599,655	$43,572	$180,939	$35,069	$145,870
Floor insulation (R-0 to R-20)	21.4	75,062	2,251,874	$61,337	$254,713	$130,293	$124,420
Wall insulation (R-0 to R-20)	20.6	72,194	2,165,814	$58,993	$244,978	$54,665	$190,314
Programmable thermostat	36.7	58,791	881,867	$18,391	$118,716	$19,099	$99,616
Faucet Aerators	4.0	4,997	74,959	$5,675	$10,894	$3,498	$7,397
Hot water pipe insulation	4.8	13,963	209,443	$6,831	$24,439	$3,746	$20,694
Low flow showerheads	5.6	42,519	297,630	$8,047	$30,772	$5,334	$25,437
Remove secondary refigerator/freezer	17.8	156,240	1,562,398	$76,515	$159,734	$51,826	$107,908
Low Income Subtotal	**233.3**	**1,673,697**	**19,829,801**	**$501,100**	**$2,163,596**	**$557,574**	**$1,606,022**
Single Family -- Existing Total	**338.1**	**2,225,268**	**31,285,952**	**$703,767**	**$3,399,670**	**$987,799**	**$2,411,871**

Table B-8 lists results for residential existing single family homes for 2009 by program.

Table B-8. Residential Existing Single Family Homes – Results for 2009 by Program

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2009 Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
Efficient Products							
CFL, 6.0 hr/day	85.2	2,089,412	10,447,060	$121,814	$1,019,470	$106,829	$912,641
CFL, 0.5 hr/day	627.8	1,604,108	11,228,756	$897,798	$1,345,319	$871,966	$473,353
CFL, 2.5 hr/day	84.2	861,021	6,027,150	$120,476	$609,963	$105,655	$504,308
LED nightlights	119.4	278,985	2,789,847	$170,783	$340,741	$149,773	$190,968
LED holiday lights	537.4	155,257	1,552,569	$768,522	$488,170	$480,834	$7,336
High Efficiency Dryer With Moisture Sensor	10.8	94,641	1,324,978	$15,449	$135,461	$70,905	$64,555
ENERGY STAR or better Refrigerator	21.5	188,725	2,830,880	$92,424	$289,419	$187,541	$101,878
Remove secondary refigerator/freezer	51.2	448,203	4,482,029	$219,497	$458,226	$148,671	$309,555
Efficient Products Subtotal	**1,537.6**	**5,720,353**	**40,683,269**	**$2,406,762**	**$4,686,768**	**$2,122,174**	**$2,564,595**
EnerGuide for Existing Houses							
ENERGY STAR or better Air Source Heat Pump, SEER=14; HSPF=	0.1	699,507	12,591,119	$144	$1,196,214	$363,215	$832,999
Duct Insulation and Sealing	19.5	68,263	2,047,878	$55,780	$231,638	$55,490	$176,149
Ceiling insulation (R-20 improved to R-40)	2.8	9,870	296,108	$8,065	$33,493	$29,928	$3,565
High Efficiency Windows, Low-e; U=0.35	71.3	249,605	7,488,136	$203,784	$846,875	$265,444	$581,431
Ceiling insulation (R-0 improved to R-20)	29.7	103,951	3,118,540	$84,943	$352,742	$68,367	$284,375
Floor insulation (R-0 to R-20)	41.8	146,335	4,390,044	$119,576	$496,564	$254,006	$242,558
Wall insulation (R-0 to R-20)	40.2	140,742	4,222,270	$115,007	$477,587	$106,569	$371,018
Programmable thermostat	71.6	114,614	1,719,207	$35,853	$231,437	$37,235	$194,203
ENERGY STAR or better Air Source Heat Pump, SEER=18; HSPF=	0.0	93,052	1,674,943	$12	$159,124	$34,848	$124,276
HE Water Heater (EF=0.95)	19.9	249,084	3,736,258	$28,424	$373,844	$82,076	$291,769
Energy Star Dish Washer (EF=0.58)	23.9	77,092	1,002,196	$34,175	$114,903	$104,458	$10,444
Horizontal-Axis Clothes Washer: Energy Star CW (EF=2.5)	84.9	370,335	5,184,695	$121,362	$567,863	$407,281	$160,582
Faucet Aerators	7.7	9,742	146,133	$11,063	$21,239	$6,819	$14,420
Hot water pipe insulation	9.3	27,221	408,312	$13,317	$47,644	$7,302	$40,342
Drain water heat recovery	162.3	1,421,657	28,433,144	$232,074	$2,906,899	$900,175	$2,006,724
Low flow showerheads	11.0	82,890	580,232	$15,688	$59,990	$10,400	$49,591
Solar Assisted Water Heating	75.0	657,239	9,858,584	$107,289	$1,007,905	$644,156	$363,749
EnerGuide for Existing Houses Subtotal	**671.0**	**4,521,199**	**86,897,798**	**$1,186,557**	**$9,125,965**	**$3,377,770**	**$5,748,195**
Low Income							
CFL, 6.0 hr/day	35.4	869,517	4,347,584	$50,693	$424,256	$44,457	$379,799
CFL, 2.5 hr/day	35.1	358,317	2,508,222	$50,136	$253,838	$43,969	$209,870
Duct Insulation and Sealing	23.4	82,067	2,462,005	$67,060	$278,481	$66,711	$211,770
Ceiling insulation (R-20 improved to R-40)	3.4	11,866	355,988	$9,696	$40,266	$35,981	$4,286
High Efficiency Windows, Low-e; U=0.35	85.7	300,080	9,002,403	$244,994	$1,018,132	$319,123	$699,009
Ceiling insulation (R-0 improved to R-20)	35.7	124,973	3,749,178	$102,120	$424,075	$82,193	$341,882
Floor insulation (R-0 to R-20)	50.3	175,927	5,277,809	$143,757	$596,981	$305,372	$291,608
Wall insulation (R-0 to R-20)	48.3	169,204	5,076,107	$138,263	$574,166	$128,120	$446,046
Programmable thermostat	86.1	137,791	2,066,868	$43,103	$278,239	$44,764	$233,475
Faucet Aerators	9.3	11,712	175,684	$13,300	$25,534	$8,198	$17,336
Hot water pipe insulation	11.2	32,725	490,881	$16,010	$57,279	$8,779	$48,500
Low flow showerheads	13.2	99,653	697,568	$18,861	$72,121	$12,503	$59,619
Remove secondary refigerator/freezer	21.3	186,521	1,865,214	$91,344	$190,693	$61,870	$128,822
Low Income Subtotal	**458.4**	**2,560,353**	**38,075,510**	**$989,340**	**$4,234,061**	**$1,162,038**	**$3,072,023**
Single Family -- Existing Total	**2,667.0**	**12,801,905**	**165,656,577**	**$4,582,659**	**$18,046,794**	**$6,661,982**	**$11,384,812**

Table B-9 lists results for residential existing single family homes for 2010 by program.

Table B-9. Residential Existing Single Family Homes – Results for 2010 by Program

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2010 Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
Efficient Products							
CFL, 6.0 hr/day	209.5	5,139,658	25,698,288	$299,646	$2,507,752	$262,784	$2,244,968
CFL, 0.5 hr/day	1,255.7	3,208,216	22,457,511	$1,795,596	$2,690,638	$1,743,931	$946,707
CFL, 2.5 hr/day	207.2	2,117,991	14,825,935	$296,353	$1,500,422	$259,896	$1,240,526
LED nightlights	238.9	557,969	5,579,694	$341,565	$681,482	$299,546	$381,936
LED holiday lights	1,074.9	310,514	3,105,138	$1,537,043	$976,339	$961,667	$14,672
High Efficiency Dryer With Moisture Sensor	21.6	189,283	2,649,955	$30,899	$270,922	$141,811	$129,111
ENERGY STAR or better Refrigerator	43.1	377,451	5,661,759	$184,847	$578,837	$375,081	$203,756
Remove secondary refigerator/freezer	125.9	1,102,516	11,025,158	$539,931	$1,127,171	$365,711	$761,461
Efficient Products Subtotal	**3,176.7**	**13,003,596**	**91,003,440**	**$5,025,881**	**$10,333,564**	**$4,410,428**	**$5,923,137**
EnerGuide for Existing Houses							
ENERGY STAR or better Air Source Heat Pump, SEER=14; HSPF=	0.1	1,399,013	25,182,238	$289	$2,392,428	$726,430	$1,665,998
Duct Insulation and Sealing	36.2	126,593	3,797,796	$103,445	$429,574	$102,906	$326,669
Ceiling insulation (R-20 improved to R-40)	5.2	18,304	549,133	$14,957	$62,113	$55,502	$6,611
High Efficiency Windows, Low-e; U=0.35	132.1	462,892	13,886,769	$377,918	$1,570,532	$492,267	$1,078,265
Ceiling insulation (R-0 improved to R-20)	55.1	192,778	5,783,341	$157,527	$654,162	$126,787	$527,375
Floor insulation (R-0 to R-20)	77.5	271,378	8,141,350	$221,755	$920,880	$471,056	$449,824
Wall insulation (R-0 to R-20)	74.6	261,007	7,830,212	$213,280	$885,686	$197,632	$688,054
Programmable thermostat	132.8	212,552	3,188,274	$66,489	$429,201	$69,052	$360,150
ENERGY STAR or better Air Source Heat Pump, SEER=18; HSPF=	0.0	186,105	3,349,885	$25	$318,249	$69,697	$248,552
HE Water Heater (EF=0.95)	39.8	498,168	7,472,516	$56,848	$747,689	$164,151	$583,538
Energy Star Dish Washer (EF=0.58)	47.8	154,184	2,004,393	$68,350	$229,805	$208,917	$20,889
Horizontal-Axis Clothes Washer: Energy Star CW (EF=2.5)	169.7	740,671	10,369,391	$242,724	$1,135,727	$814,562	$321,165
Faucet Aerators	14.3	18,067	271,003	$20,517	$39,387	$12,645	$26,742
Hot water pipe insulation	17.3	50,481	757,215	$24,696	$88,356	$13,541	$74,815
Drain water heat recovery	324.6	2,843,314	56,866,287	$464,148	$5,813,799	$1,800,351	$4,013,448
Low flow showerheads	20.3	153,720	1,076,042	$29,094	$111,252	$19,286	$91,966
Solar Assisted Water Heating	150.1	1,314,478	19,717,168	$214,578	$2,015,810	$1,288,311	$727,499
EnerGuide for Existing Houses Subtotal	**1,297.6**	**8,903,706**	**170,243,014**	**$2,276,639**	**$17,844,652**	**$6,633,095**	**$11,211,557**
Low Income							
CFL, 6.0 hr/day	31.7	778,200	3,891,000	$45,370	$379,701	$39,788	$339,913
CFL, 2.5 hr/day	31.4	320,687	2,244,808	$44,871	$227,180	$39,351	$187,829
Duct Insulation and Sealing	49.7	174,066	5,221,970	$142,237	$590,664	$141,495	$449,169
Ceiling insulation (R-20 improved to R-40)	7.2	25,169	755,058	$20,566	$85,406	$76,316	$9,090
High Efficiency Windows, Low-e; U=0.35	181.7	636,477	19,094,308	$519,637	$2,159,482	$676,867	$1,482,614
Ceiling insulation (R-0 improved to R-20)	75.7	265,070	7,952,093	$216,600	$899,473	$174,333	$725,140
Floor insulation (R-0 to R-20)	106.6	373,145	11,194,357	$304,913	$1,266,210	$647,702	$618,508
Wall insulation (R-0 to R-20)	102.5	358,885	10,766,542	$293,260	$1,217,819	$271,745	$946,074
Programmable thermostat	182.7	292,258	4,383,876	$91,422	$590,152	$94,946	$495,206
Faucet Aerators	19.7	24,842	372,629	$28,210	$54,158	$17,387	$36,770
Hot water pipe insulation	23.7	69,411	1,041,171	$33,957	$121,490	$18,620	$102,871
Low flow showerheads	28.0	211,365	1,479,558	$40,004	$152,971	$26,518	$126,453
Remove secondary refigerator/freezer	19.1	166,933	1,669,329	$81,751	$170,666	$55,373	$115,293
Low Income Subtotal	**859.8**	**3,696,508**	**70,066,699**	**$1,862,798**	**$7,915,371**	**$2,280,441**	**$5,634,931**
Single Family -- Existing Total	**5,334.0**	**25,603,810**	**331,313,153**	**$9,165,318**	**$36,093,588**	**$13,323,963**	**$22,769,625**

1.3 Commercial and Industrial DSM Analysis

1.3.1 Commercial and Industrial Customer Characterization

Summit Blue primarily used NSPI customer statistics and previously conducted market research, a Natural Resources Canada report on commercial energy use,[23] and information from two recently completed Canadian DSM potential studies to characterize NSPI's customer base.

Useful information from these sources included:

- The average commercial and institutional facility in Atlantic Canada is about 2,400 square meters in size, or about 25,500 sq. ft.[24]
- The average NSPI commercial and industrial customer has installed about six CFLs in their facilities as of late 2005. [25]
- NSPI staff believes that there is relatively little electric heating in the C&I sectors, in contrast to the residential sector.

1.3.2 Characterizing Commercial & Industrial DSM Measures

Summit Blue started the commercial/industrial DSM measure characterization process by developing a list of DSM measures from previous Summit Blue projects and NSPI staff recommendations. After the individual measures were assigned to a primary end use category (i.e., lighting, heating, etc.), the project team estimated the following parameters for each measure:

- Per-unit energy and coincident peak demand savings

[23] Natural Resources Canada, "Commercial and Institutional Consumption of Energy Survey" (Natural Resources Canada, Ottawa, ON, December 2005.)
[24] Natural Resources Canada: 2005, *op.cit,* p.7.
[25] Corporate Research Associates: 2005, *op.cit,* p.48. The six CFL per business estimate was calculated from the percentages of customers reporting having installed various numbers of CFLs.

- Typical operating hours
- Measure lifetimes
- Measure costs

To do this, the project team first separated the measures into two categories: weather-dependent measures and weather-independent measures. Much of the research and analysis for the weather-independent measures had been conducted by Summit Blue in 2005-2006 for separate studies, and this data was mostly reused with slight modifications, such as for Halifax costs, and US-Canadian exchange rates, for NSPI's service territory. The research consisted of Internet searches and phone calls for manufacturer data concerning end-use demand and energy consumption, and Internet searches and phone calls for retailer data concerning equipment costs. Other research included reviewing estimates of measure lifetimes, operating hours, and coincidence factors for a variety of end-uses and market sectors and from a number of different sources. All of this data was then compiled into a spreadsheet with outputs for per-unit energy and demand savings, incremental cost, payback periods, and benefit-cost ratios. These measure spreadsheets were used as the basis for the values required by the NSPI DSM Potential Study.

These DSM measure spreadsheets were also used as the starting point for the analysis of the weather-dependent measures, such as insulation, windows, etc. Some of the values, such as measure lifetimes, were reused for this potential study. Because of their inherent sensitivity to climate, however, the per-unit energy and demand savings were re-calculated by creating a simulation model using the DOE-2 powered eQuest software package. Summit Blue chose Halifax as the center of NSPI's service territory. Based on the billing data provided by NSPI, the project team modeled the energy consumption with a 2-story, 25,000 sq. ft. office building with slightly longer operating hours to reflect the higher energy consumption in the retail, college, and health care sectors, which are NSPI's largest commercial building segments. For each measure, a baseline case and an energy-efficient case were modeled separately, and the difference in peak demand and energy consumption per unit was calculated and entered into the measure characterization spreadsheet.

For the C&I Custom Rebate Program, custom measure savings and costs will be calculated specifically for each application, unlike the C&I Prescriptive Rebate Program, where standard engineering estimates will be used for each measure.

1.3.3 Commercial and Industrial Measure Characterizations

Table B-10 lists measure characterizations for commercial new construction.

Table B-10. Commercial New Construction Measure Characterizations

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	Measure Life (Years)	Average Peak Demand Savings per Unit (kW)	Average Annual Energy Savings per Unit (kWh)	Incremental Measure Cost ($)	Incremental Measure Cost per kW ($/kW)	Avoided Cost Benefits per kW ($/kW)	Program Admin. Cost per kW ($/kW)	Total Program Cost per kW ($/kW)	Total Resource Cost
Lighting									
CFLs	8	0.023	295.8	$11	$460	$10,124	$250	$501	14.2
T5 w/ EB	20	0.013	161.8	$45	$3,537	$25,310	$250	$501	6.7
Delamping w/ Reflectors	20	0.022	284.6	$21	$928	$25,310	$250	$501	21.5
LED Exit Signs	20	0.014	240.1	$49	$3,429	$33,367	$250	$501	9.1
Occupancy Sensors	12	0.019	600.0	$107	$5,651	$36,823	$250	$501	6.2
Daylighting	15	0.237	3,002.2	$960	$4,048	$18,982	$250	$501	4.4
Heating/HVAC and Building Envelope									
Hi-E Air-Cooled Chillers	20	0.040	105.0	$69	$1,724	$6,255	$715	$2,218	2.6
Hi-E Water-Cooled Chillers	20	0.019	50.4	$50	$2,613	$6,308	$715	$2,218	1.9
Programmable Thermostats	20	0.100	700.0	$241	$2,413	$14,568	$715	$2,218	4.7
Energy Mgmt System	20	0.764	3,500.0	$690	$902	$9,968	$715	$2,218	6.2

Table B-11 lists results for commercial new construction for 2010.

Table B-11. Commercial New Construction – Results for 2010

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2010 Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
Lighting							
CFLs	70.8	895,482.3	7,163,858	$35,420	$716,455	$50,290	$666,165
T5 w/ EB	79.1	1,001,150.1	20,023,003	$39,600	$2,002,494	$299,680	$1,702,814
Delamping w/ Reflectors	11.4	144,391.4	2,887,828	$5,711	$288,811	$13,449	$275,361
LED Exit Signs	7.5	127,302.4	2,546,048	$3,771	$251,428	$27,721	$223,707
Occupancy Sensors	4.0	127,656.2	1,531,875	$2,020	$148,598	$23,815	$124,783
Daylighting	49.7	628,929.1	9,433,936	$24,877	$943,485	$213,651	$729,833
Subtotal	**222.6**	**2,924,912**	**43,586,548**	**$111,399**	**$4,351,269**	**$628,606**	**$3,722,663**
Heating/HVAC and Building Envelope							
Hi-E Air-Cooled Chillers	2.7	7,103.1	142,062	$6,002	$16,926	$6,599	$10,327
Hi-E Water-Cooled Chillers	1.3	3,409.5	68,190	$2,851	$8,108	$4,277	$3,830
Programmable Thermostats	66.6	465,901.7	9,318,034	$147,620	$969,595	$208,208	$761,387
Energy Mgmt System	68.4	313,147.1	6,262,941	$151,670	$681,676	$110,584	$571,092
Subtotal	**138.9**	**789,561**	**15,791,227**	**$308,142**	**$1,676,305**	**$329,669**	**$1,346,636**
Custom	**30.2**	**240,957.2**	**3,036,649.6**	**29,993.0**	**314,752.4**	**155,478.0**	**159,274.4**
Commercial -- New Total	**391.7**	**3,955,430**	**62,414,425**	**$449,534**	**$6,342,327**	**$1,113,753**	**$5,228,574**

Table B-12 lists measure characterizations for industrial new construction.

Table B-12. Industrial New Construction Measure Characterizations

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	Measure Life (Years)	Average Peak Demand Savings per Unit (kW)	Average Annual Energy Savings per Unit (kWh)	Incremental Measure Cost ($)	Incremental Measure Cost per kW ($/kW)	Avoided Cost Benefits per kW ($/kW)	Program Admin. Cost per kW ($/kW)	Total Program Cost per kW ($/kW)	Total Resource Cost
Lighting									
CFLs	8	0.049	391.2	$11	$221	$6,605	$250	$501	14.0
T5 w/ EB	20	0.079	634.8	$232	$2,929	$16,512	$250	$501	5.2
Delamping w/ Reflectors	20	0.047	376.4	$21	$445	$16,512	$250	$501	23.7
LED Exit Signs	20	0.029	254.0	$49	$1,680	$17,912	$250	$501	9.3
Occupancy Sensors	12	0.090	1,799.2	$214	$2,390	$23,627	$250	$501	8.9
PS Metal Halides	8	0.126	1,007.5	$70	$554	$6,605	$250	$501	8.2
HVAC									
Air-Cooled Chillers	20	0.040	131.3	$69	$1,724	$7,502	$715	$2,218	3.1
Water-Cooled Chillers	20	0.019	63.0	$50	$2,586	$7,502	$715	$2,218	2.3
Packaged DX	20	0.030	98.0	$205	$6,879	$7,502	$715	$2,218	1.0

Table B-13lists results for industrial new construction for 2010.

Table B-13. Industrial New Construction – Results for 2010

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2010						
	Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
Lighting							
CFLs	43.7	350,916	2,807,327	$21,891	$288,877	$20,597	$268,279
T5 w/ EB	90.8	728,435	14,568,705	$45,442	$1,499,133	$288,681	$1,210,453
Delamping w/ Reflectors	14.1	113,166	2,263,327	$7,060	$232,898	$9,807	$223,092
LED Exit Signs	10.0	87,455	1,749,105	$4,997	$178,822	$19,271	$159,551
Occupancy Sensors	3.0	61,066	732,790	$1,524	$71,931	$8,038	$63,893
PS Metal Halides	7.9	63,508	508,067	$3,962	$52,281	$6,368	$45,913
Subtotal	**169.6**	**1,404,547**	**22,629,321**	**$84,874**	**$2,323,942**	**$352,761**	**$1,971,181**
HVAC							
Air-Cooled Chillers	2.0	6,576	131,521	$4,445	$15,035	$4,888	$10,148
Water-Cooled Chillers	1.0	3,157	63,130	$2,134	$7,217	$3,175	$4,042
Packaged DX	0.0	0	0	$0	$0	$0	$0
Subtotal	**3.0**	**9,733**	**194,651**	**$6,579**	**$22,252**	**$8,063**	**$14,190**
Custom	**652.5**	**5,321,013.5**	**97,681,709.4**	**795,142.8**	**10,044,734.1**	**867,410.4**	**9,177,323.7**
Industrial -- New Total	**825.1**	**6,735,293**	**120,505,681**	**$886,596**	**$12,390,928**	**$1,228,234**	**$11,162,694**

Table B-14 lists measure characterizations for commercial existing construction.

Table B-14. Commercial Existing Construction Measure Characterizations

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	Measure Life (Years)	Average Peak Demand Savings per Unit (kW)	Average Annual Energy Savings per Unit (kWh)	Incremental Measure Cost ($)	Incremental Measure Cost per kW ($/kW)	Avoided Cost Benefits per kW ($/kW)	Program Admin. Cost per kW ($/kW)	Total Program Cost per kW ($/kW)	Total Resource Cost
Lighting									
CFLs	8	0.027	302.3	$11	$402	$9,090	$250	$501	13.9
Regular T8 w/ EB	20	0.017	193.9	$56	$3,242	$22,726	$250	$501	6.5
Premium T8 w/ EB	20	0.025	279.5	$70	$2,812	$22,726	$250	$501	7.4
Delamping w/ Reflectors	20	0.026	290.9	$42	$1,621	$22,726	$250	$501	12.1
LED Exit Signs	20	0.016	245.4	$97	$6,120	$30,554	$250	$501	4.8
Occupancy Sensors	12	0.022	613.3	$107	$4,934	$32,948	$250	$501	6.4
Daylighting	15	0.272	3,068.9	$960	$3,535	$17,044	$250	$501	4.5
Small Business Direct Install Lighting									
CFLs	8	0.027	302.3	$11	$402	$9,090	$405	$1,500	11.3
Regular T8 w/ EB	20	0.017	193.9	$56	$3,242	$22,726	$405	$1,500	6.2
Premium T8 w/ EB	20	0.025	279.5	$70	$2,812	$22,726	$405	$1,500	7.1
Delamping w/ Reflectors	20	0.026	290.9	$42	$1,621	$22,726	$405	$1,500	11.2
LED Exit Signs	20	0.016	245.4	$97	$6,120	$30,554	$405	$1,500	4.7
Occupancy Sensors	12	0.022	613.3	$107	$4,934	$32,948	$405	$1,500	6.2
Daylighting	15	0.272	3,068.9	$960	$3,535	$17,044	$405	$1,500	4.3
Heating/HVAC and Building Envelope									
Air-Cooled Chillers	20	0.040	105.0	$69	$1,724	$6,255	$715	$2,218	2.6
Water-Cooled Chillers	20	0.019	50.4	$50	$2,613	$6,308	$715	$2,218	1.9
Programmable Thermostats	10	0.100	286.0	$241	$2,413	$3,351	$715	$2,218	1.1
Energy Mgmt System	10	0.320	1,430.0	$690	$2,152	$4,873	$715	$2,218	1.7
Hi-E Windows	20	0.344	715.1	$1,257	$3,649	$5,213	$715	$1,110	1.2

Table B-15 lists results for commercial existing construction for 2008.

Table B-15. Commercial Existing Construction – Results for 2008

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2008 Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
Small Business Direct Install Lighting							
CFLs	90.4	1,021,305	8,170,440	$135,647	$822,051	$72,974	$749,077
Regular T8 w/ EB	55.7	628,616	12,572,312	$83,491	$1,264,936	$203,014	$1,061,922
Premium T8 w/ EB	95.3	1,075,811	21,516,218	$142,886	$2,164,808	$306,467	$1,858,342
Delamping w/ Reflectors	34.6	391,114	7,822,280	$51,947	$787,022	$70,169	$716,853
LED Exit Signs	49.0	755,635	15,112,699	$73,535	$1,497,858	$319,888	$1,177,970
Occupancy Sensors	5.7	161,692	1,940,307	$8,590	$188,685	$30,577	$158,109
Daylighting	0.0	0	0	$0	$0	$0	$0
Subtotal	**330.7**	**4,034,173**	**67,134,257**	**$496,096**	**$6,725,361**	**$1,003,089**	**$5,722,273**
Custom	**37.8**	**314,298**	**4,078,177**	**$39,974**	**$421,709**	**$132,734**	**$288,975**
Commercial - Existing Total	**368.5**	**4,348,471**	**71,212,434**	**$536,070**	**$7,147,070**	**$1,135,822**	**$6,011,248**

Table B-16 lists results for commercial existing construction for 2009.

Table B-16. Commercial Existing Construction – Results for 2009

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2009 Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
Lighting							
CFLs	173.9	1,964,048	15,712,386	$87,040	$1,580,868	$113,423	$1,467,445
Regular T8 w/ EB	107.0	1,208,876	24,177,523	$53,573	$2,432,570	$373,847	$2,058,723
Premium T8 w/ EB	183.2	2,068,867	41,377,342	$91,685	$4,163,093	$561,010	$3,602,082
Delamping w/ Reflectors	66.6	752,142	15,042,846	$33,332	$1,513,504	$124,634	$1,388,870
LED Exit Signs	94.3	1,453,144	29,062,884	$47,185	$2,880,497	$600,580	$2,279,916
Occupancy Sensors	11.0	310,947	3,731,359	$5,512	$362,857	$57,097	$305,759
Daylighting	80.3	906,861	13,602,922	$40,189	$1,368,629	$303,919	$1,064,710
Subtotal	**716.3**	**8,664,886**	**142,707,262**	**$358,517**	**$14,302,016**	**$2,134,512**	**$12,167,504**
Small Business Direct Install Lighting							
CFLs	173.9	1,964,048	15,712,386	$260,859	$1,580,868	$140,335	$1,440,533
Regular T8 w/ EB	107.0	1,208,876	24,177,523	$160,560	$2,432,570	$390,412	$2,042,158
Premium T8 w/ EB	183.2	2,068,867	41,377,342	$274,781	$4,163,093	$589,359	$3,573,734
Delamping w/ Reflectors	66.6	752,142	15,042,846	$99,897	$1,513,504	$134,940	$1,378,564
LED Exit Signs	94.3	1,453,144	29,062,884	$141,414	$2,880,497	$615,170	$2,265,327
Occupancy Sensors	11.0	310,947	3,731,359	$16,520	$362,857	$58,802	$304,055
Daylighting	0.0	0	0	$0	$0	$0	$0
Subtotal	**636.0**	**7,758,025**	**129,104,340**	**$954,031**	**$12,933,387**	**$1,929,017**	**$11,004,371**
Heating/HVAC and Building Envelope							
Air-Cooled Chillers	7.0	18,390	367,798	$15,538	$43,823	$17,085	$26,738
Water-Cooled Chillers	3.3	8,827	176,543	$7,381	$20,990	$11,074	$9,916
Programmable Thermostats	182.6	522,248	5,222,481	$405,003	$611,889	$571,232	$40,657
Energy Mgmt System	72.0	321,383	3,213,835	$159,732	$350,967	$206,454	$144,513
Hi-E Windows	301.6	626,191	12,523,823	$334,639	$1,572,086	$1,316,090	$255,995
Subtotal	**566.5**	**1,497,040**	**21,504,480**	**$922,293**	**$2,599,754**	**$2,121,935**	**$477,819**
Custom	**66.3**	**551,400**	**7,154,697**	**$70,129**	**$739,840**	**$232,866**	**$506,974**
Commercial - Existing Total	**1,985.2**	**18,471,351**	**300,470,779**	**$2,304,971**	**$30,574,997**	**$6,418,330**	**$24,156,668**

Table B-17 lists results for commercial existing construction for 2010.

Table B-17. Commercial Existing Construction – Results for 2010

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2010 Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
Lighting							
CFLs	347.8	3,928,096	31,424,771	$174,080	$3,161,736	$226,847	$2,934,889
Regular T8 w/ EB	214.1	2,417,752	48,355,047	$107,147	$4,865,139	$747,694	$4,117,445
Premium T8 w/ EB	366.4	4,137,734	82,754,685	$183,371	$8,326,185	$1,122,021	$7,204,164
Delamping w/ Reflectors	133.2	1,504,285	30,085,693	$66,665	$3,027,007	$249,268	$2,777,740
LED Exit Signs	188.6	2,906,288	58,125,767	$94,370	$5,760,993	$1,201,161	$4,559,832
Occupancy Sensors	22.0	621,893	7,462,718	$11,024	$725,713	$114,195	$611,519
Daylighting	160.6	1,813,723	27,205,843	$80,378	$2,737,258	$607,838	$2,129,419
Subtotal	**1,432.6**	**17,329,772**	**285,414,524**	**$717,035**	**$28,604,032**	**$4,269,023**	**$24,335,009**
Small Business Direct Install Lighting							
CFLs	260.9	2,946,072	23,568,578	$391,289	$2,371,302	$210,503	$2,160,799
Regular T8 w/ EB	160.6	1,813,314	36,266,285	$240,839	$3,648,855	$585,617	$3,063,237
Premium T8 w/ EB	274.8	3,103,301	62,066,014	$412,172	$6,244,639	$884,038	$5,360,601
Delamping w/ Reflectors	99.9	1,128,213	22,564,270	$149,846	$2,270,256	$202,410	$2,067,846
LED Exit Signs	141.4	2,179,716	43,594,325	$212,120	$4,320,745	$922,754	$3,397,991
Occupancy Sensors	16.5	466,420	5,597,039	$24,779	$544,285	$88,202	$456,083
Daylighting	0.0	0	0	$0	$0	$0	$0
Subtotal	**954.0**	**11,637,037**	**193,656,511**	**$1,431,046**	**$19,400,081**	**$2,893,525**	**$16,506,556**
Heating/HVAC and Building Envelope							
Air-Cooled Chillers	14.0	36,780	735,597	$31,076	$87,645	$34,170	$53,475
Water-Cooled Chillers	6.7	17,654	353,086	$14,761	$41,981	$22,148	$19,833
Programmable Thermostats	365.2	1,044,496	10,444,963	$810,007	$1,223,777	$1,142,463	$81,314
Energy Mgmt System	144.0	642,767	6,427,669	$319,463	$701,933	$412,908	$289,026
Hi-E Windows	603.1	1,252,382	25,047,645	$669,279	$3,144,172	$2,632,181	$511,991
Subtotal	**1,133.0**	**2,994,080**	**43,008,960**	**$1,844,586**	**$5,199,508**	**$4,243,870**	**$955,638**
Custom	**132.6**	**1,102,800**	**14,309,393**	**$140,258**	**$1,479,680**	**$465,732**	**$1,013,947**
Commercial - Existing Total	**3,652.3**	**33,063,689**	**536,389,388**	**$4,132,926**	**$54,683,301**	**$11,872,151**	**$42,811,150**

Table B-18 lists measure characterizations for industrial existing construction.

Table B-18. Industrial Existing Construction Measure Characterizations

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	Measure Life (Years)	Average Peak Demand Savings per Unit (kW)	Average Annual Energy Savings per Unit (kWh)	Incremental Measure Cost ($)	Incremental Measure Cost per kW ($/kW)	Avoided Cost Benefits per kW ($/kW)	Program Admin. Cost per kW ($/kW)	Total Program Cost per kW ($/kW)	Total Resource Cost
Lighting									
CFLs	8	0.049	397.5	$11	$221	$6,703	$250	$501	14.2
Regular T8 w/ EB	20	0.031	255.0	$56	$1,780	$16,757	$250	$501	8.3
Premium T8 w/ EB	20	0.045	367.5	$70	$1,544	$16,757	$250	$501	9.3
Delamping w/ Reflectors	20	0.047	382.5	$42	$890	$16,757	$250	$501	14.7
LED Exit Signs	20	0.029	254.0	$97	$3,360	$17,912	$250	$501	5.0
Occupancy Sensors	12	0.090	1,828.1	$214	$2,390	$23,994	$250	$501	9.1
PS Metal Halides	15	0.126	1,023.8	$341	$2,716	$12,568	$250	$501	4.2
HVAC									
Air-Cooled Chillers	20	0.040	115.0	$69	$1,724	$6,730	$715	$2,218	2.8
Water-Cooled Chillers	20	0.019	55.2	$50	$2,586	$6,730	$715	$2,218	2.0
Energy Mgmt System	15	0.100	784.0	$690	$6,895	$12,123	$715	$2,218	1.6

Table B-19 lists results for the industrial existing programs for 2008.

Table B-19. Industrial Existing Construction – Results for 2008

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2008						
	Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
Custom	970.7	8,246,084	146,303,937	$1,165,067	$15,004,759	$1,638,265	$13,366,495
Industrial -- Existing Total	970.7	8,246,084	146,303,937	$1,165,067	$15,004,759	$1,638,265	$13,366,495

Table B-20 lists results for the industrial existing programs for 2009.

Table B-20. Industrial Existing Construction – Results for 2009

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2009						
	Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
Lighting							
CFLs	140.8	1,147,560	9,180,480	$70,454	$943,532	$66,291	$877,241
Regular T8 w/ EB	49.6	404,562	8,091,244	$24,838	$831,584	$100,756	$730,828
Premium T8 w/ EB	80.5	655,926	13,118,525	$40,270	$1,348,267	$144,360	$1,203,908
Delamping w/ Reflectors	53.9	439,464	8,789,280	$26,981	$903,326	$61,470	$841,856
LED Exit Signs	65.6	574,331	11,486,616	$32,814	$1,174,349	$236,698	$937,651
Occupancy Sensors	20.2	411,874	4,942,489	$10,115	$484,909	$53,354	$431,555
PS Metal Halides	28.2	230,050	3,450,756	$14,124	$354,654	$83,698	$270,956
Subtotal	**438.8**	**3,863,768**	**59,059,390**	**$219,596**	**$6,040,622**	**$746,627**	**$5,293,995**
HVAC							
Air-Cooled Chillers	2.7	7,814	156,279	$6,028	$18,292	$6,628	$11,664
Water-Cooled Chillers	1.3	3,751	75,014	$2,893	$8,780	$4,306	$4,474
Energy Mgmt System	3.3	25,556	383,344	$7,230	$39,517	$24,807	$14,711
Subtotal	**7.3**	**37,121**	**614,637**	**$16,151**	**$66,590**	**$35,741**	**$30,849**
Custom	**1,703.0**	**14,466,815**	**256,673,573**	**$2,043,977**	**$26,324,139**	**$2,874,149**	**$23,449,991**
Industrial -- Existing Total	**2,149.0**	**18,367,703**	**316,347,600**	**$2,279,724**	**$32,431,351**	**$3,656,516**	**$28,774,834**

Table B-21 lists results for the industrial existing programs for 2010.

Table B-21. Industrial Existing Construction – Results for 2010

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2010						
	Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
Lighting							
CFLs	281.5	2,295,120	18,360,961	$140,908	$1,887,063	$132,582	$1,754,481
Regular T8 w/ EB	99.3	809,124	16,182,489	$49,676	$1,663,169	$201,513	$1,461,656
Premium T8 w/ EB	160.9	1,311,852	26,237,050	$80,541	$2,696,535	$288,719	$2,407,816
Delamping w/ Reflectors	107.8	878,928	17,578,560	$53,961	$1,806,651	$122,939	$1,683,712
LED Exit Signs	131.1	1,148,662	22,973,232	$65,628	$2,348,698	$473,397	$1,875,302
Occupancy Sensors	40.4	823,748	9,884,977	$20,229	$969,818	$106,708	$863,110
PS Metal Halides	56.4	460,101	6,901,512	$28,248	$709,309	$167,396	$541,912
Subtotal	**877.5**	**7,727,535**	**118,118,780**	**$439,192**	**$12,081,243**	**$1,493,254**	**$10,587,989**
HVAC							
Air-Cooled Chillers	5.4	15,628	312,557	$12,056	$36,584	$13,256	$23,328
Water-Cooled Chillers	2.6	7,501	150,027	$5,787	$17,561	$8,612	$8,949
Energy Mgmt System	6.5	51,113	766,689	$14,460	$79,034	$49,613	$29,421
Subtotal	**14.6**	**74,242**	**1,229,274**	**$32,303**	**$133,179**	**$71,482**	**$61,698**
Custom	**3,406.0**	**28,933,629**	**513,347,147**	**$4,087,954**	**$52,648,278**	**$5,748,297**	**$46,899,981**
Industrial -- Existing Total	**4,298.0**	**36,735,406**	**632,695,200**	**$4,559,449**	**$64,862,701**	**$7,313,033**	**$57,549,668**

Table B-22 lists results for the commercial and industrial existing construction programs for 2008.

Table B-22. Commercial and Industrial Existing Construction – Results for 2008 by Program

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2008						
	Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
Small Business Direct Install Lighting							
Subtotal	**330.7**	**4,034,173**	**67,134,257**	**$496,096**	**$6,725,361**	**$1,003,089**	**$5,722,273**
C&I Custom							
Commercial Custom	37.8	314,298	4,078,177	$39,974	$421,709	$132,734	$288,975
Industrial Custom	970.7	8,246,084	146,303,937	$1,165,067	$15,004,759	$1,638,265	$13,366,495
Subtotal	**1,008.5**	**8,560,382**	**150,382,114**	**$1,205,040**	**$15,426,468**	**$1,770,998**	**$13,655,470**
C&I - Existing Total	**1,339.2**	**12,594,555**	**217,516,371**	**$1,701,137**	**$22,151,829**	**$2,774,087**	**$19,377,742**

Table B-23 lists results for the commercial and industrial existing construction programs for 2009.

Table B-23. Commercial and Industrial Existing Construction – Results for 2009 by Program

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2009						
	Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
C&I Prescriptive Rebate							
Commercial Lighting	716.3	8,664,886	142,707,262	$358,517	$14,302,016	$2,134,512	$12,167,504
Commercial HVAC and Building Envel	566.5	1,497,040	21,504,480	$922,293	$2,599,754	$2,121,935	$477,819
Industrial Lighting	438.8	3,863,768	59,059,390	$219,596	$6,040,622	$746,627	$5,293,995
Industrial HVAC and Building Envelop	7.3	37,121	614,637	$16,151	$66,590	$35,741	$30,849
Subtotal	**1,728.9**	**14,062,814**	**223,885,769**	**$1,516,558**	**$23,008,982**	**$5,038,815**	**$17,970,167**
Small Business Direct Install Lighting							
Subtotal	**636.0**	**7,758,025**	**129,104,340**	**$954,031**	**$12,933,387**	**$1,929,017**	**$11,004,371**
C&I Custom							
Commercial Custom	66.3	551,400	7,154,697	$70,129	$739,840	$232,866	$506,974
Industrial Custom	1,703.0	14,466,815	256,673,573	$2,043,977	$26,324,139	$2,874,149	$23,449,991
Subtotal	**1,769.3**	**15,018,215**	**263,828,270**	**$2,114,106**	**$27,063,979**	**$3,107,015**	**$23,956,964**
C&I - Existing Total	**4,134.2**	**36,839,054**	**616,818,379**	**$4,584,695**	**$63,006,348**	**$10,074,846**	**$52,931,502**

Table B-24 lists results for the commercial and industrial existing construction programs for 2010.

Table B-24. Commercial and Industrial Existing Construction – Results for 2010 by Program

Measure Name --savings at generator --2007 $ --avoided costs: $0.095/kWh; $63.39/kW-year	For Plan Year 2010 Achievable Potential Peak Demand Savings (kW)	Achievable Potential First Year Energy Savings (kWh)	Achievable Potential Lifetime Energy Savings (kWh)	Program Costs	Total Avoided Cost Benefits	TRC Costs	Total Net Resource Benefits
C&I Prescriptive Rebate							
Commercial Lighting	1,432.6	17,329,772	285,414,524	$717,035	$28,604,032	$4,269,023	$24,335,009
Commercial HVAC and Building Envel	1,133.0	2,994,080	43,008,960	$1,844,586	$5,199,508	$4,243,870	$955,638
Industrial Lighting	877.5	7,727,535	118,118,780	$439,192	$12,081,243	$1,493,254	$10,587,989
Industrial HVAC and Building Envelop	14.6	74,242	1,229,274	$32,303	$133,179	$71,482	$61,698
Subtotal	**3,457.7**	**28,125,629**	**447,771,538**	**$3,033,116**	**$46,017,963**	**$10,077,629**	**$35,940,334**
Small Business Direct Install Lighting							
Subtotal	**954.0**	**11,637,037**	**193,656,511**	**$1,431,046**	**$19,400,081**	**$2,893,525**	**$16,506,556**
C&I Custom							
Commercial Custom	132.6	1,102,800	14,309,393	$140,258	$1,479,680	$465,732	$1,013,947
Industrial Custom	3,406.0	28,933,629	513,347,147	$4,087,954	$52,648,278	$5,748,297	$46,899,981
Subtotal	**3,538.6**	**30,036,429**	**527,656,540**	**$4,228,212**	**$54,127,958**	**$6,214,029**	**$47,913,929**
C&I - Existing Total	**7,950.4**	**69,799,095**	**1,169,084,589**	**$8,692,375**	**$119,546,002**	**$19,185,184**	**$100,360,819**

1.4 Residential, Commercial and Industrial DSM Measure Descriptions

Lighting Measures

Most of the lighting measures discussed below are only used for DSM potential estimates for the commercial and industrial sector. CFLs and LED night lights also apply to the residential sector, while LED holiday lights only apply to the residential sector.

T8 Lamps and Electronic Ballasts

T8 lamps and electronic ballasts are the most common alternative for standard T12 lamp and magnetic ballast tubular fluorescent lighting systems. T8 fluorescent lamps are one inch in diameter, and are thinner than T12 lamps, which are 1.5 inches in diameter. T8 systems are approximately 30 percent more efficient than standard T12 systems.

T5 Lamps and Electronic Ballasts

T5 lamps and electronic ballasts are a newer alternative tubular fluorescent lighting system. T5 fluorescent lamps are 5/8 of an inch in diameter, thinner than both T8 lamps and T12 lamps. T5 lighting systems are primarily used in new construction, and are not appropriate for most retrofit situations, as the lamps are only available in metric lengths.

Compact Fluorescent Lamps

Compact fluorescent lamps (CFLs) are the most common alternatives to standard incandescent lamps. CFLs are generally about four times as efficient as incandescent lamps, and last about 10 times as long. The newer "spiral" CFLs are also generally about the same size as incandescent lamps of similar light output.

Occupancy Sensors

Occupancy sensors automatically turn off the lights in a room or an area when the area is unoccupied. Occupancy sensors are an alternative to standard wall mounted on/off lighting switches.

Pulse Start Metal Halide

Pulse start metal halide lamps are a newer type of metal halide systems that use formed body arc tubes and require an ignitor to start the lamps. Pulse start metal halide lamps are more efficient than standard metal halide systems, and also provide better light output maintenance over the lifetime of the lamp, as well as a longer lamp lifetime.

Delamping

The definition of delamping used for this project is replacing a four lamp, four foot fluorescent lighting fixture with a similar two-lamp or three-lamp fixture. This measure is intended for areas that are currently over-lit. Lighting reflectors are often used as part of delamping projects.

Efficient Street Lights

Efficient street lights generally use more efficient high intensity discharge lighting systems than mercury vapor systems. Usually either high-pressure sodium systems or pulse start metal halide systems are used. HPS systems produce a yellow-orange color of light, while pulse start metal halide systems produce “white” light comparable to mercury vapor systems.

LED Exit Signs

LED exit signs are one of the most efficient types of exit signs on the market. They generally only draw about two to three watts of power, compared to 10 watts or more for CFLs, or 20 watts or more for incandescent exit signs.

LED Traffic Lights

LED Traffic lights use LED lamps instead of incandescent lamps for each of the three lights in the traffic signal.

LED Night Lights

LED night lights use LED lamps instead of incandescent lamps.

LED Holiday Lights

LED holiday lights use LED lamps instead of incandescent lamps.

HVAC Measures

Efficient Packaged Commercial Air Conditioning Systems

Standard efficiency units are specified as units with EER ratings of 8.9-9.8, depending on unit size and type. Efficient units are specified as units with EER ratings of 10.4-11.5, depending on the sizes and efficiencies. These specifications are based on the California DEER database.

Efficient Chiller Systems

Chiller efficiency varies by compressor type (centrifugal, reciprocating or screw), condenser type (water-cooled or air-cooled) and vintage (age). Newer, water-cooled centrifugal machines tend to be the most efficient.[26] Chillers are not generally covered by government efficiency standards, so efficient units are usually defined relative to a utility or state-specific baseline. For purposes of this project, Summit Blue defined standard efficiency air cooled chillers as having kW/ton ratings of 1.3-1.4, and efficient units to have efficiencies of 0.95-1.25 kW/ton. For water cooled chillers, standard efficiency units were defined as those with efficiency ratings of 0.65 kW/ton, while efficient units were defines as units with efficiencies of 0.47- 0.61 kW/ton, depending upon the unit size and type. These specifications are also based on the California DEER database.

Energy Management Systems

Energy management systems are automated control systems that customers use to control the energy systems in their facilities. EMS systems most commonly control HVAC systems and lighting systems. They save energy by shutting energy using equipment off

[26] Itron, Inc. "Database for Energy Efficiency Resources (DEER) Update Study" (Itron Inc., Vancouver, WA, December 2005), p. 7-26. Available at http://www.energy.ca.gov/deer/.

at pre-set times, by monitoring and controlling HVAC system operation so that the equipment is operated as efficiently as possible, and by cycling equipment so that energy usage is reduced during peak periods.

ENERGY STAR® Residential Room Air Conditioners

ENERGY STAR® room air conditioners must be at least 10 percent more efficient than standard Canadian models, which are defined as units with a minimum EER rating of 9.4-10.8 depending upon the size and type of the unit.[27] Canadian 2003 minimum efficiency standards for room air conditioners range from 8.5 EER to 9.8 EER depending on the unit size and type.

ENERGY STAR® Residential Air Source Heat Pumps

ENERGY STAR® air source heat pumps are units with minimum ratings of 14 SEER, EER ratings of 11.0-11.5, and heating system performance factors of 7.0-7.1 or higher[28]. Canadian 2006 minimum efficiency standards for heat pumps are 13 SEER and 6.7 HSPF.

HVAC Diagnostic Repair, Testing, and Maintenance

Many residential and commercial HVAC systems are not operating as efficiently as possible due to inadequate maintenance. This package of services includes ensuring proper refrigerant charge, lubrication, cleanliness and fan operation.

HVAC Duct Sealing, Operations and Maintenance

Many HVAC ducts are not sealed well and leak conditioned air into unconditioned spaces such as basements and attics. Duct sealing reduces such heat loss.

[27] See Canadian Energy Star web site: http://oee.nrcan.gc.ca/energystar/.
[28] Ibid.

HVAC Duct Insulation

Uninsulated HVAC ducts that run through uninsulated spaces like basements or attics transfer some of the heated or cooled air into those spaces rather than the conditioned zones. The amount of this heat loss is reduced with duct insulation.

Building Envelope Measures

Ceiling Insulation

Ceiling insulation includes both insulating uninsulated roof areas and adding insulation to under-insulated roof areas. In Nova Scotia, the general estimate is that the proper amount of ceiling insulation is an R-value of about 40.

Wall Insulation

Wall insulation is most cost-effective when insulating un-insulated wall areas. In Nova Scotia, the general rule of thumb is that the proper amount of wall insulation is an R-value of about 20.

Floor Insulation

Many residential basement floors are uninsulated, which results in heat loss to the ground underneath the home. Floor insulation reduces this heat loss.

Efficient Windows

Efficient windows are generally considered to be either triple paned windows, windows with a radiant barrier to reflect heat back into the conditioned space, or windows with low "shading coefficients." Reducing the shading coefficients of glass will reduce the amount of solar heat gain into the building. This reduced solar gain will decrease the cooling load for the building, but may increase the heating load.[29]

[29] Itron: 2005, *op.cit.,* p. 7-17.

Comprehensive Shell Air Sealing

This measure includes caulking, weather stripping, and sealing other visible cracks and penetrations in the building shell.

Commercial and Industrial Refrigeration Measures

The following measures are most applicable to grocery stores. Secondary markets include restaurants or cafeterias in office buildings.

High Efficiency Evaporative Fan Motors

This measure involves replacing shade-pole evaporator fan motors with either permanent split-capacitor (PSC) or electrically commutated (EC) motors. According to the California DEER database, the incremental cost for these measures is small.[30]

Efficient Ice Makers

Energy-efficient ice-makers come as either air-cooled or water-cooled units and are rated based on the pounds of ice produced in a 24-hour period. Energy-efficient ice-makers are defined by the use of high-efficiency compressors, high-efficiency fan motors, and thicker insulation. Energy savings vary by type and capacity and range from 18-28 percent in most cases.[31]

Strip Curtains and Night Covers

The majority of heat loss from an open display fixture is through infiltration. Covering open fixtures with plastic curtains during low traffic periods and at night can reduce convection by 50 percent or more when they are applied, thereby reducing refrigeration loads.[32]

[30] Itron: 2005, *op.cit.,* p. 7-72.
[31] "Packaged Commercial Refrigeration Equipment", ACEEE, December 2002.
[32] Itron: 2005, *op.cit.,* p. 7-74.

Efficient Refrigeration Compressors

This measure involves the use of high-efficiency compressors in the place of standard compressors in the refrigeration cycle. Energy-savings potential is in the range of 6-16 percent.[33]

High Efficiency Multiplex Rack Compressor System

A multiplex-compressor system consists of multiple compressors drawing from a common suction header (suction-group), and serving any number of display fixtures. The suction group is controlled to satisfy the lowest temperature required by any of the attached display fixtures. For this reason the display fixtures served by a given suction group usually have similar temperature requirements; separate suction-groups are typically used for low-temperature and medium-temperature demands.[34]

Residential Refrigeration and Appliance Measures

ENERGY STAR® Refrigerators and Freezers

ENERGY STAR® refrigerators must exceed Canadian minimum energy efficiency standards by at least 15 percent for full-size units, and 20 percent for compact size units[35]. ENERGY STAR® freezers must exceed Canadian minimum energy efficiency standards by at least 10 percent for full-sized units and 20 percent for compact units.

Remove Secondary Refrigerators and Freezers

Second refrigerators and freezers that customers own are often older and less efficient appliances. For example, the most common refrigerator sold in 1990 used between 60-70 kWh per cubic foot, compared to 2003, when the most common refrigerator sold used less than 30 kWh per cubic foot.[36] According to Natural Resources Canada's 2003

[33] http://www.aps.com/images/pdf/Refrigeration.pdf
[34] Itron: 2005, *op.cit.*, p. 7-67.
[35] See Canadian Energy Star web site: http://oee.nrcan.gc.ca/energystar/.
[36] Natural Resources Canada, "Energy Consumption of Major Household Appliances Shipped in Canada, Trends for 1990-2003" (NRCAN, Gatineau, QC, December 2005) p.8.

household energy survey, 19 percent of households in the Atlantic region have more than one refrigerator.[37]

Convection Ovens

Convection ovens are similar to traditional ovens except they have circulating fans to increase heat transfer to the food. Food cooks faster and at a slightly lower temperature in a convection oven.

Power Strips with Occupancy Sensors

Power strips with occupancy sensors have several inputs that are controlled by an associated occupancy sensor and some that are not controlled. In an office environment, a computer could be plugged into an uncontrolled input and a monitor and task lamp could be plugged into the sensor controlled inputs.

Commercial and Industrial Process Measures

Compressed Air Leak Maintenance/Detection

Compressed air leak maintenance or detection includes helping customers identify and repair leaks in their air compressor systems. Utility DSM programs often offer this type of service using an ultrasonic inspection device.

Efficient Air Compressors

Efficient compressors come in a variety of system types. There are three primary factors determining a compressor's overall efficiency: the compressor type, partial loading controls, and the efficiency of the motor. Incentives for efficient compressors can be most effective as part of evaluating an entire air compressor system, and not just considering the compressor in isolation.

[37] Natural Resources Canada, "2003 Survey of Household Energy Use, Summary Report", (NRCAN, Ottawa, ON, December 2005) p.22.

Custom Measures

For purposes of this assignment, Summit Blue has defined "custom" measures as other energy efficiency measures beyond those specifically defined in this section. Generally, "custom" measures are somewhat unique or have application-specific components that make developing generic savings or cost estimates difficult, or subject to considerable judgment. Utilities' definitions of "custom" measures vary, as do their engineering analysis or assistance offers and requirements to screen and evaluate potential custom measures. For example, Otter Tail Power includes adjustable speed drives (ASDs) in its C&I Grants (custom) program, while Xcel Energy includes ASDs in its Motor Efficiency Program, with qualification requirements.

Energy-efficient Motors

NEMA has defined "Premium" efficiency motors, which many utilities, such as Otter Tail Power Company and Xcel Energy, use for their Motor DSM programs. Xcel Energy included the NEMA definitions in its 2005/2006 Biennial CIP Filing.[38]

Variable Frequency Drives

Variable frequency drives (VFDs) or adjustable speed drives (ASDs) vary the speed of motors so that their speeds are proportionate to the loads the motors are serving. This saves energy because motor energy use varies with the cube of the speed for applications such as HVAC fans. So if a motor is running at half speed and is controlled by a VFD, it will only use one-eighth of its full speed energy use (as one-half cubed equals one-eighth). Without a VFD, the motor running at half load will use about one-half of its full load energy use.

[38] Xcel Energy: 2004, *op.cit.*, p. 38.

Energy Information Assistance

Providing energy information to customers can be done in various ways. One of the most common ways for utilities to do so is through energy audits, which utilities often subsidize with DSM program funding.

Water Heating Measures

Most of the water heater measures discussed below are just included as part of the residential DSM potential estimates. Only efficient water heaters were included in the C&I DSM potential estimates.

Efficient Water Heaters

Traditional electric water heaters have an overall efficiency of about 90 percent including standby and distribution losses. High efficiency units achieve 95 percent efficiency with improved insulation and heat traps that minimize convection into under insulated distribution pipes.

Heat Pump Water Heaters

Heat pump water heaters use compressed refrigerants to extract heat from ambient air (or water) and move that heat to stored hot water. During warm weather these machines can move 4 units of heat for every one comparable unit of input energy, thus achieving a coefficient of performance (COP) up to 4.0. COP decreases as ambient air temperature decreases. At about 10-20°F, heat pumps become less effective. At cold ambient temperatures traditional electric resistance heating elements back-up the heat pump compressor

Tankless Water Heaters

Tankless water heaters are more efficient than standard water heaters since they avoid the energy lost from the hot water that is stored in conventional tanks. Tankless water heaters have “energy factors” of about 98 percent.

Low Flow Showerheads

Low flow showerheads use an orifice plate inside the fixture to restrict the water flow to a maximum 2.5 gallons per minute versus a 3.5 gallon per minute permitted with standard new showerheads. Water flow from older showerheads typically exceeds 5.0 gallons per minute.

Faucet Aerators

Faucet aerators introduce air into the water as it leaves the faucet. The result is perceived full flow at a much reduced actual flow rate. We estimated that a faucet aerator reduces flow from 2 gallons per minute to 1 gallon per minute.

Hot Water Pipe Insulation

Pre-formed segments of foam insulation are placed around hot water distribution pipes to minimize heat loss. While useful for the entire length of hot water piping, it is most cost-effective in the first 5-10 feet of pipe extending from the hot water heater.

Hot Water Set-back Thermostat

Similar to a HVAC set-back thermostat, a water heater setback thermostat reduces the temperature setpoint of the water tank during periods when full service is not required. Savings accrue from reduced stand-by and distribution system losses.

Drain Water Heat Recovery

These systems recover some of the heat from drain pipe hot water.

ENERGY STAR® Clothes Washers

ENERGY STAR® clothes washers must exceed Canadian minimum energy efficiency standards by at least 36 percent in 2004 and have a modified energy factor of 40.21, and

effective January 1, 2007, the minimum efficiency requirement for ENERGY STAR® status increases to 48.45 L/kWh/cycle, or 1.72 cu.ft./kWh/cycle.[39]

ENERGY STAR® Dishwashers

ENERGY STAR® dishwashers must exceed Canadian minimum energy efficiency standards by at least 25 percent.[40] The Canadian and American minimum efficiency standards for this appliance are the same.

[39] See Canadian ENERGY STAR® web site: http://oee.nrcan.gc.ca/energystar/.
[40] See Canadian ENERGY STAR® web site: http://oee.nrcan.gc.ca/energystar/.

Appendix C

Program Logic Model Example

New York State Research and Development Authority

MARKET SUPPORT PROGRAM

Program Logic Model Report

May 4, 2007

INTRODUCTION

This document provides:

1) A table showing a list of known documents relating to NYSERDA's Market Support Program used to provide insights during development of this program logic model report;
2) A high level summary of the context of the markets within which this program operates and the other NYSERDA programs it works with to accomplish the New York Energy $mart^{SM} goals;
3) Key program-specific elements, including market barriers and associated market actors, program activities, inputs, and potential external influences;
4) A Program Logic Model (PLM) diagram showing the linkages between program activities, outputs and outcomes, and identifying inputs and potential external influences;
5) A table listing the key outputs and outcomes, including identification of relevant measurement indicators and potential data collection approaches to guide later prioritization, and development of a monitoring and evaluation plan; and
6) A list of potential researchable issues for consideration within evaluation planning.

1 RELATED NYSERDA DOCUMENTS

The following Table C-1 identifies NYSERDA and other potentially relevant documents that were reviewed for this PLM development project:

Table C-1. Relevant Documents Reviewed

NYSERDA Document Description
System Benefits Charge Proposed Plan for **New York Energy $mart**[sM] Programs (2006-2011), March 2006, Section 5 - Market Support Program (5.1 - 5.3, 5.10 - 5.13)
New York Energy $mart[sM] Residential Energy Affordability Programs Sector-Level Logic 5/06
New York Energy $mart[sM] Residential Sector Summaries, July 2005
GDS Associates. ENERGY STAR Products and Marketing Campaign Preliminary Logic Model 2/04
New York Energy $mart[sM] Program Evaluation and Status Report, May 2006, Section 5.5 – ENERGY STAR Products and Residential ENERGY STAR Marketing Programs (5-9 through 5-20)
New York Energy $mart[sM] Program Evaluation and Status Report, May 2005, Section 6.2 – ENERGY STAR Products and Residential ENERGY STAR Marketing Programs (6-6 through 6-31)
New York Energy $mart[sM] Program Evaluation and Status Report, May 2004, Section 7.2 – ENERGY STAR Products and Residential ENERGY STAR Marketing Programs (7-6 through 7-24)
Resid EStar Products Program Implementation, RFP No. 638-01 nyserda.org/finding/638RFP.html
NY Energy Smart Products Program, RFP Notice No. 1020 www.nyserda.org/finding/1020RFP.pdf
GetEnergySmart.org website
NY ENERGY STAR Products Program website nyserda.org/programs/energyStarProducts.asp
Marketing Strategy, Partner Support and Public Relations Request For Proposal (RFP) No.986 http://www.nyserda.org/funding/986RFP.pdf

2 CONTEXT AND PROGRAM DESCRIPTION

The primary mission of the New York Energy $mart[sM] Market Support Program is to provide support services to the building performance and low-income programs by addressing the availability of energy efficient products and demand for energy-efficient products and services.'

The three initiatives involved in this program are:

- New York Energy $mart[sM] Products Program,
- Program Marketing, and the
- GetEnergySmart.org website.

The New York ENERGY STAR Products Program, the predecessor to the current New York Energy Smart Products Program, was launched in August 1999 to increase sales of residential ENERGY STAR appliances, lighting and home electronics products. The Program works on both the supply and demand sides of the market. Its two program goals are to:

- Increase the supply of products through partnerships with retailers, manufacturers and distributors.
- Create demand for ENERGY STAR products through consumer awareness and understanding of the ENERGY STAR label.

The Program Marketing initiative includes marketing assistance to mid-stream partners, and developing and distributing brochures and advertisements to consumers. This initiative also performs market research and leverages regional and national initiatives that meet program needs. In addition, Program Marketing provides support for the following New York Energy $mart[sM] residential efforts: Single Family Home Performance Program, Multifamily Building Performance Program, select low-income programs, summer and winter tips campaigns, and leveraged campaigns such as "Change a Light, Change the World".

The GetEnergySmart.org website was developed during prior System Benefits Charge (SBC)[41] funding cycles to provide consumers with on-line assessments of their homes, as well as recommendations on how to improve their home's efficiency. As the residential programs were established in the second round of SBC funding, the website's purpose shifted towards providing consumers with program information and energy efficiency tips in addition to its previous focus of providing potential program partners with information regarding how to participate in NYSERDA's program. On-line marketing campaigns and e-mail newsletters were also increasingly used to bring consumers to the website. The website has become an essential communication, marketing and education tool for the residential programs. The Market Support Program, and its logic model as presented in this document, supports product-related marketing efforts and this website.

[41] System Benefits Charge Proposed Plan for New York Energy $mart^{SM} Programs (2006-2011), March 2006, Section 5 – Market Support Programs (5.10-5.13)

3 KEY ELEMENTS SUMMARY

Based on a review of relevant NYSERDA documents, below is a summary of some key elements of the Market Support Program.

3.1 Market Barriers, Including Those that the Program Attempts to Address ("the Problem")

Markets are typically defined by the products, services, and events that meet a specific need for a group of consumers. In the case of Market Support, the program aims to address barriers that exist throughout many of the residential energy-using equipment markets.

Barriers to adopting residential energy-efficient equipment can be broken down into two general groups: (1) barriers affecting the supply side (and related infrastructure) and (2) those affecting the demand side (and associated end-use) market actors. Supply-side barriers generally involve business practices and policies that deter the delivery of energy-efficient products, or indicate an insufficient availability of, or commitment to, such energy-efficient products and services. Demand-side barriers are primarily related to consumers' lack of awareness of and knowledge about energy efficiency options and benefits.

Table C-2 lists typical barriers and related market actors (not ordered by priority) for the overarching residential sector. The barriers are notated as X1, where X is the initial for the market area (S=supply, M=market infrastructure, and D=demand), and 1 is the number of the barrier. Specific barriers being targeted by NYSERDA's Market Support program are noted with an asterisk.

Table C-2. Residential (and Market Support specific) Market Barriers for Residential Energy-Using Equipment and Associated Market Actors

Market Area	Barriers	Market Actors
Supply side	*Sl - Lack of availability of some products (especially lighting fixtures)	Lighting, appliance, and HVAC manufacturers and distributors
Market Infrastructure / Midstream	*M1 - Perception of risk with stocking or installing efficient appliances when consumer demand or product quality has yet to be proven (uncertainty about product performance and profit potential) *M2 - Lack of sales experience with high-efficiency products *M3 - Lack of availability of some products (especially lighting fixtures) *M4 - Lack of awareness among retailers leading to limited supply and availability *M5 - Inadequate marketing and promotional materials for efficient products *M6 - Lack of awareness among building professionals M7 -.Undervaluing energy efficiency and sustainability M8 - Split incentives for rental units (building owners often do not pay the energy bills; the tenant does but has little incentive or ability to improve the property)	Lighting and appliance retailers, distributors HVAC contractors , window sales and installers Building owners/managers

Market Area	Barriers	Market Actors
Demand side (residential customers)	*Dl - Higher first cost relative to standard efficiency options (for some of the products) *D2 - Lack of awareness, knowledge and understanding of efficient lighting, appliances, and HVAC as well as ENERGY STAR product benefits *D3 - Information costs associated with understanding these features and associated benefits *D4 - Undervaluing energy efficiency benefits *D5 - Consumers lack an understanding of life-cycle costs *D6 - Skepticism regarding product benefits and reliability *D7 - Lack of availability of some of the products *D8 -- Lack of awareness of the existence of some ENERGY STAR products such as fixtures D9 - Competing needs for capital (given higher first cost) D10 - Resistance to new and/or innovative technologies D11 - Performance uncertainties, and past experience with poor performance (especially CFLs) D12 - Split incentives for rental units (building owners often do not pay the energy bills; the tenant does but has little incentive or ability to improve the property)	Residential consumers Building owners/managers Small business owners

1

2

3.2 Ultimate Goals

Overall, NYSERDA's Market Support program has four primary goals[42]:

1. Improve system-wide reliability and peak reduction.
2. Improve energy efficiency and access to energy options for underserved customers.
3. Significantly increase the market share of ENERGY STAR" and energy-efficient appliances, electronics, and lighting products.
4. Expand partnerships to include mass merchandisers, big-box stores, and new retail partners selling home electronics.

The ultimate energy and demand savings goals are expected to be primarily met from increasing the proportion of lighting, appliances, home electronics, and HVAC sales that are ENERGY STAR (high efficiency) through increasing the demand for and opportunities to purchase this equipment. As part of this third SBC funding cycle, there are specific numeric one-year and five-year goals established for the Market Support Program, as shown in Table C-3.

Table C-3. Goals for New York Energy Smart[SM] Market Support Program

Activity	Year One Goal	Five-Year Goal
New manufacturing partners	4	20
New retail partners (independent)	20	100
New retail partners (big box, mass merchandisers)	1+	6
ENERGY STAR market share increase on targeted products (on average, across products)	5%	25%
Annual energy savings	30 gWh	200 gWh 3,000 MMBtu

[42] Ibid

3.3 Targeted Market Actors

As noted in Table 2 above, the Market Support program targets market actors across all areas within the supply, infrastructure and demand chain for residential energy-using equipment, including:

- Demand side: residential customers (including home owners and renters)
- Market infrastructure and midstream actors: lighting and appliance retailers, manufacturers, distributors, HVAC contractors, window sales and installers[43]
- Supply side: lighting, appliance, and HVAC[44] manufacturers and distributors

3.4 Program Implementation Approach ("Activities")

NYSERDA's Market Support Program provides a number of activities that produce outputs that lead to short- and longer-term outcomes supporting the goals of the New York Energy $mart^{SM} Program.

These activities are generated from three initiatives: (1) New York ENERGY STAR® Products, (2) Program Marketing, and (3) the GetEnergySmart.org website.

The various activities across these three program initiatives can be aggregated into five main areas:

1) Recruiting and Partnering with manufacturers, distributors and retailers,
2) Training, technical assistance and providing marketing materials (e.g., point-of-purchase (POP) materials),

[43] Program efforts in the windows market are expected to be initiated in 2008 as installation specifications are identified.
[44] Program efforts with HVAC manufacturers are expected to be initiated in 2007.

3) Providing financial incentives and assistance,

4) Conducting quality assurance reviews, and

5) Developing and implementing promotional campaigns, including website and on-line promotions.

An overview of the activities in each of these areas is provided below in Table C-4. These activities are grouped along the supply-demand continuum. The logic model is diagrammed from left to right in order to match this continuum.

Table C-4. Market Support Program Activities

Recruiting and Partnering with Manuf,ctnrers Distributors Retailers and Contractors and Collaborating with Other NYSERDA Programs (Supply-side and Market Infrastructure/ Midstream)
Recruiting retailers and distributors into the Program through signing ENERGY STAR" Products Partnership Agreements
Partnering with retailers to promote ENERGY STAR" and high efficiency products
Working with manufacturers and distributors to increase availability of energy-efficient products throughout New York
Collaborating with other NYSERDA programs such as the New York ENERGY STAR Labeled Homes and Home Performance with ENERGY STAR° programs to have ENERGY STAR" and high efficiency products promoted and incorporated by these programs' builders and contractors
Training and Technical Assistance (Market Infrastructure)
Working with field representatives to provide training, program updates, replenishment of Point of Purchase (POP) materials, and to label products in partner retailers' stores
Performing market research and leveraging regional and national initiatives that meet program needs
Providing Financial Incentives and Assistance (Market Infrastructure)
Providing incentives for co-operative (co-op) advertising and promotional incentives
Providing market share incentives based upon proportion of sales that are ENERGY STAR" and high efficiency

Conducting Quality Assurance Reviews (Market Infrastructure)
Reviewing partner-provided monthly sales data and documentation regarding regular sales staff training sessions held, POP materials displayed, and ENERGY STAR products labeled
Working with field representatives to assess training, proper use of POP materials and product labeling
Maintaining program data collected for use in program monitoring and evaluation
Performing market research to meet program needs
Developing and Implementing Promotional Campaigns, Website and On-line Promotions (Demand-side)
Developing and implementing promotional campaigns for ENERGY STAR household appliances and lighting products
Developing brochures and advertising
Conducting periodic special promotional efforts for specific product types and sales channels, or to initiate activity and interest in a product
Developing/implementing campaigns to leverage national and regional campaigns Maintaining and refining the GetEnergySmart.org website
Providing consumers with an on-line inventory of their home products and recommendations on how to improve the home's energy efficiency
Providing program and partner information to consumers Providing participation information to potential partners
Developing and implementing on-line marketing campaigns and e-mail newsletters to bring consumers to the website

3.5 Program Inputs and Potential External Influences

The ability of NYSERDA's Market Support program to accomplish the outputs and outcomes likely to result in the program reaching its ultimate goals is dependent on the level and quality/effectiveness of inputs that go into these efforts. There are also external influences that can help or hinder the development of anticipated outcomes. Key Market Support program inputs and potential external influences are presented in Table C-5.

Table C-5. Market Support Program Inputs and Potential External Influences

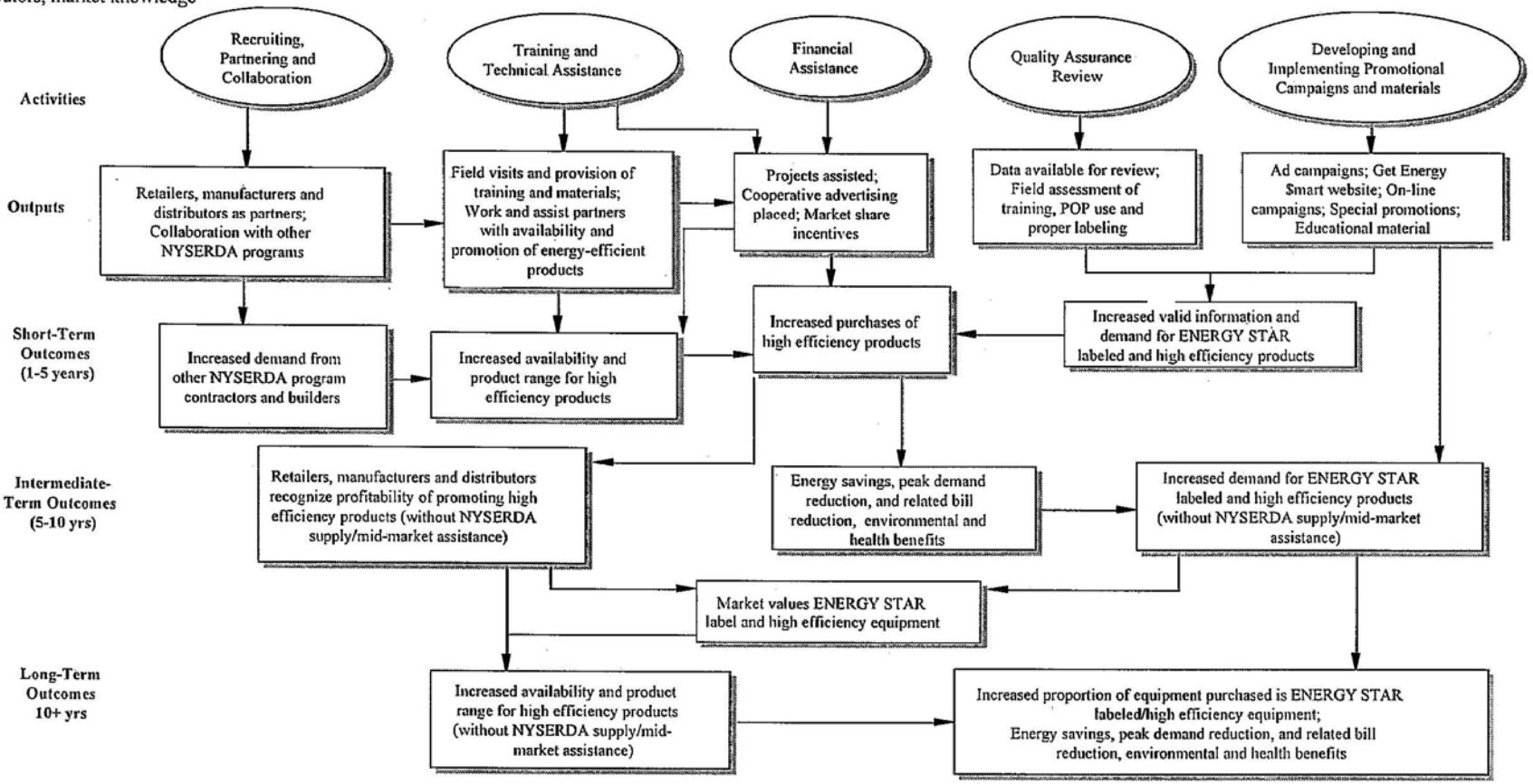
Program Inputs
SBC and other funding sources (including NYSERDA's $49M commitment over the five year period (2006 - 2011, 1s` year funding: $9.8 million)
NYSERDA's program staff and related project-specific contract staff and their related Market Support expertise
Relationship between this program and other NYSERDA programs (cross promotion/coordination)
National ENERGY STAR' program staff and contractors
Trade ally and contractor expertise
Staff experience implementing the **New York Energy $mart**[SM] program
NYSERDA's credibility and relationship with key stakeholders, policy makers and key market actors
Market knowledge
Partners: retailers and manufacturers
External Influences and Other Factors
Broad economic conditions that affect capital investment and energy costs (rapidly changing economic conditions)
Changes in political priorities
Energy prices and regulation (changes in fuel and energy prices), utility rate structure
Activities of non-NYSERDA funded public and institutional programs, including the national ENERGY STAR program and utilities
Federal energy policies including the Federal Energy Policy Act of 2005 and the Federal tax credits of 2006 and 2007
Weather and associated impacts on customer actions and energy bills

4 PROGRAM LOGIC MODEL DIAGRAM

The following page contains NYSERDA's Market Support program logic model diagram showing the linkages between activities, outputs and outcomes, and identifying inputs and potential external influences. The diagram presents the key features of the program. The logic diagram presented here is at a slightly higher level than the tables in this report, aggregating some of the outcomes, in order to provide a logic model that is easier to read. (Evaluation research should use the more detailed tables, in addition to the diagram, when examining the anticipated linkages and performance through the various outcomes.)

Market Support Program
Logic Model
May 2007

Inputs: Funds, staff, allies, awareness and credibility of NYSERDA, prior relationships with retailers and distributors, market knowledge



Key External Influences: investment climate, political priorities, energy prices, codes and standards, activities of non-NYSERDA efficiency and renewable efforts, federal energy policies including the Federal Energy Policy Act of 2005 and the Federal tax credits of 2006 and 2007, weather and its affects on energy bills

5 OUTPUTS, OUTCOMES AND ASSOCIATED MEASUREMENT INDICATORS

It is important to distinguish between outputs and outcomes. For the purposes of this logic document, outputs are defined as the immediate results from specific program activities. These results are typically easily identified and can often be counted by reviewing program records.

Outcomes are distinguished from outputs by their less direct (and often harder to quantify) results' from specific program activities. Outcomes represent anticipated impacts associated with NYSERDA's program activities and will vary depending on the time period being assessed. On a continuum, program activities will lead to immediate outputs that, if successful, will collectively work toward achievement of anticipated short-, intermediate- and long-term program outcomes.

The following tables list outputs (Table C-6) and outcomes (Table C-7), taken directly from the logic model, and associated measurement indicators. For each indicator, a proposed data source or collection approach is presented. Where appropriate, the need for baseline data is also noted. Items in this table should be prioritized and subsequently considered as potential areas for investigation as part of a formal program evaluation plan.

Table C-6. Market Support Outputs, Associated Indicators and Potential Data Sources

Outputs (<1 year)	Indicators	Data Sources and Potential Collection Approaches
Outputs from Activities in Recruitment and Partnering with Manufacturers, Distributors, Retailers and Contractors and Collaboration with other NYSERDA Programs		
Retailers, manufacturers and distributors recruited as partners	# of partners by sector, type and geographic region New partners by sector, type and geographic region	Program records
Collaborations with other NYSERDA programs	Collaborative marketing and outreach efforts with NYESLH Collaborative marketing and outreach efforts with Home Performance with ENERGY STAR	Memos, program records and notes recording meetings with builders Joint outreach and advertising efforts Memos, program records and notes recording meetings with contractors
Outputs from Training and Technical Assistance		
Field visits and provision of training and materials	# per store/partner # successfully trained # of materials by type provided and geographic region (in stores and at events) # of materials read/used by end-users (actually obtained and read by end-user as opposed to sitting in a store display) Reach of materials (e.g., how many end-users receive materials)	Program records Mystery shopping - QC' Store interviews Surveys
Work with and assist partners with availability and promotion of energy- efficient products	# of partners assisted and types of assistance provided	Program records Interviews with partners
	Degree of help provided as perceived by partners	
Partners assisted	#, type and geographic region of partners assisted	Program records

Outputs (<1 year)	Indicators	Data Sources and Potential Collection Approaches
Outputs from Provide Financial Incentives and Assistance Activities		
Cooperative advertising placed	$ value of Co-op advertising and amount leveraged # of ads supported by geographic area of state	Program records
Market share incentives	$ and # of market share incentives provided by geographic area of state	Program records
Outputs from Quality Assurance Review Activities		
Sales and related data available for review	#, proportion available and complete and usefulness of program and field data	Program records Data assessment Monitoring and evaluation efforts from program data
Field assessment of training, POP use and proper labeling	Assessment rating of store training, POP use and proper labeling	Program records On-site evaluations at retailers, contractor installations Mystery shopping - QA
Outputs from Develop and Implement Promotional Campaigns, Website and On-line Promotion Activities		
Ad campaigns	# and $ value of campaigns by type and geographic region Gross rating points (GRP)	Program records Marketing analysis Media buy reports and analysis Effects/impact evaluation
Get Energy Smart website	Material provided through website Home information provided Partner information provided # of hits, click-thrus on website, downloads, time spent on site, video views	Review of website Website monitoring information Website survey

Outputs (<1 year)	Indicators	Data Sources and Potential Collection Approaches
On-line campaigns	#, $, type and reach of on-line campaigns	Program records Focus groups E-mail surveys
Special promotions	# and $ of special promotions by type of campaign and product Reach of campaigns (# of consumers exposed)	Program records Interviews, focus groups Effect/impact evaluation
Educational material	# and type of material developed Reach of material (# of consumers exposed)	Program records Interviews, focus groups

Table C-7. Market Support Outcomes, Associated Indicators and Potential Data Sources

Outcomes	Indicators	Data Sources and Potential Collection Approaches
Short-Term (1-5 years) Outcomes		
Increased valid information on ENERGY STAR , labeled efficiency products and high efficiency products	Level of awareness, understanding, attitudes and intentions regarding ENERGY STAR and high efficiency products Customers able to identify difference between an ENERGY STAR CFL and a non-ENERGY STAR CFL	Customer surveys Store intercepts
Increased demand for ENERGY STAR and high efficiency products by NYSERDA program and builders contractors	Increased number arid variety of ENERGY STAR and high efficiency products placed into NYESLH and Home Performance with ENERGY STAR homes	NYESLH program records Home Performance with ENERGY STAR program records

Outcomes	Indicators	Data Sources and Potential Collection Approaches
Increased demand for ENERGY STAR labeled and high efficiency products by end use consumers	Consumer perceived value of ENERGY STAR and high efficiency products Consumer intent to purchase ENERGY STAR and high efficiency products ENERGY STAR/high efficiency is an important search criteria for consumers seeking new appliances and lighting equipment	Consumer surveys Purchaser intercept surveys
Increased availability and product range for high efficiency products	Increased proportion of products are ENERGY STAR/high efficiency and there are a greater variety of these high efficiency products in retail stores, in promotions and promoted by contractors and builders	Store surveys Contractor and builder surveys Consumer surveys
Increased purchases of high efficiency products	Number and proportion of product sales that are ENERGY STAR and high efficiency among home products	Market transformation evaluation for market penetration and program-induced changes
Energy savings,peak demand reduction and related bill reduction, environmental and health benefits	Amount and dollar value of kW, kWh, fossil fuel savings, and subsequent emission reductions	Impact evaluation for reliable estimates of kW, kWh, therm and oil savings Non-energy impact evaluation for health effects (customer surveys)
Intermediate-Term (5-10 years) Outcomes		
Retailers, manufacturers and distributors recognize profitability of promoting high efficiency products (without NYSERDA supply/mid-market assistance)	Retailers, manufacturers and distributors incorporate supply, promotion and service of high efficiency products (without NYSERDA support)	Surveys/interviews with retailers, manufacturers and distributors Mystery shopping - QA

Outcomes	Indicators	Data Sources and Potential Collection Approaches
Increased demand for ENERGY STAR labeled and high efficiency products (without NYSE RDA supply/mid-market assistance)	Consumer perceived value of ENERGY STAR and high efficiency products Consumer intent to purchase ENERGY STAR labeled and high efficiency products ENERGY STAR/high efficiency is an important search criteria for consumers seeking home products	Consumer surveys Purchaser intercept surveys
Market values ENERGY STAR label and high efficiency equipment	Consumer perceived value of ENERGY STAR and high efficiency products Consumers include ENERGY STAR as one of the criteria when they search for home products Retailers, manufacturers, distributors and contractors incorporate supply, promotion and service of high efficiency products (without NYSERDA support)	Consumer surveys Surveys/interviews with retailers, manufacturers, distributors and contractors Mystery shopping - QA Store intercepts
Long-Term Outcomes (10+ years)		
Increased availability and product range for high efficiency products (without NYSERDA supply/mid- market assistance)	Number and proportion of stores and contractors offering ENERGY STAR labeled and high efficiency products by geographic region, by store type Variation and ability of different needs to be met through a range of ENERGY STAR and high efficiency products offerings by geographic region, by store type	Store visits Program records Mystery shopping Market analysis, product sales specialty products

Outcomes	Indicators	Data Sources and Potential Collection Approaches
Increased proportion of equipment purchased is ENERGY STAR labeled/high efficiency equipment	Number and proportion of product sales that are ENERGY STAR and high efficiency among home products	Market transformation evaluation for market penetration and program- induced changes
Energy savings, peak demand reduction and related bill reduction, environmental and health benefits	Amount and dollar value of kW, kWh, fossil fuel savings, and subsequent emission reductions	Impact evaluation for reliable estimates of kW, kWh, therm and oil savings Non-energy impact evaluation for health effects (customer surveys)

1

2

6 TESTABLE HYPOTHESES (RESEARCHABLE ISSUES) FOR EVALUATION EFFORT

Based on this program logic model assessment for NYSERDA's Market Support program, a number of researchable issues have been identified and are noted below. Some of these have been investigated and continue to be investigated through NYSERDA evaluation activities.

- Are the advertising campaigns, outreach efforts and promotional materials effective? How effective/cost-efficient? What is the effectiveness for each of their target audiences, targeted messages? How well do they work together to increase consumer awareness, knowledge, intent and ability to act on those intentions? What is their impact on sales of ENERGY STAR and high efficiency products?
- Is the supply-side market development moving forward as anticipated? Is quality supply available to meet demand? Is the market infrastructure supportive of the growth in ENERGY STAR and high efficiency product sales?
- Are participating retailers, manufacturers, distributors and contractors pleased with the functioning and growth in the market for ENERGY STAR and high efficiency products?
- Are the ENERGY STAR and high efficiency products meeting consumer expectations? Is there confirmation of their purchasing decisions? Does this support their continued and growing interest in having ENERGY STAR labels and high efficiency as product criteria?
- Are the feedback mechanisms in the market positive and supportive of growth in demand? Of growth in supply?
- What level of supply/market infrastructure support is needed to maintain a sustainable market for ENERGY STAR and high efficiency products?
- How much continued consumer advertising is needed to maintain a sustainable market for ENERGY STAR and high efficiency products?

- What are retailer and consumer reactions to the Energy $mart logo for the products program?

Research addressing these questions will help to validate the reasonableness of the associated theories and will help inform NYSERDA program staff of progress and potential areas for program enhancement and refinement.