



EfficiencyOne

2025 DSM PROGRAMS EVALUATION REPORTS

Final DSM Reports

March 24, 2026

In Collaboration with:





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EfficiencyOne

2025 DSM PROGRAMS EVALUATION

Final Report

OVERALL EXECUTIVE SUMMARY

March 17, 2026

In collaboration with:



ABBREVIATIONS

AMH	Affordable Multifamily Housing
ARet	Appliance Retirement
ARs	Adjustment Ratios
ASFH	Affordable Single-family Homes
AWHP	Air-to-water heat pump
BER	Business Energy Rebates
BNI	Business, non-profit and institutional
CASHP	Central air-source heat pump
CGH Grant	Canada Greener Homes Grant
DAs	Delivery Agents
DHW	Domestic hot water
DIY	Do-it-yourself
DR	Demand Response/demand response
DSM	Demand-side management
E1	EfficiencyOne
EAs	energy auditors
ENS	Efficiency Nova Scotia
EPI	Efficient Product Installation
EUL	Effective useful life
EV	Electric vehicle
GHG	Greenhouse gas
HEA	Home Energy Assessment
HRM	Halifax Regional Municipality
LED	Light-emitting diode
M&V	Measurement and verification
MA	Measure Assessment
MSHP	Mini-split heat pump
MURB	Multi-Unit Residential Buildings
NECB	National Energy Code of Canada for Buildings
NS Power	Nova Scotia Power
NSUARB	Nova Scotia Utility and Review Board
NTGR	Net-to-gross ratio
OHPA	Oil to Heat Pump Program
SBES	Small Business Energy Solutions
SEM	Strategic Energy Management

DEFINITIONS

Accuracy	Reflects the proximity of measurements to the true value.
Adjustment ratio	The ratio of evaluated results to tracked results. This ratio expresses the adjustment made to tracked savings or other tracked values such as effective useful life.
Available Demand Response Capacity	The capacity which is available to NSP to reduce system peak demand. This capacity is calculated based on the first two hours of all events called between December and February, excluding weekends and holidays. If an event is shorter than two hours, only the first hour is used to measure the available DR capacity. Available DR capacity is evaluated on a per-participant basis, based on the average demand reduction observed for each event that the participant was scheduled to participate in. E1's total available DR capacity is the sum of each participant's available DR capacity.
Baseline	To determine gross savings, a baseline (or base case) is established providing detailed information about the reference (e.g. pre-existing or standard) measure or equipment chosen to be compared with the efficient measure or equipment. For the reference measure or equipment, the baseline may include such information as the hours of operation, wattage, and base consumption.
Bias	Systematic deviations of measurements from the true value.
Billing calibration	An activity that consists of adjusting the expected energy savings based on the relative difference between the results of energy simulations and the actual energy consumption of a building or system.
Confidence interval	The estimated range of values that is likely to include unknown population parameters.
Demand response	Demand response measures generate savings in the form of available capacity or load reduction in response to events called by the electric utility (Nova Scotia Power) to reduce the load at strategic moments. These events can be called at any time and for any duration, although they are usually called for one to four hours during peak periods.
Displaced wattage	The displaced wattage is defined as the difference between the wattage values of the baseline equipment or product and the efficient equipment or product.
EnerGuide rating	An EnerGuide (official brand of Natural Resources Canada) rating is a standard measure of home energy performance. It is a measure of the efficiency of the building only and does not take into account occupant behaviour. It shows how energy efficient a home is through modelled home heat losses based on several factors including building envelope characteristics, heated volume, heating systems, and air leakage.
Effective useful life	The period a measure is expected to be in service and provide both energy and peak demand savings. This value combines equipment life and measure persistence, which includes factors such as business turnover or early retirement.
Equipment life	The number of years installed equipment will operate before it fails.

Equivalent CO2	A unit of measurement indicating the amount of carbon dioxide to which various kinds of emitted greenhouse gases are equivalent in terms of warming effects. In this report, gas global-warming potential is estimated over a timescale of 100 years.
Equivalent effective useful life	The number of years by which the first-year savings estimate is multiplied to obtain lifetime energy savings. This value takes into account variations in annual energy savings throughout the effective useful life due to increased baselines.
Evaluated savings	Gross and net energy or peak demand savings calculated by the Evaluator using the parameters (unitary savings values, installation rates, interactive effects, net-to-gross ratios, etc.) validated or measured during the evaluation process. Unless otherwise specified, evaluated savings are first-year savings.
Evaluation plan	The evaluation plan summarizes the program description, objectives, base cases, documentation, evaluation methodology, budget, and schedule.
First-year savings	The first full year of energy or peak demand savings generated by an energy efficiency measure.
Free-ridership	Percentage of gross savings attributable to participants who would have implemented the same or similar energy efficiency measures, with no change in timing, in the absence of the program.
Gross savings	Change in energy consumption and/or demand that results directly from program-related actions taken by participants in an efficiency program regardless of why they participated.
Induced consumption	Energy consumption of appliances that would have been unplugged and not replaced by participants in the absence of the program.
Interactive effects	Effects on the energy consumption of other systems in a building (such as heating and cooling) due to the installation of an energy-efficient measure.
In-service rate	The proportion of incentivized products that are installed and operating. This rate is usually applied to programs through which rebates are offered in-store and products are likely to be stored for a certain period before being installed, such as LED lamps.
Installation rate	The proportion of incentivized products reported as installed and that remain installed and operating at the time of evaluation. This rate is usually applied to direct install or mail-in rebate programs through which measures are expected to be installed immediately at the time of participation.
Lifetime energy savings	The energy savings that occur over the lifetime of an energy efficiency measure. Lifetime energy savings account for a measure's effective useful life and any increase in the baseline efficiency level (which reduces attributable annual savings) over its lifetime.
Line loss factor	The multiplier to convert savings at the customer meter to savings at the utility generator. It accounts for the electrical losses of the transmission and distribution system.
Margin of error	The amount of random sampling error.
Market effects	The impact of a program on the market (in terms of increased product availability, practices, and prices) that extends beyond changing program participant behaviours. This includes spillover among non-participants.

Net savings	Energy or peak demand savings that can be reliably attributed to a program. This includes effects such as free-ridership and spillover that negatively or positively affect the savings attributable to a program.
Net-to-gross ratio	The ratio of net energy savings to gross energy savings.
Non-sampling error	Errors arising during all survey activities other than sampling. Non-sampling errors tend to lead to bias in measurements and are very difficult to quantify.
Peak coincidence factor	The percentage of measure demand savings that coincide in time with the annual peak demand of the entire electricity system.
Peak demand savings	The demand savings that coincide in time with the expected annual peak demand period of the entire electricity system. For industrial participants on an interruptible rate, peak demand savings may include savings on non-firm loads, i.e. loads that may be interrupted when Nova Scotia Power's 10-minute reserve is low.
Precision	The extent to which repeated measurements agree with one another.
Random sampling error	An error in measurement because measurements are taken from a subset of the population and not the entire population.
Realization rate	The ratio of evaluated savings to tracked savings.
Sample size	The number of observations or replicates included in a statistical sample.
Secondary market impacts	Energy consumption of appliances that would have been transferred to the secondary market if said appliances had not been retired.
Spillover	Savings attributable to participants who implement the energy efficiency measure(s) introduced by a program after participating in it once, without participating in the program a second time.
Tracked savings	Gross and net savings calculated based on various parameters such as number of participants or units installed or sold, unitary savings values, installation rates, interactive effects, and net-to-gross ratios. Those parameters, except the number of participants or units installed or sold, are obtained from the previous evaluation.
Unitary savings	Energy or peak demand savings established on a unitary basis. A unit can either be a product (e.g. an 8 W LED lamp), a capacity (e.g. one-tonne capacity of an air-source heat pump), or a participant (e.g. one participant taking part in a behaviour-based program).



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INTRODUCTION



EfficiencyOne (E1), an independent, non-profit organization, is responsible for helping Nova Scotians improve the energy efficiency of their homes and workplaces by designing, marketing, and delivering demand-side management (DSM) for Nova Scotians. E1 provides energy efficiency, demand response, and carbon mitigation services through the Efficiency Nova Scotia (ENS) franchise. Regulatory oversight of E1 DSM activities is provided by the Nova Scotia Energy Board (NSEB). E1 receives funding for its electricity DSM activities from Nova Scotia Power (NS Power) ratepayers.

E1 has a DSM portfolio of three residential programs, three business, non-profit, and institutional (BNI) programs, and one demand response (DR) program that are marketed to Nova Scotians through the ENS franchise. Each program has one or more program components. Econoler was commissioned by E1 to evaluate E1's 2025 DSM program portfolio.

To carry out these services, Econoler collaborated with Equilibrium Engineering, Richard Patterson of CDM Energy Solutions, Narrative Research, and Akonovia. Econoler served as team leader and was involved in every aspect of the evaluation. Specifically, Econoler was in charge of coordinating and supervising all activities, conducting final reviews of all data-collection instruments, performing process and market evaluations and impact evaluation calculations, as well as preparing and reviewing evaluation reports. Equilibrium Engineering, Richard Patterson, and Akonovia conducted project reviews.¹ Equilibrium Engineering conducted project reviews and on-site visits.² Narrative Research conducted interviews and surveys with participants and partners³ as well as analyzed and reported on the data collected from those activities. Throughout this report, this team is referred to as the Evaluator.

The Evaluator confirmed that the E1 DSM program portfolio achieved a total of 129.444 GWh in net electrical energy savings at the generator, 23.556 MW in net peak demand savings at the generator, and 6.795 MW in available DR capacity in 2025. These net savings represent 60,748 tonnes of CO₂ eq in terms of annually avoided greenhouse gas (GHG) emissions. Total net lifetime electrical energy savings at the generator amounted to 1,476.864 GWh.

¹ For the 2025 evaluation, Akonovia conducted project reviews of Custom New Construction projects, while Richard Patterson conducted project reviews of Custom Retrofit and Building Optimization projects.

² For the 2025 evaluation, Equilibrium Engineering conducted project reviews, complemented by on-site visits for BER-AR and on-site visits for SEM projects.

³ For the 2025 evaluation, Narrative Research conducted surveys with BER participants and Residential DR non-participants. They also conducted interviews with BER New Brunswick distributors, non-participant distributors, and Custom participants.



1 Evaluation Scopes and Objectives

The 2025 Portfolio Evaluation Plan was based on the Evaluation Schedule outlined in the Overall Strategic Evaluation Plan⁴ that provides the framework and approach to guide evaluation planning and implementation for the 2023-2025 demand-side management (DSM) activities. The Evaluator is responsible for designing annual evaluation plans that meet the evaluation goals and principles for conducting third-party reviews of E1 program results and reporting evaluated results in evaluation reports.

The following factors are used to guide the prioritization of evaluation activities in the development of annual evaluation plans:

- › The level of program savings compared to portfolio savings: More resources should be allocated to programs that account for a relatively large portion of total portfolio savings.
- › Uncertainty regarding expected savings: Those initiatives with lower uncertainty regarding results should be given a lower evaluation priority. Similarly, evaluation efforts should prioritize those program characteristics or assumptions associated with a higher level of uncertainty.
- › Changes to program design or delivery: Changes to a program that could affect parameters, such as baseline scenarios, indicate that a comprehensive evaluation is likely warranted.
- › Timely feedback in the program life cycle: Information valuable to planning a new initiative (e.g. a pilot) or improving an ongoing program should be prioritized. Process evaluations should be scheduled to obtain early feedback to help ensure that a program is on track to meeting its goals.
- › Regulatory requirements: The information needed to respond to regulatory orders or requirements should be more highly prioritized than the information not needed for that purpose.
- › Evaluation scheduling: The evaluation schedule should be carefully thought out to optimize the robustness and usefulness of evaluation results (e.g. the need to evaluate a program after changes are made to program offerings, the length of the interval between two consecutive evaluations of a program).

There are three broad evaluation categories: Impact evaluations, process evaluations, and market evaluations. Based on the three evaluation categories, Table 1 below presents a summary of the 2025 Portfolio Evaluation Plan. The table also indicates the scopes of the impact evaluations (comprehensive or condensed), which are further detailed in the following subsection.

It should be noted that some program components are further divided into services that are discussed throughout this report. Such is the case for the Custom component that includes the Retrofit, New Construction, Pay-for-Performance, and Building Optimization services as well as for the Business Energy Rebates program component comprised of two services, namely Application Rebates and Instant Rebates.

⁴ Econoler, Overall Strategic Evaluation Plan, December 2025.

Table 1: 2025 Portfolio Evaluation Plan

Program Components	PY2025		
	Impact	Process	Market
Residential DSM Program Components			
Appliance Retirement	Condensed*		
Instant Savings	Condensed		
Affordable Multifamily Housing	Condensed		
Affordable Single-family Homes	Condensed		
Efficient Product Installation	Condensed		
Home Energy Assessment	Condensed		
Green Heat	Condensed		
Mi'kmaw Home Energy Efficiency Project	Condensed		
Residential Behaviour	Comprehensive**		
New Home Construction	N/A		
BNI DSM Program Components			
Business Energy Rebates – Application Rebates	Comprehensive		X
Business Energy Rebates – Instant Rebates	Condensed		
Custom	Comprehensive		
Strategic Energy Management	Comprehensive		
Small Business Energy Solutions	Condensed		
Demand Response Program			
Residential Demand Response	Comprehensive	X	
BNI Demand Response	Comprehensive		
*Program ended January 2025. Evaluation will include January 2025 savings only.			
**Cumulative billing analysis to be conducted for 2025 months for which AMI data are available.			

The following subsections describe the objectives of the impact, process, and market evaluations.

1.1 Impact Evaluation Objectives and Scope

The impact evaluation activities were aimed at determining:

- › Gross electrical energy and peak demand savings at the meter and at the generator
- › Available DR capacity for DR programs
- › Net-to-gross ratios (NTGRs), including free-ridership and spillover levels where appropriate
- › Net electrical energy and peak demand savings at the meter and at the generator
- › Effective useful life (EUL) values for program measures
- › Gross and net lifetime electrical energy savings at the generator
- › Avoided GHG emissions linked to evaluated gross and net electrical energy savings



Impact evaluations were conducted for all program components. As explained below, there were two types of impact evaluations:

- › **Comprehensive impact evaluations** – A comprehensive impact evaluation consists of reviewing the following four key elements: (1) The baseline definition; (2) the savings calculation methodology; (3) the values of the parameters used to calculate savings; and (4) NTGRs. The specific activities to be carried out for such reviews may include surveys, project reviews, site visits, billing analyses, literature reviews, etc.
- › **Condensed impact evaluations** – A condensed impact evaluation consists of using all of the impact evaluation parameters from the previous program year, such as unitary savings values, adjustment ratios, installation rates, and NTGRs, to provide evaluated results.

At least one comprehensive impact evaluation is conducted on all program components every three years with the exception of program components that represent a small proportion of portfolio savings or whose savings calculation methodologies rely on parameters that are evaluated through another program component comprehensive evaluation. To determine which type of impact evaluation (comprehensive or condensed) should be planned for each program component, when they should be conducted, and why, the Evaluator applied the priorities outlined above. For impact evaluations, factors driving uncertainty include:

- › Program maturity and the stability of impact evaluation parameters (e.g. adjustment ratios and free-ridership levels) over time. Mature and stable programs warrant fewer comprehensive impact evaluations.
- › Complexity of savings calculations. Complex or custom savings calculation methodologies that are more likely to result in errors indicate that a comprehensive evaluation is likely warranted.

Demand-side Management Measure Assessment Document

The impact evaluation scope for 2025 also included an update of the Demand-side Management Measure Assessment (DSM MA) document. The DSM MA was updated to include new products added to program offerings,⁵ remove products that are no longer offered,⁶ update products that are offered in a different program component or format, and update new savings parameters in cases for which a comprehensive impact evaluation is planned.

While the 2024 DSM MA update was extensive, the 2025 update was of smaller scope. The Evaluator implemented targeted technical revisions to the DSM MA to reflect the latest available evidence and improve methodological consistency. The Evaluator notably:

- › Updated or removed several measures to reflect updated program offerings, notably removing lighting from Instant Savings
- › Updated lighting effective useful life values to reflect evolving baselines
- › Updated some residential measure algorithms to align with the most recent methodologies used in evaluation
- › Refined or corrected the algorithms of several commercial measures to address technical issues, incorporate updated reference sources, and better reflect current technologies and operating conditions
- › Corrected formatting and equation discrepancies to improve clarity and internal consistency

In addition, 2025 adjustment ratios were updated, as is the case annually based on the DSM MA.

⁵ The following products were added in 2025: Smart thermostat load control (Residential DR), battery control (Residential DR), and EV telematics and charger control (Residential DR).

⁶ The following products were removed in 2025: ENERGY STAR certified non-A-type lamps (Instant Savings), ENERGY STAR certified LED recessed downlight fixtures, certified LED fixtures (Instant Savings), heat pump water heaters (MHEEP only), refrigerator retirements (ASFH and MHEEP only), freezer retirements (ASFH and MHEEP only), dehumidifier replacements or retirements (Instant Savings only), humidity sensors for bathroom exhaust fans (Instant Savings only), smart power controllers for audiovisual equipment (EPI only), and three-element water heaters (Green Heat).



1.2 Process and Market Evaluation Objectives and Scopes

One market evaluation was completed in 2025. Market evaluation activities were aimed at achieving the following objectives:

- › Validate 2024 market evaluation results and determine timing for when a baseline for Business Energy Rebates – Instant Rebates LED fixtures should take effect
- › Identify implications of baseline changes for Business Energy Rebates – Application Rebates and Small Business Energy Solutions

Results from the market evaluation of Business Energy Rebates – Application Rebates are presented in Section 6 further below.

One process evaluation was completed for Residential Demand Response. Process evaluation activities were aimed at achieving the following objective:

- › Collect feedback from program staff, service providers, staff from other jurisdictions, and non-participants on increasing/maintaining participation along with opportunities for operational improvements

Process evaluation results are presented in the relevant evaluation reports.



2 Evaluation Methodology

This section presents the methodologies used and the activities carried out to evaluate E1 DSM program components and services through impact, process, and market evaluations.

2.1 Impact Evaluations

The impact evaluations were conducted through a range of activities such as tracking sheet audits, data-collection tool development, project reviews assisted by participant follow-up interviews, energy model reviews, on-site visits, as well as other data-collection activities and analyses. The following subsections describe the steps that were followed to conduct the impact evaluations.

2.1.1 Tracking Sheet Audits

The final tracking sheets submitted to the Evaluator by E1 contained both data for all completed projects for 2025 and the tracked results required to calculate final savings. The final tracking sheets were audited to assess the consistency and completeness of program data, including discrepancies that needed to be clarified to enable savings calculations. Following this analysis, the Evaluator determined corrected tracked values and then compiled evaluated savings.

The Evaluator audited the project tracking sheet of each program component. Therefore, the tracked savings results presented in the evaluation reports refer to the corrected tracked savings obtained by the Evaluator as a result of the tracking sheet audits.

2.1.2 Data Collection

Data-collection tool development and sampling were carried out for Affordable Multifamily Housing (AMH), Business Energy Rebates (BER), Custom, Strategic Energy Management (SEM), Residential Demand Response, and BNI Demand Response.

The Evaluator developed the relevant data-collection instruments, namely survey questionnaires, interview guides, and project review protocols. Data-collection instruments were informed by the results of documentation reviews, program staff interviews, and preliminary tracking sheet audits.

Using an integrated approach, the data-collection tools also included questions to inform the sample selection process and market evaluation activities.

Surveys and Interviews

This subsection describes the data-collection activities conducted for the impact evaluations.

- › **A participant survey** was used to collect data on free-ridership and spillover for Business Energy Rebates – Application Rebates. The survey was conducted by telephone between October and November 2025 inclusively and included 57 participants. Table 2 below lists the survey completes for the Business Energy Rebates – Application Rebates impact evaluation, along with the number of respondents. For completeness, the table also includes additional surveys conducted as part of process and market evaluations of other program components in the 2025 evaluation. Surveys conducted solely for market and process data collection are indicated in green.

Table 2: 2025 Participant and Non-participant Surveys

Program Component	Number of Respondents
BNI	
Business Energy Rebates – Application Rebates	57
Demand Response	
Residential Demand Response	103
Total	160

- › **In-depth interviews** with program staff, participants, and partners were conducted as part of impact evaluation activities to collect data on free-ridership and spillover. Between May 2025 and January 2026 inclusively, the Evaluator conducted 70 interviews with various market actors and stakeholders. The number of completed interviews for each program component is presented in Table 3 below. Note that Table 3 includes all in-depth interviews completed as part of the 2025 evaluation for completeness. In-depth interviews aimed solely at market and process data collection only are indicated in green.

Table 3: 2025 Interviews Completed

Program Component	Program Manager/ ¹ E1 Staff/Business Development Manager	Service Providers/ Distributors/Retailers/Builders	Participants	Program Manager in Other Jurisdictions
Residential				
Appliance Retirement ²	0	-	-	-
Instant Savings	2	-	-	-
Affordable Multifamily Housing	2	-	-	-
Affordable Single-family Homes	2	-	-	-
Efficient Product Installation	2	-	-	-
Green Heat	2	-	-	-
Home Energy Assessment	2	-	-	-
Mi'kmaw Home Energy Efficiency Project	1	-	-	-
Residential Behaviour	2	-	-	-
BNI				
Business Energy Rebates	4 ³	7 ⁴	-	1
Custom	4 ⁵	-	26 ⁶	-
Strategic Energy Management	2	-	2	-
Small Business Energy Solutions	2	-	-	-
Demand Response				
Residential Demand Response	3 ⁷	2	-	2
BNI Demand Response		-	-	-
Total	30	9	28	3

¹ Two rounds were performed with the program manager (round 1 in May 2025 and round 2 in September 2025).

² ARet: The program was discontinued, so no interview was conducted with E1 staff.

³ BER: Four program manager interviews were conducted (two for Application Rebates and two for Instant Rebates).

⁴ BER: Six interviews were conducted with New Brunswick distributors and one with a non-participant distributor.

⁵ Custom: Four program manager interviews were conducted (two for New Construction and two for Retrofit).

⁶ Custom: Ten interviews were conducted with New Construction participants, 13 with regular Retrofit participants, two with compressed air leak Retrofit participants, and one with a Pay-for-performance participant.

⁷ DR: Three program manager interviews were conducted (two for Residential and BNI DR combined and one for Residential DR as part of the process evaluation).

Site Visits and Project Reviews with Follow-up Site Visits or Interviews

The Evaluator performed a total of 133 project reviews during the summer and fall of 2025, 49 of which were complemented through site visits and 24 were complemented through phone interviews.

For Affordable Multifamily Housing, project reviews were conducted to validate the equivalent full load hours (EFLHs).

For Business Energy Rebates - Application Rebates, Custom, Strategic Energy Management, and BNI Demand Response, the Evaluator carried out full technical reviews of project documentation and followed up through telephone interviews or site visits with participants to finalize the project reviews when required. The telephone interviews also served to collect information on free-ridership and spillover as well as participant perspectives on the program component where relevant.

Table 4 indicates the number of site visits and project reviews conducted for each program component. The complete results of the on-site visits are provided in the relevant program component evaluation reports.

Table 4: 2025 Site Visits and Project Reviews with Follow-up Site Visits or Interviews

Program Component	Project Reviews Followed by Site Visits	Project Reviews Followed by Phone Interviews	Project Reviews Without Site Visits or Phone Interviews	Total Project Reviews or Site Visits
Residential				
Affordable Multifamily Housing	-	-	5	5
BNI				
Business Energy Rebates - Application Rebates	40	-	-	40
Custom ¹	7	21	12 ²	40
Strategic Energy Management	2	3	13	18
Demand Response				
BNI Demand Response	-	-	30	30
Total	49	24	60	133
¹ Custom: 40 project reviews were conducted (18 for Retrofit, one for Pay-for-performance, nine for Building Optimization, and 12 for New Construction). All Retrofit reviews were for regular Retrofit projects. ² Custom New Construction: Although 10 participants were asked free-ridership questions by phone, these calls were not part of the project reviews. Project reviews are, therefore, considered to have been conducted without phone interviews. Free-ridership interviews are listed in Table 3 above.				

Energy Model Reviews

The Evaluator performed energy model reviews of the 12 Custom New Construction projects to verify the accuracy of energy models. After the initial file reviews, the Evaluator concluded that the available documentation was sufficient and site visits or follow-up phone interviews were not required. The energy model reviews involved comparing energy models against as-built drawings and project documentation. The Evaluator also compared baseline energy models against the appropriate baseline definition for each project. The resulting adjusted models were then used to establish evaluated savings.



2.1.3 Unitary Savings Review

The Evaluator updated unitary savings values mainly based on comprehensive evaluation findings, including one or more of the following approaches: literature reviews of TRMs; metering studies and evaluation reports; engineering calculations; adjustments based on data collected through participant surveys or site visits; and secondary research on household/facility characteristics such as types of heating and cooling systems.

In 2025, no program component with unitary savings values - namely Affordable Single-family Homes, Appliance Retirement, Instant Savings, Home Energy Assessment, Green Heat, Efficient Product Installation, the Mi'kmaw Home Energy Efficiency Project, the Business Energy Rebates – Instant Rebates service, and the Small Business Energy Solutions Commercial Direct Installation pilot – had a comprehensive evaluation in 2025. Therefore, the Evaluator mostly relied on the parameters and equations from the 2024 DSM MA, although some values were updated where necessary as part of the update to the 2025 DSM MA.

While no unitary savings value was directly updated in 2025, the domestic water heater load control in-service rate was updated based on metering data analysis findings from the 2025 evaluation. In addition, the semi-prescriptive algorithms and parameters of multiple commercial measures were updated to address technical issues, incorporate updated reference sources, and better reflect current technologies and operating conditions; these changes were based on reviews of the most recent TRMs.

2.1.4 Metering or Billing Data Analyses

In 2025, a Residential Behaviour billing analysis was performed on the months for which AMI data were available (i.e. January to April 2025)⁷ to calculate net electrical energy savings, including a comparison of the treatment and control group electricity consumption levels, using a difference-in-difference approach.

Metering data analyses were also conducted for Residential Demand Response to update or establish in-service rates for all measures as well as update or establish unitary available DR capacities for smart thermostat controls, EV telematic and charger controls, and battery controls. The analyses were conducted for the December 2024 to February 2025 period, as the reported available DR capacity corresponds to winter DR events that ended during the evaluation year.

2.1.5 Effective Useful Life Review

As part of the 2025 DSM MA update, the Evaluator only reviewed the EUL values for lighting measures and relied on previously established EUL values for other measures. Lighting measure EUL values were updated to account for the BNI lighting market research findings conducted as part of the 2025 Business Energy Rebates evaluation. The resulting EUL values were included in the 2025 DSM MA.

For some measures, the Evaluator considered both the measure life and the evolution of the baseline over the lifetime of the measure. Lifetime electrical energy savings were calculated based on the existing baseline until the end of the period when the equipment would have been replaced and then based on the new standard baseline for the remaining EUL of the measure.⁸ The adjusted EUL of a given project was then calculated as the lifetime electrical energy savings divided by first-year electrical energy savings.

⁷ Due to a cybersecurity incident at NS Power in Spring 2025, AMI data were no longer available to E1 after April.

⁸ Gold, Rachel & Seth Nowak, Energy Efficiency Over Time: Measuring and Valuing Lifetime Energy Savings in Policy and Planning. Washington, DC: American Council for an Energy Efficient Economy, Report U1902, February 2019.



2.1.6 Gross Savings Analysis

Gross savings refer to changes in energy consumption resulting from actions taken by participants regardless of their reasons for participating in a program. Upon completion of the impact evaluation activities described above, the Evaluator analyzed the data collected to calculate evaluated gross savings and compare results with the data tracked by E1. Establishing gross savings consists of compiling all the savings from measures implemented through a program component, along with the evaluated parameters.

2.1.7 Net Savings Analysis

Net-to-gross Assessment and Net Savings Calculations

Free-ridership levels were established for select program components by conducting self-report surveys or in-depth interviews. Those surveys and interviews included questions used to establish program component attributions for the free-ridership calculations. The self-report approach consisted of asking questions to participants to assess factors such as planning, quantity, efficiency, period, and cost as well as the influence of a given program component. For the midstream BER – Instant Rebates program component, both market actor (distributor) and end-user (participant) perspectives were used to assess free-ridership. Based on survey or interview results, a free-ridership level was established for each respondent. Subsequently, a weighted average based on each respondent's savings was used to estimate overall program component free-ridership levels. The free-ridership calculation methodology also takes into account the impact of cross-influence of previous participation in other E1 program components. The methodology used to conduct a net-to-gross review in the 2024 evaluation guided the data collection and analysis of all program components in 2025.

As part of the 2025 evaluation, free-ridership levels were updated for Instant Savings,⁹ Business Energy Rebates – Application Rebates, Custom,¹⁰ Pay-for-Performance, and New Construction.

The free-ridership levels from past evaluations were used for Appliance Retirement, Instant Savings,¹¹ Efficient Product Installation, Home Energy Assessment, Green Heat, Business Energy Rebates – Instant Rebates, Building Optimization, as well as Small Business Energy Solutions.

The impact evaluations included assessments of spillover levels for program components wherein spillover was a factor. For all program components with the exception of Instant Savings and Home Energy Assessment, the spillover levels corresponded to participant spillover. Participant spillover assessments were conducted through telephone surveys or during follow-up interviews or site visits during project reviews. In all cases, participants were asked if they had implemented additional energy efficiency measures without receiving additional funding or assistance from E1. If so, participants were then asked a set of questions designed to identify the additional energy efficiency measures implemented and their associated savings. Subsequently, another question was asked to quantify the level of influence a given program component had on their decision to implement the additional measures. Thereafter, the value established on the level of influence was used to determine the portion of the additional savings attributable to the given program component. Finally, the level of participant spillover was established by dividing the total additional savings attributable to the program component by the total savings achieved by said component for all survey respondents.

⁹ A literature review was performed for Instant Savings to identify deemed NTGR values to be applied to non-lighting measures included in the program.

¹⁰ Except for solar PV projects for which the 2023 free-ridership level was applied.

¹¹ For any remaining LED measures.



As part of the 2025 evaluation, the spillover levels were updated for Instant Savings,¹² Business Energy Rebates – Application Rebates, and Custom,¹³ and Custom Pay-for-Performance. The spillover levels from past evaluations were used for Appliance Retirement, Instant Savings, Efficient Product Installation, and Home Energy Assessment. The unconverted D assessment spillover and non-participants spillover from past evaluations were also used for Home Energy Assessment and Small Business Energy Solutions respectively.

The Evaluator did not establish free-ridership and spillover levels for measures and program components offered to low-income participants as these were considered to have nil free-ridership and spillover levels.

Avoided GHG Emission Calculations

The Evaluator estimated the avoided annual GHG emissions resulting from the electrical energy savings generated through all program components. For 2025, avoided GHG emissions were estimated by using a Nova Scotia-specific factor¹⁴ equal to 469.3 tonnes of CO₂ eq/GWh for GHG emissions generated by electricity production. This factor was updated with the most recent NS Power data on total system emissions and electricity generation.

2.2 Process and Market Evaluations

Process and market evaluations were conducted using a range of activities such as program component documentation as well as secondary data reviews, jurisdictional scans, participant and non-participant surveys, and in-depth interviews with program staff, stakeholders, and participants. The following subsections describe the key tasks the Evaluator carried out for the market evaluation of Business Energy Rebates – Application Rebates and the process evaluation of Residential Demand Response.

Documentation Review

The Evaluator reviewed all relevant evaluation and program component-specific documentation such as program manuals, logic models, marketing materials, application forms, tracking sheets, and any other information on changes made to program components since the previous evaluation. Additionally, the Evaluator used annual staff interviews to follow up on past evaluation recommendations and become aware of any program component improvements and changes.

Data-collection Tool Development and Sampling Strategy

As described in Subsection 2.1.2 above, the Evaluator used an integrated approach to developing data-collection tools that serve all evaluation types where possible. For instance, survey instruments and interview guides included questions for process, market, and impact evaluations. This approach reduces respondent burden and ensures that evaluation results are integrated.

¹² For non-lighting measures.

¹³ Except for solar PV projects for which the 2023 spillover level was applied.

¹⁴ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO₂ eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed January 15, 2026) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed January 15, 2026).



Data Collection

This subsection describes the data-collection activities conducted for the process and market evaluations. As discussed above, surveys and interviews were integrated, where applicable, to enable the simultaneous collection of information for the impact, process, and market evaluations.

- › **In-depth interviews** were conducted with program staff, distributors, service providers, staff from other jurisdictions, and trade allies to collect data on their involvement in as well as their experience with a given program component, among other things. Unlike participant surveys that require interviewers to ask questions in the exact same way, in-depth interviews are semi-directed, thus allowing for more flexibility discussion. They are a great option for evaluations that require exploring certain research areas or asking in-depth and complex questions that are not suited to a survey. The number of completed interviews for each program component is presented in Table 3, Subsection 2.1.2, above.
- › **Participant and non-participant surveys** conducted by phone between November and December 2025 with non-participants in Residential Demand Response served to collect information on awareness levels, perceived benefits of DR programs, along with motivations and barriers to participation. The number of completed surveys is presented in Table 2, Subsection 2.1.2, above.

Jurisdictional Scans

The Evaluator conducted two jurisdictional scans across other jurisdictions in Canada and the United States (US), one for Business Energy Rebates – Instant Rebates, and the other for Residential Demand Response. As part of the Business Energy Rebates – Instant Rebates market evaluation, the objective was to document the BNI lighting offers in those jurisdictions, which measures are included, and whether the programs are instant or application-based. This jurisdictional scan also included a review of publicly available TRMs to identify which baseline and EUL values they use for BNI LED fixtures and lamps. As part of the Residential Demand Response process evaluation, the Evaluator conducted a second jurisdictional scan to identify strategies that enhance operational efficiency when scaling programs from the pilot phase to the full implementation phase.

Analysis

The results of the process and market evaluation activities were analyzed in relation to the research objectives identified in Subsection 1.2 above. The results from all evaluation activities were consolidated and triangulated to ensure that findings were based on a preponderance of results.



3 Other Activity

E1 launched the Heat Pump Water Heater pilot program in 2024. The program component is intended to transform the water heater market in Nova Scotia. The 2025 evaluation included a Heat Pump Water Heater program market transformation baseline study to establish baseline market progress indicators for the program. The baseline study provides data against which the market transformation of the pilot program can be assessed in future evaluations.

4 Impact Evaluation Results

This section presents an analysis of the impact evaluation results for all program components by comparing 2025 tracked electrical energy and peak demand savings with evaluated electrical energy and peak demand savings. Evaluated NTGRs, lifetime electrical energy savings, and GHG emission reductions are also presented in the subsections below.

4.1 Individual Impact Evaluation Results

Table 5 and Table 6 below respectively list the evaluated electrical energy and peak demand savings as well as the corresponding savings tracked by E1 for each program component offered in 2025. Net savings were calculated by multiplying gross savings by the NTGR. Lifetime electrical energy savings are equal to the savings generated by efficiency measures over their EUL. The line loss factors correspond to the values submitted to the Nova Scotia Utility and Review Board (NSUARB) as part of the 2014 Cost of Service Study Progress Update.¹⁵

¹⁵ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.

Table 5: Comparison of 2025 Evaluated and Tracked Electrical Energy Savings at the Generator ^a

DSM Program	Program Component	Tracked Results		Evaluated Results				Difference in Net Savings (GWh)	Net Realization Rate
		Annual Gross Savings (GWh)	Annual Net Savings (GWh)	Annual Gross Savings (GWh)	NTGR ^b	Annual Net Savings (GWh)	Lifetime Net Electrical Energy Savings (GWh)		
Residential									
Residential Efficient Product Rebates	Appliance Retirement	0.205	0.115	0.205	0.56	0.115	0.461	-	100%
	Instant Savings	16.337	15.981	14.817	0.77	11.430	106.508	-4.551	72%
Existing Residential	Affordable Multifamily Housing	1.378	1.378	1.378	1.00	1.378	23.345	-	100%
	Affordable Single-family Homes	6.059	6.059	6.135	1.00	6.135	118.611	0.076	101%
	Efficient Product Installation	7.405	7.338	7.405	0.99	7.300	53.898	-0.038	99%
	Green Heat	1.414	0.749	1.414	0.53	0.749	13.488	-	100%
	Home Energy Assessment	14.769	13.820	14.769	0.94	13.820	342.195	-	100%
	Mi'kmaw Home Energy Efficiency Project	0.337	0.337	0.337	1.00	0.337	6.905	-	100%
	Residential Behaviour ^c			5.555		5.555	5.555		
Residential Subtotal		47.904	45.777	52.016	1.01	46.819	670.966	-4.513	90% ^d
BNI									
Efficient Products Rebates	Business Energy Rebates	44.659	38.065	45.081	0.89	40.244	294.786	2.179	106%
Custom Incentives	Custom	36.627	28.244	36.207	0.84	30.487	437.723	2.243	108%
	Strategic Energy Management	4.228	4.228	4.031	1.00	4.031	20.515	-0.197	95%
Direct Installation	Small Business Energy Solutions	9.805	7.886	9.774	0.80	7.862	52.874	-0.025	100%
BNI Subtotal		95.319	78.424	95.094	0.87	82.624	805.898	4.201	105%
Portfolio Total		143.223	124.201	147.110	0.91	129.444	1,476.864	-0.312	100% ^d

^a Numbers may not add up due to rounding.

^b Subtotal NTGR values represent average values for the Residential and BNI portfolios. The portfolio total NTGR value represents an average value for all programs.

^c There were no tracked savings for Residential Behaviour, and net savings were used in place of gross savings (gross=net) to avoid undercounting gross savings.

^d Residential Behaviour results were excluded from the evaluated net savings used to calculate the realization rate as there were no tracked savings.

Table 6: Comparison of 2025 Evaluated and Tracked Peak Demand Savings at the Generator ^a

DSM Program	Program Component	Tracked Results			Evaluated Results				Difference in Net Savings (MW)	Difference in Available Capacity (MW)	Net Realization Rate
		Annual Gross Savings (MW)	Annual Net Savings (MW)	Available Capacity (MW)	Annual Gross Savings (MW)	NTGR ^b	Annual Net Savings (MW)	Available Capacity (MW)			
Residential											
Residential Efficient Product Rebates	Appliance Retirement	0.029	0.017		0.029	0.56	0.017		-		100%
	Instant Savings	0.757	0.713		0.700	0.67	0.466		-0.247		65%
Existing Residential	Affordable Multifamily Housing	0.648	0.648		0.648	1.00	0.648		-		100%
	Affordable Single-family Homes	2.338	2.338		2.338	1.00	2.338		-		100%
	Efficient Product Installation	0.519	0.509		0.518	0.98	0.509		-		100%
	Green Heat	2.176	1.191		2.176	0.55	1.191		-		100%
	Home Energy Assessment	4.684	4.578		4.684	0.98	4.578		-		100%
	Mi'kmaw Home Energy Efficiency Project	0.420	0.420		0.319	1.00	0.319		-0.101		76%
	Residential Behaviour	-	-		-	-	-		-		-
Residential Subtotal		11.571	10.414		11.413	0.88	10.066		-0.348		97%
BNI											
Efficient Products Rebates	Business Energy Rebates	6.181	5.328		6.046	0.88	5.332		0.004		100%
Custom Incentives	Custom	7.883	5.887		7.523	0.85	6.372		0.485		108%
	Strategic Energy Management	0.421	0.421		0.372	1.00	0.372		-0.049		88%
Direct Installation	Small Business Energy Solutions	1.741	1.400		1.759	0.80	1.414		0.014		101%
BNI Subtotal		16.226	13.035		15.700	0.86	13.490		0.454		103%
Demand Response (DR) Program											
Residential Demand Response				0.540				0.854		0.314	158%
BNI Demand Response				6.648				5.941		-0.706	89%
DR Program Subtotal				7.187				6.795		-0.392	95%
Portfolio Total		27.797	23.450	7.187	27.113	0.87	23.556	6.795	0.107	-0.392	100%
^a Numbers may not add up due to rounding. ^b Subtotal NTGR values represent average values for the Residential and BNI portfolios. The portfolio total NTGR value represents an average value for all programs.											



The following subsections discuss how evaluated savings compared to E1 tracked savings, and participation for each program and component.

4.1.1 Residential DSM Programs

Residential Efficient Product Rebates

In 2025, Residential Efficient Product Rebates achieved net electrical energy and peak demand savings of 11.545 GWh and 0.483 MW respectively at the generator. This program consists of two components, namely Appliance Retirement (ARet) and Instant Savings. The results of each program component are provided below.

Appliance Retirement

- › With the program component having been discontinued in January 2025, ARet fell short of its net savings targets, achieving 9% of both its electrical energy and peak demand savings targets.
- › The evaluated net electrical energy savings and peak demand savings determined by the Evaluator were identical to the net savings tracked by E1.
- › Since 2012, ARet has retired or replaced a total of 77,981 old and inefficient appliances from homes and schools.

Instant Savings

- › Instant Savings surpassed its net electrical energy savings target by 18% and fell short of its peak demand savings target by 52%.
- › Following the removal of LED lighting products and dehumidifiers from the Instant Savings offering, 2025 program participation levels decreased by 71% compared to 2024 levels.
- › Controls now constitute the most significantly rebated product category, representing 61% of all rebated products and 68% of all gross electrical energy savings.
- › The evaluated net electrical energy savings and net peak demand savings determined by the Evaluator were lower than the net savings tracked by E1.
- › Following the 2025 literature review to establish NTGRs for non-lighting products, the overall program NTGR was updated from 0.98 in 2024 to 0.77 in 2025.

Existing Residential

In 2025, the net electrical energy savings for Existing Residential reached 35.274 GWh at the generator, while the net peak demand savings amounted to 9.584 MW at the generator. Existing Residential is comprised of Affordable Multifamily Housing, Affordable Single-family Homes, Efficient Product Installation, Green Heat, Home Energy Assessment, the Mi'kmaw Home Energy Efficiency Project, and Residential Behaviour. The results of these seven program components are provided below.



Affordable Multifamily Housing

- › In 2025, AMH achieved 1.378 GWh in net electrical energy savings and 0.648 MW in net peak demand savings at the generator, thus falling 27% short of planned net electrical energy savings of 1.880 GWh and exceeding by 13% the planned net peak demand savings of 0.572 MW.
- › In 2025, AMH reached its highest participation rate since inception with 98 completed projects (66 prescriptive and 32 comprehensive) generating electrical savings, which represents an 18% increase compared to 2024 levels. Together, AMH paths generated 19% and 14% more electrical energy and peak demand savings respectively compared to 2024 levels.
- › Following project reviews, the Evaluator confirmed that equivalent full load hour (EFLH) values had been properly applied to prescriptive heat pump projects.
- › Evaluated net electrical energy savings and peak demand savings were the same as the savings tracked by E1.

Affordable Single-family Homes

- › ASFH achieved 6.135 GWh in net electrical energy savings and 2.338 MW in net peak demand savings at the generator in 2025, thus exceeding the planned electrical energy and peak demand savings targets by 114% and 183% respectively.
- › In 2025, 1,920 homes participated in ASFH, representing a 59% participation increase compared to 2024 levels. While average savings per participant remained stable, gross electrical energy and peak demand savings were respectively 65% and 12% higher than in 2024, primarily due to increased participation.
- › The evaluated peak demand savings were equal to those tracked by E1, while the evaluated electrical energy savings were approximately 1% higher than the savings tracked by E1 due to the inclusion of 2024 unclaimed savings from non-modelled heat pump measures.

Efficient Product Installation

- › With 7.300 GWh in net electrical energy savings and 0.509 MW in net peak demand savings at the generator in 2025, EPI net electrical energy and peak demand savings fell short of targets by 46% and 68% respectively.
- › In 2025, participation decreased by 7.5% while the number of measures installed decreased by 40% compared to 2024 levels. Despite this decrease, due to the phasing out of lighting measures in June 2025, the average gross electrical energy savings per participant decreased by only 12% in 2025 compared to 2024 levels.
- › The only update made by the Evaluator in the 2025 EPI evaluation was the calculation of the overall 2025 NTGR values based on the proportions of savings associated with each participant type for each product category, which resulted in minor changes. Due to this update, the net electrical energy and peak demand savings have realization rates of 99% and 100% respectively.



Green Heat

- › In 2025, Green Heat achieved 0.749 GWh in net electrical energy savings and 1.191 MW in net peak demand savings at the generator, thus falling 79% short of planned net electrical energy savings of 3.571 GWh and 56% short of planned net peak demand savings of 2.717 MW.
- › Program participation declined for the fourth year in a row. In 2025, participation decreased by an average of 33% compared to 2024 levels, especially for mini-split heat pumps (MSHPs, down 30%) and demand reduction (down 56%). This decrease began after participants switched to HEA and the Canada Green Homes (CGH) Grant for better incentives. Green Heat participation did not rebound despite the closure of the CGH Grant, and lower rebates linked to reduced electrical energy savings in 2024 may have deterred new participants.
- › The evaluated gross and net electrical energy and peak demand savings determined by the Evaluator were the same as the gross and net savings tracked by E1.

Home Energy Assessment

- › In 2025, HEA achieved 13.820 GWh in net electrical energy savings and 4.578 MW in net peak demand savings at the generator, thus exceeding by 61% planned net electrical energy savings of 8.580 GWh and falling short by 6% of planned net peak demand savings of 4.325 MW.
- › With 3,157 projects, 2025 participation significantly decreased compared to 2024 levels that had 5,367 projects. With the closure of the CGH Grant and the fact that CGH Grant applicants had until the end of November 2025 to complete their E assessments, participation and gross savings are expected to decrease further in future years.
- › The average gross electrical energy savings per home were 4,678 kWh in 2025, also a significant decrease compared to 2024 levels of 5,367 kWh representing the highest level observed since HEA launch. Solar PV projects represented 56% of gross savings, down from 74% in 2024. Solar PV projects have higher per participant savings than non-solar PV projects, which contributed to the decrease in average gross electrical energy savings per participant.
- › Realization rates of 100% were achieved for both electrical energy savings and peak demand savings, meaning the evaluated electrical energy and peak demand savings were identical to the savings tracked by E1.

Mi'kmaw Home Energy Efficiency Project

- › In 2025, MHEEP achieved 0.337 GWh in net electrical energy savings and 0.319 MW in net peak demand savings at the generator, thus falling 39% short of planned net electrical energy savings of 0.548 GWh and 104% above planned net peak demand savings of 0.156 MW.
- › Participation declined by 18% in 2025, while average electrical energy savings per participant remained stable, resulting in 16% lower gross electrical energy savings and 34% lower gross peak demand savings compared to 2024 levels.
- › While the evaluated net electrical energy savings were equal to the values tracked by E1, evaluated net peak demand savings were 24% lower due to a change in methodology resulting in the Evaluator only claiming peak demand savings for fully electrically heated households to align with 2024 Green Heat billing analysis findings and with similar program component methodologies.



Residential Behaviour

- › Residential Behaviour has been paused since May 2025 due to a cybersecurity incident at NS Power in spring 2025 whereby AMI data were no longer available. The evaluation was, therefore, limited to the four months in 2025 (January to April) for which AMI data were available and during which the program was in operation.
- › Residential Behaviour achieved 5.555 GWh in net electrical energy savings in the four months of operation in 2025, thus falling short of the planned net electrical energy savings of 29.771 GWh.

4.1.2 Business, Non-profit, and Institutional DSM Programs

Efficient Product Rebates

Efficient Product Rebates is comprised of one program component, Business Energy Rebates, which is further comprised of two services, namely Application Rebates and Instant Rebates. In 2025, Business Energy Rebates achieved 40.244 GWh in net electrical energy savings at the generator and 5.332 MW in net peak demand savings at the generator. The results of the program are provided below.

Business Energy Rebates

- › In 2025, BER achieved 40.244 GWh in net electrical energy savings and 5.332 MW in net peak demand savings at the generator, thus exceeding by 5% the planned net electrical energy savings of 38.451 GWh and falling 26% short of planned net peak demand savings of 7.241 MW.
- › Application Rebates:
 - › There was a 36% reduction in business participation in Application Rebates compared to 2024 levels. As a result of the reduced participation in Application Rebates, BER gross electrical energy savings and peak demand savings decreased by 4% and 11% respectively compared to 2024 levels.
 - › Through site visits, the Evaluator established updated adjustment ratios to track electrical energy and peak demand savings. For lighting as well as heating, ventilation, and air-conditioning (HVAC) measures, these ratios are respectively 1.117 and 1.006 for electrical energy savings and 1.031 and 1.027 for peak demand savings. For agriculture, motor, pumping, refrigeration, and commercial kitchen measures, a combined adjustment ratio of 0.0951 was calculated for electrical energy savings and 0.514 for peak demand savings. The 0.514 adjustment ratio applied in 2025 has a higher margin of error than anticipated, which means this value may not be reliable for future years.
 - › The average free-ridership levels decreased relative to the last time they were evaluated in 2021, while spillover remained nil. Consequently, NTGR values for Application Rebates increased to 0.83 for HVAC, 0.94 for lighting, and 0.91 for all other measure categories compared to an overall NTGR of 0.74 in 2021.
 - › Application Rebates evaluated net electrical energy and peak demand savings were respectively 25% and 27% higher than the values tracked by E1, mainly due to the decrease in free-ridership levels and updated adjustment ratios.
 - › Revisions to the Application Rebates tracking sheet led to increases of 0.06% in gross tracked electrical energy savings and 0.02% and gross tracked peak demand savings. These changes were mostly due to updated interactive effects factors for recessed fixtures that consisted exclusively of troffers and corrections to wattage values for multi-wattage fixtures for which DesignLights Consortium (DLC) values were verified as reliable.
 - › Application Rebates adjustment ratios were embedded within the gross electrical energy savings and peak demand savings fields in the tracking sheet, which can increase the risk of errors.

- › Instant Rebates:
 - › Instant Rebates saw a 79% increase in participation compared to 2024 levels, which was largely driven by the promotion of T8 LED linear lamps in the first quarter of 2025.
 - › Average interactive effects factors calculated for Instant Rebates were similar to those used in the 2024 evaluation.
 - › For Instant Rebates, evaluated net electrical energy savings were 4% higher than tracked results, while evaluated net peak demand savings were 6% lower than tracked results mainly due to updated line loss factors, interactive effects factors, and unitary energy savings values.

Custom Incentives

In 2025, Custom Incentives achieved 34.519 GWh in net electrical energy savings and 6.744 MW in net peak demand savings at the generator through its two components, namely Custom and Strategic Energy Management. Custom comprises four services, Retrofit, Pay-for-Performance, New Construction, and Building Optimization. The results of both program components are provided below.

Custom

- › Custom achieved 30.487 GWh in net electrical energy savings and 6.372 MW in net peak demand savings at the generator in 2025, thereby surpassing by 26% the planned electrical energy savings of 24.160 GWh and by 32% the planned peak demand savings of 4.824 MW.
- › Participation decreased for Retrofit and increased for Building Optimization and New Construction in 2025 compared to 2024 levels. One Pay-for-Performance project was completed in 2025. Overall, total Custom participation decreased in 2025 compared to 2024 levels.
- › Following the project reviews, the Evaluator adjusted the electrical energy and peak demand savings for three Custom services. For Retrofit, these adjustments resulted in adjustment ratios of 0.993 and 1.011 for electrical energy and peak demand savings respectively. Similarly, resulting adjustment ratios for Pay-for-Performance were 1.000 and 0.528 for electrical energy and peak demand savings respectively, while New Construction had resulting adjustment ratios of 0.949 and 0.937 for electrical energy and peak demand savings respectively.
- › The free-ridership level decreased from 15% to 8% for regular Retrofit projects. The free-ridership level was established at 8% for compressed air leak audits and was maintained at 38% for solar PV. New Construction free-ridership was established at 18%, a decrease from 28% in 2024. The free-ridership level for Pay-for-Performance was established at 8%, while it was not measured for Building Optimization and was, therefore, maintained at 9%. Spillover was nil for regular Retrofit projects and compressed air leak audit projects. Spillover levels were not measured for solar PV and Building Optimization and were, therefore, maintained at 1% and nil respectively.
- › The evaluated net electrical energy and peak demand savings determined by the Evaluator were both 8% higher than the savings tracked by E1.

Strategic Energy Management

- › In 2025, SEM achieved 4.031 GWh in net electrical energy savings and 0.372 MW in net peak demand savings at the generator, thus exceeding the 2.657 GWh target by 52% and the planned 0.289 MW in net peak demand savings by 29%.
- › In 2025, the SEM participation level increased to 11 completed projects, the highest level since 2018. Conversely, electrical energy savings per participant were lower than in the last three years.
- › In SEM, 54% of electrical energy savings are the result of compressed air leak repair measures.
- › While the Evaluator made adjustments to electrical energy savings and peak demand savings, the measurement and verification guideline written by E1 for calculating peak demand savings was generally followed by the Service Provider and, in most cases, projects and assumptions were well documented.



Direct Installation

Direct Installation consists of one program component, namely Small Business Energy Solutions (SBES). In 2025, Direct Installation achieved 7.862 GWh in net electrical energy savings at the generator and 1.414 MW in net peak demand savings at the generator. The results of the program are provided below.

Small Business Energy Solutions

- › In 2025, SBES achieved 7.862 GWh in net electrical energy savings and 1.414 MW in net peak demand savings at the generator, falling short of the net electrical energy savings and net peak demand savings targets by 38% and 46% respectively.
- › The evaluated net electrical energy savings were slightly lower than the net savings tracked by E1, while the evaluated net peak demand savings were slightly higher.
- › SBES participation in terms of units rebated increased by 1% in 2025 compared to 2024 levels. The Do-it-yourself (DIY) path remained the most popular, accounting for 99% of all units rebated.

4.1.3 Demand Response DSM Programs

Demand Response

The Demand Response program is comprised of two program components, namely Residential Demand Response (Residential DR) and Business, Non-profit, and Institutional Demand Response (BNI DR). In 2025, Demand Response achieved 6.795 MW in available demand response capacity. The results of each program component are provided below.

Residential Demand Response

- › Residential DR participation increased substantially during the 2024/25 DR season,¹⁶ with 3,676 participants and 11,405 enrolled devices across all four pathways, an increase of 907% compared to 2023/24 levels. Smart thermostats remained the most common device with 10,200 enrolled units, followed by 1,002 domestic hot water (DHW) controllers, 191 electric vehicle (EV) telematics and chargers, and 12 batteries.
- › In 2025, Residential DR generated available DR capacity of 0.854 MW at the generator, thus not reaching the planned available DR capacity of 7.135 MW despite the substantial increase in participation.
- › The evaluated available DR capacity for Residential DR was 58% higher than the value tracked by E1. This difference is mainly due to the higher unitary available DR capacity values established for smart thermostats, with only minor differences for other pathways.

¹⁶ Uses of the term 2024/25 herein refer to the DR season while uses of the term 2025 refer to the evaluation year.



Business, Non-profit, and Institutional Demand Response

- › In 2025, BNI DR available DR capacity at the generator amounted to 5.941 MW. Therefore, BNI DR did not reach its target of 10.726 MW in available DR capacity.
- › DR events that occur in the morning, on average, generate more available DR capacity than events that occur in the evening. On average, BNI DR generated 6.774 MW in available DR capacity during morning events compared to 4.928 MW during evening events.
- › Participation increased by 88% from 76 participants in 2024 to 143 participants in 2025. Conversely, the available DR capacity per participant decreased from 106 kW in 2024 to 42 kW in 2025. This decrease is largely due to the lack of participation by enrolled participants in events, with reviewed event non-participation increasing from 31% in 2024 to 60% in 2025.
- › The BNI DR available DR capacity calculation guidelines developed by E1 were followed in 2025 and reflected the changes recommended by the Evaluator pursuant to the 2024 evaluation. The project reviews conducted by the Evaluator resulted in modest downward adjustments to available DR capacity estimates, primarily where participant response was not evident in event load profiles.
- › The use of a stratified sample of meters for project reviews enabled the Evaluator to establish reliable adjustment ratios and produce accurate evaluated available DR capacity results for 2025. The adjustment ratios differed from those observed in the previous evaluation, indicating that they should not be assumed to remain stable year over year and should be established again in 2026.
- › The evaluated available DR capacity was 11% lower than the value tracked by E1. This difference is due to the adjustments made through the project reviews.

4.2 Net-to-gross Ratios

The NTGRs outlined in Table 7 below were applied to gross savings to estimate net savings. NTGRs were established based on the free-ridership levels and spillover in some cases. Based on the established free-ridership and spillover levels, NTGRs were calculated using the following equation.

$$NTGR = (1 - \% \text{ Free-ridership} + \% \text{ Spillover})$$

NTGR estimations were based on a self-reporting approach, and the methodology used is described in Subsection 2.1.7 above.

Table 7 below summarizes the free-ridership and spillover levels used in the 2025 evaluation as well as the resulting NGTRs for each program component.

Table 7: 2025 Free-ridership, Spillover, and NTGRs

Program Component and Measure Type		Free-ridership Levels	Spillover Levels	NTGRs
Residential				
Appliance Retirement ^a	Refrigerators	43%	0%	0.57
	Freezers	45%		0.55
	Air Conditioners	47%		0.53
	Small Refrigerators	32%		0.68
	Small Freezers	32%		0.68
	Dehumidifiers	0%		1.00
Instant Savings	LED Lamps ^a	39%	9%	0.70
	LED Fixtures ^a	26%	2%	0.76
	Dimmer Switches	-	-	0.75
	Indoor Motion Sensors	-	-	0.75
	Indoor Motion Sensors with Dimmer Switches	-	-	0.75
	Outdoor Motion Sensors	-	-	0.75
	Heavy-duty Outdoor Timers	-	-	0.75
	Solar Fixtures ^a	26%	2%	0.76
	Power Bars with Integrated Timers	-	-	0.86
	Smart Power Bars	-	-	0.86
	Programmable Thermostats	-	-	0.86
	Smart Thermostats for Mini-split Heat Pumps	-	-	0.86
	Smart Thermostats for Electric Baseboards	-	-	0.86
	Smart Thermostats for Electric In-floor Heating	-	-	0.86
	Efficient Clothes Washers	51%	3%	0.52
	ENERGY STAR® Certified Clothes Dryers	48%	3%	0.55
	Efficient Combined Clothes Washers and Dryers	50%	3%	0.53
	ENERGY STAR Certified Room Air Purifiers	-	-	0.65
	ENERGY STAR Certified Dehumidifiers	34%	3%	0.69
	ENERGY STAR Certified Variable Speed Pool Pumps	24%	3%	0.79
	ENERGY STAR Heat Pump Water Heaters	-	-	1.00
	ENERGY STAR Certified Dishwashers	-	-	0.55
	ENERGY STAR Certified Bathroom and Utility Fans	38%	3%	0.65
	Outdoor Clotheslines and Outdoor Drying Racks	-	-	0.65
Home Energy Assessment ^a	Energy Efficiency Measures	17%	1%	0.84
	Solar PV Measures	26%	1%	0.75
Green Heat ^a	MSHPs	48%	-	0.52
	Biomass and Solar	47%		0.53
	Demand Reduction	9%		0.91
	Central Air-source Heat Pumps (CASHPs) and Air-to-water Heat Pumps (AWHPs)	33%		0.67

Program Component and Measure Type		Free-ridership Levels	Spillover Levels	NTGRs
Efficient Product Installation ^a	LED Lamps and Lighting-Related Products, Non-low-income Participants	16%	8%	0.92
	LED Lamps and Lighting-Related Products, Low-income Participants	0%	0%	1.00
	Smart and Advanced Learning Thermostats, Non-low-income Participants	9%	8%	0.99
	Smart and Advanced Learning Thermostats, Low-income Participants	0%	0%	1.00
	DHW Products, Non-low-income Participants	11%	8%	0.97
	DHW Products, Low-income Participants	0%	0%	1.00
	Air Sealing Products, Non-low-income Participants	12%	8%	0.96
	Air Sealing Products, Low-income Participants	0%	0%	1.00
	Humidity Sensors, Non-low-income Participants	0%	8%	1.08
	Humidity Sensors, Low-income Participants	0%	0%	1.00
Mi'kmaw Home Energy Efficiency Project		-	-	1.00
Affordable Multifamily Housing		-	-	1.00
Affordable Single-family Homes		-	-	1.00
Residential Behaviour				
BNI				
Business Energy Rebates – Application Rebates ^a	Lighting	6%	0%	0.94
	HVAC	17%	0%	0.83
	All	9%	0%	0.91
	Renewable Generation ^a	0%	0%	1.00
Business Energy Rebates – Instant Rebates	LED Linear Fixtures ^a	8%	-	0.92
	LED Linear Lamps ^a	15%		0.85
	LED Outdoor Fixtures ^a	15%		0.85
	Other Measures ^a	-		1.00
Custom Retrofit	Regular Retrofit Projects	8%	0%	0.92
	Solar PV Projects	38%	1%	0.63
	Compressed Air Leak Audit Projects	8%	0%	0.92
Custom Pay-for-Performance		8%	-	0.92
Custom New Construction		18%	-	0.82
Custom Building Optimization ^a		9%	0%	0.91
Strategic Energy Management ^a		-	-	1.00
Small Business Energy Solutions	Audit Path ^a	20%	0%	0.80
	DIY Path ^a	12%		0.88
^a Net-to-gross ratios were determined based on the results of past evaluations.				

4.3 Lifetime Electrical Energy Savings

The Evaluator reviewed the EUL values of all measures offered by E1 and their associated lifetime electrical energy savings. The Evaluator found that the DSM portfolio generated 1,476.864 GWh in lifetime net electrical energy savings.¹⁷ As presented in Table 8 below, the weighted average EUL of measures offered in the E1 DSM portfolio is 11.4 years. Program components with measures affecting building envelopes, such as insulation, generate significant lifetime savings due to the persistence of these types of measures. For example, Home Energy Assessment has an average EUL of 24.8 years and, while it contributes to 11% of DSM portfolio annual electrical energy savings, it generates 23% of lifetime energy savings. Program components composed of mainly lighting measures, such as Instant Savings and Efficient Product Installation, generate lower lifetime electrical energy savings compared to annual savings due to the shorter equivalent EUL of these types of measures.

Table 8: 2025 Evaluated Net Lifetime Electrical Energy Savings at the Generator

DSM Program	Program Component	Annual Net Electrical Energy Savings (GWh)	Lifetime Net Electrical Energy Savings (GWh)	Weighted Average EUL (years)	Share of Annual Net Electrical Energy Savings (%)	Share of Lifetime Net Electrical Energy Savings (%)
Residential						
Residential Efficient Product Rebates	Appliance Retirement	0.115	0.461	4.0	0%	0%
	Instant Savings	11.430	106.508	9.3	9%	7%
Existing Residential	Affordable Multifamily Housing	1.378	23.345	16.9	1%	2%
	Affordable Single-family Homes	6.135	118.611	19.3	5%	8%
	Efficient Product Installation	7.300	53.898	7.4	6%	4%
	Green Heat	0.749	13.488	18.0	1%	1%
	Home Energy Assessment	13.820	342.195	24.8	11%	23%
	Mi'kmaw Home Energy Efficiency Project	0.337	6.905	20.5	0%	0%
	Residential Behaviour	5.555	5.555	1.0	4%	0%
Residential Subtotal		46.819	670.966	14.3	36%	45%
BNI						
Efficient Product Rebates	Business Energy Rebates	40.244	294.786	7.3	31%	20%
Custom Incentives	Custom	30.487	437.723	14.4	24%	30%
	Strategic Energy Management	4.031	20.515	5.1	3%	1%
Direct Installation	Small Business Energy Solutions	7.862	52.874	6.7	6%	4%
BNI Subtotal		82.624	805.898	9.8	64%	55%
Portfolio Total^a		129.444	1,476.864	11.4	100%	100%
^a Numbers may not add up due to rounding.						

4.4 Greenhouse Gas Emission Reductions

The Evaluator established the reduced GHG emissions due to the DSM portfolio at 60,748 tonnes of CO₂ eq in terms of annually avoided net GHG emissions. Table 9 below presents the GHG emission reductions of each program component in 2025 as well as those for the portfolio as a whole.¹⁸

Table 9: 2025 Evaluated GHG Emission Reductions

DSM Program	Program Component	Gross Annual Avoided GHG Emissions in CO ₂ eq Tonnes	Net Annual Avoided GHG Emissions in CO ₂ eq Tonnes
Residential Efficient Product Rebates	Appliance Retirement	96	54
	Instant Savings	6,954	5,364
Existing Residential New Residential	Affordable Multifamily Housing	647	647
	Affordable Single-family Homes	2,879	2,879
	Efficient Product Installation	3,475	3,426
	Green Heat	664	352
	Home Energy Assessment	6,931	6,486
	Mi'kmaw Home Energy Efficiency Project	158	158
	Residential Behaviour	2,607 ^a	2,607
Residential Subtotal		24,411	21,972
Efficient Product Rebates	Business Energy Rebates	21,156	18,886
Custom Incentives	Custom	16,992	14,308
	Strategic Energy Management	1,892	1,892
Direct Installation	Small Business Energy Solutions	4,587	3,689
BNI Subtotal		44,628	38,776
Portfolio Total		69,039	60,748

^a Net GHG savings were used in place of gross savings (gross = net) to avoid undercounting gross GHG impacts.

¹⁷ The Demand Response program is not included since no electrical energy savings were generated, and it generated available demand response capacity only.

¹⁸ Ibid.

5 DSM Portfolio Performance

This section presents a comparison of evaluated savings with E1 planned savings at the program and component levels. It also presents satisfaction results, annual savings performance, as well as the historical performance and contribution of individual program components to portfolio savings.

5.1 Participant and Partner Satisfaction

No data collection was conducted in the 2025 evaluation to assess satisfaction with E1 and its programs.

5.2 Annual Savings Performance by Program Component

Table 10 presents E1 planned savings,¹⁹ evaluated results, and the variances between them.

Table 10: 2025 Planned Net Savings and Evaluated Results

Program Component and DSM Program	Planned Savings*			Evaluated Results**			Variance	
	Net Electrical Energy Savings (GWh)	Net Peak Demand Savings (MW)	Available DR Capacity (MW)	Net Electrical Energy Savings (GWh)	Net Peak Demand Savings (MW)	Available DR Capacity (MW)	GWh (%)	MW (%)
Residential								
Residential Efficient Product Rebates	10.937	1.144		11.545	0.483		6%	-58%
Appliance Retirement	1.247	0.179		0.115	0.017		-91%	-91%
Instant Savings	9.690	0.965		11.430	0.466		18%	-52%
Existing Residential	60.639	10.177		35.274	9.584		-42%	-6%
Affordable Multifamily Housing	1.880	0.572		1.378	0.648		-27%	13%
Affordable Single-family Homes	2.863	0.825		6.135	2.338		114%	183%
Efficient Product Installation	13.426	1.581		7.300	0.509		-46%	-68%
Green Heat	3.571	2.717		0.749	1.191		-79%	-56%
Home Energy Assessment	8.580	4.325		13.820	4.578		61%	6%
Mi'kmaw Home Energy Efficiency Project	0.548	0.156		0.337	0.319		-39%	104%
Residential Behaviour	29.771	0.000		5.555	-		-81%	-
Residential Subtotal	71.577	11.321		46.819	10.066		-35%	-11%
BNI								
Efficient Product Rebates	38.451	7.241		40.244	5.332		5%	-26%
Business Energy Rebates	38.451	7.241		40.244	5.332		5%	-26%
Custom Incentives	26.817	5.112		34.519	6.744		29%	32%
Custom	24.160	4.824		30.487	6.372		26%	32%
Strategic Energy Management	2.657	0.289		4.031	0.372		52%	29%
Direct Installation	12.616	2.621		7.862	1.414		-38%	-46%
Small Business Energy Solutions	12.616	2.621		7.862	1.414		-38%	-46%
BNI Subtotal	77.883	14.974		82.624	13.490		6%	-10%

¹⁹ E1's 2023 Q1 Demand-side Management (DSM) Report (M11148), page 3, Table 1: 2023 Approved Plan, Mid-Course Adjustments and Q1 Results [filed May 25, 2023].

Program Component and DSM Program	Planned Savings*			Evaluated Results**			Variance	
	Net Electrical Energy Savings (GWh)	Net Peak Demand Savings (MW)	Available DR Capacity (MW)	Net Electrical Energy Savings (GWh)	Net Peak Demand Savings (MW)	Available DR Capacity (MW)	GWh (%)	MW (%)
Demand Response								
Demand Response			17.861			6.795		-62%
Residential Demand Response			7.135			0.854		-88%
BNI Demand Response			10.726			5.941		-45%
DR Program Subtotal			17.861			6.795		-62%
Portfolio Total	149.460	26.295	17.861	129.444	23.556	6.795	-13%	-10%
* Planned savings correspond to E1 mid-course adjustments.								
** Numbers may not add up due to rounding.								

The E1 DSM portfolio of program components achieved 129.444 GWh in total net electrical energy savings at the generator and 23.556 MW in total net peak demand savings at the generator, representing 13% lower savings than planned electrical energy savings and 10% lower savings than planned peak demand savings for 2025. Custom Incentives exceeded the planned electrical energy and peak demand targets in 2025, while Residential Efficient Product Rebates and Efficient Product Rebates exceeded the electrical energy targets and fell short of peak demand targets. Existing Residential and Direct Installation fell short of planned electrical energy and peak demand savings targets in 2025.

E1 residential programs achieved 46.819 GWh in net electrical energy savings at the generator and 10.066 MW in net peak demand savings at the generator. Residential electrical energy savings were 35% lower than planned as follows: Residential Efficient Product Rebates and Existing Residential had 6% higher and 42% lower savings than targets respectively. Both residential programs missed the peak demand savings targets, Residential Efficient Product Rebates by 58% and Existing Residential by 6%. As a result, residential net peak demand savings were 11% below the planned values.

E1 BNI programs achieved 82.624 GWh in net electrical energy savings at the generator and 13.490 MW in net peak demand savings at the generator in 2025, thus exceeding planned electrical energy savings by 6% and falling short of planned peak demand savings by 9%. Efficient Product Rebates and Custom Incentives exceeded the electrical energy savings target by 5% and 29% respectively, while Direct Installation fell 38% short of the electrical energy savings target. Custom Incentives exceeded the planned peak demand savings target by 32%, while Efficient Product Rebates and Direct Installation missed targets by 26% and 46% respectively.

5.3 Historical Portfolio Analysis

This subsection presents year-over-year program performance (GWh electrical energy savings) and the contribution of individual program components to portfolio savings (% electrical energy savings). Table 11, Table 12, and Table 13 below provide a historical overview of program component performance and changes in DSM portfolio composition.

Table 11: Evaluated Net Electrical Energy Savings at the Generator, 2020-2025

DSM Program	Program Component	Electrical Energy Savings (GWh)						Electrical Energy Savings (%)					
		2020	2021	2022	2023	2024	2025	2020	2021	2022	2023	2024	2025
Residential													
Residential Efficient Product Rebates	Appliance Retirement	2.111	2.474	2.051	1.698	2.365	0.115	2%	2%	2%	1%	1%	0%
	Instant Savings	10.533	14.314	13.741	11.476	22.252	11.430	11%	13%	11%	9%	13%	9%
Existing Residential	Affordable Multifamily Housing	0.676	0.402	0.920	1.460	1.159	1.378	1%	0%	1%	1%	1%	1%
	Affordable Single-family Homes ^a				1.444	3.719	6.135				1%	2%	5%
	Efficient Product Installation	7.402	7.812	8.315	9.357	8.948	7.300	8%	7%	7%	7%	5%	6%
	Green Heat	5.407	6.795	3.755	2.918	0.872	0.749	6%	6%	3%	2%	1%	1%
	Home Energy Assessment	3.823	3.481	11.377	25.966	31.962	13.820	4%	3%	9%	20%	19%	11%
	Mi'kmaw Home Energy Efficiency Project	0.088	0.316	0.380	0.577	0.401	0.337	0%	0%	0%	0%	0%	0%
	Residential Behaviour ^b					6.270	5.555					4%	4%
New Residential	New Home Construction	5.867	5.683	6.479	5.281			6%	5%	5%	4%		
Residential Subtotal		35.908	41.276	47.019	60.177	77.948	46.819	38%	38%	39%	46%	45%	36%
BNI													
Efficient Product Rebates	Business Energy Rebates	33.687	33.491	37.046	38.814	39.529	40.244	35%	31%	30%	30%	23%	31%
Custom Incentives	Custom ^c	17.790	23.293	23.588	21.746	39.951	30.487	19%	21%	19%	17%	23%	24%
	Energy Management Information Systems	0.605	0.027					1%	0%				
	Strategic Energy Management ^d	2.120	1.845	3.177	3.381	4.478	4.031	2%	2%	3%	3%	3%	3%
Direct Installation	Small Business Energy Solutions	5.415	9.486	11.069	7.451	10.854	7.862	6%	9%	9%	6%	6%	6%
BNI Subtotal		59.616	68.142	74.880	71.392	94.812	82.624	62%	62%	61%	54%	55%	64%
Portfolio Total		95.524	109.418	121.899	131.569	172.760	129.444	100%	100%	100%	100%	100%	100%
^a Affordable Single-family Homes was launched in 2023. ^b Residential Behaviour was introduced in 2024. ^c Custom includes four services: Retrofit, Pay-for-Performance, New Construction, and Building Optimization. ^d Strategic Energy Management includes Energy Management Information System since 2022 when the two program components were merged.													

Table 12: Evaluated Net Peak Demand Savings at the Generator, 2020-2025

DSM Program	Program Component	Peak Demand Savings (MW)						Peak Demand Savings (%)					
		2020	2021	2022	2023	2024	2025	2020	2021	2022	2023	2024	2025
Residential													
Residential Efficient Product Rebates	Appliance Retirement	0.309	0.357	0.298	0.243	0.337	0.017	1%	1%	1%	1%	1%	0%
	Instant Savings	1.206	1.629	1.771	1.459	2.428	0.466	6%	6%	6%	5%	8%	2%
Existing Residential	Affordable Multifamily Housing	0.181	0.186	0.447	0.741	0.570	0.648	1%	1%	1%	3%	2%	3%
	Affordable Single-family Homes ^a				0.627	2.089	2.338				2%	7%	10%
	Efficient Product Installation	1.007	1.098	0.864	0.920	0.880	0.509	5%	4%	3%	3%	3%	2%
	Green Heat	4.741	6.451	3.424	2.561	1.529	1.191	22%	23%	11%	9%	5%	5%
	Home Energy Assessment	1.823	1.495	6.703	7.820	8.681	4.578	9%	5%	21%	28%	28%	19%
	Mi'kmaw Home Energy Efficiency Project	0.026	0.147	0.194	0.373	0.481	0.319	0%	1%	1%	1%	2%	1%
	Residential Behaviour												
New Residential	New Home Construction	2.397	2.285	2.358	1.909			11%	8%	8%	7%		
Residential Subtotal		11.689	13.649	16.059	16.653	16.994	10.066	55%	50%	51%	60%	55%	43%
BNI													
Efficient Product Rebates	Business Energy Rebates	5.711	5.401	5.762	6.014	5.746	5.332	27%	20%	18%	22%	19%	23%
Custom Incentives	Custom ^b	2.427	6.105	6.931	3.053	5.255	6.372	11%	22%	22%	11%	17%	27%
	Energy Management Information Systems	0.000	0.003					0%	0%				
	Strategic Energy Management ^c	0.241	0.282	0.373	0.366	0.538	0.372	1%	1%	1%	1%	2%	2%
Direct Installation	Small Business Energy Solutions	1.120	2.045	2.222	1.491	2.155	1.414	5%	7%	7%	5%	7%	6%
BNI Subtotal		9.500	13.835	15.288	10.924	13.694	13.490	45%	50%	49%	40%	45%	57%
Portfolio Total		21.189	27.484	31.347	27.577	30.688	23.556	100%	100%	100%	100%	100%	100%
^a Affordable Single-family Homes was introduced in 2024.													
^b Custom includes four services: Retrofit, Pay-for-Performance, New Construction, and Building Optimization.													
^c Strategic Energy Management includes Energy Management Information Systems. In 2023, the two program components were merged.													

Table 13: Evaluated Net Available DR Capacity, 2023-2025

DSM Program	Program Component	Available DR Capacity (MW)			Available DR Capacity (%)		
		2023	2024	2025	2023	2024	2025
Demand Response							
Demand Response	Residential Demand Response	0.058	0.057	0.854	2%	1%	13%
	BNI Demand Response	2.365	8.034	5.941	98%	99%	87%
Demand Response Subtotal		2.423	8.091	6.795	100%	100%	100%

In 2025, E1 achieved a total of 129.444 GWh in net electrical energy savings at the generator and 23.556 MW in net peak demand savings at the generator. Both net electrical energy and peak demand savings decreased compared to 2024 levels. The net electrical energy and peak demand savings of residential programs decreased by 40% and 41% respectively compared to 2024 levels, while BNI program net electrical energy and peak demand savings decreased by 13% and 1% respectively.

In 2025, the residential sector accounted for 36% of net electrical energy savings and the BNI sector accounted for 64% of net electrical energy savings. Compared to 2024 levels, the share of lighting in residential programs decreased from 10% to 2% in 2025, largely driven by the removal of LED lighting products from the Instant Savings offering. Conversely, the share of lighting in BNI programs increased from 24% to 31%. For the overall portfolio, savings from lighting slightly decreased from 34% to 33% in 2025.

The residential sector accounted for 43% of net peak demand savings, while the BNI sector accounted for the remaining 57%. In 2025, the program components that generated the largest shares of peak demand savings were Custom (27%), Business Energy Rebates (23%), and Home Energy Assessment (19%).

As presented in Table 13 above, the Demand Reduction program, introduced in 2023, resulted in 6.795 MW in available demand response capacity in 2025.



6 Process Evaluation Results

For the 2025 evaluation, the Evaluator conducted one process evaluation for Residential Demand Response.

Residential Demand Response

To collect feedback from program staff, service providers, staff from other jurisdictions, and non-participants on increasing/maintaining participation along with opportunities for operational improvements, the Evaluator conducted a survey with non-participants, interviews with program staff, service providers, as well as staff from other jurisdictions and conducted a jurisdictional scan.

The key findings specific to the Residential Demand Response process evaluation are outlined below.

- › **Residential DR offers a comprehensive mix of eligible device types compared to other jurisdictions. All reviewed programs offer smart thermostats, with five out of nine jurisdictions offering EV chargers, home batteries, and hot water controllers.**

Residential DR offers participants the opportunity to enroll four distinct device types, which is comparable with leading jurisdictions such as British Columbia and Puget Sound. Offers in other jurisdictions include one, two, or three pathways only.

- › **Residential DR service providers report that the relationship with E1 is positive.**

Service providers indicated that the program component is running smoothly from their perspective and the relationship with E1 is positive and collaborative.

- › **For the 2024/25 DR season, all Residential DR device pathways were integrated into a streamlined offer from the participant perspective.**

Service providers indicated that the program component is running smoothly from their perspective and the relationship with E1 is positive and collaborative.

- › **Lessons learned in delivering Residential DR have led to necessary updates to the program component offer, eligibility criteria, and enrollment process.**

As Residential DR has evolved, lessons learned have been gathered and applied to program component design. Eligibility criteria and enrollment pathways have been adapted over time. An interviewed Canadian program manager noted that slower program growth is expected in demand response programs. A higher level of testing and a longer pilot phase is typically required for demand response programs compared to energy efficiency programs due to the value proposition being less tangible for participants and the importance of demonstrating that reliable demand reduction can be achieved for the grid.

- › **Program documentation has not kept pace with program changes.**

The Evaluator noted that Residential DR program changes, dates of program changes, and rationales thereof are not clearly documented in one document. Additionally, in the demand response program manual, information regarding Residential DR is blended with information regarding the BNI program component. In some sections of the manual, it is not clear which information relates to which sector.

- › **Residential DR service providers report that participant retention is high.**

Year-over-year participant retention is reported as high with over 90% of participants remaining enrolled in the program over the long-term.

- › **Similar to other jurisdictions, E1 leverages energy efficiency programs, notably EPI, to create a channel of DR participants, and this process could be fine-tuned.**

Mandatory enrollment in demand response when a participant receives an eligible device via an energy efficiency program is not uncommon in other North American jurisdictions.



EPI participants who receive a free, direct-install smart thermostat through that program component are now required to enroll in Residential DR. However, the Evaluator estimates that, based on a tracking sheet matching exercise, 40% of EPI participants who received a free smart thermostat in 2024 have not enrolled in Residential DR.

The Evaluator noted that there is not a unique participant identifier present in the EPI and Residential DR tracking sheets to easily discern which EPI participants have successfully completed enrollment in Residential DR following the installation of their smart thermostat through EPI. Additionally, a program service provider noted that there are instances whereby the EPI installer does not accurately collect the required device information, leading to difficulty identifying and auto-enrolling devices in Residential DR post-device installation.

› **Non-participants shared key perceived benefits and barriers that can be leveraged to enhance program messaging and communications as well as increase participation.**

All EPI participants interviewed (Residential DR non-participants) indicated they were aware of Residential DR and shared key sources of awareness along with their perceived benefits and barriers to participation in Residential DR, including what prevented them from enrolling. Key sources of awareness for Residential DR include emails from E1 and the E1 website (among EPI and Residential DR participants). Top perceived benefits of Residential DR among non-participants are incentives and helping to reduce peak demand in Nova Scotia. Barriers to participation reported by non-participants relate to enrollment issues, discomfort with external control of their heating system, privacy concerns, and lack of clarity around what demand response entails. A service provider shared that privacy issues are heightened in Nova Scotia compared to in other jurisdictions. A Canadian program manager emphasized the importance of a simple enrollment process and continuous education around demand response in communications to potential and enrolled participants.

› **Maximizing the number of devices enrolled per household was unanimously shared as a key strategy for the program component moving forward.**

A total of 40% of participants surveyed by Narrative Research in the summer of 2025 indicated that they have additional eligible devices not enrolled in Residential DR in their homes. Maximizing the number of devices installed per household was shared as a key strategy for consideration by several interviewees in this evaluation.

Implementing this strategy in the Smart Thermostat DLC pathway would also reduce the likelihood of back-up heating systems coming online during an event when only some thermostats in the home are registered in Residential DR, thus maximizing the available DR capacity per household. Adding smart thermostats to heating systems in residential spaces that are disconnected from the main living spaces (i.e. garages) or only occasionally used spaces (i.e. basement storage rooms) can be limited via the EPI enrollment pathway by ensuring that installers have instructions on appropriate locations for smart thermostat installations.

› **Participants and service providers provided information on communication strategies and event design that may reduce DR event opt-out rates.**



Event design, frequency, and length vary greatly by jurisdiction included in the research due to the variety of system needs across North America. Therefore, some aspect may not be applicable in the Nova Scotia context. The participant survey conducted by Narrative Research (July 2025) includes participant preferences on event design and communications that may be leveraged to improve event-level opt-out rates, including the benefits of providing post-event communications. Additionally, the operational improvement workshop hosted by a program service provider suggested further educational and engagement initiatives aimed at increasing participation. A Canadian DR program manager and the Residential DR Service Provider both shared that EV charging patterns do not line up with expectations in terms of timing and frequency. This leads to many EVs not being plugged in during DR events both in Nova Scotia and in another Canadian jurisdiction.

› **Incentive levels and structures vary across researched North American jurisdictions. Residential DR incentive levels are comparable on average.**

A service provider noted that there may be opportunities to reduce Residential DR enrollment incentives and maximize participation incentives to encourage participation in events and reduce opt-out rates. Additionally, an interviewed Canadian program administrator mentioned challenges with achieving first-year cost-effectiveness thresholds in DR programs due to enrollment incentives impacting first-year cost-effectiveness results.

› **Residential DR offered participation incentives to all participants regardless of participation in DR events in the 2024/25 DR season.**

This strategy may have contributed to lower participation levels in DR events in the 2024/25 DR season. The Evaluator has confirmed that participation incentives will only be issued during the 2025/26 DR season in Nova Scotia to Residential DR participants who participate in 50% or more events within a season. Other North American jurisdictions also offer ongoing participation incentives (fixed or variable) based on participation in individual DR events by participants. That structure is often implemented to encourage lower DR event opt-out rates.



7 Market Evaluation Results

For the 2025 evaluation, the Evaluator conducted one market evaluation for Business Energy Rebates – Instant Rebates focused on the BNI lighting market.

Business Energy Rebates – Instant Rebates

To validate 2024 market evaluation results and determine timing for when a baseline for Business Energy Rebates – Instant Rebates LED fixtures should take effect as well as to identify the implications of baseline changes for BER-AR and SBES, the Evaluator completed a lighting market study.

The key findings specific to the Business Energy Rebates – Instant Rebates market evaluation are outlined below.

- › **According to participant distributors, the New Brunswick commercial lighting market has become more energy efficient and diverse over the past three years.**

The commercial lighting market has increased integration of controls and sensors in LED products and has shifted technological innovation toward fixtures rather than lamps. Prices have generally declined mainly due to increased competitiveness.

- › **New Brunswick distributors and one non-participant distributor in Nova Scotia reported that the fixture market has been transformed to LED. Distributors indicate that non-LED options for fixtures are now rare, reporting that their entire stocks of outdoor and high-bay fixtures and 99% of linear fixtures are LED.**

Distributors reported that manufacturers no longer supply non-LED alternatives and expect the proportion of LED fixtures in their inventory to remain stable or increase slightly by 2026-2027.

- › **The market findings in New Brunswick indicate that a rebound effect is unlikely from discontinuing incentives in BER-IR for LED fixtures in Nova Scotia.**
- › **Nearly all fixtures offered by participating distributors are DLC-certified, with no differences in inventory stocking practices before and after joining the Midstream Business Rebate Program (MBRP).**

Some distributors said they were unable to differentiate between DLC Standard products and DLC Premium products.

- › **Some New Brunswick distributors continue stocking non-LED inventory (mainly lamps) to serve customers who have not yet undertaken a full LED retrofit and are instead seeking replacement lamps or fixtures.**

These customers tend to be small organizations with limited capital such as churches and non-profits, institutional customers such as schools and hospitals with long-term maintenance contracts, and large industries.

- › **DSM program administrators are shifting their programs in the face of LED market transformation, with some exiting the BNI sector completely and others adapting their offers.**

Of the eight jurisdictions reviewed and as of 2025, two have discontinued offering LED incentives to the broader business market and two have indicated an upcoming change in their LED offer in the next few years. After removing LED lamp and fixture incentives from their midstream program, another jurisdiction continues to offer LED incentives via an application-based program for their difficult-to-reach customer segments.

- › **For application-based and direct install programs, jurisdictions have updated their baselines to reflect LED market transformation, similarly to what is seen in Nova Scotia for LED fixtures, using either a market blend baseline or dual baseline. The approach varies depending on the project**

type (e.g. early replacement or end-of-life). The timing of baseline adjustments for application-based and direct install programs should be aligned across the program portfolio.

- › Based on the findings of this market study, the following dates for the implementation of lighting baseline changes were identified in collaboration with E1 to provide sufficient market notice periods.

Program	Measure	Date an Early Replacement Baseline Calculation Approach Comes into Effect	Date of LED Baseline Expected to Come into Effect for All Projects
BER-IR	Fixtures	N/A – midstream program	June 30, 2026
	Lamps	N/A – midstream program	January 1, 2028*
SBES	Fixtures	June 30, 2026	January 1, 2029
	Lamps	January 1, 2028*	January 1, 2029
BER-AR	Fixtures	June 30, 2026	January 1, 2029
	Lamps	January 1, 2028*	January 1, 2029
	New Construction**		June 15, 2025
*To be confirmed through 2026 market study.			
**All lighting			



CONCLUSIONS AND RECOMMENDATIONS

Overall, 2025 evaluated net electrical energy savings and peak demand savings for the E1 DSM portfolio were 129.444 GWh and 23.556 MW respectively above the values tracked by E1, while available DR capacity was 6.795 MW below E1 tracked values, as illustrated in Table 14 and Table 15 above.

The Evaluator's recommendations on individual program components are outlined in individual reports as well as in Table 14 and Table 15 below. The Evaluator made one cross-cutting recommendation for 2025.

2025 Cross-Cutting-Recommendation 1: Review how savings are distributed between DSM-funded and government-funded programs for whole home renovation program components (HEA, MHEEP, and AFSH). The review should serve to ensure that savings calculation approaches for these components are adequately and clearly defined for households that installed a heat pump and have both electric and non-electric heating while reflecting the data available for each program component. The savings calculation approach should account for the allocation between DSM and government funding, while the savings approach and allocation methodology should ideally be aligned. The savings calculation approach may differ between program components since the data available for MHEEP and ASFH, notably the percentage of electric heating, come from different data sources and rely on different assumptions than those used for HEA.

Table 14: 2025 Recommendations on Residential Program Components

No.	Recommendation
ASFH/HEA/MHEEP – R1	Review how savings are distributed between DSM-funded and government-funded programs for whole home renovation program components (HEA, MHEEP, and ASFH). The review should serve to ensure that savings calculation approaches for these components are adequately and clearly defined for households that installed a heat pump and have both electric and non-electric heating while reflecting the data available for each program component. The savings calculation approach should account for the allocation between DSM and government funding, while the savings approach and allocation methodology should ideally be aligned. The savings calculation approach may differ between program components since the data available for MHEEP and ASFH, notably the percentage of electric heating, come from different data sources and rely on different assumptions than those used for HEA.
Residential DR – R1	Include all changes to the pilot and program in the program manual, including historical changes since the pilot was launched. Include dates of all changes, a description of the change, along with the rationale for the change. Clearly define all eligibility criteria by pathway in the program manual. Reorganize the demand response program manual to create two distinct and continuous sections for residential and BNI given key differences in the approach by sector for demand response initiatives.
Residential DR/EPI – R2	Ensure that participant data and the information collected through the EPI installation process are complete and accurate. Ensure EPI installers properly and accurately record device information to ensure connectivity in Residential DR after device installation.
Residential DR – R3	Leverage key awareness channels to increase program participation in Residential DR within and outside the current and past EPI participant population. Focus key messaging on program benefits, including available incentives, and contributing to reducing strain on the grid while clearly outlining privacy protection mechanisms and the flexibility and control that participants maintain over their devices once enrolled. Clearly define how Residential DR works, the importance of participating in events, and how to achieve ongoing participation incentives (participation in 50%+ of DR events).
Residential DR – R4	Through continuous engagement with enrolled participants, encourage participation in DR events and enrollment of more devices per household (additional device types and additional smart thermostats installed on heating systems in all contiguous living areas in regular use only).
Residential DR – R5	Investigate ways to improve EV device potential for DR considering the low participation rate in DR events. To improve participation, consider additional opportunities for EV devices to participate in DR events, such as leveraging bidirectional chargers to use EVs as batteries during events.
Residential DR – R6	Monitor the impact of introducing a participation threshold to qualify for ongoing participation incentives. Should individual event participation rates not improve in the 2025/26 DR season, consider reviewing the Residential DR incentive structure and levels. In that review, consider both the incentive structure in terms of the enrollment incentive level compared to the ongoing participation incentive level and the effectiveness of the 50% participation threshold to qualify for ongoing participation incentives to encourage higher DR event participation rates. Ensure that the incentive structure encourages enrollment growth and increases ongoing DR event participation as both strategies are required to achieve targets in DR programs.
Residential DR – R7	To ensure that the unitary available DR capacity values are consistent year over year, reconduct metering data analyses for each pathway in the next evaluation if the required data are available.

Table 15: 2025 Recommendations on Business, Non-profit, and Institutional Program Components

No.	Recommendation
BER – R1	Use the calculated adjustment ratios to track gross electrical energy and peak demand savings moving forward, with the exception of the 0.514 adjustment ratio for peak demand savings for non-lighting and non-HVAC measures. Reassess the electrical energy and peak demand adjustment ratios for agriculture, motor, pumping, refrigeration, and commercial kitchen measures in the 2026 evaluation after sampling additional projects in this measure group. Recalculate adjustment ratios for electrical energy and peak demand savings specifically for agriculture and motor measures to determine whether standalone ratios are warranted.
BER – R2	Moving forward, use the updated measure-level NTGR values to convert gross electrical energy and peak demand savings into net savings for reporting and evaluation purposes.
BER – R3	Continue using DLC wattages as the efficient wattage values for multi-wattage products. Rather than tracking whether each fixture is multi-wattage, conduct periodic spot checks, particularly on large applications, to confirm the accuracy of DLC wattage listings and identify any cases that may require correction.
BER – R4	Rather than tracking whether a fixture is recessed in Application Rebates, adopt an assumption that recessed fixtures are limited to troffers, which is consistent with practices in BER-IR, and apply the recessed interactive effect factors to troffers only.
BER – R5	Apply adjustment factors separately rather than embedding them in gross values and record the adjusted results in dedicated fields in the tracking sheet to improve transparency and reduce error risks.
BER – R6	Update the baseline for LED fixtures in 2026 to reflect that the market stocking practice has become LED only. This baseline would apply to all LED fixtures rebated through BER-IR.
BER – R7	When the new LED baseline is applied, it should be at the efficiency level of DLC-certified Standard LED fixtures. Explore the possibility of continuing to offer rebates for DLC Premium products and lighting controls in midstream programs, with updated savings assumptions based on a LED baseline.
BER – R8	The 2024 recommendation that the current non-LED baseline for lamps be maintained for BER-IR remains valid and should be reassessed in 2026. Given trends, E1 should plan for a baseline change for BER-IR lamps starting in 2028.
BER – R9	Focus LED fixture rebates on application-based and direct install programs in the near-to-medium term to target early replacements in the laggard market segments (small businesses, institutions, non-profits, etc.).
BER/SBES – R10	For SBES, given the target population of small businesses, the Evaluator assumes that many projects are early replacement. Therefore, implement a dual baseline approach for LED fixtures, notably by using the existing baseline for one-third of the lifetime of the existing measure and a LED baseline for the remainder of the efficient measure lifetime.
BER – R11	For BER-AR, consider two options: Option 1: Focus BER-AR on market laggards and adopt eligibility criteria to ensure projects are early replacement (as seen in ComEd). If this is feasible, the Evaluator recommends using the Uniform Methods Project (UMP) approach of developing a dual baseline by using the existing baseline for one-third of the lifetime of the existing measure and a LED baseline for the remainder of the efficient measure lifetime. Option 2: If developing and enforcing eligibility criteria to ensure all projects are early replacement, a market blend baseline should be used and that accounts for the proportion of projects aimed at early replacement versus end of life. The blended baseline should assume a LED baseline for the proportion of projects assumed to be at end of life.
BNI DR – R1	Conduct a process evaluation in 2026 to determine strategies to increase the enrolled participant rate of participation in events.
BNI DR – R2	Conduct project reviews again in 2026 to establish evaluated savings.



LIST OF APPENDICES

The following are presented in the 2025 DSM Programs Evaluation Executive Summary – Appendices document.

Appendix I: Bibliography

Appendix II: Calculations of Margins of Error

Appendix III: NTGR Calculations



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EXECUTIVE SUMMARY

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	Minister of Justice, Canada, Energy Efficiency Regulations, 2016, http://laws-lois.justice.gc.ca/PDF/SOR-2016-311.pdf (last accessed December 5, 2019).
	Corporate Research Associates Inc., 2016 Socket Study, Final Report prepared for Efficiency Nova Scotia, December 2016.
	NMR Group Inc. and DNV GL, Northeast Residential Lighting Hours-of-Use Study, May 5, 2014, p. 69.
	Econoler, Residential Lighting Metering Study, December 14, 2017.
	NMR Group Inc. and DNV GL, Northeast Residential Lighting Hours-of-Use Study, May 5, 2014, p. 69.
	NMR Group Inc. and DNV GL, Residential Lighting Hours-of-Use Quick Hit Study, March 31, 2020.
	Ontario Power Authority (OPA), 2011 Prescriptive Measures and Assumptions Version 1, March 2011.
	U.S. Department of Energy, 2020 U.S. Lighting Market Characterization, April 2024, p. 37.
	U.S. Department of Energy, Table 3.10 Lighting Technology Distribution of Residences by Room Type in 2020, 2020 U.S. Lighting Market Characterization, April 2024, p. 44.
	Pennsylvania Public Utility Commission, Technical Reference Manual Volume 2: Residential Measures, August 2019 (revised February 2021), p. 8.
	Econoler, Residential Direct Install 2015 Evaluation, March 3, 2016.
	Minister of Justice, Canada, <i>Energy Efficiency Regulations, 2016</i> , http://laws-lois.justice.gc.ca/PDF/SOR-2016-311.pdf (last accessed December 5, 2019).
	Mayer, P. W., DeOreo W. B. et al., Residential End Uses of Water, published by the AWWA Research Foundation, 1999, pp. 99-102.
	Mayer, P. W., DeOreo W. B. et al., Residential End Uses of Water, Version 2: Executive Report, published by Water Research Foundation, April 2016. pp. 5-8.
	United Illuminating Company and Connecticut Light & Power Company, Connecticut Program Savings Document, 15 th Edition for 2019 Program Year, March 2019.
	Ecotope inc., NEEA Heat Pump Water Heater Model Validation Study, March 2, 2015.
	Ecotope inc., NEEA Heat Pump Water Heater Model Validation Study, 2015, p. 72.
	DeOreo et al. (2016). Residential End Uses of Water, Version 2: Executive Report, published by Water Research Foundation, http://www.waterrf.org/PublicReportLibrary/4309A.pdf (March 16, 2017), pp. 5-8.
	DeOreo et al. <i>Residential End Uses of Water, Version 2: Executive Report</i> , published by Water Research Foundation, 2016, pp. 5-8.
	Pennsylvania Public Utility Commission, Technical Reference Manual Volume 2: Residential Measures, September 2024, p. 82.
	Illinois Commerce Commission, Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 5.0 – Volume 3: Residential Measures, February 11, 2016, p. 175.
	Pennsylvania Public Utility Commission, Technical Reference Manual Volume 2: Residential Measures, August 2019 (revised February 2021), p. 93.
	Ontario Power Authority (OPA), OPA Prescriptive Measures and Assumptions List, December 2010.

Program Components	Bibliographic References
	Ontario Power Authority (OPA), 2011 Prescriptive Measures and Assumptions Version 1, March 2011.
	Mayer, P. W., W. B. Oreo et al., <i>Residential End Uses of Water</i> , published by the AWWA Research Foundation, 1999, pp. 99-102.
	Giant Inc., Engineering Submittal Data Sheet 172ETE Models, http://www.giantinc.com/tech-data/FT-172E-An.pdf (last accessed February 18, 2015).
	Frost King Weatherization Products, Water Heater Insulation Blanket, http://www.frostking.com/water-heater-insulation-blanket/ (last accessed January 4, 2014).
	NRCAN regulation, https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/guide-canadas-energy-efficiency-regulations/split-system-central-air-conditioners-and-heat-pumps/6895 .
	NRCAN for room air conditioning, https://www.nrcan.gc.ca/energy/publications/efficiency/residential/air-conditioning/6051 .
	Pennsylvania Public Utility Commission (PUC), Technical Reference Manual, August 2019, Subsection 2.2 – HVAC.
	Minnesota Department of Commerce Division of Energy Resources, State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs Version 3.1, January 2020.
	Dunsky Energy Consulting, Residential Fuel Substitution Pilot Program, Final Report, December 2010.
	United Illuminating Company and Connecticut Light & Power Company, <i>Connecticut Program Savings Document, 15th Edition for 2019 Program Year</i> , March 2019.
	Illinois Commerce Commission, Illinois Statewide Technical Reference Manual for Energy Efficiency Version 12.0, Volume 3, September 22, 2023, p. 384.
	Energize Connecticut. Connecticut's 2021 Program Savings document, March 1. Available at: https://energizect.com/sites/default/files/documents/Final%202022%20PSD%20FILED%20110122.pdf .
	Iowa Utilities Board, Iowa Energy Efficiency Statewide Technical Reference Manual, July 23, 2021. Available at: https://iub.iowa.gov/sites/default/files/documents/2021/09/iowa_trm_v6_vol_1_overview_and_user_guide_2069155_210820-161936.pdf .
	Econoler, Évaluation du programme thermostats électroniques – Volet nouvelle construction au marché résidentiel, final report presented to Hydro-Québec, February 9, 2009.
	Statistics Canada. (2021). Census Profile, 2021 Census, https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/Page.cfm?Lang=E&Geo1=PR&Code1=12&Geo2=PR&Code2=01&SearchText=Nova%20Scotia&SearchType=Begins&SearchPR=01&B1=All&GeoLevel=PR&GeoCode=12&type=0 (last accessed September 18, 2024).
	Illinois Commerce Commission, Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 13.0 – Volume 3: Residential Measures, September 20, 2024, p. 220.
	Natural Resources Canada, 2021 Comprehensive Energy Use Database, https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/comprehensive/trends_res_ns.cfm .
	Apex Analytics LLC, Energy Trust of Oregon Nest Thermostat Heat Pump Control Pilot Evaluation, October 10, 2014, p. 123.
	Bonneville Power Administration, Nest Learning Thermostat Pilot Program Savings Assessment Bonneville Power Administration & Franklin Public Utility District, November 16, 2016.
	Statistics Canada, Census Profile, 2016 Census, https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/Page.cfm?Lang=E&Geo1=PR&Code1=12&Geo2=&Code2=&Data=Count&SearchType=Begins&SearchPR=01&B1=All (last accessed December 3, 2019).

Program Components	Bibliographic References
	Statistics Canada, Residential Sector, Nova Scotia, Table 14: Total Households by Building Type and Energy Source, https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CP&sector=res&juris=ns&year=2020&rn=14&page=0 (last accessed September 25, 2024).
	Statistics Canada, Table 38-10-0019-01 – Air conditioners, https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=3810001901 (last accessed September 2024).
	National Renewable Energy Laboratory, ResStock End-use Load Profiles Data Sets 2022.1 Release, https://resstock.nrel.gov/datasets (last accessed November 6, 2023).
	NRCan, 2015 Survey of Household Energy Use, Table 10.6. Calculated average annual dried loads for Atlantic, assuming 100 days of summer and 265 days of winter. Available at: https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=SH&sector=aaa&juris=ca&year=2015&rn=38&page=1 , (last accessed July 12, 2024).
	Econoler, Residential Efficient Product Rebates Program – 2017 DSM Evaluation, Final Report presented to Efficiency Nova Scotia, March 15, 2018.
	Natural Resources Canada, EnerGuide appliance directory, https://publications.gc.ca/site/eng/9.500453/publication.html (last accessed October 10, 2024).
	Paul A. et al., Impact of aging on the energy efficiency of household refrigerating appliances, Applied Thermal Engineering, Volume 205 (117992), 25 March 2022. https://doi.org/10.1016/j.applthermaleng.2021.117992 (last accessed November 30, 2022).
	U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Energy Conservation: Program for Consumer Products: Energy Conservation Standards for Refrigerators, Refrigerator-Freezers, and Freezers, 10 CFR Part 430, April 28, 1997.
	Natural Resources Canada, Refrigerators, Refrigerator-Freezers and Wine Chillers - Energy Efficiency Regulations, http://www.nrcan.gc.ca/energy/regulations-codes-standards/products/6877 (last accessed January 17, 2019).
	Natural Resources Canada, Registration and Publication of Regulations Amending Canada's Energy Efficiency Regulations, https://www.nrcan.gc.ca/energy-efficiency/energy-efficiency-regulations/regulatory-announcements/amendment-13/18419 (last accessed October 1, 2020).
	New York Department of Public Service, New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs - Residential, Multi-Family, and Commercial/Industrial Measures, April 15, 2019, p. 29.
	Econoler, Residential Efficient Product Rebates Program – 2022 DSM Evaluation, final report presented to Efficiency Nova Scotia, March 2023.
	Natural Resources Canada, <i>EnerGuide appliance directory</i> , https://publications.gc.ca/site/eng/9.500453/publication.html (last accessed October 10, 2024).
	NRCan, 2015 Survey of Household Energy Use, Table 10.4. Calculated average annual loads for Atlantic region. Available at: https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=SH&sector=aaa&juris=ca&year=2015&rn=36&page=1 (last accessed September 13, 2024).
	NRCan's Office of Energy Efficiency, EnerGuide Room Air Conditioner Directory 2012, May 2012, p. 88.
	Natural Resources Canada, National Energy Use Database, Residential Sector, Nova Scotia, Table 27: Cooling System Stock by Type, New Unit Efficiencies, Stock Efficiencies and Unit Capacity Ratio, 2007-2012 https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CP&sector=res&juris=ns&rn=27&page=2 (last accessed September 19, 2024).
	Ecox, Technical Information Bulletin No. E-004-EN: SEER, www.ecoxline.com (last accessed March 3, 2016).
	Natural Resources Canada, Search: Clothes Dryers Energy Efficiency Ratings. Available at: https://oee.nrcan.gc.ca/pml-lmp/index.cfm?action=app.search-recherche&appliance=CLOTHESDRYERS (last accessed September 25, 2024).

Program Components	Bibliographic References
	Pennsylvania Public Utility Commission (PUC), Technical Reference Manual, August 2019, Subsection 2.4 – Appliances.
	NRCAN, 2015 Survey of Household Energy Use, Table 10.6. Calculated average annual washed loads for Atlantic, assuming 100 days of summer and 265 days of winter. Available at: https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=SH&sector=aaa&juris=ca&year=2015&rn=38&page=1 (last accessed September 13, 2024).
	ENERGY STAR, ENERGY STAR Certified Residential Clothes Washers, https://www.energystar.gov/productfinder/product/certified-clothes-washers/ (last accessed December 21, 2018).
	Natural Resources Canada, Search: Clothes Washers Energy Efficiency Ratings, http://oee.nrcan.gc.ca/pml-lmp/index.cfm?action=app.search-recherche&appliance=CLOTHESWASHERS (last accessed September 13, 2024).
	Ad Hoc Recherche, Rapport d'évaluation, Programme : Produits Mieux Consommer – Électroménagers Energy Star (Années 2008 et 2009), p. 18.
	Ad Hoc Recherche, Rapport d'évaluation, Programme : Produits Mieux Consommer – Électroménagers Energy Star (Années 2008 et 2009), p. 19.
	ENERGY STAR, Savings Calculator for ENERGY STAR Qualified Appliances, https://dnr.mo.gov/sites/dnr/files/media/file/2021/01/energy-star-appliance-calculator.xlsx (last accessed December 1, 2019).
	NRCAN, Search: Dishwasher Energy Efficiency Ratings Natural Resources Canada, https://oee.nrcan.gc.ca/pml-lmp/index.cfm?action=app.search-recherche&appliance=DISHWASHERS (last accessed January 22, 2024).
	Illinois Energy Efficiency Stakeholder Advisory Group, 2022 Illinois Statewide Technical Reference Manual for Energy Efficiency Version 10.0, Volume 2, September 24, 2021, p. 21
	NRCAN, Choosing and Using Appliances with EnerGuide, available at https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/pdf/energystar/EnerGuideappliances.pdf , 2013, p. 23
	ENERGY STAR, ENERGY STAR Ventilation Fans Key Product Criteria, https://www.energystar.gov/products/ventilation_fans/key_product_criteria#:~:text=All%20certifying%20bathroom%20and%20utility,measured%20by%20industry%20standard%20testing (last accessed October 1, 2024).
	Vitalijus Pavlovas. Demand controlled ventilation, A case study for existing Swedish multi-family buildings. 2004.
	Efficiency Vermont Technical Reference Manual, Program Year 2023, pp. 225-226.
	Statistics Canada, Table 38-10-0286-01 (formerly CANSIM 153-0145) Primary heating systems and type of energy, 2021, December 12, 2022. https://www150.statcan.gc.ca/t1/tbl1/en/cv!recreate.action?pid=3810028601&selectedNodeIds=1D4&checkedLevels=1D1&refPeriods=20170101,20210101&dimensionLayouts=layout3,layout3,layout2&vectorDisplay=false (last accessed September 13, 2024).
	NMR Group Inc., RLPNC 17-3: Advanced Power Strip Metering Study, March 18, 2019.
	NMR Group Inc., RLPNC 17-4 and 17-5: Products Impact Evaluation of In-service and Short-Term Retention Rates Study, October 5, 2018.
	Research into Action, Final Report: 2012 Consumer Program Evaluation, Report presented to OPA, October 11, 2013, p. 154.
	Northeast Energy Efficiency Partnership (NEEP), Mid-Atlantic Technical Reference Manual Version 10, May 2020, p. 195.
	Southern California Edison, Pool Pump Demand Response Potential, June 2008.
	Southern California Edison, Pool Pump Demand Response Potential, June 2008, p. 13.

Program Components	Bibliographic References
	Southern California Edison, Pool Pump Demand Response Potential, June 2008, p. 19.
	Northeast Energy Efficiency Partnership (NEEP), Mid-Atlantic Technical Reference Manual Version 10, May 2020, p. 195.
	Hydro-Québec. Essais terrain 2007-2008 d'un nouveau concept de chauffe-eau électrique à 3 éléments, provided by Hydro-Québec - not publicly available, February 9, 2009.
	Nova Scotia Power. 2019 Load Forecast Report - Redacted, April 30, 2019, p. 28.
	Northern Alberta Institute of Technology, Solar Photovoltaic Array Reference Array Report, March 31, 2016.
	California Public Utilities Commission. DEER 2014. EUL table update, Excel spreadsheet (version 2014) downloadable via READI http://www.deeresources.com/index.php/23-deer-versions/27-deer-2014 (last accessed June 16, 2020).
	https://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/water_heaters/WaterHeaterDraftCriteriaAnalysis.pdf .
	MichaelsEnergy. X2001: Connecticut Measure Life/EUL Update Study – Residential & Commercial, May 11, 2023, p. 17.
	https://energy.gov/energysaver/heat-and-cool/heat-pump-systems/geothermal-heat-pumps#306534-tab-1 .
	https://www.nrcan.gc.ca/energy-efficiency/energy-star-canada/about-energy-star-canada/energy-star-announcements/publications/heating-cooling-heat-pump/ground-source-heat-pumps-earth-energy-systems/6833 .
	https://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/water_heaters/WaterHeaterDraftCriteriaAnalysis.pdf .
	Hydro-Québec. Essais terrain 2007-2008 d'un nouveau concept de chauffe-eau électrique à 3 éléments, provided by Hydro-Québec - Not publicly available, March 15, 2011.
	NREL. <i>Benchmarking Utility-Scale PV Operational Expenses and Project Lifetimes</i> , June 2020, p. 3.
	DNV. Residential Insulation Measure Effective Useful Life Study Final Report, December 22, 2023, p. 16.
	U.S. Department of Energy, <i>Energy Conservation Standards for General Service Lamps (EISA 2007 Backstop, 45 lm/W) — Enforcement Timelines, National Law Review summary</i> , May 2, 2022 (retail enforcement July 2023).
	Natural Resources Canada, <i>Regulations Amending the Energy Efficiency Regulations</i> , 2016 (Amendment 18), Canada Gazette, Part II, April 9, 2025.
	Illinois Commerce Commission, Illinois Statewide Technical Reference Manual for Energy Efficiency Version 8.0, Volume 3, October 17, 2019, p. 258.
	EfficiencyOne's "Efficient Product Rebates Program 2025 DSM Evaluation," Section 6 – BER Market Evolution.
	Chantrasrisalai and Fisher, "Lighting heat gain parameters: Experimental results" in HVAC&R Research, 12(2), pp. 305-324.
	Duke Energy Progress. Fixture Wattage Table. http://www.ahutton.com/LED/Progress%20wattages.pdf (last accessed November 21, 2018).
	DNV-GL, Massachusetts Commercial and Industrial Upstream Lighting Program: "In Storage" Lamps Follow-up Study, March 2015.
	Duke Energy, Fixture Wattage Table, http://www.ahutton.com/LED/Progress%20wattages.pdf (last accessed, January 10, 2018).
	Efficiency Vermont, Technical Reference Manual (TRM): Program Year 2023, 2023.
	Pennsylvania Public Utility Commission, Technical Reference Manual – State of Pennsylvania, August 2019, p. 7.

Program Components	Bibliographic References
	Iowa Utilities Commission. Iowa Energy Efficiency Statewide Technical Reference Manual Version 5.0, Volume 3: Non-residential Measures, July 22, 2020, pp. 43-47.
	Jesse Remillard and Nick Collins, Trends and Observations of Energy Use in the Cannabis Industry, 2017 ACEEE Summer Study on Energy Efficiency in Industry.
	Hawai'i Energy, <i>Hawai'i Energy Efficiency Program Technical Reference Manual (TRM), PY2024 V1.2</i> , November 8, 2024.
	Illinois Energy Efficiency Stakeholder Advisory Group, 2021 Illinois Statewide Technical Reference Manual for Energy Efficiency Version 9.0, Volume 2, September 2020, p. 393.
	Government of Canada, Historical Climate Data. Retrieved from https://climate.weather.gc.ca/historical_data/search_historic_data_e.html .
	Illinois Energy Efficiency Stakeholder Advisory Group. <i>2021 Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 9.0 – Volume 2: Commercial and Industrial Measures</i> , p. 131.
	Econoler, Efficient Product Rebates 2016 DSM Evaluation, March 8, 2017.
	Mass Save, <i>Massachusetts Technical Reference User Manual (TRM) for Estimating Savings from Energy Efficiency Measures</i> , 2025-2027 Three-Year Plan Version, October 31, 2024, p. 582.
	Mass Save, <i>Massachusetts Technical Reference User Manual (TRM) for Estimating Savings from Energy Efficiency Measures</i> , 2025-2027 Three-Year Plan Version, October 31, 2024, p. 479.
	Efficiency Vermont, Technical Reference Manual (TRM) Program Year 2023, p. 90.
	Efficiency Vermont, <i>Technical Reference Manual (TRM)</i> , Program Year 2023, pp. 149-151.
	Efficiency Vermont, Technical Reference Manual (TRM) Program Year 2023, p. 91.
	Minnesota Commerce Department, State of Minnesota Technical Reference Manual, Version 4.1, January 31, 2024, p. 340.
	Efficiency Vermont, Technical Reference User Manual Measure Savings Algorithms and Cost Assumptions, March 2015.
	Efficiency Vermont, Technical reference User Manual, March 16, 2015.
	Illinois Commerce Commission, Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 5.0. February 2016.
	Pennsylvania Public Utility Commission, <i>Technical Reference Manual</i> , State of Pennsylvania, June 2013, p. 174.
	DeOreo et al. (2016). Residential End Uses of Water, Version 2: Executive Report, published by Water Research Foundation, http://www.waterrf.org/PublicReportLibrary/4309A.pdf (March 16, 2017), pp. 5-8.
	Pennsylvania Public Utility Commission, Technical Reference Manual Volume 2: Residential Measures, September 2024, p. 82.
	Iowa Energy Efficiency, Iowa Energy Efficiency Statewide Technical Reference Manual Version 6.0, July 23, 2021.
	Illinois Energy Efficiency, 2021 Illinois Statewide Technical Reference Manual for Energy Efficiency Version 9.0, September 25, 2020.
	Giant Inc., <i>Engineering Submittal Data Sheet 172ETE Models</i> , http://www.giantinc.com/tech-data/FT-172E-An.pdf (last accessed February 18, 2015).
	Giant Inc., Engineering Submittal Data Sheet 172ETE Models, 16.
	Natural Resources Canada. <i>Electric water heaters</i> , July 2022. Retrieved from https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/electric-water-heaters (last accessed October 24, 2025).
	Pennsylvania Public Utility Commission, 2026 <i>Technical Reference Manual Volume 3: Commercial & Industrial Measures</i> , September 2024, p. 185.

Program Components	Bibliographic References
	Minnesota Commerce Department, State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs, January 31, 2021.
	Pennsylvania Public Utility Commission, <i>Technical Reference Manual – Volume 3: Commercial & Industrial Measures</i> , September 2024, p. 184.
	Minnesota Department of Commerce Division of Energy Resources, State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs Version 3.1, January 2020, p. 691-692.
	ENERGY STAR Pool Pump Calculator, https://www.energystar.gov/productfinder/downloads/Pool_Pump_Calculator_2020.05.05_FINAL.xlsx .
	Fricke, Brian, Becker, Bryan, “Energy use of doored and open vertical refrigerated display cases.” International Refrigeration and Air Conditioning Conference. Paper 1154, 2010.
	Fricke, Brian, Becker, Bryan, Energy use of doored and open vertical refrigerated display cases, 2010. International Refrigeration and Air Conditioning Conference. Paper 1154.
	Iowa Energy, Iowa Energy Efficiency Statewide Technical Reference Manual, July 31, 2023, pp. 405-408.
	Iowa Utilities Commission, <i>Iowa Energy Efficiency Statewide Technical Reference Manual Version 10.0</i> , Volume 3: Non-residential Measures, July 31, 2025, pp. 429-432.
	Iowa Utilities Board, Iowa Energy Efficiency Statewide Technical Reference Manual Version 8.0, Volume 3, July 2023, p. 388.
	Department of Energy – Office of Energy Efficiency and Renewable Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Commercial Refrigeration Equipment, June 2022, pp. 5-16.
	The Cadmus Group, Commercial Refrigeration Load Shape Project Final Report, Northeast Energy Efficiency Partnerships, Regional Evaluation, Measurement, and Verification Forum, Lexington, MA 2015, page 67, Table 34.
	Mass Save, <i>Technical Reference User Manual (TRM) for Estimating Savings from Energy Efficiency Measures – 2022 Report Version</i> , June 1, 2023, pp. 791-792.
	Econoler, Business Energy Rebates 2015 DSM Evaluation, Report presented to Efficiency Nova Scotia, 2016.
	Pennsylvania PUC, Technical Reference Manual (TRM) Volume 3, August 2019.
	Illinois Commerce Commission, <i>2024 Illinois Statewide Technical Reference Manual for Energy Efficiency Version 12.0</i> , Volume 2: Commercial and Industrial Measures, September 22, 2023, p. 214.
	Pennsylvania Public Utility Commission, Technical Reference Manual Volume 3: Commercial and Industrial Measures, April 2019, p. 308.
	Bioenvironmental and Structural Systems Laboratory, Agricultural Ventilation Fans, Performance and Efficiencies data, 2021. Retrieved from: http://www.bess.illinois.edu/type.asp .
	Efficiency Vermont, <i>Technical Reference User Manual (TRM) Measure Savings Algorithms and Cost Assumptions</i> , March 16, 2015.
	Independent Electrical System Operator, IESO Prescriptive Measures and Assumptions List, February 2024.
	Efficiency Vermont, <i>Technical Reference User Manual</i> , March 16, 2015.
	Efficiency Vermont, <i>Technical Reference Manual (TRM)</i> , Program Year 2023, pp. 63-65.
	Efficiency Vermont, <i>Technical Reference Manual (TRM) Program Year 2023</i> , pp. 75-77.
	New York Department of Public Service, New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs - Residential, Multi-Family, and Commercial/Industrial Measures, October 6, 2023, p. 429.
	New York Department of Public Service, New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs - Residential, Multi-Family, and Commercial/Industrial Measures, October 6, 2023, p. 430.

Program Components	Bibliographic References
	Illinois Energy Efficiency, Illinois Statewide Technical Reference Manual – Volume 2: Commercial and Industrial Measure, September 22, 2023.
	Pennsylvania PUC, Technical Reference Manual Volume 3: Commercial and Industrial Measures, February 2021.
	Iowa Energy Efficiency, Iowa Energy Efficiency Statewide Technical Reference Manual Version 8.0 Volume 3, July 31, 2023.
	Iowa Utilities Commission, <i>Iowa Energy Efficiency Statewide Technical Reference Manual Version 10.0</i> , Volume 3: Non-residential Measures, July 31, 2025, pp. 21-23.
	Government of Canada. Average production per cow and breed for selected countries. Retrieved from: https://agriculture.canada.ca/en/sector/animal-industry/canadian-dairy-information-centre/statistics-market-information/dairy-animal-genetics/production-breed/per-cow (last modified June 18, 2024).
	Massachusetts Farm Energy. Best Management Practices for Dairy Farms. 2012. Retrieved from: https://massfarmenergy.com/wp-content/uploads/2014/03/Dairy%20Farms%20Best%20Practices.pdf .
	New Jersey's Clean Energy Program. New Jersey 2023 Triennial Technical Reference Manual for 2024 Filings, May 22, 2023, p. 260.
	West, J.W., Mullinix, B.G., Bernard, J.K. (2003). Effects of Hot, Humid Weather on Milk Temperature, Dry Matter Intake, and Milk Yield of Lactating Dairy Cows. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0022030203736029 .
	Government of Alberta states a VFD milk transfer pump further decreases milk temperature by 8 to 11 °C. Government of Alberta. Energy Efficiency on Dairy Farms. Retrieved from: https://open.alberta.ca/dataset/9f69749b-6b62-4474-8dfe-25e78986918a/resource/24dcf621-f817-460b-a7c1-760a0ef16e43/download/af-energy-efficiency-on-dairy-farms.pdf .
	Parmar, P., Lopez-Vallalobos, N., Tobin, J. T., Murphy, E., McDonagh, A., Crowley, S. V., Kelly, A. L., Shalloo, L. The Effect of Compositional Changes Due to Seasonal Variation on Milk Density and the Determination of Season-Based Density Conversion Factors for Use in the Dairy Industry. July 27, 2020. Retrieved from: https://pubmed.ncbi.nlm.nih.gov/32726926/ .
	Minnesota Department of Commerce Division of Energy Resources, State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs Version 4.1, January 31, 2024, p. 659.
	Minnesota Department of Commerce Division of Energy Resources, <i>State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs Version 4.1</i> , January 31, 2024, p. 667.
	Pennsylvania Public Utility Commission, <i>Technical Reference Manual – Volume 3: Commercial & Industrial Measures</i> , September 2024, pp. 173-174.
	U.S. Department of Energy, <i>Energy Conservation Program: Energy Conservation Standards for Commercial Clothes Washers</i> , December 20, 2021. Retrieved from: https://www.federalregister.gov/documents/2021/12/20/2021-27461/energy-conservation-program-energy-conservation-standards-for-commercial-clothes-washers (last accessed October 29, 2025).
	Pennsylvania PUC, Technical Reference Manual (TRM) Volume 1, August 2019.
	https://www.energystar.gov/sites/default/files/asset/document/LowCarbonITSavingsCalc.xlsx .
	California Municipal Utilities Association, Savings Estimation Technical Reference Manual, 2017, pp .8-15.
	KEMA. Focus on Energy Evaluation Business Programs: Measure Life Study. Prepared for PA Consulting Group Inc., August 2009.
	ERS. Measure Life Study. Prepared for the Massachusetts Joint Utilities. November 2005.
	California Public Utilities Commission, Commercial HVAC and Water Heating Measure Effective Useful Life Study Draft Report, May 2, 2024, p. 21.
	https://energy.gov/energysaver/heat-and-cool/heat-pump-systems/geothermal-heat-pumps#306534-tab-1_
	https://www.nrcan.gc.ca/energy-efficiency/energy-star-canada/about-energy-star-canada/energy-star-announcements/publications/heating-cooling-heat-pump/ground-source-heat-pumps-earth-energy-systems/6833 .

Program Components	Bibliographic References
	https://www.energystar.gov/products/water_heaters/water_heater_solar/benefits_savings .
	National Renewable Energy Laboratory. Benchmarking Utility-Scale PV Operational Expenses and Project Lifetimes, June 2020, p. 3.
	https://www.nrel.gov/analysis/tech-footprint.html .
	Roberts J. and Tso B. (SBW Consulting), Do Savings from Retrocommissioning Last? Results from an Effective Useful Life Study, ACEEE Summer Study on Energy Efficiency in Buildings, 2010.
	E1's Efficient Product Rebates Program 2025 DSM Evaluation report, Section 6 – BER Market Evolution.
Appliance Retirement	NREL, The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures. Chapter 7: Refrigerator Recycling Evaluation Protocol, prepared by the Cadmus Group, September 2017.
	Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.
	National Renewable Energy Laboratory, "Chapter 21: Estimating Net Savings – Common Practices", The Uniform Methods Project, October 2017, p. 3, available at: https://www.nrel.gov/docs/fy17osti/68578.pdf .
Instant Savings	Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.
	Nova Scotia Power, Total System Emissions, https://www.nspower.ca/clean-energy/air-emissions-reporting (last accessed August 26, 2025).
	Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).
	Canada Gazette. (March 20, 2025). <i>Regulations Amending the Energy Efficiency Regulations, 2016 (Amendment 18)</i> , (Part II, Volume 159, Number 8). https://gazette.gc.ca/rp-pr/p2/2025/2025-04-09/html/sor-dors110-eng.html .
	Natural Resources Canada. (April 9, 2025). <i>Amendment 18 – Natural Resources Canada</i> . https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/amendment-18 .
	Econoler for E1. <i>Net-to-Gross Ratio Review – Final Report</i> , November 2024.
Affordable Multifamily Housing	Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix 1.
	Nova Scotia Power, Total System Emissions, https://www.nspower.ca/clean-energy/air-emissions-reporting (last accessed August 26, 2025).
	Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).
Affordable Single-family Homes	Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.
	Nova Scotia Power, Total System Emissions, https://www.nspower.ca/clean-energy/air-emissions-reporting (last accessed August 26, 2025).
	Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).
Efficient Product Installation	Guidehouse. <i>Residential Programs Net-to-Gross Research of RCD and Select Products Measures: Results Workbook</i> . 2021, retrieved from: https://api-plus.anbetrack.com/etrm-gateway/etrm/api/v1/etrm/documents/6130ceaae6933d4a3eeb9d0f/view?authToken=f20f0d437bdeaaafd3da64175dbb2ee0a1891776d21fca7d98da2350eba6ca493b93859bddd54814b92cb8e630fac359f56e61535ff4bb94ef13fb398049128721572dc3920feb .
	Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix 11.

Program Components	Bibliographic References
	Nova Scotia Power, Total System Emissions, https://www.nspower.ca/clean-energy/air-emissions-reporting (last accessed August 26, 2025).
	Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).
	National Renewable Energy Laboratory, “Chapter 21: Estimating Net Savings – Common Practices”, The Uniform Methods Project, October 2017, p. 3, available at: https://www.nrel.gov/docs/fy17osti/68578.pdf .
Green Heat	Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.
	Nova Scotia Power, Total System Emissions, https://www.nspower.ca/clean-energy/air-emissions-reporting (last accessed January 15, 2026).
	Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed January 15, 2026).
	National Renewable Energy Laboratory, “Chapter 21: Estimating Net Savings – Common Practices”, The Uniform Methods Project, October 2017, p. 3, available at: https://www.nrel.gov/docs/fy17osti/68578.pdf .
Home Energy Assessment	Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.
	Nova Scotia Power, Total System Emissions, https://www.nspower.ca/clean-energy/air-emissions-reporting (last accessed August 26, 2025).
	Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).
	National Renewable Energy Laboratory, “Chapter 21: Estimating Net Savings – Common Practices”, The Uniform Methods Project, October 2017, p. 3, available at: https://www.nrel.gov/docs/fy17osti/68578.pdf .
Mi'kmaw Home Energy Efficiency Project	Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.
	Nova Scotia Power, Total System Emissions, https://www.nspower.ca/clean-energy/air-emissions-reporting (last accessed August 26, 2025).
	Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).
	National Renewable Energy Laboratory, “Chapter 21: Estimating Net Savings – Common Practices”, The Uniform Methods Project, October 2017, p. 3, available at: https://www.nrel.gov/docs/fy17osti/68578.pdf .
Residential Behaviour	NREL (2020). Chapter 17: Residential Behaviour Evaluation Protocol, The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures: September 2011 – August 2020.
	State and Local Energy Efficiency Action Network (2012). Evaluation, Measurement, and Verification (EM&V) of Residential Behaviour-Based Energy Efficiency Programs: Issues and Recommendations.
	Nova Scotia Power, Total System Emissions, https://www.nspower.ca/clean-energy/air-emissions-reporting (last accessed January 15, 2026).
	Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed January 15, 2026).
	NREL (2020). Chapter 21: Estimating Net Savings – Common Practices, The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures: September 2011 – August 2020.
Business Energy Rebates	Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.
	Nova Scotia Power, Total System Emissions, https://www.nspower.ca/clean-energy/air-emissions-reporting (last accessed August 26, 2025).

Program Components	Bibliographic References
Custom	Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).
	Chapter 2 of the Uniform Methods Project (UMP). Gowans, D.; Telarico, C. (2017). Chapter 2: Commercial and Industrial Lighting Evaluation Protocol, The Uniform Methods Project: Methods for Determining Energy-Efficiency Savings for Specific Measures. Golden, CO; National Renewable Energy Laboratory. NREL/SR-7A40- 68558. http://www.nrel.gov/docs/fy17osti/68558.pdf .
	National Renewable Energy Laboratory, “Chapter 21: Estimating Net Savings – Common Practices”, The Uniform Methods Project, October 2017, p. 3, available at: https://www.nrel.gov/docs/fy17osti/68578.pdf .
	National Renewable Energy Laboratory, “Chapter 21: Estimating Net Savings – Common Practices”, The Uniform Methods Project, October 2017, p. 3, available at: https://www.nrel.gov/docs/fy17osti/68578.pdf . Benton, Nathanael; Patrick Burns, and Joel Zahlan. (2021). Chapter 22: Compressed Air Evaluation Protocol. The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures. Golden, CO; National Renewable Energy Laboratory. NREL/SR-7A40-77820. http://www.nrel.gov/docs/fy21osti/77820.pdf .
	Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1. Nova Scotia Power, Total System Emissions, https://www.nspower.ca/clean-energy/air-emissions-reporting (last accessed August 26, 2025) Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).
Strategic Energy Management	Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.
	Nova Scotia Power, Total System Emissions, https://www.nspower.ca/clean-energy/air-emissions-reporting (last accessed August 26, 2025).
	National Renewable Energy Laboratory, “Chapter 21: Estimating Net Savings – Common Practices”, The Uniform Methods Project, October 2017, p. 3, available at: https://www.nrel.gov/docs/fy17osti/68578.pdf .
	Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).
Small Business Energy Solutions	Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.
	Nova Scotia Power, Total System Emissions, https://www.nspower.ca/clean-energy/air-emissions-reporting (last accessed August 26, 2025).
	National Renewable Energy Laboratory, “Chapter 21: Estimating Net Savings – Common Practices”, The Uniform Methods Project, October 2017, p. 3, available at: https://www.nrel.gov/docs/fy17osti/68578.pdf .
	Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).
Demand Response	Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.
Overall Executive Summary	Econoler, Overall Strategic Evaluation Plan, December 2025.
	Gold, Rachel & Seth Nowak, Energy Efficiency Over Time: Measuring and Valuing Lifetime Energy Savings in Policy and Planning. Washington, DC: American Council for an Energy Efficient Economy, Report U1902, February 2019.
	Nova Scotia Power, Total System Emissions, https://www.nspower.ca/clean-energy/air-emissions-reporting (last accessed August 26, 2025)
	Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).
	Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.
	EfficiencyOne’s 2023 Q1 Demand-Side Management (DSM) Report (M11148) at page 3, Table 1: 2023 Approved Plan, Mid-Course Adjustments and Q1 Results [filed May 25, 2023].

APPENDIX II

Calculation of Margins of Error

This appendix presents some examples of how the Evaluator established the margins of error for participant surveys, adjustment ratios, installation rates, and free-ridership levels. For participant survey margins of error, the example is drawn from the 2025 Residential Demand Response (DR) evaluation. For the adjustment ratio margins of error, the example is drawn from the 2025 Business, Non-profit, and Institutional (BNI) DR evaluation. For the free-ridership level margins of error, the example is drawn from the 2025 Business Energy Rebates (BER) – Application Rebates (AR) evaluation.

Survey Margins of Error

The Evaluator used the margin of error calculation of the 2025 Residential DR non-participant survey as an example. Below are the steps followed to calculate this margin of error.

The margin of error was established by using the following formula that corresponds to the margin of error calculation for a proportion (i.e. a value between 0% and 100%).

$$\text{Margin of Error } (e) = Z\alpha \times \sqrt{\frac{p \times (1-p)}{n}} \times \sqrt{\frac{N-n}{N-1}}$$

Where:

- › $Z\alpha$ is the coefficient used at a specific confidence level.
- › p is the proportion (typically established conservatively at 0.50, which yields the maximum error).
- › N is the population or, in this case, the total number of unique participants.
- › n is the sample size.

The sample size for this example is 103 households that had smart thermostats installed through Efficient Product Installation (EPI), did not participate in Residential DR, and were sampled for a survey. Therefore, assuming a confidence level of 90%, a $Z\alpha$ coefficient of 1.645 is used, as presented in Table 1.

Table 1: Distribution of Coefficients t

Sample Size	Confidence Level		
	95%	90%	80%
2	12.710	6.314	3.078
5	2.776	2.132	1.533
10	2.262	1.833	1.383
15	2.145	1.761	1.345
20	2.093	1.729	1.328
30	2.045	1.699	1.311
100	1.984	1.660	1.290
∞^*	1.960	1.645	1.282

* Coefficient z corresponds to the value of coefficient t for an infinite sample size and is used for samples larger than 30.

By using the formula presented above and assuming a confidence level of 90%, a proportion of 0.50, and a total number of 1,337 participants who had smart thermostats installed through EPI for the study period, the margin of error was established at 7.8%.

$$\text{Margin of Error} = 1.645 \times \sqrt{\frac{0.50 \times (1-0.50)}{103}} \times \sqrt{\frac{1,337-103}{1,337-1}} = 7.8\%$$

In 2025, this calculation was performed for all surveys.

Adjustment Ratio Margins of Error – Stratified Sample

Below is a description of the steps followed to calculate the margins of error for adjustment ratios applied to either electrical energy savings, peak demand savings, or available DR capacity. The example below is based on the BNI DR overall adjustment ratio for available DR capacity from the 2025 evaluation.

Calculation of the Weighted Average of Adjustment Ratios

In 2025, the Evaluator used a stratified sample for BNI DR, selecting the 20 largest projects and 10 randomly selected projects among the 138 remaining projects. Therefore, the weighted average adjustment ratio was calculated by using the following formula.

$$\text{Weighted Average AR} = \frac{\sum_{i=1}^n (\text{Stratum Weight}_i \times \text{Tracked Available DR Capacity}_i)}{\sum_{i=1}^n (\text{Stratum Weight}_i \times \text{Revised Available DR Capacity}_i)} = 0.615$$

In this calculation, n is the number of reviewed measures (30), and i represents each individual evaluated project; the Evaluator established a weighted average adjustment ratio of 0.615.¹ The stratum weight corresponds to the total population number of projects in the stratum in which each project is found divided by the number of projects in that stratum in the sample.

Calculation of the Standard Error

Since the overall adjustment ratio is based on a stratified weighted average, the Evaluator also calculated a stratified weighted standard error for the adjustment ratio instead of a simple standard error. The following formula is taken from the Uniform Methods Project (UMP) Chapter 11² and is applicable to a ratio that is obtained from a stratified sample. The standard error on evaluated available DR capacity is calculated.

$$\text{Standard Error Evaluated Available DR Capacity} = \sqrt{\sum_{h=1}^H \left(\frac{(N_h)^2}{n_h} \times \left(1 - \frac{n_h}{N_h} \right) \times (S_h)^2 \times \frac{\mu_{all}}{\bar{x}_{all}} \right)} = 160$$

Where:

- › H is the number of strata (2) and h represents each stratum.
- › N_h is the number of projects in the population for a stratum.
- › n_h is the number of projects in the sample for a stratum.

¹ The ratio presented herein serves as an example, although it was not used for the 2025 evaluation. The adjustment ratios established for each stratum were used since they had acceptable margins of error. Still, the same margin of error calculation is applicable for these ratios, with the stratum weight being 1.

² Khawaja, M.S., Rushton, J. and Keeling, J., Chapter 11: Sample Design Cross-Cutting Protocol, The Uniform Methods Project: Methods for Determining Energy-Efficiency Savings for Specific Measures. Golden, CO; National Renewable Energy Laboratory. NREL/SR-7A40-68567, 2017.

S_h is an estimator for stratum weights calculated with the equation below.

$$(S_h)^2 = \sum_{i=1}^{n_h} \frac{(\text{Revised Available DR Capacity}_i - \text{Weighted Average AR} \times \text{Tracked Available DR Capacity}_i)^2}{n_h - 1}$$

- › μ_{all} is the average available DR capacity per project for the population.
- › $\bar{x}_{all}$ is the average available DR capacity per project for the sample while accounting for weights, as presented in the equation below.

$$\bar{x}_{all} = \frac{\sum_{i=1}^{n_h} (\text{Stratum Weight}_i \times \text{Tracked Available DR Capacity}_i)}{\sum_{i=1}^{n_h} (\text{Stratum Weight}_i)}$$

The weighted standard error for the available DR capacity adjustment ratio of BNI DR projects was established at 160.

Calculation of the Margins of Error

The margin of error on the adjustment ratio of BNI DR available DR capacity was established by using the following formula, which compares the error in evaluated available DR capacity divided by the evaluated available DR capacity to obtain a margin of error in percentage; this percentage represents the error on the adjustment ratio.

$$\text{Margin of Error AR} = \frac{\text{Standard Error Evaluated Available DR Capacity} \times t}{\text{Tracked Energy Available DR Capacity}_{all} \times \text{Weighted Average AR}} = \frac{160 \times 1.699}{6,264 \times 0.615} = 7.1\%$$

In this calculation, the coefficient t was calculated for a sample size of 30 at a level of confidence of 90%, which yields 1.699. By using the above formula, the margin of error for the adjustment ratio applied to the available DR capacity generated by BNI DR projects was established at 7.1%.

In 2025, this calculation was performed for the adjustment ratios of BER-AR, Custom, and BNI DR. Sometimes, such as for small measure categories or small programs (like Strategic Energy Management [SEM]), a census approach was used, meaning that all projects were reviewed and that calculating a margin of error on the adjustment ratio was unnecessary.

Free-ridership Level Margin of Error

The Evaluator used the margin of error calculation of the free-ridership level for BER-AR LED lighting in 2025 as an example. Below are the steps followed to calculate this margin of error. The same calculation is used for installation rates and adjustment ratios for non-stratified samples, with the only difference being the use of installation rates or adjustment ratios instead of free-ridership levels in the equations.

Calculation of the Weighted Average of Free-ridership Levels

The weighted average was calculated by using the following formula.

$$\text{Weighted Average FR} = \frac{\sum_{i=1}^n \text{Free-ridership Level}_i \times \text{Revised Gross Electrical Energy Savings}_i}{\text{Total Revised Gross Electrical Energy Savings}} = 6\%$$

In this calculation, n is the number of surveyed participants who installed LED lighting in 2025, and i represents each individual participant surveyed. The Evaluator established the weighted average free-ridership level at 6%.

Calculation of the Standard Error

Since the free-ridership level is based on a weighted average, the Evaluator also calculated a weighted standard error for the free-ridership level instead of a simple standard error. The same formula as that used for the adjustment ratio standard error was applied, as follows.

$$\text{Standard Error FR} = \frac{1}{\sqrt{n}} \sqrt{\sum_{i=1}^n \left(\frac{(FR \text{ Savings}_i - \text{Weighted Average FR} \times \text{Revised Gross Savings}_i)^2}{(\text{Average Revised Gross Savings per Participant})^2 \times (n-1)} \right)} = 0.0191$$

In this calculation, n is the sample size (the number of surveyed participants) and $FR \text{ Savings}_i$ is the free-ridership percentage measured for a given participant i multiplied by the gross savings of that participant. The average evaluated gross savings per participant are calculated for all surveyed participants who installed LED lighting in 2025³ at the time of the survey.

Calculation of the Margin of Error

The margin of error on the LED lighting free-ridership level was established by using the following formula that is the general equation linking the standard error to the margin of error.

$$\begin{aligned} \text{Margin of Error FR} &= \text{Standard Error FR} \times t \times \text{Finite Population Correction Factor} \\ &= \text{Standard Error} \times t \times \sqrt{\frac{N-n}{N-1}} = 0.0191 \times 1.7613 \times \sqrt{\frac{187-15}{187-1}} = 3.2\% \end{aligned}$$

In this calculation, N represents the total number of participants at the time of the survey and who installed LED lighting in 2025,³ which was 187. The coefficient t was calculated for a sample size of 15 at a confidence level of 90%, which yields 1.7613. By using the above formula, the margin of error for the LED lighting free-ridership level was established at 3.2%.

In 2025, this calculation was performed for the free-ridership ratios of BER-AR and Custom.

³ In the case of BER-AR, the survey was conducted among both 2024 and 2025 participants to obtain a sufficient response rate. Therefore, all lighting projects installed in 2024 and 2025 were considered in the calculation of the margin of error.



APPENDIX III

NTGR Calculations

This appendix provides an example of net-to-gross ratio (NTGR) calculations. The example details the calculations of participant free-ridership levels and resulting NTGRs for BER-AR lighting measures. The Evaluator used a similar approach in assessing the NTGRs of other program components. More details are provided in the evaluation reports of individual program components.

NTGR Calculations

Free-ridership algorithm

Questions	Calculation Algorithm		Low Free-ridership Participant		High Free-ridership Participant		Medium Free-ridership Participant	
			Answer	Calc.	Answer	Calc.	Answer	Calc.
D1. Before learning about the Business Energy Rebates Program, had your business already decided to install energy-efficient LED lighting products?	1) Yes	Use D2						
	2) No	0%	2) No	0%	1) Yes	100%	1) Yes	100%
	98/99) Don't know/Refused							
D2. [ASK IF D1=1] Just to confirm, your business had already made the decision to install energy-efficient LED lighting products before you learned about the Business Energy Rebates Program?	1) Yes, the business had already made the decision	100%			1) Yes, the business had already made the	100%	1) Yes, the business had already made the decision	100%
	2) No, the business had not already made the decision	0%	-	-				
	98/99) Don't know/Refused							
D3. [ASK IF (D1=2 OR D2=2) AND NEW CONSTRUCTION=YES] Before learning about the Business Energy Rebates Program, what other lighting options did you consider for your project? (PROBE FOR: fluorescent, metal halide, different LED product, incandescent, halogen, high-pressure sodium)	1) Enter response	INCONSISTENCY TEST (D3 vs D1/D2)						
	2) Only considered LED lighting							
	98/99) Don't know/Refused		-	-	-	-	-	-
Planning Score (PS):	D1 Adjusted with D2		0%		100%		100%	
D4. The Efficiency Nova Scotia Business Energy Rebates Program offered you a rebate of <LIGHTING REBATE> for the purchase of your energy-efficient LED lighting products. If your business had not received the rebate from Efficiency Nova Scotia, what is the likelihood you would have paid the full cost of the energy-efficient LED lighting products?	1) Definitely would have	100%	3) Probably would not have	25%	1) Definitely would have	100%	2) Probably would have	75%
	2) Probably would have	75%						
	3) Probably would not have	25%						
	4) Definitely would not have	0%						
	98/99) Don't know/Refused	EMPTY						
Cost Score (CS):	D4		25%		100%		75%	
D5. [ASK ONLY IF DLC Premium=YES] Without the Business Energy Rebates Program, what is the likelihood that you would have purchased DLC Premium LED lighting products?	1) Definitely would have	100%	-	-	2) Probably would have	75%	2) Probably would have	75%
	2) Probably would have	75%						
	3) Probably would not have	25%						
	4) Definitely would not have	0%						
	98/99) Don't know/Refused	EMPTY						
Efficiency Score (ES)	D6		-		75%		75%	
D6. [ASK IF LIGHTING QTY>1 AND (D2=1 OR D4=1, 2 OR 3)] Without the rebate, which of the following scenarios would have most likely occurred? You would have purchased... [SINGLE RESPONSE]	1) Exactly the same number of energy-efficient lighting products	100%	2) Some, but not all of the energy-efficient lighting	50%	1) Exactly the same number of energy-efficient lighting products	100%	2) Some, but not all of the energy-efficient lighting products	50%
	2) Some, but not all of the energy-efficient lighting products	50%						
	3) You would not have purchased any of the energy-efficient lighting products	0%						
	98/99) Don't know/Refused	EMPTY						
Quantity Score (QS)	D6		50%		100%		50%	
D7. [ASK IF D2=1 OR D4=1, 2 OR 3] Without the Business Energy Rebates Program, what is the likelihood that you would have postponed the purchase of the energy-efficient lighting products by at least one year?	1) Definitely would have	0%	3) Probably would not have	75%	4) Definitely would not have	100%	2) Probably would have	25%
	2) Probably would have	25%						
	3) Probably would not have	75%						
	4) Definitely would not have	100%						
	98/99) Don't know/Refused	EMPTY						
D8. [ASK IF NOT NEW CONSTRUCTION = NO] As your project was to replace existing lamps or fixtures, what proportion of the lamps or fixtures were:	Working but at the end of their useful life: _____%	NO SCORE	80	-	80	-	80	-
	Working and not close to the end of their useful life: _____%		0		0		0	
	Broken: _____%		20		20		20	
Timing Score (TS)	D7		75%		100%		25%	
nonconsistency Test (adjusted D1)	IF D1=100% AND IF D4<75% OR D5<75% D1= EMPTY	-	0%		100%		100%	
nonconsistency Test (adjusted D4)	IF ABS (D4-D10a) * 0.75% D4 = MIN (D4; D10a)	-	25%		100%		75%	
Intention Score	INTENTION Score: MIN (MEAN (PS; CS); MEAN (PS; CS; ES); MEAN (PS; CS; TS); MEAN (PS; CS; QS); MEAN (PS; CS; ES; TS); MEAN (PS; CS; ES; QS); MEAN (PS; CS; TS; QS); MEAN (PS; CS; ES; TS; QS))		0,13		0,92		0,63	

D9. Did your organization use the services of an Onsite Energy Manager or Business Development Manager while the project was being considered for implementation?	1) Yes, an Onsite Energy Manager	NO SCORE	1) Yes, an Onsite Energy Manager	-	3) No	-	3) No	-
	2) Yes, a Business Development Manager							
	3) No							
	98/99) Don't know/Refused							
D10. How influential were the following factors in your decision to purchase an energy-efficient lighting products? (RANDOMIZE) a) The program rebate b) The information from Efficiency Nova Scotia's website c) (IF D9=1) The recommendations and technical assistance provided by the Onsite Energy Manager d) (IF D9=2) The recommendations and technical assistance provided by the Business Development Manager e) The information and recommendations provided by a contractor or distributor	1) Very influential	0%	1) Very influential	0%	4) Not at all influential	100%	2) Somewhat influential	25%
	2) Somewhat influential	25%	2) Somewhat influential	25%	4) Not at all influential	100%	2) Somewhat influential	25%
	3) Not very influential	75%	2) Somewhat influential	25%	-	-	-	-
	4) Not at all influential	100%	-	-	-	-	-	-
	98/99) Don't know/Refused	EMPTY	3) Not very influential	75%	2) Somewhat influential	25%	3) Not very influential	75%
Influence Score (IS)	MIN (D9a; D9b; D9c; D9d; D9e)		0.00		0.25		0.25	
Free-Ridership (FR)	Free-Ridership (FR): (INTENTION + INFLUENCE)/2		6%		58%		44%	

Cross-influence algorithm		Low Free-ridership Participant		High Free-ridership Participant		Medium Free-ridership Participant	
Questions	Calculation Algorithm	Answer	Calc. Result	Answer	Calc. Result	Answer	Calc. Result
F1. Before participating in the Business Energy Rebates (BER) Program in (MONTH AND YEAR OF PARTICIPATION), had your company/organization at any time in the past already participated in the Business Energy Rebates program or another Efficiency Nova Scotia program?	1) Yes, in BER 2) Yes, in another program(s) 3) Yes, in both BER and another program(s) 4) No 98/99) Don't know/Refused	USE FOR F2	4) No	-	4) No	-	3) Yes, in both BER and another program(s) -
F2. Before participating in the Business Energy Rebates Program, had you at any time in the past seen Efficiency Nova Scotia promotional materials advertising the benefits of energy efficiency?	1) Agree 2) Disagree 98/99) Don't know/Refused	1) Agree	1	1) Agree	1	1) Agree	1
F3. (IF F1=1, 2 OR 3) Do you agree or disagree that your company/organization's previous participation in an Efficiency Nova Scotia program was a major factor in the decision to purchase energy-efficient lighting products?	1) Agree 2) Disagree 98/99) Don't know/Refused	-	-	-	-	2) Disagree	-
F4. (IF AND F1=1, 2 OR 3) Do you agree or disagree that because of your company/ organization's previous participation in an Efficiency Nova Scotia program and what was learned by participating in that program, a company representative asked a contractor or a technical staff member to examine	1) Yes 2) No 98/99) Don't know/Refused	-	-	-	-	1) Agree	1
F5. (IF F1=1, 2 OR 3) Do you agree or disagree that because of your company's previous participation in an Efficiency Nova Scotia program and what was learned by participating in that program, a company representative took into account the cost-effectiveness of energy-efficient lighting	1) Agree 2) Disagree 98/99) Don't know/Refused	-	-	-	-	1) Agree	1
F6. (IF F2=1) Do you agree or disagree that Efficiency Nova Scotia promotional materials or communications were a major factor in your company/organization's decision to purchase energy-efficient lighting products?	1) Agree 2) Disagree 98/99) Don't know/Refused	1) Agree	1	2) Disagree	-	1) Agree	1
F7. (IF AND IF F2=1) Do you agree or disagree that Efficiency Nova Scotia promotional materials or communications prompted a company representative to ask a contractor or a distributor about energy-efficient lighting products options for your organization?	1) Agree 2) Disagree 98/99) Don't know/Refused	1) Agree	1	2) Disagree	-	2) No	-
F8. (IF F2=1) Do you agree or disagree that Efficiency Nova Scotia promotional materials or communications prompted a company representative to take into account the cost-effectiveness of energy-efficient lighting products when evaluating different options for the facility?	1) Agree 2) Disagree 98/99) Don't know/Refused	1) Agree	1	2) Disagree	-	1) Agree	1
Cross-influence (CI)	IF (F3 OR F6 = Agree; 1) + IF (F4 OR F7 = Agree; 1) + IF (F5 OR F8) = Agree; 1)	3		0		3	
Revised Free-ridership	IF CI = 0 OR 1: Revised FR = FR IF CI = 2: Revised FR = FR*0.75 IF CI = 3: Revised FR = FR*0.50	3%		58%		22%	

Overall free-ridership level (%)
for LEDs

$$FR_{total} = \frac{\sum_{i=1}^n (FR_i \times Gross\_Savings_i)}{\sum_{i=1}^n Gross\_Savings_i}$$

FR = 6%

SO = 0%

NTGR for LEDs

$$NTGR = 1 - FR_{total} + SO$$

NTGR = 0.94



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ECONOLÉR



EfficiencyOne

RESIDENTIAL EFFICIENT PRODUCT REBATES PROGRAM

Final Report

2025 DSM EVALUATION

March 4, 2026



ECONOLUX



ABBREVIATIONS

ARCA	ARCA Canada Inc.
ARet	Appliance Retirement
ASFH	Affordable Single-family Homes
BNI	Business, non-profit, and institutional
DA	Delivery agent
DR	Demand response
DSM	Demand-side management
DSM MA	Demand-side Management Measure Assessment
E1	EfficiencyOne
ENS	Efficiency Nova Scotia
EUL	Effective useful life
GHG	Greenhouse gas
LED	Light-emitting diode
MA	Measure Assessment
MHEEP	Mi'kmaw Home Energy Efficiency Project
NS Power	Nova Scotia Power
NSEB	Nova Scotia Energy Board
NSUARB	Nova Scotia Utility and Review Board
NTGR	Net-to-gross ratio
RUL	Remaining useful life
SKU	Stock keeping unit
UMP	Uniform Methods Project

DEFINITIONS

Accuracy	Reflects the proximity of measurements to the true value.
Adjustment ratio	The ratio of evaluated results to tracked results. This ratio expresses the adjustment made to tracked savings or other tracked values such as effective useful life values.
Available demand response capacity	The capacity that is available to Nova Scotia Power (NS Power) to reduce system peak demand. This capacity is calculated based on the first two hours of all events called between December and February, excluding weekends and holidays. If an event is shorter than two hours, only the first hour is used to measure available demand response (DR) capacity. Available DR capacity is evaluated per participant based on the average demand reduction observed for each event in which the participant was scheduled to participate. E1's total available DR capacity is the sum of each participant's available DR capacity.
Baseline	To determine gross savings, a baseline (or base case) is established, providing detailed information about the reference (e.g. pre-existing or standard) measure or equipment chosen to be compared with the efficient measure or equipment. For the reference measure or equipment, the baseline may include such information as the hours of operation, wattage, and base consumption.
Bias	Systematic deviations of measurements from the true value.
Billing calibration	An activity that consists of adjusting the expected electrical energy savings based on the relative difference between the results of energy simulations and the actual energy consumption of a building or system.
Confidence interval	The estimated range of values that is likely to include unknown population parameters.
Demand response	Demand response measures generate savings in the form of available capacity or a load reduction in response to events called by the electric utility (NS Power) to reduce the load at strategic moments. These events can be called at any time and for any duration, although they are usually called for one to four hours during peak periods.
Displaced wattage	Displaced wattage is defined as the difference between the wattage values of the baseline equipment or product and that of the efficient equipment or product.
EnerGuide rating	An EnerGuide (official brand of Natural Resources Canada) rating is a standard measure of home energy performance. It is a measure of the efficiency of the building only and does not take into account occupant behaviour. It shows how energy efficient a home is through modelled home heat losses based on several factors, including building envelope characteristics, heated volume, heating systems, and air leakage.
Effective useful life	The period a measure is expected to be in service and provide both electrical energy and peak demand savings. This value combines equipment life and measure persistence that includes factors such as business turnover or early retirement.
Equipment life	The number of years installed equipment will operate before it fails.

Equivalent CO2	A unit of measurement indicating the amount of carbon dioxide to which various kinds of emitted greenhouse gases are equivalent in terms of warming effects. In this report, gas global warming potential is estimated over a timescale of 100 years.
Equivalent effective useful life	The number of years by which the first-year savings estimate is multiplied to obtain lifetime electrical energy savings. This value takes into account variations in annual electrical energy savings throughout the effective useful life due to increased baselines.
Evaluated savings	Gross and net electrical energy or peak demand savings calculated by the Evaluator using the parameters (unitary savings values, installation rates, interactive effects, net-to-gross ratios, etc.) validated or measured during the evaluation process. Unless otherwise specified, evaluated savings are first-year savings.
Evaluation plan	The evaluation plan summarizes the program description, objectives, base cases, documentation, evaluation methodology, budget, and schedule.
First-year savings	The first full year of electrical energy or peak demand savings generated by an energy efficiency measure.
Free-ridership	Percentage of gross savings attributable to participants who would have implemented the same or similar energy efficiency measures, with no change in timing, in the absence of the program.
Gross savings	Change in energy consumption and/or demand that results directly from program-related actions taken by participants in an energy efficiency program regardless of why they participated.
Induced consumption	Energy consumption of appliances that would have been unplugged and not replaced by participants in the absence of the program.
Interactive effects	Effects on the energy consumption of other systems (such as heating and cooling) in a building due to the installation of an energy efficiency measure.
In-service rate	The proportion of incentivized products installed and operating. This rate is usually applied to programs through which rebates are offered in-store and products are likely to be stored for a certain period before being installed, such as light-emitting diode (LED) lamps.
Installation rate	The proportion of incentivized products reported as installed and that remain installed and operating at the time of evaluation. This rate is usually applied to direct install or mail-in rebate programs through which measures are expected to be installed immediately at the time of participation.
Lifetime electrical energy savings	The electrical energy savings that occur over the lifetime of an energy efficiency measure. Lifetime energy savings account for the effective useful life of a measure and any increase in the baseline efficiency level (which reduces attributable annual savings) over the measure lifetime.
Line loss factor	The multiplier to convert savings at the customer meter to savings at the utility generator. It accounts for the electrical losses of the transmission and distribution system.
Margin of error	The amount of random sampling error.
Market effects	The impact of a program on the market (in terms of product availability, practices, and prices) and that extends beyond changing program participant behaviours. Market effects include spillover among non-participants.

Net savings	Electrical energy or peak demand savings that can be reliably attributed to a program. These include effects such as free-ridership and spillover that negatively or positively affect the savings attributable to a program.
Net-to-gross ratio	The ratio of net electrical energy savings to gross electrical energy savings.
Non-sampling error	Errors arising during the course of all survey activities other than sampling. Non-sampling errors tend to lead to bias in measurements and are very difficult to quantify.
Peak coincidence factor	The percentage of measure demand savings that coincide in time with the annual peak demand of the entire electricity system.
Peak demand savings	The demand savings that coincide in time with the expected annual peak demand period of the entire electricity system. For industrial participants on an interruptible rate, peak demand savings may include savings on non-firm loads, i.e. loads that may be interrupted when NS Power's 10-minute reserve is low.
Precision	The extent to which repeated measurements agree with one another.
Random sampling error	An error in measurement due to measurements being taken from a subset of the population and not the entire population.
Realization rate	The ratio of evaluated savings to tracked savings.
Sample size	The number of observations or replicates included in a statistical sample.
Secondary market impacts	Energy consumption of appliances that would have been transferred to the secondary market if said appliances had not been retired.
Spillover	Savings attributable to participants who implement additional energy efficiency measure(s) introduced by a program after participating in it once and without participating in the program a second time.
Tracked savings	Gross and net savings calculated based on various parameters such as number of participants or units installed or sold, unitary savings values, installation rates, interactive effects, and net-to-gross ratios. Those parameters, with the exception of the number of participants or units installed or sold, are obtained from the previous evaluation.
Unitary savings	Electrical energy or peak demand savings established on a unitary basis. A unit can either be a product (e.g. an 8 W LED lamp), a capacity (e.g. one tonne capacity of an air-source heat pump), or a participant (e.g. one participant taking part in a behaviour-based program).



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EXECUTIVE SUMMARY

This report presents the 2025 demand-side management (DSM) evaluation results of the Residential Efficient Product Rebates program administered by EfficiencyOne (E1). This program is comprised of two components: (1) Appliance Retirement (ARet) and (2) Instant Savings.

Evaluation Approach

The 2025 evaluation was aimed at calculating program component gross and net results, namely first-year and lifetime electrical energy savings, peak demand savings, as well as avoided greenhouse gas (GHG) emissions. Table 1 summarizes the types of evaluation conducted for each program component and the corresponding methodology.

Table 1: Summary of 2025 Residential Efficient Product Rebates Program Evaluation

Program Component	Evaluation Type			Methodology
	Impact	Process	Market	
Appliance Retirement	Condensed			› Tracking sheet audit › Calculations using evaluation results › Use of 2022 net-to-gross ratio (NTGR) results › GHG emission reduction calculations
Instant Savings	Condensed			› Tracking sheet audit › 2025 DSM Measure Assessment (DSM MA)¹ update › Literature review for deemed NTGR values for non-lighting measures › Calculations using evaluation results › GHG emission reduction calculations

Program Performance

Table 2 below presents the participation levels, NTGRs, evaluated gross and net savings at the generator, annual GHG emission reductions, as well as effective useful life (EUL) values for each program component and for Residential Efficient Product Rebates as a whole.

¹ The 2025 DSM MA is a reference document that provides an in-depth review of all parameters necessary to calculate the annual and lifetime gross electrical energy and peak demand savings of all prescriptive measures and most semi-prescriptive measures offered through E1's DSM program portfolio. In addition, the MA includes effective useful life values for all measures offered in E1's program portfolio. For the evaluation conducted during the last year of the 2023-2025 DSM cycle, the Evaluator refers to the values presented in the 2025 DSM MA.

Table 2: Overall 2025 Residential Efficient Product Rebates Participation and Evaluated Savings

	Participation Level		Gross Savings		NTGR	Net Savings	
	Value	Unit	Value	Unit	Value	Value	Unit
ARet							
Electrical Energy Savings	285	Appliances	0.205	GWh	0.56	0.115	GWh
Lifetime Electrical Energy Savings			0.818	GWh	0.56	0.461	GWh
Peak Demand Savings			0.029	MW	0.56	0.017	MW
Annual GHG Emission Reductions			96	Tonnes of CO2 eq	0.56	54	Tonnes of CO2 eq
EUL			4.0	Years		4.0	Years
Instant Savings							
Electrical Energy Savings	113,696	Products sold	14.817	GWh	0.77	11.430	GWh
Lifetime Electrical Energy Savings			137.661	GWh	0.77	106.508	GWh
Peak Demand Savings			0.700	MW	0.67	0.466	MW
Annual GHG Emission Reductions			6,954	Tonnes of CO2 eq	0.77	5,364	Tonnes of CO2 eq
EUL			9.3	Years		9.3	Years
Total							
Electrical Energy Savings			15.022	GWh	0.77	11.545	GWh
Lifetime Electrical Energy Savings			138.479	GWh	0.77	106.969	GWh
Peak Demand Savings			0.729	MW	0.66	0.483	MW
Annual GHG Emission Reductions			7,050	Tonnes of CO2 eq	0.77	5,418	Tonnes of CO2 eq
EUL			9.2	Years		9.3	Years

Residential Efficient Product Rebates was aimed at achieving 10.937 GWh in net electrical energy savings and 1.144 MW in net peak demand savings at the generator for 2025. The program exceeded the net electrical energy savings target by 6%, while it fell short of the peak demand savings target by 58%, mostly driven by Instant Savings that remains the largest contributor to both total program net electrical energy and peak demand savings.

The following subsections present findings and recommendations at the program component level.

ARet Findings and Recommendations

This subsection presents the key findings from the 2025 ARet evaluation. The Evaluator has no specific recommendation for ARet.

2025 ARet-Finding: With the program component having been discontinued in January 2025, ARet fell short of its net savings targets, achieving 9% of both its electrical energy and peak demand savings targets.

2025 ARet-Finding: The evaluated net electrical energy savings and peak demand savings determined by the Evaluator were identical to the net savings tracked by E1.

2025 ARet-Finding: Refrigerator and freezer retirements remained the largest drivers of participation and savings in 2025.

Instant Savings Findings and Recommendations

This subsection presents the key findings from the 2025 Instant Savings evaluation. The Evaluator has no specific recommendation for Instant Savings.

2025 Instant Savings-Finding: Instant Savings surpassed its net electrical energy savings target by 18% and fell short of its peak demand savings target by 52%.

2025 Instant Savings-Finding: Following the removal of LED lighting products and dehumidifiers from the Instant Savings offering, 2025 program participation levels decreased by 71% compared to 2024 levels.

2025 Instant Savings-Finding: Controls now constitute the most significantly rebated product category, representing 61% of all rebated products and 68% of all gross electrical energy savings.

2025 Instant Savings-Finding: The evaluated net electrical energy savings and net peak demand savings determined by the Evaluator were lower than the net savings tracked by E1.

2025 Instant Savings-Finding: The overall evaluated 2025 program NTGR was 0.77, while the overall tracked program NTGR was 0.98.

Program Tracked and Evaluated Savings

Table 3 below compares E1 tracked electrical energy and peak demand savings to evaluated savings at the generator. The realization rate and NTGR are also presented and correspond to the rounded averages obtained by dividing net savings by gross savings, which explains why the NTGR values differ from those presented in the other sections.

Table 3: Comparison of 2025 Tracked and Evaluated Savings at the Generator

		Gross Savings		NTGR*	Net Savings		Realization Rate
		Value	Unit		Value	Unit	
ARet	Electrical Energy Savings						
	Tracked Savings by E1	0.205	GWh	0.56	0.115	GWh	100%
	Evaluation Results	0.205	GWh	0.56	0.115	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	0.029	MW	0.56	0.017	MW	100%
	Evaluation Results	0.029	MW	0.56	0.017	MW	
Instant Savings	Electrical Energy Savings						
	Tracked Savings by E1	16.337	GWh	0.98	15.981	GWh	72%
	Evaluation Results	14.817	GWh	0.77	11.430	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	0.757	MW	0.94	0.713	MW	65%
	Evaluation Results	0.700	MW	0.67	0.466	MW	
*NTGRs vary for each type of appliance. The NTGRs presented in this table correspond to the rounded averages obtained by dividing net savings by gross savings.							

INTRODUCTION

EfficiencyOne (E1), an independent and non-profit organization, is responsible for helping Nova Scotians improve the energy efficiency of their homes and workplaces by designing, marketing, and delivering demand-side management (DSM) for Nova Scotians. E1 provides energy efficiency, demand response (DR), and carbon mitigation services through the Efficiency Nova Scotia (ENS) franchise. Regulatory oversight of its DSM activities is provided by the Nova Scotia Energy Board (NSEB). E1 receives funding for its electricity DSM activities from Nova Scotia Power (NS Power) ratepayers.

E1 has a DSM portfolio of three residential programs, three business, non-profit, and institutional (BNI) programs, and one DR program that are marketed to Nova Scotians through the ENS franchise. Each program has one or more program components. Econoler was commissioned by E1 to evaluate E1's 2025 DSM program portfolio.

This evaluation report relates to the Residential Efficient Product Rebates program comprised of two components: Appliance Retirement (ARet) and Instant Savings. Note that ARet was discontinued as of January 2025. Table 4 below lists the Residential Efficient Product Rebates program components and the types of evaluations conducted for 2025. A condensed impact evaluation involves using some or all of the impact evaluation parameters from the previous year, such as unitary savings values, adjustment ratios, installation rates, and NTGRs, to provide evaluated results.

Table 4: Types of Evaluation Conducted for Each Program Component, 2025

Program	Program Component	2025		
		Process	Market	Impact
Residential Efficient Product Rebates	ARet			Condensed
	Instant Savings			Condensed

For each program, the Evaluator prepared a DSM evaluation report presenting key findings, first-year and lifetime electrical energy savings, peak demand savings, and avoided greenhouse gas (GHG) emissions.²

² Unless specified otherwise, electrical energy savings refer to first-year savings rather than lifetime savings throughout this report.

1 ARet Overview

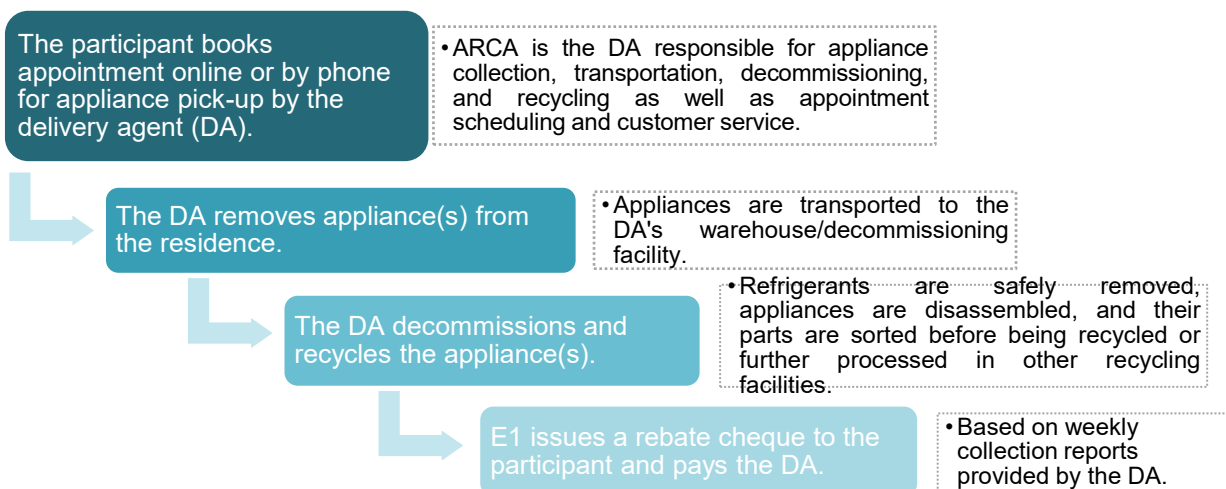
This section describes the Appliance Retirement (ARet) program component, follows up on past evaluation recommendations, and provides an overview of participation history.

1.1 ARet Description

Through ARet, E1 promotes the retirement of old, inefficient household appliances such as refrigerators, freezers, room air conditioners, and dehumidifiers. ARet educates Nova Scotians about the cost of maintaining old and inefficient appliances, provides free appliance pick-ups from homes, and offers financial incentives for appliance retirements.

In addition to removing old appliances from participants' homes, ARet transports them to a local recycling depot where over 95% of components are decommissioned and responsibly recycled. ARCA Canada Inc. (ARCA) is the delivery agent (DA) responsible for appliance collection, transportation, decommissioning, and recycling. To have appliances picked up, participants must call a toll-free number or register online using the booking portal available on the E1 website, both of which are managed by the DA. All website bookings, scheduling, and maintenance activities are the responsibility of the DA. Figure 1 outlines the main steps of the ARet participation process.

Figure 1: ARet Participation Process Summary



Eligible appliances must be in working condition and be 10 years of age or older. In 2025, this meant that eligible appliances had to be manufactured before 2015. In addition, full-sized refrigerators must have a standard size between 10 and 25 cubic feet, while full-sized freezers must be between seven and 25 cubic feet. For cost effectiveness, room air conditioners as well as small refrigerators and freezers are only picked up when a participant retires a full-sized refrigerator or full-sized freezer at the same time. To participate in ARet, participants must own the appliance(s) to be retired.



The following rebates are offered through ARet:

- › \$50 for each retired full-sized refrigerator³
- › \$50 for each retired full-sized freezer⁴
- › \$10 for each retired room air conditioner
- › \$10 for each retired small refrigerator or freezer

The 2025 ARet results presented herein only include participation for January 2025 since the program component was discontinued in January 2025.

ARet was aimed at achieving 1.247 GWh in net electrical energy savings and 0.179 MW in net peak demand savings at the generator in 2025.

1.2 Follow-up on Past Evaluation Report Recommendations

No recommendations were made for ARet in the 2024 evaluation.

1.3 Participation History

Since 2012, ARet has retired or replaced a total of 77,981 old and inefficient appliances from homes and schools. These appliances were recycled so that they could not be refurbished, sold second hand, or left plugged in.

As outlined in Figure 2 below, 285 appliances were retired through ARet in 2025. Specifically, a total of 184 refrigerators, 87 freezers, seven air-conditioning units, six small refrigerators, and one small freezer were retired. No dehumidifiers were retired in 2025.

In 2025, 95% fewer appliance retirements were recorded compared to 2024 results. This decrease was observed across all categories and was due to ARet being discontinued in January 2025. Hence, the evaluation results presented herein only include savings from January 2025.

Figure 3 further below provides an overview of the evolution of ARet gross energy and peak demand savings from 2012 to 2025. The 2025 results represent decreases of 95% in both gross energy and peak demand savings compared to 2024 levels.

³ Incentives for full-sized refrigerators and freezers were increased from \$30 to \$50 in July 2021 to increase participation.

⁴ Ibid.

Figure 2: Overview of ARet Participation, 2012-2025

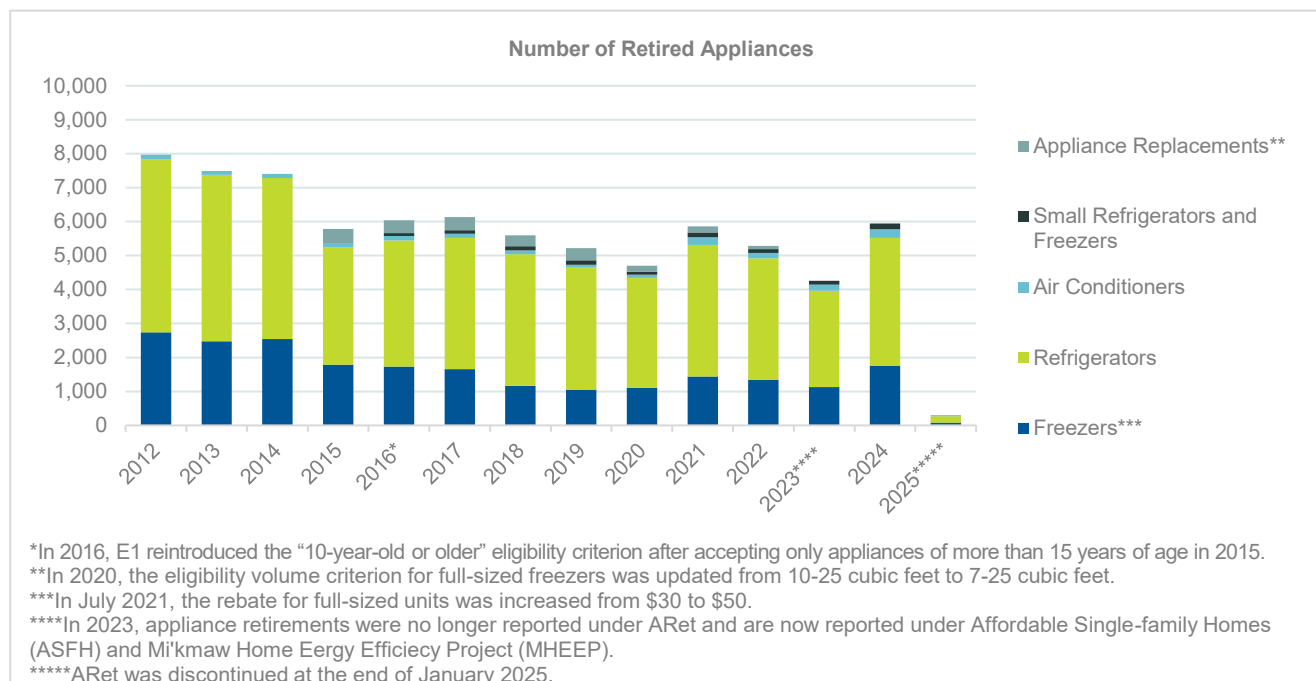
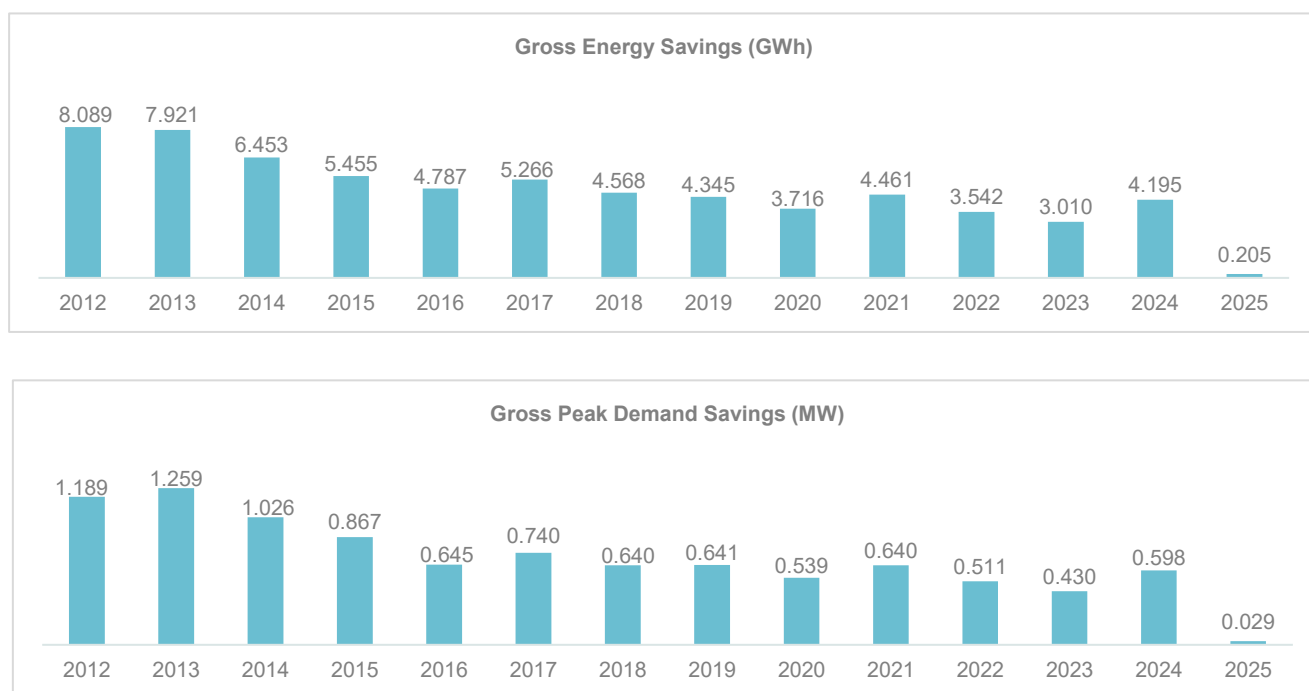


Figure 3: Evolution of ARet Gross Savings, 2012-2025



2 ARet Evaluation Approach

The 2025 ARet evaluation involved a condensed impact evaluation. The main objectives were as follows:

- › Calculate gross and net results, namely first-year and lifetime electrical energy savings, peak demand savings, as well as avoided GHG emissions

The Evaluator identified key research questions aimed at achieving the above objectives. Table 5 outlines the evaluation objectives and maps them to the research questions and methods established by the Evaluator. Each methodology is described further below.

Table 5: 2025 ARet Evaluation Approach

Evaluation Objectives		Research Questions	Methodology
Calculate gross results	› Are the data in the tracking sheet complete, accurate, and consistent? › What are the evaluated first-year and lifetime gross electrical energy and peak demand savings?	› Tracking sheet audit › Calculations using evaluation results	
Calculate net results	› What are the evaluated first-year and lifetime net electrical energy and peak demand savings? › What are the net GHG emission reductions in CO2 eq?	› Use of 2022 NTGR results › Calculations using evaluation results › GHG emission reduction calculations	

Tracking Sheet Audit

Prior to performing a unitary savings review, the Evaluator performed an audit of the final 2025 tracking sheet to ensure it was complete and the entered data was consistent. The detailed protocol used for the tracking sheet audit and the results obtained are presented in Appendix I.

Calculations Using Evaluation Results

The Evaluator calculated the first-year and lifetime electrical energy and peak demand savings per the calculation methodology presented in Section 3 below.

GHG Emission Reduction Calculations

To obtain net avoided GHG emissions in CO2 eq for ARet, the Evaluator multiplied the net energy savings by the latest Nova Scotia-specific factor for GHG emissions generated by electricity production. This factor was established using NS Power data.



3 ARet Impact Evaluation

The objectives of the 2025 ARet impact evaluation were to determine gross and net electrical energy and peak demand savings, annually avoided GHG emissions, as well as weighted average EUL values and associated lifetime energy savings.

3.1 Tracking Sheet Audit

To ensure program results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1 as well as correcting the tracked savings as needed. The results are provided in Appendix I. The tracked savings results presented in this report therefore refer to the corrected tracked savings obtained by the Evaluator.

3.2 Gross Savings

For ARet, gross savings correspond to the change in energy consumption resulting from the retirement of energy inefficient appliances in participants' homes compared to the consumption level had retirements not occurred.⁵

No activity aimed at updating ARet unitary savings were planned for the 2025 evaluation. Therefore, the Evaluator relied on the values from the 2025 Demand-side Management Measure Assessment (DSM MA),⁶ which includes detailed descriptions of the unitary savings calculations.

3.2.1 Unitary Energy Savings

There was no change in unitary energy savings in 2025. The detailed unitary energy savings calculations are presented in the 2025 DSM MA.

3.2.2 Peak Demand Savings

Peak demand savings correspond to the demand savings that coincide in time with the peak demand period of the electricity system. The projected electricity peak demand period in Nova Scotia is between 5 p.m. and 7 p.m. in the months of December to February on non-holiday weekdays.

Similarly to unitary energy savings, there was no change in unitary peak demand savings in 2025. The detailed unitary peak demand savings calculations are presented in the 2025 DSM MA.

3.2.3 Interactive Effects

Interactive effects occur when the implementation of an energy efficiency measure has an impact on the energy consumption of other elements such as heating and cooling equipment. For ARet, retiring old appliances causes an increase in the heating load in winter and a decrease in the cooling load in summer since the compressor of the old appliance releases significantly more waste heat than the compressor of a newer and more efficient model. If an inefficient appliance is retired without being replaced, interactive effects are greater.

⁵ Definition adapted from National Renewable Energy Laboratory, "Chapter 21: Estimating Net Savings – Common Practices", The Uniform Methods Project, October 2017, p. 3, available at: <https://www.nrel.gov/docs/fy17osti/68578.pdf>.

⁶ The 2025 DSM MA is a reference document that provides an in-depth review of all parameters necessary to calculate the annual and lifetime gross energy and peak demand savings of all prescriptive measures and most semi-prescriptive measures offered through E1's DSM program portfolio. In addition, the MA includes effective useful life values for all measures offered in E1's program portfolio. For the evaluation conducted during the last year of the 2023-2025 DSM cycle, the Evaluator refers to the values presented in the 2025 DSM MA.



As presented in the 2025 DSM MA, the Evaluator considers that ARet interactive effects are negligible and therefore established the interactive effects factor at 0%.

3.2.4 Effective Useful Life

Effective useful life (EUL) values are used in the calculations of electrical energy savings that are expected to persist over time. For ARet, the lifetime energy savings and equivalent EUL values are highly influenced by the remaining useful life (RUL) of old units; the latter corresponds to the remaining time that the old appliance would still have been used if it had not been retired.

For the 2025 evaluation, the Evaluator relied on the EUL values presented in the 2025 DSM MA. The equivalent EUL values were applied to the gross and net first-year energy savings of each appliance to obtain gross and net lifetime energy savings (see Subsections 3.2.5 and 3.3.4 below). The weighted average EUL value is 4.0 years.

3.2.5 Evaluated Gross Savings

The gross electrical energy and peak demand savings resulting from the retirement of appliances through ARet are listed in Table 6 below.

The line loss factors were updated in 2019 and correspond to the values submitted to the Nova Scotia Utility and Review Board (NSUARB), now named the Nova Scotia Energy Board (NSEB), as part of the 2014 Cost of Service Study Progress Update.⁷ The proportions of residential participants versus that of commercial participants were calculated using 2025 ARet tracking sheet data. For appliances retired through ARet, gross electrical energy savings at the generator were estimated by using a line loss factor of 0.0946 kW, while peak demand savings were estimated using a line loss factor of 0.1462 kW.

⁷ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.

Table 6: Evaluated 2025 ARet Gross Electrical Energy and Peak Demand Savings

Measure Category	Appliance Retirement					
	Refrigerators	Freezers	Room Air Conditioners	Small Refrigerators	Small Freezers	Total
Number of Units Retired	184	87	7	6	1	285
Electrical Energy Savings						
Unitary Electrical Energy Savings (kWh)	660	726	184	164	230	-
Gross Electrical Energy Savings – at the Meter (GWh)	0.121	0.063	0.001	0.001	0.000	0.187
Line Loss Factor	1.0946	1.0946	1.0946	1.0946	1.0946	-
Gross Electrical Energy Savings – at the Generator (GWh)	0.133	0.069	0.001	0.001	0.000	0.205
Equivalent Effective Useful Life (years)	4.0	4.0	3.0	4.0	4.0	-
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.532	0.277	0.004	0.004	0.001	0.818
Peak Demand Savings						
Unitary Peak Demand Savings (W)	91.1	100	-	22.6	31.7	-
Gross Peak Demand Savings – at the Meter (MW)	0.017	0.009	-	0.000	0.000	0.026
Line Loss Factor	1.1462	1.1462	1.1462	1.1462	1.1462	-
Gross Peak Demand Savings – at the Generator (MW)	0.019	0.010	-	0.000	0.000	0.029

Figure 4 below compares the tracked and evaluated gross electrical energy savings, while Figure 5 further below compares the tracked and evaluated gross peak demand energy savings for 2025. The two measures generating the majority of first-year electrical energy savings were refrigerator retirements (65%) and freezer retirements (34%).

Figure 4: 2025 Tracked and Evaluated Gross Electrical Energy Savings at the Generator

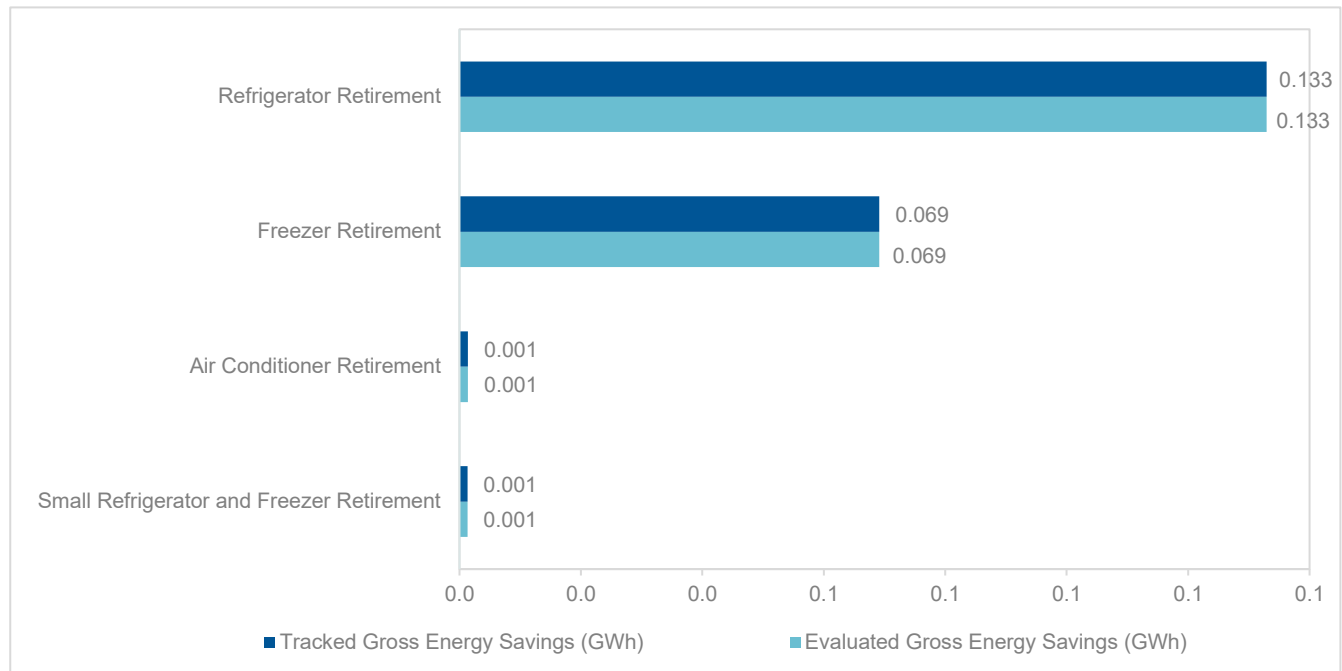
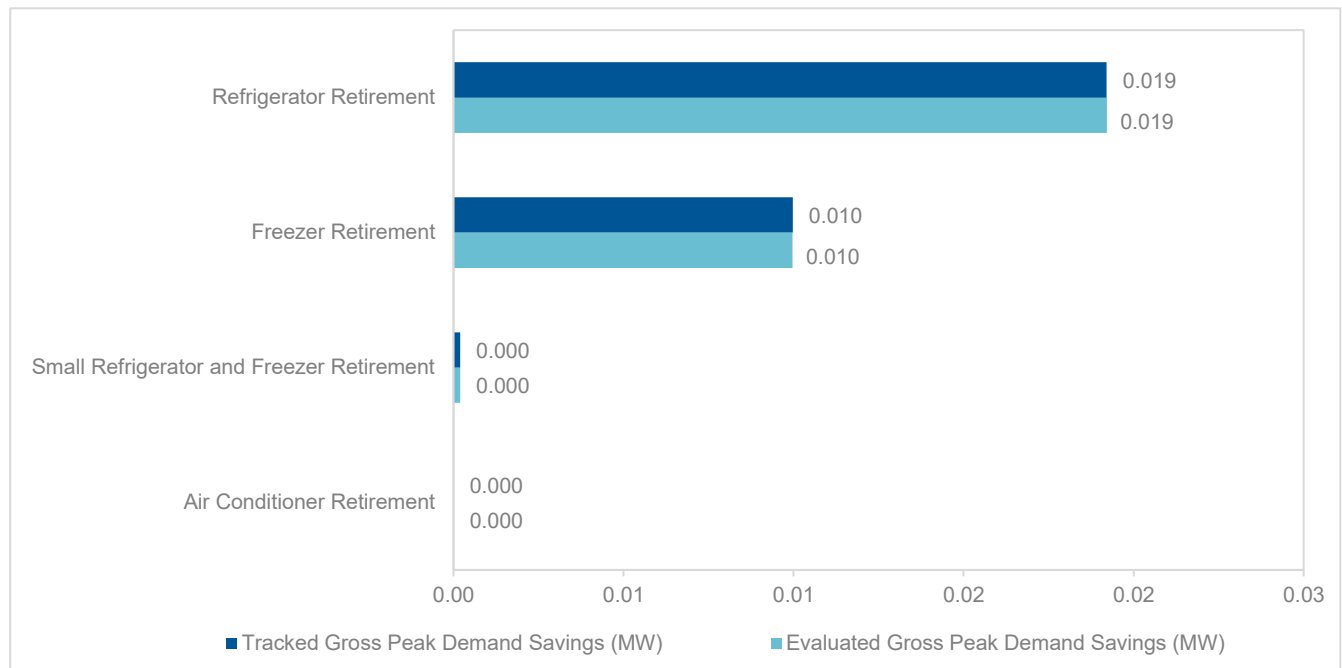


Figure 5: 2025 Tracked and Evaluated Gross Peak Demand Savings at the Generator



As presented in Table 7 below, gross GHG emission reductions were calculated by applying the Nova Scotia-specific factor for GHG emissions generated by electricity production to ARet gross savings.

Table 7: Evaluated 2025 ARet Gross GHG Emission Reductions

	Total
Gross Electrical Energy Savings – at the Generator (GWh)	0.205
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO2 eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO2 eq)	96

3.3 Net Savings

The Evaluator determined the net electrical energy and peak demand savings, that is the electrical energy and peak demand savings that can be reliably attributed to the program component, by establishing a NTGR for each appliance type. For ARet, the NTGRs were established by considering the free-ridership and secondary market impacts that negatively affect energy savings as well as spillover that positively affects energy savings.

For appliance retirements, NTGRs were determined based on a methodology that complies with the general guidelines of the Uniform Methods Project (UMP) for refrigerator recycling evaluations.⁸ This methodology involves considering the full energy consumption of retired appliances as gross unitary energy savings; then, net savings (without spillover) are obtained by deducting the energy impacts from free-ridership and secondary market scenarios. From these results, average free-ridership levels (including secondary market impacts) are calculated, while spillover is determined by calculating the energy impacts of all appliance retirements influenced by the program component but not achieved through the latter as a percentage of ARet gross energy savings.

3.3.1 Free-ridership and Secondary Market Impacts

For appliance retirements, free-ridership corresponds to the energy consumption of appliances that would have been disposed of in the absence of the program, and secondary market impacts correspond to the consumption of those appliances that would have been transferred to other owners.

Since no data collection was conducted in 2025, the 2022 free-ridership and secondary market impact levels were used for full-sized refrigerators and freezers. These levels were assessed during the 2022 evaluation using a self-reporting approach consisting of a participant telephone survey. Participants were asked questions to assess the likelihood that their appliance would have been kept, transferred, or destroyed in the absence of ARet. The participation levels for the retirement of other appliance types were too low to reliably assess free-ridership using the 2022 survey; thus, for air conditioners and small appliances, the free-ridership levels from the 2018 evaluation were used.

The average free-ridership levels and secondary market impacts are presented in Table 8 for each appliance type.

⁸ NREL, The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures. Chapter 7: Refrigerator Recycling Evaluation Protocol, prepared by the Cadmus Group, September 2017.

Table 8: 2025 ARet Free-ridership Levels

Appliance Type	Free-ridership (with Secondary Market Impacts)	
	Level	Margin of Error
Refrigerators	43%	6.3%
Freezers	45%	5.5%
Air Conditioners	47%	13.0%
Small Refrigerators	32%	10.3%
Small Freezers	32%	10.3%
Dehumidifiers	0%	N/A

3.3.2 Participant Spillover

Appliance retirements may have occurred due to the influence of ARet even if no application was submitted. This influence can be due to factors such as better awareness about the energy impacts from keeping the appliances. These retirements should be attributed to the program component as a form of spillover.

The methodology used to calculate spillover consists of estimating the energy impacts as a percentage of ARet gross energy savings for all appliance retirements influenced by the program component but not made through it.

There was no change in spillover since the last evaluation for ARet; hence, the spillover level was still considered to be nil.

3.3.3 Net-to-gross Ratio Calculation

NTGR values were calculated using the following equation.

$$NTGR = (1 - \% \text{ Free-ridership} + \% \text{ Spillover})$$

Using the average free-ridership levels established for each appliance type, the Evaluator calculated corresponding NTGR values, the results of which are presented in Table 9.

Table 9: 2025 ARet Net-to-gross Ratios

Appliance Type	Average Free-ridership (with Secondary Market Impacts)	Spillover	NTGR
Refrigerators	43%	0%	0.57
Freezers	45%		0.55
Air Conditioners	47%		0.53
Small Refrigerators	32%		0.68
Small Freezers	32%		0.68
Dehumidifiers	0%		1.00



3.3.4 Evaluated Net Savings

Net savings represent the savings that can be reliably attributed to a program component. For ARet, net savings are calculated by applying the NTGR values to gross savings as illustrated in the following equation.

$$\text{Net Savings} = \text{Gross Savings} \times \text{NTGR}$$

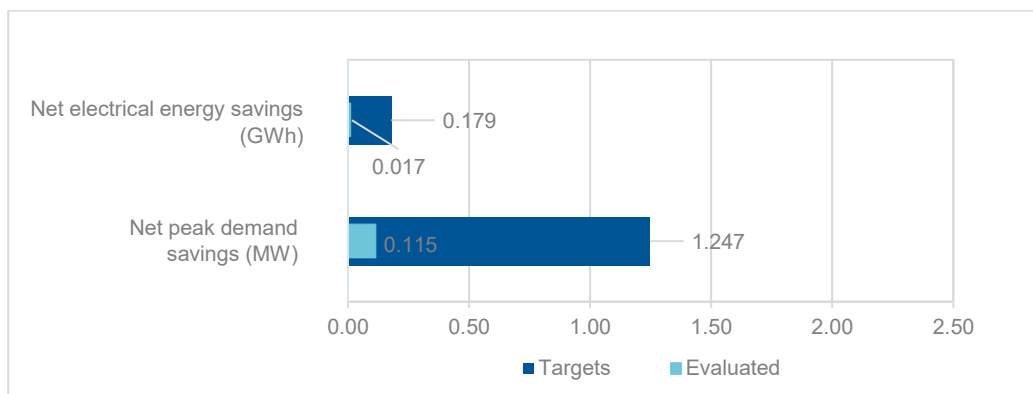
The detailed savings results are outlined in Table 10 below. The net energy savings resulted in 54 tonnes of CO₂ eq in net annual GHG emission reductions.

Table 10: Evaluated 2025 ARet Net Electrical Energy and Peak Demand Savings

Measure Category	Appliance Retirement					
	Refrigerators	Freezers	Room Air Conditioners	Small Refrigerators	Small Freezers	Total
Electrical Energy Savings						
Gross Electrical Energy Savings – at the Meter (GWh)	0.121	0.063	0.001	0.001	0.000	0.187
NTGR	0.57	0.55	0.53	0.68	0.68	-
Net Electrical Energy Savings – at the Meter (GWh)	0.069	0.035	0.001	0.001	0.000	0.105
Line Loss Factor	1.0946	1.0946	1.0946	1.0946	1.0946	-
Net Electrical Energy Savings – at the Generator (GWh)	0.076	0.038	0.001	0.001	0.000	0.115
Equivalent Effective Useful Life (years)	4.0	4.0	3.0	4.0	4.0	-
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	0.303	0.152	0.002	0.003	0.001	0.461
Peak Demand Savings						
Gross Peak Demand Savings – at the Meter (MW)	0.017	0.009	-	0.000	0.000	0.026
NTGR	0.57	0.55	0.53	0.68	0.68	-
Net Peak Demand Savings – at the Meter (MW)	0.010	0.005	-	0.000	0.000	0.014
Line Loss Factor	1.1462	1.1462	1.1462	1.1462	1.1462	-
Net Peak Demand Savings – at the Generator (MW)	0.011	0.005	-	0.000	0.000	0.017

As outlined in Figure 6, ARet did not meet its 2025 targets. ARet only achieved 9% of both its electrical energy and peak demand savings targets.

Figure 6: 2025 ARet Targets and Evaluated Savings



3.4 Realization Rate

Table 11 below compares total ARet tracked and evaluated savings. It also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings.

Table 11: Comparison of 2025 ARet Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR*	Net Savings		Realization Rate
	Value	Unit	Value	Value	Unit	Value
Electrical Energy Savings						
Tracked Savings by E1	0.205	GWh	0.56	0.115	GWh	100%
Evaluation Results	0.205	GWh	0.56	0.115	GWh	
Peak Demand Savings						
Tracked Savings by E1	0.029	MW	0.56	0.017	MW	100%
Evaluation Results	0.029	MW	0.56	0.017	MW	
*NTGRs vary for each type of appliance. The NTGRs presented in this table correspond to the rounded averages obtained by dividing net savings by gross savings.						

The evaluated net electrical energy savings and peak demand savings determined by the Evaluator were identical to the net savings tracked by E1.



4 ARet Key Findings and Recommendations

The 2025 ARet evaluation consisted of a condensed impact evaluation whose main objectives were as follows:

- › Calculate gross and net ARet results, namely electrical first-year and lifetime energy savings, peak demand savings, as well as avoided GHG emissions

This section provides the Evaluator's key findings in relation to the above objectives. The Evaluator has no specific recommendation for ARet.

2025 ARet-Finding: With the program component having been discontinued in January 2025, ARet fell short of its net savings targets, achieving 9% of both its electrical energy and peak demand targets.

ARet achieved 0.115 GWh in net electrical energy savings and 0.017 MW in net peak demand savings at the generator in 2025, thus not reaching the planned net electrical energy savings and net peak demand savings of 1.247 GWh and 0.179 MW respectively.

2025 ARet-Finding: The evaluated net electrical energy savings and peak demand savings determined by the Evaluator were identical to the net savings tracked by E1 respectively.

Since the unitary energy and peak demand savings were not updated, the net electrical energy and peak demand savings were identical to the net savings tracked by E1.

2025 ARet-Finding: Refrigerator and freezer retirements remained the largest drivers of participation and savings in 2025.

Full-sized refrigerators and freezers continued to be the largest contributors to ARet participation and savings, generating 96% of 2025 savings. In 2025, participation decreased by 95% compared to 2024 participation levels due to the program being discontinued in January 2025.

5 Instant Savings Overview

This section describes Instant Savings, follows up on past evaluation recommendations, and provides an overview of participation history.

5.1 Instant Savings Description

Instant Savings offers instant cash rebates to consumers who purchase eligible energy efficient products. Instant Savings is delivered with the help of one Delivery Agent (DA), Summerhill Group Inc., as well as national and independent retailers that offer instant rebates on energy efficient products at over 150 locations across Nova Scotia. To respond to online shopping trends, E1 introduced both online retailers to their list of participating retailers in 2019 and online purchasing of select products directly from manufacturers in 2020.

Some notable changes were made to the program in 2025, namely the removal of the following products:

- › ENERGY STAR® certified non-A-series light-emitting diode (LED) lights
- › ENERGY STAR certified LED recessed downlight fixtures
- › ENERGY STAR certified LED fixtures without motion sensors
- › ENERGY STAR certified dehumidifiers

Moreover, seasonal campaigns were removed, meaning that rebates are now offered year-round on eligible products, although rebates on a number of products were halted as of May 1, 2025 until the end of the year due to sales being higher than expected at the start of 2025.

Table 12 below summarizes the energy efficient products offered through Instant Savings and their respective rebate amount. For each product category, a list of eligible stock keeping units (SKUs) for each retail partner is maintained and approved by E1.

Table 12: List of 2025 Rebates by Product

Products Offered During Campaigns	Rebate
Products Offered Year-Round	
Clothes Washers (qualifying models are on the ENERGY STAR Most Efficient list)	\$75
Bathroom and Utility Room Fans (no light) (qualifying models must have an efficacy of at least 5.5 CFM/W)	\$25
Programmable or Wi-Fi Enabled Thermostats for Electric Baseboard Heaters (single and multipacks)	Up to \$25
ENERGY STAR Certified Air-source Heat Pump Hot Water Heaters	\$400
Dimmer Switches or Wi-Fi Enabled Switches (single pack and multipack)	\$3
Indoor Motion Sensors	\$5
Outdoor Clothesline Kits and Outdoor Drying Racks	\$5
ENERGY STAR Certified Variable Speed Pool Pumps	\$200
Power Bars with Integrated Timers ⁹	\$5
Smart Power Strips (load sensing power strips only)	\$10
Products Offered from January 1, 2025 to May 31, 2025	
Clothes Dryers (qualifying models must be ENERGY STAR certified and use less than 100 kWh per cubic foot of drum capacity)	\$75
Energy Efficient Combined Washer/Dryer (qualifying models must meet efficiency requirements for washer and dryer components separately; models must be pre-approved by Efficiency Nova Scotia prior to offering rebates)	\$150
Dishwashers (qualifying models must be ENERGY STAR certified and use less than or equal to 250 kWh per year)	\$75
ENERGY STAR Certified Room Air Purifiers	Up to \$75
Select Smart Thermostats (with occupancy sensors) for Electric Heating: Electric Baseboards, Mini-split Heat Pumps, and In-floor Radiant Heat	\$45
Outdoor Motion Sensors	\$8
ENERGY STAR Certified LED Fixtures with Motion Sensors	\$8
ENERGY STAR Certified Solar LED Fixtures (with or without motion sensors)	\$10
Heavy-duty Outdoor Timers	\$10

Instant Savings is typically advertised through point-of-purchase materials and signage, the Efficiency Nova Scotia (ENS) website, and other media, including television commercials, social media, as well as print, online, and outdoor advertising. Consumer engagement events were held in participating retail stores during both campaign periods to provide information about Instant Savings and cross-promote other E1 programs, components, and services.

Instant Savings was aimed at achieving 9.690 GWh in net electrical energy savings and 0.965 MW in net peak demand savings at the generator in 2025.

5.2 Follow-up on Past Evaluation Report Recommendations

No recommendations were made for Instant Savings in the 2024 evaluation.

⁹ No power bars with integrated timers were rebated in 2025.

5.3 Participation History

In 2025, 113,696 eligible products were rebated in participating stores across Nova Scotia, a total that represents a decrease of 71% compared to 2024.

As presented in Table 13 below, sales of ENERGY STAR certified non-A-type LED lamps and ENERGY STAR certified LED fixtures decreased by 98% and 91% respectively, which was an expected impact of the removal of LED lamps and fixtures from the Instant Savings offering following the 2024 E1 “Lights Out” campaign and a change to a LED baseline assumption. Control products now constitute the product category with the most sales, representing 61% of all products rebated through Instant Savings in 2025 with an increase of 255% between 2024 and 2025 as well as representing 68% of gross electrical energy savings. This was the only product category that saw an increase in sales in the same period. Notable drivers of control product sales were heavy-duty outdoor timers with a 1,675% increase in sales, dimmer switches with a 188% increase in sales, and smart thermostats for electrical heat with a 162% increase in sales. These three products respectively represent 40%, 25% and 29% of all rebated control products.

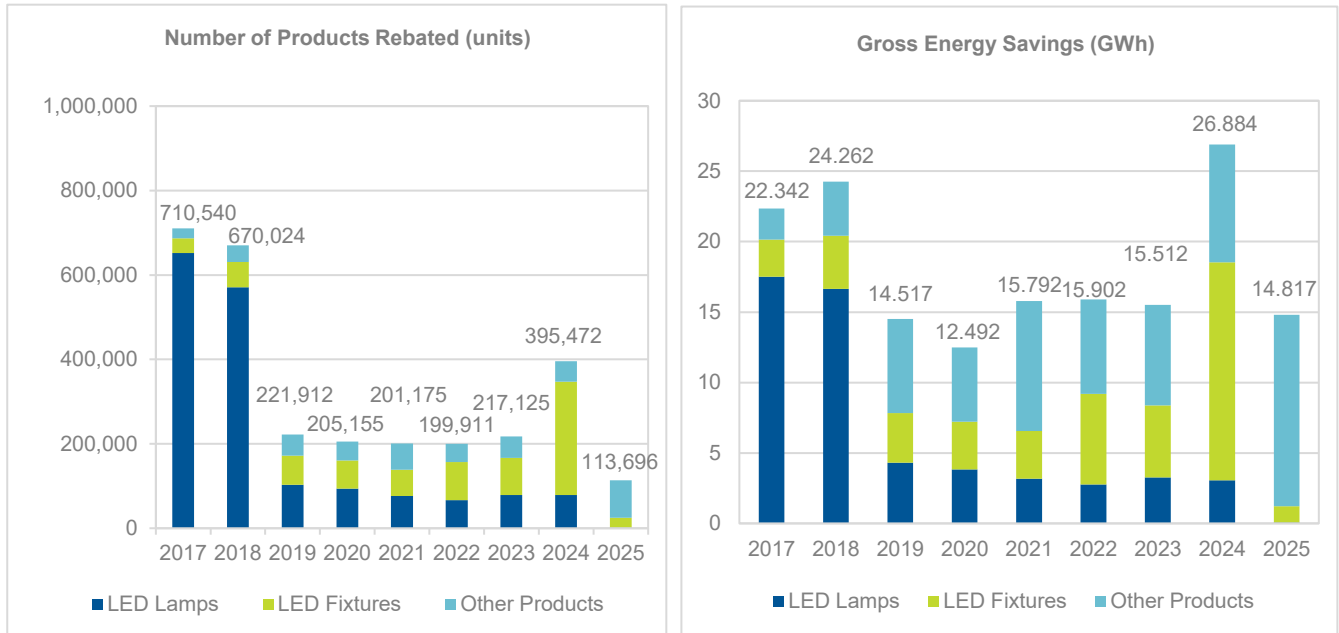
Sales in the appliance product category decreased by 36%, driven mainly by the removal of dehumidifiers from the Instant Savings offering.

Table 13: Number of Rebated Products Rebated Through Instant Savings, 2024–2025

Product Category	2024	2025	Variation
ENERGY STAR Certified Non-A-type LED Lamps	78,539	1,651	-98%
ENERGY STAR Certified LED Fixtures ^a	268,740	23,606	-91%
Controls ^b	19,545	69,295	255%
Clothesline Kits and Outdoor Drying Racks	3,115	2,786	-11%
Appliances ^c	25,327	16,177	-36%
ENERGY STAR Certified Air-source Heat Pump Hot Water Heaters	163	160	-2%
ENERGY STAR Certified Variable Speed Pool Pumps	43	21	-51%
Total	395,472	113,696	-71%
^a Including ENERGY STAR certified LED fixtures with and without motion sensors, ENERGY STAR certified LED recessed downlight fixtures, and solar fixtures.			
^b Including dimmer switches, indoor and outdoor motion sensors, heavy-duty outdoor timers, programmable thermostats, smart thermostats for heat pumps, electrical heat and in-floor heating, and smart power bars.			
^c Including ENERGY STAR certified clothes washers and dryers, ENERGY STAR certified combination washer and dryer units, ENERGY STAR certified dishwashers, ENERGY STAR certified dehumidifiers, ENERGY STAR certified room air purifiers and ENERGY STAR certified bathroom and utility fans.			

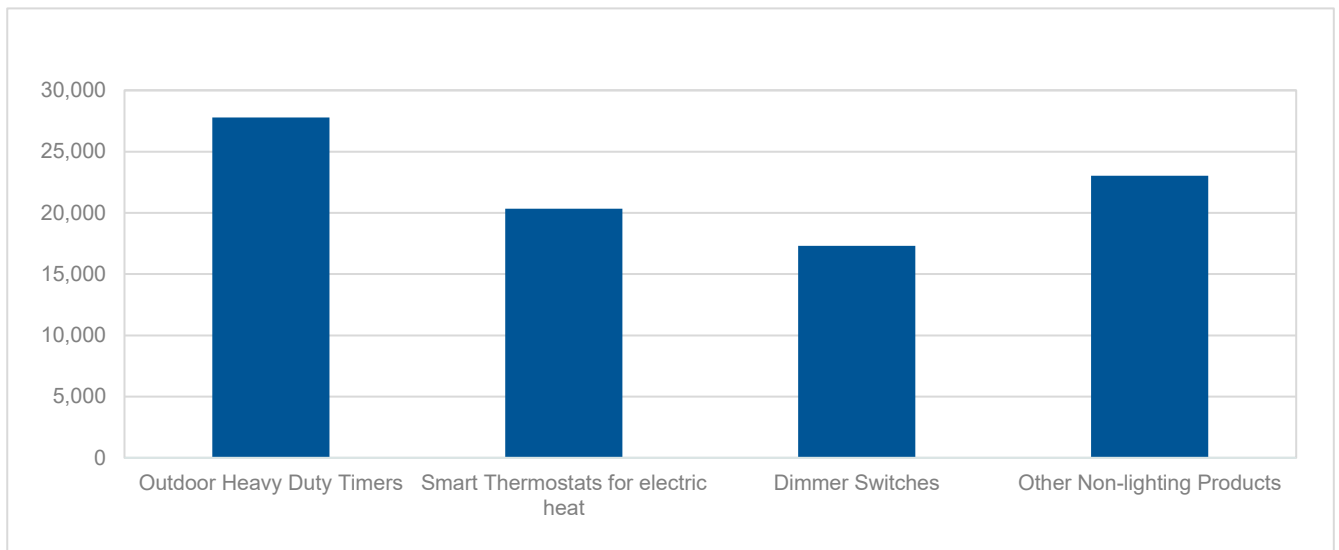
As illustrated in Figure 7 below, non-lighting products now represent the vast majority of products rebated through Instant Savings, accounting for 78% of rebated products and 92% of gross savings. In 2024, they represented only 12% of rebated products and 31% of gross savings. Rebated lighting products were mostly all LED fixtures and represented 22% of rebated products and 8% of savings.

Figure 7: Overview of Participation in Instant Savings, 2017-2025



As for non-lighting products, outdoor heavy-duty timers, smart thermostats for electrical heat, and dimmer switches were the main drivers, respectively accounting for 24%, 18%, and 15% of all rebated products.

Figure 8: Distribution of Non-lighting Products Rebated Through Instant Savings in 2025¹⁰



¹⁰ Other non-lighting products here include bathroom and utility fans, clothes dryers, clothesline kits, clothes washers, combined washer/dryer units, dehumidifiers, dishwashers, heat pump water heaters, indoor motion sensors, outdoor motion sensors, pool pumps, programmable thermostats, room air purifiers, smart power bars, smart thermostats for in-floor electric heat and smart thermostats for MSHPs.

6 Instant Savings Evaluation Approach

The 2025 Instant Savings evaluation included a condensed impact evaluation with a literature review to identify NTGR values to be applied to non-lighting measures included in the program. The main objectives of the 2025 Instant Savings evaluation were as follows:

- › Calculate gross and net results, namely electrical first-year and lifetime energy savings, peak demand savings, as well as avoided GHG emissions.

The Evaluator identified key research questions aimed at achieving these objectives. Table 14 outlines the evaluation objectives and maps them to the Evaluator's research questions, methods, and sample sizes (n). Each method is described further below.

Table 14: 2025 Instant Savings Evaluation Approach

Evaluation Objective	Research Question	Methodology
Calculate gross results	› Are the data in the tracking sheet complete, accurate, and consistent? › Are the unitary savings for appliance measures still valid? If not, what are the unitary savings by product? › What are the evaluated first-year and lifetime gross electrical energy and peak demand savings?	› Tracking sheet audit › 2025 DSM Measure Assessment (DSM MA)¹¹ update › Calculations using evaluation results
Calculate net results	› What is the free-ridership level for non-lighting measures in 2025? › What is the spillover level (market effects) for non-lighting measures in 2025? › What are the evaluated first-year and lifetime net electrical energy and peak demand savings? › What are the net GHG emission reductions in CO2 eq?	› Literature review for deemed NTGR values for non-lighting measures › Use of 2024 NTGRs for any remaining LED measures › Calculations using evaluation results › GHG emission reduction calculations

Tracking Sheet Audit

The Evaluator performed an audit of the final 2025 tracking sheet to ensure it was complete and the entered data were consistent. The results obtained are presented in Appendix III.

Measure Assessment Update

A unitary savings review was conducted for certain measures to update the DSM MA following the change to a LED baseline assumption for residential lighting. This prompted the removal of all rebates on LED lamps and LED fixtures (except for units with motion sensors) and an adjustment to the controlled wattage of all lighting control measures. The savings algorithms for smart thermostats as well as bathroom and utility fans were also updated. Also, due to the removal of a double baseline scenario, the EUL values of LED fixtures with motion sensors and solar fixtures were updated.

The Evaluator also reviewed Amendment 18 to Canada's Energy Efficiency Regulations and concluded that it did not affect products rebated under Instant Savings in this evaluation period.

¹¹ The 2025 DSM MA is a reference document that provides an in-depth review of all parameters necessary to calculate the annual and lifetime gross electrical energy and peak demand savings of all prescriptive measures and most semi-prescriptive measures offered through E1's DSM program portfolio. In addition, the MA includes effective useful life values for all measures offered in E1's program portfolio. For the evaluation conducted during the last year of the 2023-2025 DSM cycle, the Evaluator refers to the values presented in the 2025 DSM MA.



NTGR Update

The Evaluator updated the NTGR values for non-lighting measures, which were previously all 1.00, following a literature review. The results of the literature review are presented in Subsection 7.3.3 and Appendix IV.

Calculations Using Evaluation Results

Building on all the above methods and collected data, the Evaluator calculated first-year and lifetime electrical energy and peak demand savings as per the calculation methodology presented in Section 7 below.

GHG Emission Reduction Calculations

To obtain net avoided GHG emissions in CO₂ eq for Instant Savings, the Evaluator multiplied the net energy savings by the latest Nova Scotia-specific factor for GHG emissions generated by electricity production. This factor was provided by Nova Scotia Power (NS Power).



7 Instant Savings Impact Evaluation

The objectives of the 2025 Instant Savings impact evaluation were to determine gross and net electrical energy and peak demand savings, annually avoided GHG emissions, as well as EUL values and associated lifetime energy savings.

7.1 Tracking Sheet Audit

To ensure program component results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1. The verification and corrective actions taken by the Evaluator, where applicable, are described in Appendix III. The tracked savings results presented in this report, therefore, refer to the corrected tracked savings obtained by the Evaluator.

7.2 Gross Savings

For Instant Savings, gross savings correspond to the change in energy consumption resulting from eligible energy efficient products being purchased by participants compared to the consumption level had those purchases not occurred.¹²

7.2.1 Installation Rates

The installation rates of products sold under Instant Savings are assumed to be 100% except for smart power controllers for audiovisual equipment (smart power strips) for which the installation rate is assumed to be 86%. Please refer to the 2025 DSM MA for more details.

7.2.2 Unitary Energy Savings

Table 15 below summarizes the tracked and evaluated electrical energy savings values for the product categories rebated through Instant Savings, which were revised as part of the 2025 DSM MA update. Detailed descriptions of inputs, references, and unitary savings for all products are provided in the 2025 DSM MA. The unitary savings for all other measures remain unchanged.

The changes in unitary energy savings values of LED products and lighting controls are due to the change to a LED baseline assumption for residential lighting products. The changes in smart thermostat unitary energy savings values are due to a revision of the measure before the 2025 evaluation period in which the Evaluator conducted a literature review to differentiate savings and features of different types of thermostats found in the DSM MA, namely programmable thermostats, smart thermostats, and advanced learning thermostats. The Evaluator also noticed that the bathroom and utility fans algorithm had never been added to the DSM MA and that last year's savings assigned to this measure were actually based on the algorithm for humidity sensors for bathroom fans delivered through EPI. Therefore, the algorithm for bathroom and utility fans algorithm was added to the 2025 DSM MA and its unitary energy savings was updated.

¹² Definition adapted from National Renewable Energy Laboratory, "Chapter 21: Estimating Net Savings – Common Practices", The Uniform Methods Project, October 2017, p. 3, available at: <https://www.nrel.gov/docs/fy17osti/68578.pdf>.

The Evaluator also examined Amendment 18^{13,14} to Canada's Energy Efficiency Regulations to see if it would impact unitary savings values for products rebated through Instant Savings, notably appliances. Among products mentioned in Amendment 18, only pool pumps and line voltage thermostats are rebated through Instant Savings. After review, the Evaluator deemed that the amendments to regulations surrounding these products do not affect unitary savings values, and these have, therefore, been maintained. With no mention of appliances in Amendment 18, the baseline for appliances remains unchanged; thus, no update to the unitary savings values were made.

Table 15: 2025 Instant Savings Tracked and Evaluated Unitary Energy Savings¹⁵

Product	Tracked Savings [kWh/year]	Evaluated Savings [kWh/year]
Dimmer Switches	8.20	3.42
Indoor Motion Sensors with Dimmer Switches*	25.9	10.8
Outdoor Motion Sensors	54.1	19.7
Solar Fixtures	81.0	8.11
Non-learning Smart Thermostats for Electric Baseboards	312	265
Non-learning Smart Thermostats for Mini-split Heat Pumps	564	479
Non-learning Smart Thermostats for Electric In-floor Heating	312	265
ENERGY STAR Certified Bathroom and Utility Fans	143	42.2
*No products rebated in 2025.		

7.2.3 Unitary Peak Demand Savings

Peak demand savings correspond to the demand savings that coincide in time with the peak demand period of the electricity system. The projected electricity peak demand period in Nova Scotia is defined as the coldest days (with an on-peak temperature estimated at -15 °C) between 5 p.m. and 7 p.m. in the months of December to February on non-holiday weekdays. The Evaluator developed unitary peak demand savings for each measure for all products, and the differences between tracked and evaluated peak demand savings reflect updates made to the unitary energy savings of those products. The peak demand-to-energy ratios used are presented in the 2025 DSM MA.

Similarly as for unitary energy savings, the changes in the unitary peak demand savings values of LED products and lighting controls are due to the change to a LED baseline assumption for residential lighting products. Furthermore, unitary peak demand savings for bathroom and utility fans were also updated.

Table 16 below summarizes the tracked and evaluated unitary peak demand savings for the product categories rebated through Instant Savings, which were revised as part of the 2025 DSM MA update. The unitary peak demand savings for all other measures remain unchanged.

¹³ Natural Resources Canada. (April 9, 2025). *Amendment 18 – Natural Resources Canada*. <https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/amendment-18>.

¹⁴ Canada Gazette. (March 20, 2025). *Regulations Amending the Energy Efficiency Regulations, 2016 (Amendment 18)*, (Part II, Volume 159, Number 8). <https://gazette.gc.ca/rp-pr/p2/2025/2025-04-09/html/sor-dors110-eng.html>

¹⁵ In the 2024 evaluation, ENERGY STAR certified LED fixtures with motion sensors and indoor motion sensors had unitary energy savings values of 201 kWh and 22.1 kWh respectively. Following discussions with the Evaluator before the start of the 2025 evaluation, E1 proactively adjusted the tracked unitary energy savings values for these measures, which is why they are not represented in this table.

Table 16: 2025 Instant Savings Tracked and Evaluated Unitary Peak Demand Savings

Product	Tracked Savings [W]	Evaluated Savings [W]
ENERGY STAR Certified LED Fixtures with Motion Sensors	32.6	2.37
Dimmer Switches	1.33	0.554
Solar Fixtures	13.1	1.31
ENERGY STAR Certified Bathroom and Utility Fans	14.3	4.96

7.2.4 Interactive Effects

In a home, interactive effects occur when implementing energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling. Interactive effects occur only when products are installed inside homes. In the case of Instant Savings, adding lighting controls to existing lamps results in an increase in the heating load during winter and a decrease in the cooling load during summer. Therefore, interactive effects factors were calculated for lighting controls.

No interactive effects factors were calculated for plug load controls, outdoor products, and thermostats sold through Instant Savings. For clotheslines and outdoor drying racks as well as appliances, interactive effects were considered negligible. For heat pump water heaters, interactive effects were already considered in the unitary savings values.

7.2.5 Effective Useful Life

The Evaluator validated the EUL values based on the 2025 DSM MA. The EUL values are used in the calculation of electrical energy savings that are expected to persist over time.

Table 17 below summarizes the tracked and evaluated equivalent EUL values that were updated in 2025 for product categories rebated through Instant Savings. The EUL values for LED fixtures with motion sensors and solar fixtures were updated following the change to a LED baseline assumption. All savings from these measures come from motion sensors; hence, the EUL value was updated accordingly. The EUL values for all other measures remain unchanged.

The evaluated equivalent EUL values were applied to the gross and net first-year electrical energy savings of each product to obtain gross and net lifetime energy savings (see Subsections 7.2.6 and 7.3.4 below). The gross and net weighted average EUL values for Instant Savings as a whole were both established at 9.3 years.

Table 17: 2025 Instant Savings Equivalent EUL and Gross Lifetime Unitary Savings Values

Product	Tracked Equivalent EUL [years]	Evaluated Equivalent EUL [years]	Evaluated Gross Lifetime Unitary Savings [kWh]
ENERGY STAR Certified LED Fixtures with Motion Sensors	1.6	10	146
Solar Fixtures	1.9	10	81.1



7.2.6 Evaluated Gross Savings

Annual gross savings are based on the evaluated unitary savings values established for each product for which savings were claimed in 2025. These measures also include remaining LED lighting products and dehumidifiers sold in 2024 for which savings had not yet been claimed. The results are presented in Table 18 below.

Gross savings at the generator were estimated by using a line loss factor of 1.0947 and 1.1466 for electrical energy and peak demand savings respectively.¹⁶ The line loss factors were updated in 2019 and correspond to the values submitted to the Nova Scotia Utility and Review Board (NSUARB), now named the Nova Scotia Energy Board (NSEB), as part of the 2014 Cost of Service Study Progress Update.¹⁷

¹⁶ For municipal utility participants, the line loss factor for the most similar NS Power rate code was assumed. If a municipal utility participant did not have a specific rate code, the average of participants for which the line loss was known was used.

¹⁷ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.

Table 18: Evaluated 2025 Instant Savings Gross Electrical Energy and Peak Demand Savings

Product Category	LED Non-A-type Lamps		LED Recessed Downlight Fixtures	ENERGY STAR LED Fixtures			Dimmer Switches	Indoor Motion Sensors	Outdoor Motion Sensors
	R, BR, and Decorative	Others		Without Motion Sensors	With Motion Sensors	Solar Fixtures			
Number of Units									
Total Number of Units	778	873	14,471	5,713	244	3,178	17,306	704	1,354
Installation Rate (%)	100%	100%	100%	100%	100%	100%	100%	100%	100%
Total Number of Units Installed	778	873	14,471	5,713	244	3,178	17,306	704	1,354
Electrical Energy Savings									
Unitary Electrical Energy Savings Value (kWh)	43.2	41.3	52.8	83.8	14.6	8.11	3.42	9.22	19.7
Energy Interactive Effects Factor (%)	-16.3%	-16.3%	-17.7%	-17.7%	-0.5%	0.0%	-17.7%	-17.7%	0.0%
Gross Electrical Energy Savings – at the Meter (GWh)	0.028	0.030	0.629	0.394	0.004	0.026	0.049	0.005	0.027
Line Loss Factor	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.031	0.033	0.688	0.431	0.004	0.028	0.053	0.006	0.029
Effective Useful Life (years)	1.0	1.0	1.0	1.0	10	10	10	10	10
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.031	0.033	0.688	0.431	0.039	0.282	0.533	0.058	0.292
Peak Demand Savings									
Unitary Peak Demand Savings (W)	7.00	6.69	8.55	13.6	2.37	1.31	0.554	-	-
Peak Demand Interactive Effects Factor (%)	-43.1%	-43.1%	-46.8%	-46.8%	-1.4%	0.0%	-46.8%	-46.8%	0.0%
Gross Peak Demand Savings – at the Meter (MW)	0.003	0.003	0.066	0.041	0.001	0.004	0.005	-	-
Line Loss Factor	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466
Gross Peak Demand Savings – at the Generator (MW)	0.004	0.004	0.075	0.047	0.001	0.005	0.006	-	-

Evaluated 2025 Instant Savings Gross Electrical Energy and Peak Demand Savings (Continued)

Product Category	Smart Power Bars	Heavy-duty Outdoor Timers	Programmable Thermostats	Smart Thermostats			Clotheslines	Efficient Clothes Washers	Efficient Clothes Dryers
				Electric Baseboards	MSHPs	In-floor Heating			
Number of Units									
Total Number of Units	148	27,781	1,282	20,327	370	23	2,786	4,369	3,483
Installation Rate (%)	86%	100%	100%	100%	100%	100%	100%	100%	100%
Total Number of Units Installed	127	27,781	1,282	20,327	370	23	2,786	4,369	3,483
Electrical Energy Savings									
Unitary Electrical Energy Savings Value (kWh)	105	122	164	265	479	265	70.6	138	25.0
Energy Interactive Effects Factor (%)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Gross Electrical Energy Savings – at the Meter (GWh)	0.013	3.389	0.210	5.387	0.177	0.006	0.197	0.603	0.087
Line Loss Factor	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.015	3.710	0.230	5.897	0.194	0.007	0.215	0.660	0.095
Effective Useful Life (years)	4	10	10	10	10	10	10	11	12
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.059	37.102	2.302	58.968	1.940	0.067	2.153	7.260	1.144
Peak Demand Savings									
Unitary Peak Demand Savings (W)	-	-	-	-	-	-	-	19.0	3.45
Peak Demand Interactive Effects Factor (%)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Gross Peak Demand Savings – at the Meter (MW)	-	-	-	-	-	-	-	0.083	0.012
Line Loss Factor	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466
Gross Peak Demand Savings – at the Generator (MW)	-	-	-	-	-	-	-	0.095	0.014

Evaluated 2025 Instant Savings Gross Electrical Energy and Peak Demand Savings (Continued)

Product Category	Efficient Combined Washers/Dryers	Room Air Purifiers	Dehumidifiers	Pool Pumps	Heat Pump Water Heaters	High-efficiency Dishwashers	Bathroom and Utility Fans	Total for All Products
Number of Units								
Total Number of Units	527	2,439	1,917	21	160	2,904	538	113,696
Installation Rate (%)	100%	100%	100%	100%	100%	100%	100%	-
Total Number of Units Installed	527	2,439	1,917	21	160	2,904	538	113,675
Electrical Energy Savings								
Unitary Electrical Energy Savings Value (kWh)	144	768	45.2	530	1007	15.2	42.2	-
Energy Interactive Effects Factor (%)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-
Gross Electrical Energy Savings – at the Meter (GWh)	0.076	1.873	0.087	0.011	0.161	0.044	0.023	13.536
Line Loss Factor	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.083	2.051	0.095	0.012	0.176	0.048	0.025	14.817
Effective Useful Life (years)	11	9	12	10	15	11	19	9.3
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.914	18.455	1.138	0.122	2.646	0.532	0.472	137.661
Peak Demand Savings								
Unitary Peak Demand Savings (W)	19.9	131	15.1	-	163	1.39	4.96	-
Peak Demand Interactive Effects Factor (%)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-
Gross Peak Demand Savings – at the Meter (MW)	0.010	0.320	0.029	-	0.026	0.004	0.003	0.610
Line Loss Factor	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466
Gross Peak Demand Savings – at the Generator (MW)	0.012	0.366	0.033	-	0.030	0.005	0.003	0.700

Figure 9 and Figure 10 below respectively compare tracked unitary electrical energy and peak demand savings to evaluated gross savings. Both sets of savings values include adjustments to account for interactive effects. As outlined in both figures, the most significant difference in gross electrical energy and peak demand savings were from the revision of the unitary energy savings and unitary peak demand savings values for smart thermostats for electric heat and dimmer switches.

Figure 9: 2025 Instant Savings Tracked and Evaluated Gross Electrical Energy Savings

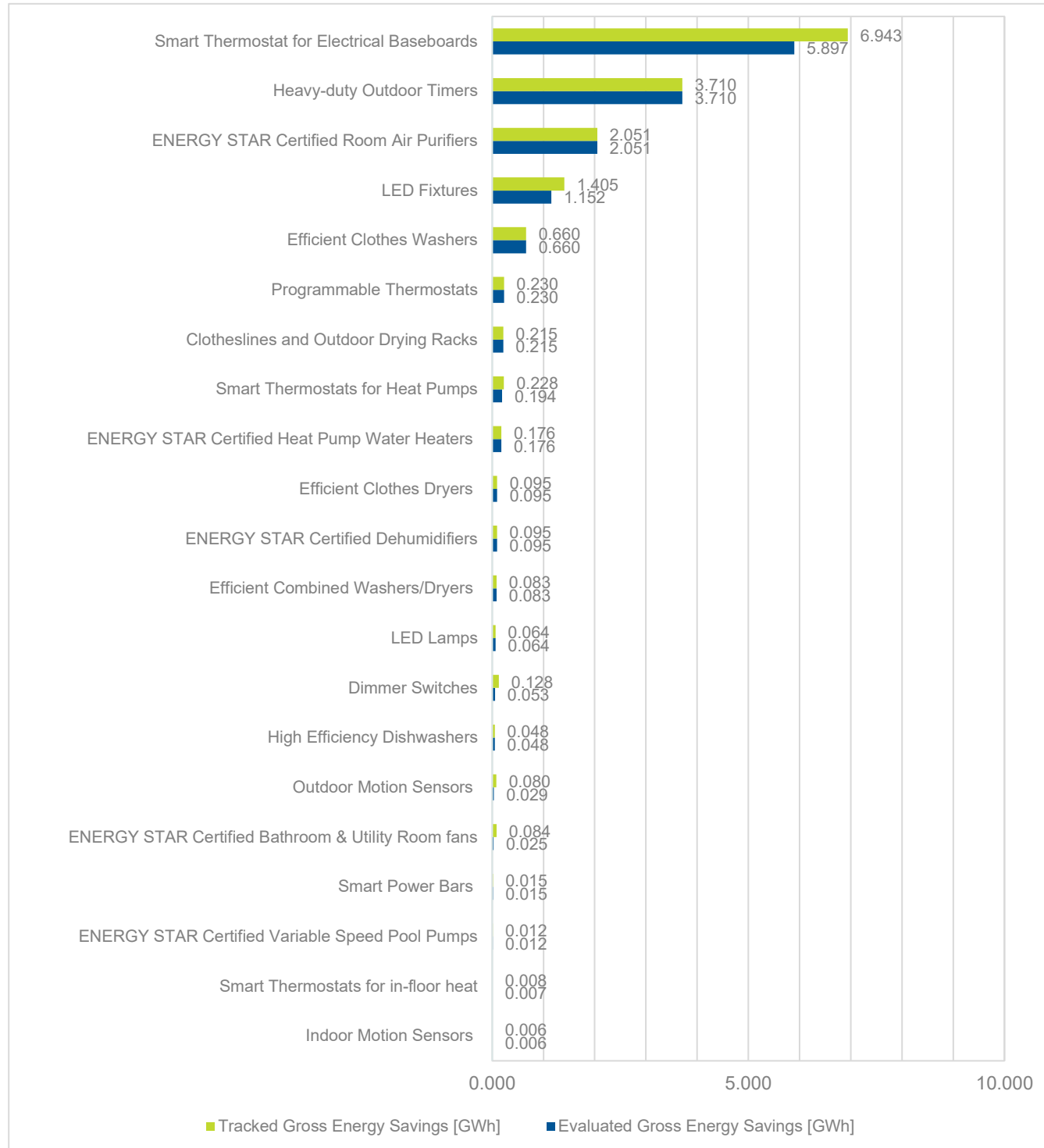
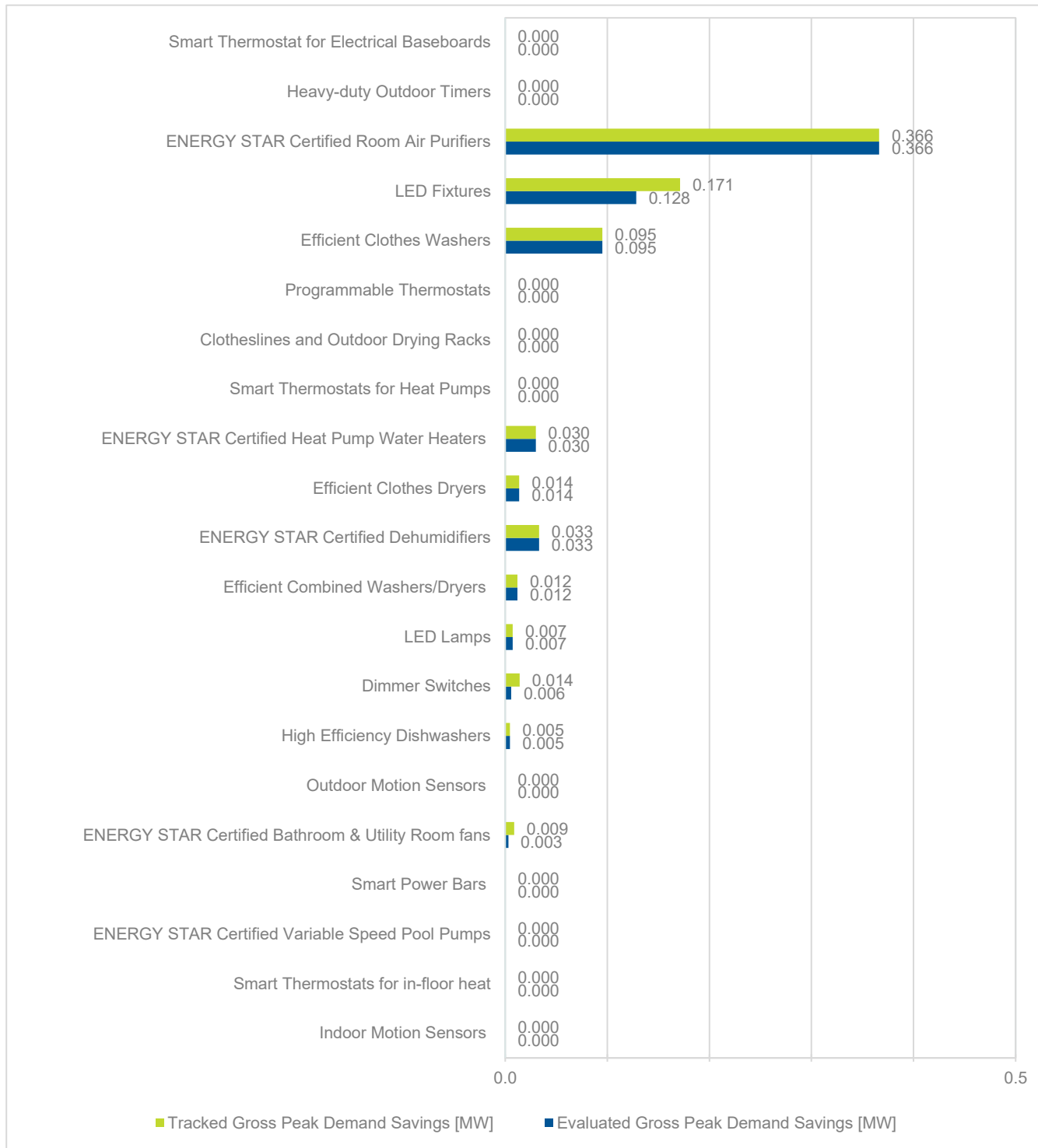


Figure 10: 2025 Instant Savings Tracked and Evaluated Gross Peak Demand Savings



As presented in Table 19 below, GHG emission reductions were calculated by applying the Nova Scotia-specific factor¹⁸ for GHG emissions generated by electricity production to Instant Savings gross savings.

Table 19: Evaluated 2025 Instant Savings Gross GHG Emission Reductions

	Total
Gross Energy Savings – at the Generator (GWh)	14.817
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO2 eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO2 eq)	6,954

7.3 Net Savings

The Evaluator determined the net electrical energy and peak demand savings, that is the electrical energy and peak demand savings that can be reliably attributed to the program component, by estimating the NTGR. In the case of Instant Savings, before this evaluation, free-ridership and spillover had only been considered for three specific products, namely LED lamps, LED recessed downlight fixtures (simplified as recessed fixtures), and other LED fixtures. With the removal of most LED products following the LED baseline change, the Evaluator reassessed the evaluation of net savings. To comply with current industry best practices highlighted in the Net-to-Gross Ratio Review¹⁹ report by not assuming nil free-ridership for measures without measured free-ridership, the Evaluator established NTGR values for all other non-lighting products offered through Instant Savings. The literature review provided distinct free-ridership and spillover levels for certain measures while only providing final NTGR values for others. The results of the literature review are presented in Appendix IV.

7.3.1 Free-ridership

For LED fixtures with motion sensors and solar fixtures, the free-ridership levels established in the 2024 Instant Savings evaluation were used. For certain non-lighting measures, namely clothes washers, clothes dryers, combined washers/dryers, dehumidifiers, pool pumps, and bathroom and utility fans, the conducted literature review provided enough detail to establish a distinct free-ridership level. The free-ridership levels for the above products are presented in Table 20.

Table 20: Free-ridership Levels Established in the 2025 Instant Savings Evaluation

Product	Free-ridership Level
Efficient Clothes Washers	51%
ENERGY STAR Certified Clothes Dryers	48%
Efficient Combined Washers/Dryers	50%
ENERGY STAR Certified Dehumidifiers	34%
ENERGY STAR Certified Variable Speed Pool Pumps	24%
ENERGY STAR Certified Bathroom and Utility Fans	38%

¹⁸ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO2 eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed August 26, 2025) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).

¹⁹ Econoler for E1. *Net-to-Gross Ratio Review – Final Report*, November 2024.

7.3.2 Spillover

For LED fixtures with motion sensors and solar fixtures, the spillover levels established in the 2024 Instant Savings evaluation were used. For non-lighting measures for which free-ridership levels were established, namely clothes washers, clothes dryers, combined washers/dryers, pool pumps and bathroom and utility fans, the conducted literature review provided enough detail to also establish a distinct spillover level. The spillover levels for the above products are shown in Table 21 below.

Table 21: Spillover Levels Used in the 2025 Instant Savings Evaluation

Product	Spillover Level
Efficient Clothes Washers	3%
ENERGY STAR Certified Clothes Dryers	
Efficient Combined Washers/Dryers	
ENERGY STAR Certified Dehumidifiers	
ENERGY STAR Certified Variable Speed Pool Pumps	
ENERGY STAR Certified Bathroom and Utility Fans	

7.3.3 Net-to-gross Ratio Calculations

The NTGRs are calculated using the following equation.

$$NTGR = (1 - \% \text{ Free-ridership} + \% \text{ Spillover})$$

Using this equation, the NTGR values were estimated for rebated products for which free-ridership and spillover levels were determined. For other products, only a final NTGR value was established based on the literature review findings.

Table 22 summarizes the NTGR of each product category and its respective free-ridership and spillover levels where applicable. For LED lighting products, the NTGR values established through the 2024 Instant Savings evaluation were used.

Table 22: 2025 Instant Savings Net-to-gross Ratios

Product	Free-ridership Level	Spillover Level	Tracked Net-to-gross Ratio	Evaluated Net-to-gross Ratio
Dimmer Switches	-	-	1.00	0.75
Indoor Motion Sensors	-	-		0.75
Indoor Motion Sensors with Dimmer Switches	-	-		0.75
Outdoor Motion Sensors	-	-		0.75
Heavy-duty Outdoor Timers	-	-		0.75
Power Bars with Integrated Timers	-	-		0.86
Smart Power Bars	-	-		0.86
Programmable Thermostats	-	-		0.86
Smart Thermostats for Mini-split Heat Pumps	-	-		0.86
Smart Thermostats for Electric Baseboards	-	-		0.86
Smart Thermostats for Electric In-floor Heating	.	-		0.86
Efficient Clothes Washers	51%	3%		0.52
ENERGY STAR Certified Clothes Dryers	48%	3%		0.55
Efficient Combined Clothes Washers and Dryers	50%	3%		0.53
ENERGY STAR Certified Room Air Purifiers	-	-		0.65
ENERGY STAR Certified Dehumidifiers	34%	3%		0.69
ENERGY STAR Certified Variable Speed Pool Pumps	24%	3%		0.79
ENERGY STAR Heat Pump Water Heaters	-	-		1.00
ENERGY STAR Certified Dishwashers	-	-		0.55
ENERGY STAR Certified Bathroom and Utility Fans	38%	3%		0.65
Outdoor Clotheslines and Outdoor Drying Racks	-	-		0.65

7.3.4 Evaluated Net Savings

Net savings are defined as the changes in energy use that are attributable specifically to Instant Savings. Net program component impacts were estimated by applying the overall NTGR to gross savings as exemplified in the following equation.

$$\text{Net Savings} = \text{Gross Savings} \times \text{NTGR}$$

This equation was used to calculate both net electrical energy savings and net peak demand savings.

The detailed results are presented in Table 23 below. The net electrical energy savings resulted in 5,364 tonnes of CO₂ eq in net annual GHG emission reductions.

Table 23: Evaluated 2025 Instant Savings Net Electrical Energy and Peak Demand Savings

#Product Category	LED Non-A-type Lamps		LED Recessed Downlight Fixtures	LED ENERGY STAR Fixtures			Dimmer Switches	Indoor Motion Sensors	Outdoor Motion Sensors
	R, BR, and Decorative	Others		Without Motion Sensors	With Motion Sensors	Solar Fixtures			
Electrical Energy Savings									
Gross Electrical Energy Savings – at the Meter (GWh)	0.028	0.030	0.629	0.394	0.004	0.026	0.049	0.005	0.027
NTGR	0.70	0.70	0.76	0.76	0.76	0.76	0.75	0.75	0.75
Net Electrical Energy Savings – at the Meter (GWh)	0.020	0.021	0.478	0.299	0.003	0.020	0.037	0.004	0.020
Line Loss Factor	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947
Net Electrical Energy Savings – at the Generator (GWh)	0.022	0.023	0.523	0.328	0.003	0.021	0.040	0.004	0.022
Effective Useful Life (years)	1.0	1.0	1.0	1.0	10	10	10	10	10
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	0.022	0.023	0.523	0.328	0.029	0.214	0.400	0.044	0.219
Peak Demand Savings									
Gross Peak Demand Savings – at the Meter (MW)	0.003	0.003	0.066	0.041	0.001	0.004	0.005	-	-
NTGR	0.70	0.70	0.76	0.76	0.76	0.76	0.75	0.75	0.75
Net Peak Demand Savings – at the Meter (MW)	0.002	0.002	0.050	0.031	0.000	0.003	0.004	-	-
Line Loss Factor	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466
Net Peak Demand Savings – at the Generator (MW)	0.002	0.003	0.057	0.036	0.000	0.004	0.004	-	-

Evaluated 2025 Instant Savings Net Energy and Peak Demand Savings (Continued)

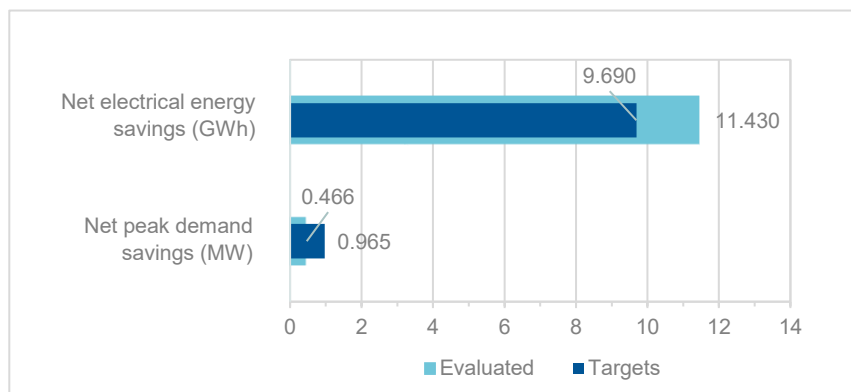
Product Category	Smart Power Bars	Heavy-duty Outdoor Timers	Programmable Thermostats	Smart Thermostats			Clotheslines	Efficient Clothes Washers	Efficient Clothes Dryers
				Electric Baseboards	MSHPs	In-floor Heating			
Electrical Energy Savings									
Gross Electrical Energy Savings – at the Meter (GWh)	0.013	3.389	0.210	5.387	0.177	0.006	0.197	0.603	0.087
NTGR	0.86	0.75	0.86	0.86	0.86	0.86	0.65	0.52	0.55
Net Electrical Energy Savings – at the Meter (GWh)	0.011	2.542	0.181	4.633	0.152	0.005	0.128	0.314	0.048
Line Loss Factor	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947
Net Electrical Energy Savings – at the Generator (GWh)	0.013	2.783	0.198	5.071	0.167	0.006	0.140	0.343	0.052
Effective Useful Life (years)	4	10	10	10	10	10	10	11	12
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	0.050	27.827	1.979	50.712	1.669	0.057	1.400	3.775	0.629
Peak Demand Savings									
Gross Peak Demand Savings – at the Meter (MW)	-	-	-	-	-	-	-	0.083	0.012
NTGR	0.86	0.75	0.86	0.86	0.86	0.86	0.65	0.52	0.55
Net Peak Demand Savings – at the Meter (MW)	-	-	-	-	-	-	-	0.043	0.007
Line Loss Factor	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466
Net Peak Demand Savings – at the Generator (MW)	-	-	-	-	-	-	-	0.049	0.008

Evaluated 2025 Instant Savings Net Electrical Energy and Peak Demand Savings (Continued)

Product Category	Efficient Combined Washers/Dryers	Room Air Purifiers	Dehumidifiers	Pool Pumps	Heat Pump Water Heaters	High Efficiency Dishwashers	Bathroom and Utility Fans	Total for All Products
Electrical Energy Savings								
Gross Electrical Energy Savings – at the Meter (GWh)	0.076	1.873	0.087	0.011	0.161	0.044	0.023	13.536
NTGR	0.53	0.65	0.69	0.79	1.00	0.55	0.65	0.77
Net Electrical Energy Savings – at the Meter (GWh)	0.040	1.218	0.060	0.009	0.161	0.024	0.015	10.441
Line Loss Factor	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947
Net Electrical Energy Savings – at the Generator (GWh)	0.044	1.333	0.065	0.010	0.176	0.027	0.016	11.430
Effective Useful Life (years)	11	9	12	10	15	11	19	9.3
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	0.484	11.996	0.785	0.096	2.646	0.292	0.307	106.508
Peak Demand Savings								
Gross Peak Demand Savings – at the Meter (MW)	0.010	0.320	0.029	-	0.026	0.004	0.003	0.610
NTGR	0.53	0.65	0.69	0.79	1.00	0.55	0.65	0.67
Net Peak Demand Savings – at the Meter (MW)	0.006	0.208	0.020	-	0.026	0.002	0.002	0.406
Line Loss Factor	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466
Net Peak Demand Savings – at the Generator (MW)	0.006	0.238	0.023	-	0.030	0.003	0.002	0.466

As outlined in Figure 11 below, Instant Savings exceeded its electrical energy savings target by 18% and fell short of its peak demand savings targets by 52%.

Figure 11: 2025 Instant Savings Targets and Evaluated Results



7.4 Realization Rate

Table 24 below compares the electrical energy and peak demand savings established through this evaluation to those tracked by E1. It also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings.

Table 24: Comparison of 2025 Instant Savings Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR*	Net Savings		Realization Rate
	Value	Unit	Value	Value	Unit	Value
Electrical Energy Savings						
Tracked Savings by E1	16.337	GWh	0.98	15.981	GWh	72%
Evaluation Results	14.817	GWh	0.77	11.430	GWh	
Tracked Savings by E1	0.757	MW	0.94	0.713	MW	65%
Evaluation Results	0.700	MW	0.67	0.466	MW	
*NTGRs varied for each product category. The NTGRs presented in this table correspond to the rounded averages obtained by dividing net savings by gross savings.						

The evaluated net electrical energy savings and net peak demand savings were 28% and 35% respectively lower than the values tracked by E1 due to the inclusion of NTGR values for non-lighting measures. The evaluated gross electrical energy savings were 9% lower than those tracked by E1 and evaluated peak demand savings were 8% lower than those tracked due to updates to the unitary savings values for several products, notably dimmer switches, following a change to a LED baseline assumption.



8 Instant Savings Key Findings and Recommendations

The 2025 Instant Savings evaluation included a condensed impact evaluation and a literature review to determine NTGRs for non-lighting measures. The main objectives of the 2025 Instant Savings evaluation were as follows:

- › Calculate gross and net results, namely first-year and lifetime electrical energy savings, peak demand savings, as well as avoided GHG emissions

This section provides the Evaluator's key findings in relation to the above objectives. The Evaluator has no specific recommendation for Instant Savings.

2025 Instant Savings-Finding: Instant Savings surpassed its net electrical energy savings target by 18% and fell short of its peak demand savings target by 52%.

Instant Savings achieved 11.430 GWh in net electrical energy savings and 0.466 MW in net peak demand savings at the generator in 2025, thus surpassing the planned net electrical energy savings target of 9.690 GWh and falling short of its net peak demand savings target of 0.965 MW.

2025 Instant Savings-Finding: Following the removal of LED lighting products and dehumidifiers from the Instant Savings offering, 2025 program participation levels decreased by 71% compared to 2024 levels.

With the removal of LED lighting products and dehumidifiers from the program offering, the total number of rebated products fell from 395,472 products in 2024 to 113,696 products in 2025.

2025 Instant Savings-Finding: Controls now constitute the most significantly rebated product category, representing 61% of all rebated products and 68% of all gross electrical energy savings.

With 69,295 rebated products and 10.141 GWh in gross electrical energy savings, controls are now the most popular rebated product category in the Instant Savings program offering. Within this product category, outdoor heavy-duty timers, dimmer switches, and smart thermostats for electric heat are the best-selling control products, representing 40%, 25%, and 29% of all rebated control products respectively.

2025 Instant Savings-Finding: The evaluated net electrical energy savings and net peak demand savings determined by the Evaluator were lower than the net savings tracked by E1.

The evaluated net electrical energy and peak demand savings were 28% and 35% respectively lower than the values tracked by E1 due to the application of NTGRs established for non-lighting products in the NTGR literature review.

2025 Instant Savings-Finding: The evaluated overall 2025 program NTGR was 0.77, while the overall program NTGR value tracked was 0.98.

Before the 2025 evaluation, LED lamps and LED fixtures were assigned NTGR values of 0.70 and 0.76 respectively. All other non-lighting products had an assigned NTGR value of 1.00. Following the 2025 literature review to establish NTGRs for non-lighting products, the overall program NTGR was updated from 0.98 to 0.77.

CONCLUSION

Table 25 presents the participation levels, NTGRs, evaluated gross and net savings at the generator, annual GHG emission reductions, as well as EUL values for each Residential Efficient Product Rebates program component and for the program as a whole.

Table 25: Overall 2025 Residential Efficient Product Rebates Participation and Evaluated Savings

	Participation Level		Gross Savings		NTGR	Net Savings	
	Value	Unit	Value	Unit	Value	Value	Unit
ARet							
Electrical Energy Savings	285	Appliances	0.205	GWh	0.56	0.115	GWh
Lifetime Electrical Energy Savings			0.818	GWh	0.56	0.461	GWh
Peak Demand Savings			0.029	MW	0.56	0.017	MW
Annual GHG Emission Reductions			96	Tonnes of CO2 eq	0.56	54	Tonnes of CO2 eq
EUL			4.0	Years		4.0	Years
Instant Savings							
Electrical Energy Savings	113,696	Products sold	14.817	GWh	0.77	11.430	GWh
Lifetime Electrical Energy Savings			137.661	GWh	0.77	106.508	GWh
Peak Demand Savings			0.700	MW	0.67	0.466	MW
Annual GHG Emission Reductions			6,954	Tonnes of CO2 eq	0.77	5,364	Tonnes of CO2 eq
EUL			9.3	Years		9.3	Years
Total							
Electrical Energy Savings			15.022	GWh	0.77	11.545	GWh
Lifetime Electrical Energy Savings			138.479	GWh	0.77	106.969	GWh
Peak Demand Savings			0.729	MW	0.66	0.483	MW
Annual GHG Emission Reductions			7,050	Tonnes of CO2 eq	0.77	5,418	Tonnes of CO2 eq
EUL			9.2	GWh		9.3	Years

Figure 12 and Figure 13 below illustrate the net electrical energy and peak demand savings targets respectively for each program component and for Residential Efficient Product Rebates as a whole. Residential Efficient Product Rebates was aimed at achieving 10.937 GWh in net electrical energy savings and 1.144 MW in net peak demand savings at the generator for 2024. The program exceeded the net electrical energy savings target by 6% while falling short of the net peak demand savings target by 58%, mostly driven by Instant Savings that remains the largest contributor to total program net electrical energy and peak demand savings.

Figure 12: 2025 Residential Efficient Product Rebates Targeted and Evaluated Net Electrical Energy Savings

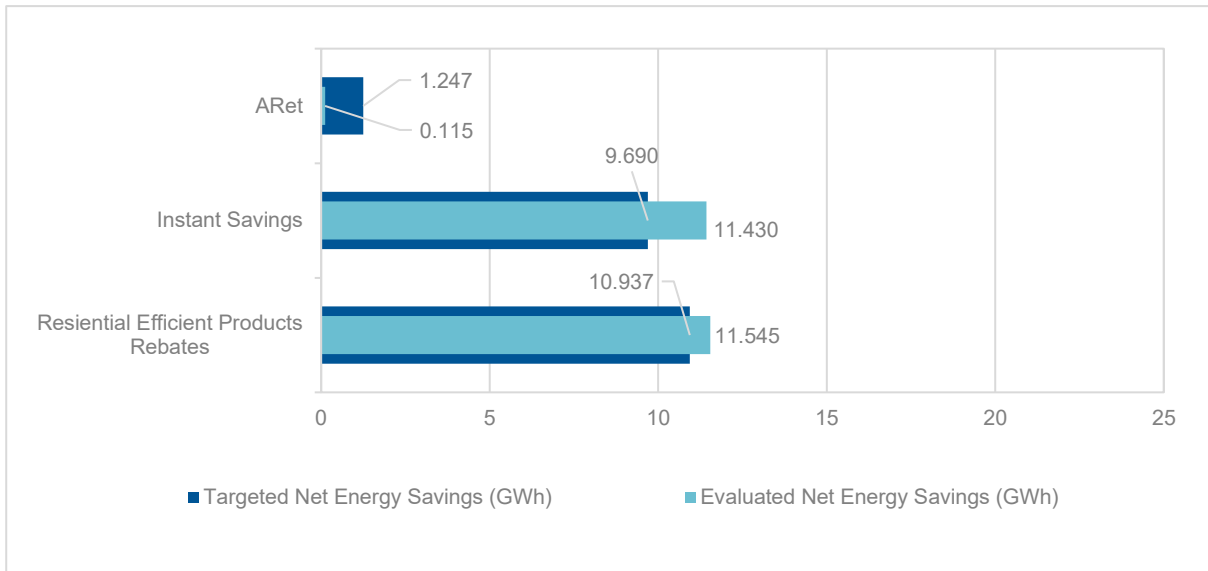
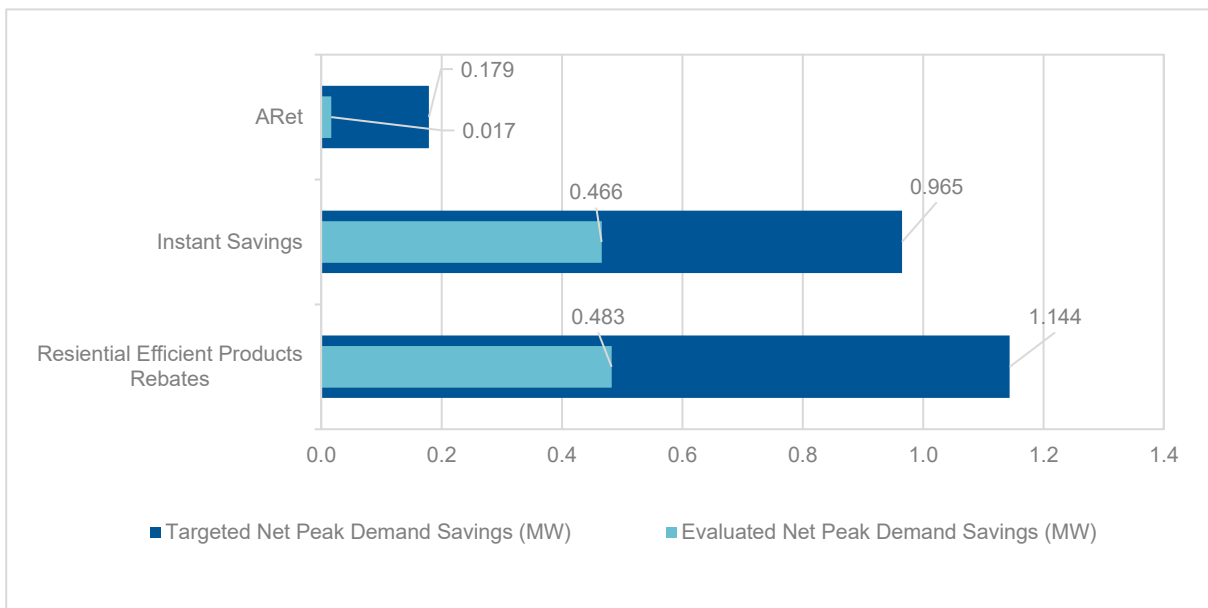


Figure 13: 2025 Residential Efficient Product Rebates Targeted and Evaluated Net Peak Demand Savings



LIST OF APPENDICES

The following are presented in the Residential Efficient Product Rebates Program – Appendices document.

Appliance Retirement

Appendix I ARet: Tracking Sheet Audit

Appendix II ARet: 2025 Recommendations

Instant Savings

Appendix III Instant Savings: Tracking Sheet Audit

Appendix IV Instant Savings: 2025 Net-to-gross Ratio Literature Review

Appendix V Instant Savings: 2025 Recommendations



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Final Appendix Report

2025 DSM EVALUATION

March 4, 2026



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APPENDIX I

ARet Tracking Sheet Audit

This appendix presents the main results of the tracking sheet audit performed by the Evaluator, which was aimed at:

- › Verifying that all data fields required for the evaluation were included and filled out in the tracking sheet submitted by EfficiencyOne (E1)
- › Ensuring that tracked results were accurate by:
 - › Verifying that parameters used to calculate program results (gross and net energy and peak demand savings at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were performed consistently

Table 1 presents the corrected tracked savings resulting from all changes made by the Evaluator.

Table 1: 2025 ARet Corrected Tracked Savings

Program Component Results	Value Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	Value
ARet					
Gross Energy Savings at the Generator	0.204	GWh	0.205	GWh	0.61%
Gross Peak Demand Savings at the Generator	0.029	MW	0.029	MW	0.59%
Net Energy Savings at the Generator	0.115	GWh	0.115	GWh	0.62%
Net Peak Demand Savings at the Generator	0.016	MW	0.017	MW	0.60%

Overall, the difference between tracked and corrected values is minor. The difference in gross electrical energy and peak demand savings is mainly due to the different rounding method used by the Evaluator for peak demand-to-energy ratios and line loss factors. The impact is negligible.



APPENDIX II

ARet 2025 Recommendations

The Evaluator made no specific recommendation as part of the 2025 evaluation of ARet.

APPENDIX III

Instant Savings Tracking Sheet Audit

This appendix presents the main results of the tracking sheet audit performed by the Evaluator, which was aimed at:

- › Verifying that all data fields required for the evaluation were included and filled out in the tracking sheet submitted by E1
- › Ensuring that tracked results were accurate by:
 - › Verifying that parameters used to calculate program results (gross and net energy and peak demand savings at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were performed consistently

Table 1 presents the corrected tracked savings resulting from all changes made by the Evaluator.

Table 1: 2025 Instant Savings Corrected Tracked Savings

Program Component Results	Value Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	Value
Instant Savings					
Gross Electrical Energy Savings at the Generator	16.340	GWh	16.337	GWh	-0.01%
Gross Peak Demand Savings at the Generator	0.765	MW	0.757	MW	-1.09%
Net Electrical Energy Savings at the Generator	15.983	GWh	15.981	GWh	-0.01%
Net Peak Demand Savings at the Generator	0.720	MW	0.713	MW	-0.88%

The Evaluator found differences between the tracked and corrected tracked values for electrical energy savings mainly because the installation rate of 86% for smart power controllers was not applied. As for the peak demand savings, the difference comes from the unitary peak demand savings value not having been updated following an adjustment when accounting for a change to a LED baseline assumption.

APPENDIX IV

Instant Savings Net-to-Gross Ratio Literature Review

Introduction

For Instant Savings, free-ridership occurs when participants would have installed the same energy efficient products in the absence of the program component. The Net-to-Gross Ratio Review¹ report recommends that NTGR is considered for all measures, utilizing a deemed ratio or program level ratio when it is not measured. In the case of Instant Savings, due to the number of measures in the program and program design, it is challenging to measure net-to-gross (NTG) levels for all measures. Therefore, the Evaluator relied on a literature review to establish NTG levels to be used for Instant Savings measures.

Methodology

The Evaluator conducted a literature review of technical reference manuals (TRMs), NTG studies and instant rebate program impact evaluation reports across 12 jurisdictions in Canada and the United States for NTGR assumptions of Instant Savings measures. If NTGR values for specific measures were not found, the Evaluator grouped certain similar measures, assuming that the motivation behind the customer's purchase as well as program influence regarding grouped measures were similar. This is the case for lighting controls, power strips and thermostats.

Two main factors were used to determine whether NTGR values found in the literature would be retained or discarded: the referenced program delivery method and the quality of the sources of NTGR assumptions. Regarding the program delivery method, priority was given to instant rebate programs and online marketplaces, both of which include incentives applied to end users' purchases at the point of sale and target the same stage of the customer decision-making process. Priority was also given to values determined using participant survey data followed by values established through literature reviews. For reference, Table 1 indicates which jurisdictions were consulted, the source of available information on NTGRs and whether the jurisdictions were retained.

¹ Econoler for E1. *Net-to-Gross Ratio Review – Final Report*, November 2024.

Table 1: Jurisdictions Consulted Within Literature Review

Jurisdiction	Scope of Available Information on NTGRs	Whether the Jurisdiction Was Retained	Rationale
California	Found in program evaluation reports	No	Reviewed reports with NTG evaluations are not for instant rebate programs.
Connecticut	Found in studies	No	Reviewed studies with NTG evaluations are not for instant rebate programs.
Iowa	Unavailable	No	No NTG information specific to Iowa found.
Illinois	Found in program evaluation reports and studies	Yes	Available NTG information pertains to instant rebate programs.
Maine	Found in TRM	No	Available NTG information pertaining to instant rebate measures is outdated compared to other available sources.
Massachusetts	Found in TRM, program evaluation reports and studies	No	Available NTG information is either old or is not for instant rebate programs
Minnesota	Unavailable	No	No NTG information specific to Minnesota found
New Jersey	Found in TRM and studies	Yes	Available NTG information pertains to instant rebate programs.
New York	Found in studies	Yes	Available NTG information pertains to instant rebate programs.
Ontario	Unavailable	No	No NTG information specific to Ontario found.
Regional Technical Forum (Northwestern US)	Unavailable	No	No NTG information specific to this region found.
Rhode Island	Found in TRM	No	Available NTG information pertaining to instant rebate measures is outdated or refers to studies from jurisdictions already mentioned in this review.
Vermont	Unavailable	No	No NTG information specific to Vermont found.
Wisconsin	Found in program evaluation reports	Yes	Available NTG information pertains to instant rebate programs.

For the most part, only final NTGR values were provided in the literature, that is free-ridership and spillover were not separately documented. However, documentation from Illinois contained additional context by also providing free-ridership (FR) and spillover (SO) values. When available, spillover values were included in NTG assumptions.

Table 2 presents NTGR established by measure based on this review along with reference and rationale used. It should be noted that the NTGR values for solar fixtures and heat pump water heaters were not based on the literature review. The literature review did not reveal any reliable NTGR value to assign to solar fixtures, so the Evaluator elected to assign a value of 0.76, which is currently used by EfficiencyOne (E1) as the NTGR for LED fixtures. As for heat pump water heaters, given that the Evaluator is aware that heat pump water heater awareness and market penetration is low in Nova Scotia based on recent market transformation research, the NTGR value is assumed to be 1.00.

Table 2: Assigned NTGR Assumptions

Measure Available Through Instant Savings	Associated Measure in Reference	Assigned NTGR	Reference	Program Delivery Mode Associated with Assigned NTGR	Rationale Behind Assigned NTGR
Dimmer Switches	Occupancy Sensors	0.75	New Jersey Net-to-Gross Ratios Overall Report	Online	Value assigned based on market data (broad market trends) supported by a literature review of 78 sources spread across eight jurisdictions.
Indoor Motion Sensors					
Indoor Motion Sensors with Dimmer Switches					
Outdoor Motion Sensors					
Heavy-duty Outdoor Timers					
Solar Fixtures	LED Fixtures	0.76	E1 2024 Instant Savings evaluation	Instant rebate/Point of sale	No reliable value found in literature assigned to solar fixtures, therefore the Evaluator assigned the existing LED fixture NTGR value.
Power Bars with Integrated Timers	Advanced Power Strips	0.86	Focus on Energy CY2022 Evaluation report	Online marketplace	2021 self-report participant survey, data from 73 completed surveys.
Smart Power Controllers for Audiovisual Equipment					
Programmable Thermostats	Smart Thermostats	0.86	Focus on Energy CY2022 Evaluation report	Online marketplace	2021 self-report participant survey, data from 104 completed surveys.
Smart Thermostats for Mini-split Heat Pumps					
Smart Thermostats for Electric Baseboards					
Smart Thermostats for Electric In-floor Heating					
Efficient Clothes Washers	Clothes Washers	0.52 (FR = 0.51, SO = 0.03)	Ameren 2025 NTGR Recommendations	Instant rebate/Point of sale	FR: 2024 evaluation with self-report participant survey, data from 89 completed surveys SO: 2024 evaluation with self-report participant survey, data from 366 completed surveys
ENERGY STAR Certified Clothes Dryers	Clothes Dryers	0.55 (FR = 0.48, SO = 0.03)	Ameren 2025 NTGR Recommendations	Instant rebate/Point of sale	FR: 2024 evaluation with self-report participant survey, data from 68 completed surveys SO: 2024 evaluation with self-report participant survey, data from 366 completed surveys

Measure Available Through Instant Savings	Associated Measure in Reference	Assigned NTGR	Reference	Program Delivery Mode Associated with Assigned NTGR	Rationale Behind Assigned NTGR
Efficient Combined Clothes Washers and Dryers	Clothes Washers Clothes Dryers	0.53 (FR = 0.50, SO = 0.03)	Ameren 2025 NTGR Recommendations	Instant rebate/Point of sale	Average FR and SO values of Efficient Clothes Washers and ENERGY STAR Certified Clothes Dryers
ENERGY STAR Certified Room Air Purifiers	Air Purifiers	0.65	New York State Electric & Gas Corporation (NYSEG) and Rochester Gas and Electric Corporation (RG&E) Attribution Study Evaluation Report	Instant rebate/Point of sale	Value from New Jersey 2023 TRM, median of 13 NTGR values from literature review
ENERGY STAR Certified Dehumidifiers	Dehumidifiers	0.69 (FR = 0.34, SO = 0.03)	Ameren 2025 NTGR Recommendations	Instant rebate/Point of sale	<u>FR</u> : 2024 evaluation with self-report participant survey, data from 52 completed surveys <u>SO</u> : 2024 evaluation with self-report participant survey, data from 366 completed surveys
ENERGY STAR Certified Variable Speed Pool Pumps	Pool Pumps	0.79 (FR = 0.24, SO = 0.03)	Ameren 2025 NTGR Recommendations	Instant rebate/Point of sale	<u>FR</u> : 2018 evaluation with self-report participant survey, data from 61 completed surveys <u>SO</u> : 2024 evaluation with self-report participant survey, data from 366 completed surveys
ENERGY STAR Heat Pump Water Heaters	N/A	1.00	Assumption	N/A	Value assumed to be 1.00 given EOne and the Evaluator research for market transformation program showing low awareness and market penetration.
ENERGY STAR Certified Dishwashers	Dishwashers	0.55	New Jersey Net-to-Gross Ratios Overall Report	Application rebate/Point of Sale	Value based on median of suggested range for comparable kitchen appliances of 0.50 to 0.59.
Bathroom Exhaust Fans	Bathroom Exhaust Fans	0.65 (FR = 0.38, SO = 0.03)	Ameren 2025 NTGR Recommendations	Instant rebate/Point of sale	<u>FR</u> : 2018 evaluation with self-report participant survey, data from 46 completed surveys <u>SO</u> : 2024 evaluation with self-report participant survey, data from 366 completed surveys

Future Considerations

In order to remain aligned with good industry practice, the Evaluator recommends the adoption of the NTGR values presented in this memo. Looking ahead, the Evaluator intends to work with E1 to consider targeted evaluation activities to estimate NTGR values for selected Instant Savings program measures, particularly if they represent a large portion of portfolio-savings.



APPENDIX V

Instant Savings 2025 Recommendations

The Evaluator made no specific recommendation as part of the 2025 evaluation of Instant Savings.



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EfficiencyOne

EXISTING RESIDENTIAL PROGRAM

Final Report

2025 DSM EVALUATION

March 13, 2026



ECONOLUX



ABBREVIATIONS

AMH	Affordable Multifamily Housing
AMI	Advanced metering infrastructure
AR	Adjustment ratio
ASFH	Affordable Single-family Homes
AWHP	Air-to-water heat pump
BNI	Business, non-profit, and institutional
CASHP	Centrally ducted air-source heat pump
CGH Grant	Canada Greener Homes Grant
CIS	Customer Information System
DA	Delivery agent
DHW	Domestic hot water
DiD	Difference-in-difference
DR	Demand response
DSM	Demand-side management
DSM MA	Demand-side Management Measure Assessment
E1	EfficiencyOne
EA	Energy auditor
EFLH	Equivalent full load hour
ENS	Efficiency Nova Scotia
EPI	Efficient Product Installation
EPP	Efficiency Preferred Partners
ESA	Energy Solutions Advisor
ETN	Efficiency Trade Network
ETS	Electric Thermal Storage
EUL	Effective useful life
GHG	Greenhouse gas
HEA	Home Energy Assessment
HER	Home Energy Report
HM	Housing manager
HPWH	Heat pump water heater
LCEF	Low Carbon Economy Fund
LED	Light-emitting diode



MEI	MyEnergy Insights
MHEEP	Mi'kmaw Home Energy Efficiency Project
MSHP	Mini-split heat pump
MURB	Multi-unit residential building
NRCan	Natural Resources Canada
NS Power	Nova Scotia Power
NSEB	Nova Scotia Energy Board
NSUARB	Nova Scotia Utility and Review Board
NTGR	Net-to-gross ratio
OHPA	Oil to Heat Pump Affordability
OR	Overestimation ratio
PNS	Province of Nova Scotia
PV	Photovoltaic
RCT	Randomized control trial
UMP	Uniform Methods Project

DEFINITIONS

Accuracy	Reflects the proximity of measurements to the true value.
Adjustment ratio	The ratio of evaluated results to tracked results. This ratio expresses the adjustment made to tracked savings or other tracked values such as effective useful life values.
Available Demand Response Capacity	The capacity that is available to Nova Scotia Power (NS Power) to reduce system peak demand. This capacity is calculated based on the first two hours of all events called between December and February, excluding weekends and holidays. If an event is shorter than two hours, only the first hour is used to measure available demand response (DR) capacity. Available DR capacity is evaluated on a per-participant basis based on the average demand reduction observed for each event in which the participant was scheduled to participate. E1's total available DR capacity is the sum of each participant's available DR capacity.
Baseline	To determine gross savings, a baseline (or base case) is established, providing detailed information about the reference (e.g. pre-existing or standard) measure or equipment chosen to be compared with the efficient measure or equipment. For the reference measure or equipment, the baseline may include such information as the hours of operation, wattage, and base consumption.
Bias	Systematic deviations of measurements from the true value.
Billing calibration	An activity that consists of adjusting the expected energy savings based on the relative difference between the results of energy simulations and the actual energy consumption of a building or system.
Confidence interval	The estimated range of values that is likely to include unknown population parameters.
Demand response	Demand response measures generate savings in the form of available capacity or a load reduction in response to events called by the electric utility (NS Power) to reduce the load at strategic moments. These events can be called at any time and for any duration, although they are usually called for one to four hours during peak periods.
Displaced wattage	The displaced wattage is defined as the difference between the wattage values of the baseline equipment or product and that of the efficient equipment or product.
EnerGuide rating	An EnerGuide (official brand of Natural Resources Canada) rating is a standard measure of home energy performance. It is a measure of the efficiency of the building only and does not take into account occupant behaviour. It shows how energy efficient a home is through modelled home heat losses based on several factors including building envelope characteristics, heated volume, heating systems, and air leakage.
Effective useful life	The period a measure is expected to be in service and provide both electrical energy and peak demand savings. This value combines equipment life and measure persistence, which includes factors such as business turnover or early retirement.
Equipment life	The number of years installed equipment will operate before it fails.



Equivalent CO2	A unit of measurement indicating the amount of carbon dioxide to which various kinds of emitted greenhouse gases are equivalent in terms of warming effects. In this report, gas global warming potential is estimated over a timescale of 100 years.
Equivalent effective useful life	The number of years by which the first-year savings estimate is multiplied to obtain lifetime energy savings. This value takes into account variations in annual electrical energy savings throughout the effective useful life due to increased baselines.
Evaluated savings	Gross and net electrical energy or peak demand savings calculated by the Evaluator using the parameters (unitary savings values, installation rates, interactive effects, net-to-gross ratios, etc.) validated or measured during the evaluation process. Unless otherwise specified, evaluated savings are first-year savings.
Evaluation plan	The evaluation plan summarizes the program description, objectives, base cases, documentation, evaluation methodology, budget, and schedule.
First-year savings	The first full year of electrical energy or peak demand savings generated by an energy efficiency measure.
Free-ridership	Percentage of gross savings attributable to participants who would have implemented the same or similar energy efficiency measures, with no change in timing, in the absence of the program.
Gross savings	Change in energy consumption and/or demand that results directly from program-related actions taken by participants in an energy efficiency program regardless of why they participated.
Induced consumption	Energy consumption of appliances that would have been unplugged and not replaced by participants in the absence of the program.
Interactive effects	Effects on the energy consumption of other systems (such as heating and cooling) in a building due to the installation of an energy efficiency measure.
In-service rate	The proportion of incentivized products installed and operating. This rate is usually applied to programs through which rebates are offered in-store and products are likely to be stored for a certain period before being installed, such as light-emitting diode (LED) lamps.
Installation rate	The proportion of incentivized products reported as installed and that remain installed and operating at the time of evaluation. This rate is usually applied to direct install or mail-in rebate programs through which measures are expected to be installed immediately at the time of participation.
Lifetime energy savings	The energy savings that occur over the lifetime of an energy efficiency measure. Lifetime energy savings account for a measure's effective useful life and any increase in the baseline efficiency level (which reduces attributable annual savings) over its lifetime.
Line loss factor	The multiplier to convert savings at the customer meter to savings at the utility generator. It accounts for the electrical losses of the transmission and distribution system.
Margin of error	The amount of random sampling error.
Market effects	The impact of a program on the market (in terms of product availability, practices, and prices) and that extends beyond changing program participant behaviours. Market effects include spillover among non-participants.

Net savings	Electrical energy or peak demand savings that can be reliably attributed to a program. These include effects such as free-ridership and spillover that negatively or positively affect the savings attributable to a program.
Net-to-gross ratio	The ratio of net electrical energy savings to gross electrical energy savings.
Non-sampling error	Errors arising during the course of all survey activities other than sampling. Non-sampling errors tend to lead to bias in measurements and are very difficult to quantify.
Peak coincidence factor	The percentage of measure demand savings that coincide in time with the annual peak demand of the entire electricity system.
Peak demand savings	The demand savings that coincide in time with the expected annual peak demand period of the entire electricity system. For industrial participants on an interruptible rate, peak demand savings may include savings on non-firm loads, i.e. loads that may be interrupted when NS Power's 10-minute reserve is low.
Precision	The extent to which repeated measurements agree with one another.
Random sampling error	An error in measurement due to the fact that measurements are taken from a subset of the population and not the entire population.
Realization rate	The ratio of evaluated savings to tracked savings.
Sample size	The number of observations or replicates included in a statistical sample.
Secondary market impacts	Energy consumption of appliances that would have been transferred to the secondary market if said appliances had not been retired.
Spillover	Savings attributable to participants who implement additional energy efficiency measure(s) introduced by a program after participating in it once and without participating in the program a second time.
Tracked savings	Gross and net savings calculated based on various parameters such as number of participants or units installed or sold, unitary savings values, installation rates, interactive effects, and net-to-gross ratios. Those parameters, with the exception of the number of participants or units installed or sold, are obtained from the previous evaluation.
Unitary savings	Electrical energy or peak demand savings established on a unitary basis. A unit can either be a product (e.g. an 8 W LED lamp), a capacity (e.g. one tonne capacity of an air-source heat pump), or a participant (e.g. one participant taking part in a behaviour-based program).



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EXECUTIVE SUMMARY

This report presents the 2025 demand-side management (DSM) results of the Existing Residential program administered by EfficiencyOne (E1). This program is comprised of seven components: (1) Affordable Multifamily Housing (AMH); (2) Affordable Single-family Homes (ASFH); (3) Efficient Product Installation (EPI); (4) Green Heat; (5) Home Energy Assessment (HEA); (6) Mi'kmaw Home Energy Efficiency Project (MHEEP); and (7) Residential Behaviour. Combined, these program components encourage energy efficiency upgrades in existing residential homes, affordable housing, and non-profit organizations by providing financial incentives, technical information, and recommendations as well as free-of-charge direct installations of energy efficient products.

Evaluation Approach

The 2025 Existing Residential evaluation was aimed at calculating program component gross and net results, namely electrical first-year and lifetime energy savings, peak demand savings, as well as avoided greenhouse gas (GHG) emissions. Table 1 summarizes the types of evaluation conducted for each program component and the corresponding methodology.

Table 1: Summary of 2025 Existing Residential Program Evaluation

Program Component	Evaluation Type			Methodology
	Impact	Process	Market	
AMH	Condensed			› Tracking sheet audit › Desk reviews › Effective useful life (EUL) update › Use of a net-to-gross ratio (NTGR) of 1 › Calculations using evaluation results › GHG emission reduction calculations
ASFH	Condensed			› Tracking sheet audit › Use of a NTGR of 1 › Calculations using evaluation results › GHG emission reduction calculations
EPI	Condensed			› Tracking sheet audit › Use of NTGR results from the 2024 survey › Use of a NTGR of 1 for low-income participants › Calculations using evaluation results › GHG emission reduction calculations
Green Heat	Condensed			› Tracking sheet audit › Use of 2023 NTGR results › Calculations using evaluation results › GHG emission reduction calculations
HEA	Condensed			› Tracking sheet audit › Use of 2023 NTGR results › Use of the 2024 unconverted D assessment savings parameters › Calculations using 2024 evaluation results › GHG emission reduction calculations

Program Component	Evaluation Type			Methodology
	Impact	Process	Market	
MHEEP	Condensed			› Tracking sheet audit › Use of a net-to-gross ratio (NTGR) of 1 › Calculations using evaluation results › GHG emission reduction calculations
Residential Behaviour	Comprehensive			› Billing analysis › Analysis of participation in other programs › GHG emission reduction calculations

Program Performance

Table 2 below presents the participation levels, NTGRs, evaluated gross and net savings at the generator, annual GHG emission reductions, as well as effective useful life (EUL) values for each program component and for Existing Residential as a whole.

Table 2: Overall 2025 Existing Residential Participation and Evaluated Savings

	Participation Level		Gross Savings		NTGR	Net Savings	
	Value	Unit	Value	Unit	Value*	Value	Unit
AMH							
Electrical Energy Savings	98	Projects	1.378	GWh	1.00	1.378	GWh
Lifetime Electrical Energy Savings			23.345	GWh	1.00	23.345	GWh
Peak Demand Savings			0.648	MW	1.00	0.648	MW
Annual GHG Emission Reductions			647	Tonnes of CO2 eq	1.00	647	Tonnes of CO2 eq
EUL			16.9	Years		16.9	Years
ASFH							
Electrical Energy Savings	1,920	Participants	6.135	GWh	1.00	6.135	GWh
Lifetime Electrical Energy Savings			118.611	GWh	1.00	118.611	GWh
Peak Demand Savings			2.338	MW	1.00	2.338	MW
Annual GHG Emission Reductions			2,879	Tonnes of CO2 eq	1.00	2,879	Tonnes of CO2 eq
EUL			19.3	Years		19.3	Years
EPI							
Electrical Energy Savings	9,245	Participants	7.405	GWh	0.99	7.300	GWh
Lifetime Electrical Energy Savings			54.400	GWh	0.99	53.898	GWh
Peak Demand Savings			0.518	MW	0.98	0.509	MW
Annual GHG Emission Reductions			3,475	Tonnes of CO2 eq	0.99	3,426	Tonnes of CO2 eq
EUL			7.3	Years		7.4	Years

	Participation Level		Gross Savings		NTGR	Net Savings	
	Value	Unit	Value	Unit	Value*	Value	Unit
Green Heat							
Electrical Energy Savings	944	Measures installed	1.414	GWh	0.53	0.749	GWh
Lifetime Electrical Energy Savings			25.460	GWh	0.53	13.488	GWh
Peak Demand Savings			2.176	MW	0.55	1.191	MW
Annual GHG Emission Reductions			664	Tonnes of CO2 eq	0.53	352	Tonnes of CO2 eq
EUL			18.0	Years		18.0	Years
HEA							
Electrical Energy Savings	3,157	Participants	14.769	GWh	0.94	13.820	GWh
Lifetime Electrical Energy Savings			380.764	GWh	0.90	342.195	GWh
Peak Demand Savings			4.684	MW	0.98	4.578	MW
Annual GHG Emission Reductions			6,931	Tonnes of CO2 eq	0.94	6,486	Tonnes of CO2 eq
EUL			25.8	Years		24.8	Years
MHEEP							
Electrical Energy Savings	157	Participants	0.337	GWh	1.00	0.337	GWh
Lifetime Electrical Energy Savings			6.905	GWh	1.00	6.905	GWh
Peak Demand Savings			0.319	MW	1.00	0.319	MW
Annual GHG Emission Reductions			158	Tonnes of CO2 eq	1.00	158	Tonnes of CO2 eq
EUL			20.5	Years		20.5	Years
Residential Behaviour							
Electrical Energy Savings	224,730	Treatment participants		GWh		5.555	GWh
Lifetime Electrical Energy Savings				GWh		5.555	GWh
Peak Demand Savings				MW		0.000	MW
Annual GHG Emission Reductions				Tonnes of CO2 eq		2,607	Tonnes of CO2 eq
EUL				Years		1.0	Years
Total							
Electrical Energy Savings			31.438	GWh		35.274	GWh
Lifetime Electrical Energy Savings			609.485	GWh		563.997	GWh
Peak Demand Savings			10.684	MW		9.584	MW
Annual GHG Emission Reductions			14,754	Tonnes of CO2 eq		16,554	Tonnes of CO2 eq
EUL			19.4	Years		16.0	Years
* The average NTGR values presented in this table correspond to the ratios of net savings to gross savings by program component and then for the entire program.							





Existing Residential was aimed at achieving 60.639 GWh in net electrical energy savings and 10.177 MW in net peak demand savings at the generator for 2025. The program fell short of achieving planned electrical energy and peak demand savings. AMH, EPI, Green Heat, MHEEP and Residential Behaviour fell short of energy targets, while ASFH and HEA exceeded theirs. Notably, Residential Behaviour has been paused since May 2025 due to a cybersecurity incident, and the evaluation was limited to the four months in 2025, which affected program electrical energy savings. EPI and Green Heat also fell short of peak demand targets, while AMH, ASFH, HEA, and MHEEP exceeded peak demand targets. AMH and ASFH participation levels reached their highest point in 2025. HEA was the largest contributor to total program net energy (39%) and peak demand savings (48%).

The following subsections present evaluation results at the program component level.

AMH Findings and Recommendations

This subsection presents the key findings from the 2025 AMH evaluation. The Evaluator has no specific recommendation for AMH.

2025 AMH-Finding: In 2025, AMH achieved 1.378 GWh in net electrical energy savings and 0.648 MW in net peak demand savings at the generator, falling 27% short of planned net electrical energy savings of 1.880 GWh and exceeding by 13% the planned net peak demand savings of 0.572 MW.

2025 AMH-Finding: In 2025, AMH reached its highest participation rate since inception with 98 completed projects (66 prescriptive and 32 comprehensive) generating electrical savings, which represents an 18% increase compared to 2024 levels. Together, AMH paths generated 19% and 14% more electrical energy and peak demand savings respectively compared to 2024 levels.

2025 AMH-Finding: Following project reviews, the Evaluator confirmed that equivalent full load hour (EFLH) values had been properly applied to prescriptive heat pump projects.

2025 AMH-Finding: Evaluated net electrical energy savings and peak demand savings were the same as the savings tracked by E1.

ASFH Findings and Recommendations

This subsection presents the key findings from the 2025 ASFH evaluation. The Evaluator has no specific recommendation for ASFH.

2025 ASFH-Finding: ASFH achieved 6.135 GWh in net electrical energy savings and 2.338 MW in net peak demand savings at the generator in 2025, thus exceeding the planned electrical energy and peak demand savings targets by 114% and 183% respectively.

2025 ASFH-Finding: In 2025, 1,920 homes participated in ASFH, representing a 59% participation increase compared to 2024 levels. Gross electrical energy and peak demand savings were respectively 65% and 12% higher than in 2024, primarily due to increased participation.

2025 ASFH-Finding: The evaluated peak demand savings were equal to those tracked by E1, while the evaluated electrical energy savings were approximately 1% higher than the savings tracked by E1 due to the inclusion of 2024 unclaimed savings from non-modelled heat pump measures.



EPI Findings and Recommendations

This subsection presents the key findings from 2025 EPI evaluation. The Evaluator has no specific recommendation for EPI.

2025 EPI-Finding: With 7.300 GWh in net electrical energy savings and 0.509 MW in net peak demand savings at the generator in 2025, EPI net electrical energy and peak demand savings fell short of targets by 46% and 68% respectively.

2025 EPI-Finding: In 2025, participation decreased by 7.5% while the number of measures installed decreased by 40% compared to 2024 levels. Despite this decrease due to the phasing out of lighting measures in June 2025, the average electrical energy savings per participant decreased by only 12% in 2025 compared to 2024.

2025 EPI-Finding: The only update made by the Evaluator in the 2025 EPI evaluation was the calculation of the overall 2025 NTGR values based on the proportions of savings associated with each participant type for each product category, which was very minor. Due to this update, the net electrical energy and peak demand savings have realization rates of 99% and 100% respectively.

Green Heat Findings and Recommendations

This subsection presents the key findings from the Green Heat evaluation. The Evaluator has no specific recommendation for Green Heat.

2025 Green Heat-Finding: In 2025, Green Heat achieved 0.749 GWh in net electrical energy savings and 1.191 MW in net peak demand savings at the generator, thus falling 79% short of planned net electrical energy savings of 3.571 GWh and 56% short of planned net peak demand savings of 2.717 MW.

2025 Green Heat-Finding: Program participation declined for the fourth year in a row. In 2025, participation decreased, on average, by 33% compared to 2024 levels, especially for mini-split heat pumps (MSHPs, down 30%) and demand reduction (down 56%). This decrease began after participants switched to HEA and the Canada Green Homes (CGH) Grant for better incentives. Green Heat participation did not rebound despite the closure of the CGH Grant; lower rebates linked to reduced electrical energy savings in 2024 may have deterred new participants.

2025 Green Heat-Finding: The evaluated gross and net electrical energy and peak demand savings determined by the Evaluator were the same as the gross and net savings tracked by E1.

HEA Findings and Recommendations

This subsection presents the key findings from the 2025 HEA evaluation. The Evaluator has no specific recommendation for HEA.

2025 HEA-Finding: HEA net electrical energy savings exceeded the 8.580 GWh target by 61% and the planned 4.325 MW in net peak demand savings by 6%.

2025 HEA-Finding: With 3,157 projects, 2025 participation significantly decreased compared to 2024 levels. The average gross electrical energy savings per home were 4,678 kWh, also a significant decrease compared to 2024 levels, which represented the highest level observed since HEA launch. With the closure of the Canada Greener Homes (CGH) Grant and the fact that CGH Grant applicants had until the end of November 2025 to complete their E assessments, participation and gross savings are expected to decrease even further in future years.





2025 HEA-Finding: Realization rates of 100% were achieved for both electrical energy savings and peak demand savings, meaning the evaluated electrical energy and peak demand savings were identical to the savings tracked by E1.

MHEEP Findings and Recommendations

This subsection presents the key findings from the MHEEP evaluation. The Evaluator has no specific recommendation for MHEEP.

2025 MHEEP-Finding: MHEEP net electrical energy savings fell short of the 0.548 GWh target by 39% and exceeded the planned 0.156 MW in net peak demand savings by 104%.

2025 MHEEP-Finding: Participation declined by 18% in 2025, while average electrical energy savings per participant remained stable, resulting in 16% lower gross electrical energy savings and 34% lower gross peak demand savings compared to 2024 levels.

2025 MHEEP-Finding: While the evaluated net electrical energy savings were equal to the values tracked by E1, evaluated net peak demand savings were 24% lower due to a change in methodology to align with 2024 Green Heat billing analysis findings and with similar program component methodologies.

Residential Behaviour Findings and Recommendations

This subsection presents the key findings from the 2025 Residential Behaviour evaluation. The Evaluator has no specific recommendation for Residential Behaviour.

2025 Residential Behaviour-Finding: Residential Behaviour has been paused since May 2025 due to a cybersecurity incident at NS Power in spring 2025 whereby AMI data were no longer available. The evaluation was, therefore, limited to the four months in 2025 (January to April) for which AMI data were available.

2025 Residential Behaviour-Finding: Residential Behaviour achieved 5.555 GWh in net electrical energy savings in the four months of operation in 2025, thus falling short of the planned net electrical energy savings of 29.771 GWh.

Program Tracked and Evaluated Savings

Table 3 below compares E1 tracked electrical energy and peak demand savings to evaluated savings at the generator. It also includes the realization rate for both electrical energy savings and peak demand savings. The NTGRs are also presented therein and correspond to the rounded averages obtained by dividing net savings by gross savings, which explains why the values differ from those presented in the other sections herein. Residential Behaviour relies on a random selection of treatment group participants among all residential customers; therefore, the program component does not have a tracking sheet and there is no realization rate.

Table 3: Comparison of 2025 Tracked and Evaluated Savings at the Generator

		Gross Savings		NTGR	Net Savings		Realization Rate
		Value	Unit		Value	Unit	
AMH	Electrical Energy Savings						
	Tracked Savings by E1	1.378	GWh	1.00	1.378	GWh	100%
	Evaluation Results	1.378	GWh	1.00	1.378	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	0.648	MW	1.00	0.648	MW	100%
	Evaluation Results	0.648	MW	1.00	0.648	MW	
ASFH	Electrical Energy Savings						
	Tracked Savings by E1	6.059	GWh	1.00	6.059	GWh	101%
	Evaluation Results	6.135	GWh	1.00	6.135	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	2.338	MW	1.00	2.338	MW	100%
	Evaluation Results	2.338	MW	1.00	2.338	MW	
EPI	Electrical Energy Savings						
	Tracked Savings by E1	7.405	GWh	0.99	7.338	GWh	99%
	Evaluation Results	7.405	GWh	0.99	7.300	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	0.518	MW	0.98	0.509	MW	100%
	Evaluation Results	0.518	MW	0.98	0.509	MW	
Green Heat	Electrical Energy Savings						
	Tracked Savings by E1	1.414	GWh	0.53	0.749	GWh	100%
	Evaluation Results	1.414	GWh	0.53	0.749	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	2.176	MW	0.55	1.191	MW	100%
	Evaluation Results	2.176	MW	0.55	1.191	MW	
HEA	Electrical Energy Savings						
	Tracked Savings by E1	14.769	GWh	0.94	13.820	GWh	100%
	Evaluation Results	14.769	GWh	0.94	13.820	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	4.684	MW	0.98	4.578	MW	100%
	Evaluation Results	4.684	MW	0.98	4.578	MW	
MHEEP	Electrical Energy Savings						
	Tracked Savings by E1	0.337	GWh	1.00	0.337	GWh	100%
	Evaluation Results	0.337	GWh	1.00	0.337	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	0.420	MW	1.00	0.420	MW	76%
	Evaluation Results	0.319	MW	1.00	0.319	MW	

		Gross Savings		NTGR	Net Savings		Realization Rate
		Value	Unit		Value	Unit	
Residential Behavioural ^a	Electrical Energy Savings						
	Tracked Savings by E1						
	Evaluation Results				5.555	GWh	
	Peak Demand Savings						
	Tracked Savings by E1						
	Evaluation Results						
^a No gross or tracked savings were calculated for Residential Behaviour; therefore, there was no realization rate.							

INTRODUCTION

EfficiencyOne (E1), an independent and non-profit organization, is responsible for helping Nova Scotians improve the energy efficiency of their homes and workplaces by designing, marketing, and delivering demand-side management (DSM) for Nova Scotians. E1 provides energy efficiency, demand response, and carbon mitigation services through the Efficiency Nova Scotia (ENS) franchise. Regulatory oversight of its DSM activities is provided by the Nova Scotia Energy Board (NSEB). E1 receives funding for its electricity DSM activities from Nova Scotia Power (NS Power) ratepayers.

E1 has a DSM portfolio of three residential programs, three business, non-profit, and institutional (BNI) programs, and one demand response (DR) program that are marketed to Nova Scotians through the ENS franchise. Each program has one or more program components. Econoler was commissioned by E1 to evaluate E1's 2025 DSM program portfolio.

This evaluation report relates to the Existing Residential program comprised of seven components: Affordable Multifamily Housing (AMH); Affordable Single-family Homes (ASFH); Efficient Product Installation (EPI); Green Heat; Home Energy Assessment (HEA); Mi'kmaw Home Energy Efficiency Project (MHEEP); and Residential Behaviour. Table 4 below lists the Existing Residential program components and the types of evaluations conducted for 2025. A comprehensive impact evaluation involves reviewing the following four key elements: (1) The baseline definition; (2) the savings calculation methodology; (3) the values of the parameters used to calculate savings; and (4) NTGRs. A condensed impact evaluation involves using some or all previous year impact evaluation parameters such as unitary savings values, adjustment ratios, installation rates, and NTGRs to provide evaluated results.

Table 4: Types of Evaluations Conducted for Each Program Component, 2025

Program	Program Component	2025		
		Process	Market	Impact
Existing Residential	AMH			Condensed
	ASFH			Condensed
	EPI			Condensed
	Green Heat			Condensed
	HEA			Condensed
	MHEEP			Condensed
	Residential Behaviour			Comprehensive*
* Cumulative billing analysis conducted for months in 2025 where AMI data are available.				

For each program component, the Evaluator prepared a DSM evaluation report presenting key findings, electrical first-year and lifetime energy savings, peak demand savings, and avoided GHG emissions.

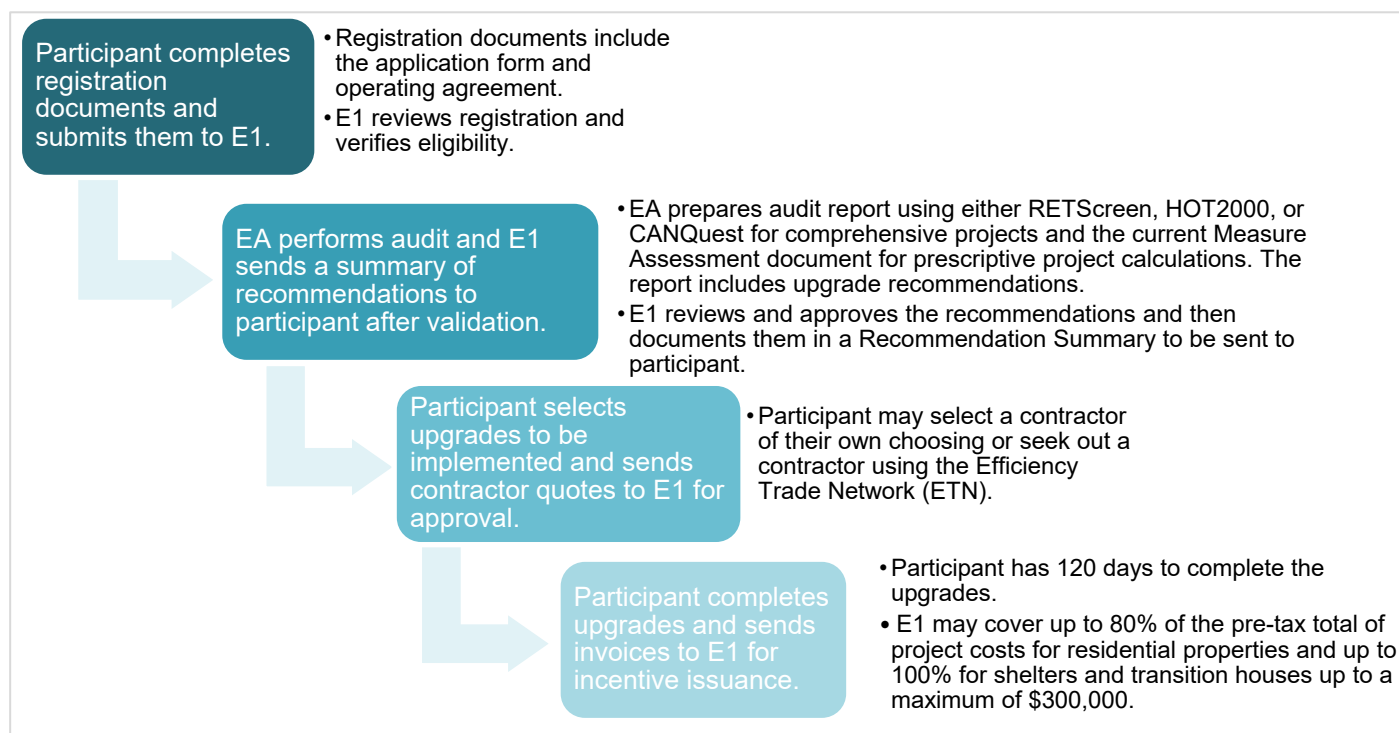
1 AMH Overview

This section describes Affordable Multifamily Housing (AMH), follows up on past evaluation recommendations, and provides an overview of AMH participation history.

1.1 AMH Description

AMH provides affordable housing owners and non-profit organizations, such as rehabilitation or transition houses, with incentives for building-wide energy retrofit projects with the intent of reducing electrical and non-electrical energy consumption in Nova Scotia. Unless they follow a prescriptive path to install specific measures, AMH projects must undergo a complimentary energy audit at the beginning of the participation process to identify eligible energy efficiency measures such as water and space heating systems and building envelope measures. The audit is conducted by one of five AMH-approved energy auditors (EAs). Further details about the AMH participation process are provided in Figure 1.

Figure 1: AMH Participation Process Summary



Since 2021, AMH savings have been generated through two project paths, the comprehensive path and prescriptive path.

- › Comprehensive path projects serve to implement measures that are modelled in HOT2000, RETScreen, or CANQuest. Electrical energy savings from comprehensive projects are calculated by comparing the energy models of a base case and a proposed case. Calculations are performed with project-specific parameters.
- › Prescriptive path projects are not modelled because electrical energy savings are calculated using the 2025 Demand-side Management Measure Assessment (DSM MA).¹

¹ The 2025 DSM MA contains the equations originally presented in the CIRx Screening Tool, which was the tool used by E1 to document the savings calculation methodologies, assumptions, and calculation parameters for measures implemented under AMH.

In July 2023, the maximum incentive amounts were changed from \$15,000 to \$17,254 per affordable unit (multi-unit residential buildings [MURBs] and cooperatives) and from \$5,000 to \$5,751 per affordable room (rooming houses). The maximum rebate was amended in December 2022 to \$300,000 for all building types.

AMH funding comes from two sources: (1) Electricity ratepayer funding is used for measures that reduce electricity consumption; and (2) funding from the Province of Nova Scotia (PNS) is used for measures that reduce non-electrical fuel consumption as well as a portion of upgrades that reduce electricity consumption. Since April 2021, additional funding from PNS through the Green Fund allows for an increase in the incentive amount of up to 80% of costs for electrical projects in residential properties and up to 100% in shelters and transition houses. This report presents all electrical energy savings achieved through AMH and allocated to DSM funding.

AMH was aimed at achieving 1.880 GWh in net electrical energy savings and 0.572 MW in net peak demand savings at the generator in 2025.

1.2 Follow-up on Past Evaluation Report Recommendations

The Evaluator evaluated AMH in previous years and issued improvement recommendations. Table 5 provides a summary of the implementation status of past recommendations that were carried forward.

Table 5: Implementation Status of Past Recommendations for AMH

#	Past Recommendations	Status	Comments
2024 AMH-R1	To further aid understanding, consider providing participants with case study examples of incentive calculations to show pre-tax costs and how incentive amounts may change based on supplier quotes and/or the equipment installed.	Complete	E1 agrees with this recommendation. To demonstrate pre-tax costs and how incentive amounts may change based on supplier quotes and/or the equipment installed, E1 now shares examples of past projects with participants when applying to the program component.
2024 AMH-R2	Ensure that support and handholding are available for participants who may need help navigating the program component and finding various contractors. Make technical guides available, providing general advice to help participants through the program component.	Complete	E1 agrees with this recommendation. Resources and useful links have been added to documentation to aid participants with navigating the program component and finding contractors. E1 has added clarity for participants by updating introduction emails (e.g. tailored to participants), redesigning the quote requirements (e.g. prescriptive applicants now have a separate document), and providing more detailed preapproval and recommendation reports.
2024 AMH-R3	Investigate the possibility of improving the audit reporting templates to improve time efficiencies for EAs, for example, by streamlining the reports as much as possible.	Complete	E1 agrees with this recommendation. To improve time efficiencies for EAs, E1 has created and shared a new audit report template to be used by EAs.
2024 AMH-R4	In the early stages of participant engagement, ensure that participants are aware of the co-financing options listed in the E1 agreement.	Complete	E1 agrees with this recommendation. E1 staff explored ways to provide participants with more information about program options and have implemented the following: 1) Changes to the application form; 2) emails and Navigator calls to applicants to discuss options; 3) welcome letters with details on the applicant's choice; and 4) a new customer portal providing status updates. E1 staff will continue to explore ways to provide information about program options and participation steps to participants in 2025.

1.3 Participation History

Since 2021, AMH savings are generated by two types of projects, namely comprehensive and prescriptive projects. In 2025, 98 projects generating electrical energy savings were completed under AMH, which resulted in 1.378 GWh in gross electrical energy savings and 0.648 MW in gross peak demand savings at the generator.

As illustrated in Figure 2 below, the number of projects increased from 83 to 98 projects between 2024 and 2025. More precisely, the number of prescriptive projects remained stable with 66 projects in 2025 compared to 64 in 2024, while the number of comprehensive projects increased from 19 to 32. The large increases in the number of participants observed in 2022 and 2023 were due to the inclusion of prescriptive heat pump projects, and this trend appears to have stabilized.

As observed in Figure 2 below, electrical energy savings per project considerably vary from year to year, mostly due to the various building sizes included in AMH. In 2025, electrical energy savings per prescriptive project slightly decreased compared to 2024 levels, while they increased for comprehensive projects. Finally, the number of overall projects increased by 18% compared to 2024 levels.

Figure 2: Overview of AMH Participation, 2018-2025

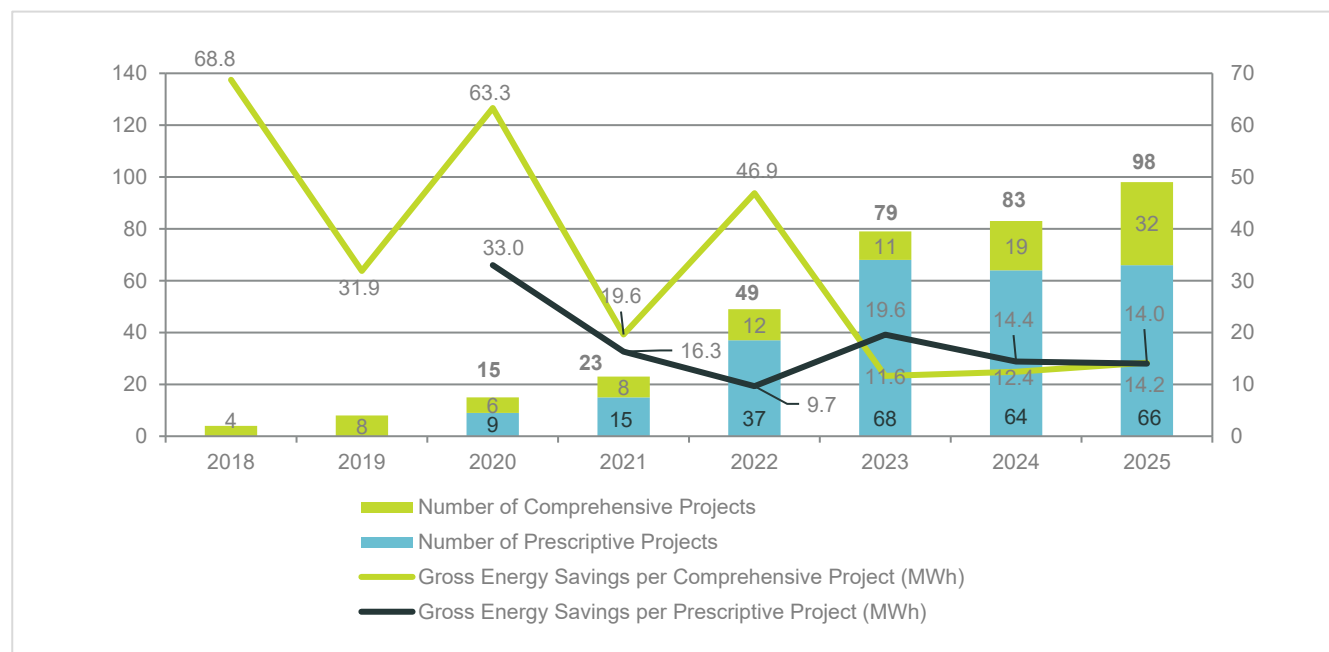
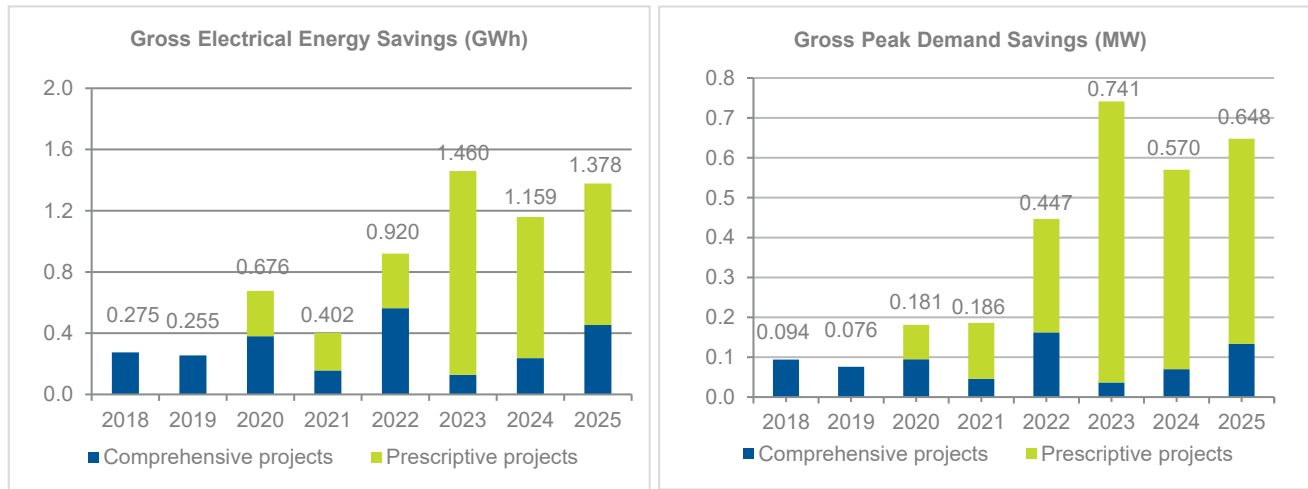


Figure 3 below presents the evolution of AMH gross savings since 2018. In 2025, gross electrical energy and peak demand savings increased by 19% and 14% respectively compared to 2024 levels. Prescriptive project savings remained similar to those in 2024, while comprehensive project electrical energy and peak demand savings increased by 92% and 91% respectively. Again in 2025, prescriptive projects generated the most electrical energy savings (67%) and the most peak demand savings (79%).

Figure 3: Evolution of AMH Gross Savings at the Generator, 2018-2025



2 AMH Evaluation Approach

The 2025 AMH evaluation comprised a condensed impact evaluation. The main objectives of the 2025 AMH evaluation were as follows:

- › Calculate AMH gross and net results, namely first-year and lifetime electrical energy savings, peak demand savings, as well as avoided GHG emissions

The Evaluator identified key research questions aimed at achieving the above objectives. Table 6 outlines the evaluation objectives and maps them to the Evaluator's research questions, methods, and sample sizes (n). Each method is described further below.

Table 6: 2025 AMH Evaluation Approach

Evaluation Objectives	Research Questions	Methodology
Calculate gross results	› Are the data in the tracking sheet complete, accurate, and consistent? › Were the correct equivalent full load hour (EFLH) values used? › What are the evaluated first-year and lifetime gross electrical energy and peak demand savings?	› Tracking sheet audit › Desk reviews (n=5) › EUL update › Calculations using evaluation results
Calculate net results	› What are the evaluated first-year and lifetime net electrical energy and peak demand savings? › What are the net GHG emission reductions in CO2 eq?	› Calculations using a NTGR of 1 › Calculations using evaluation results › GHG emission reduction calculations

Tracking Sheet Audit

Prior to performing the unitary savings review, the Evaluator performed an audit of the final 2025 tracking sheet to ensure it was complete and the entered data were consistent. The results obtained are presented in Appendix I.

Desk Reviews

The Evaluator reviewed the documentation of five prescriptive heat pump projects. The desk reviews were aimed at validating whether the EFLH value derived from the 2024 Green Heat billing analysis was properly applied to mini-split heat pump savings. The results are presented in Subsection 3.2 below.

EUL Update

Using the effective useful life (EUL) values for common measures presented in the 2025 Demand-side Management Measure Assessment² (DSM MA) and the proportions of savings generated by individual measures implemented through AMH in 2025, the Evaluator calculated an average EUL for comprehensive projects. The EUL value of each measure was used for prescriptive projects based on EUL values from the 2025 DSM MA.

² The 2025 DSM MA is a reference document that provides an in-depth review of all parameters necessary to calculate the annual and lifetime gross electrical energy and peak demand savings of all prescriptive measures and most semi-prescriptive measures offered through E1's DSM program portfolio. In addition, the MA includes effective useful life values for all measures offered in E1's program portfolio. For the evaluation conducted during the last year of the 2023-2025 DSM cycle, the Evaluator refers to the values presented in the 2025 DSM MA.

Calculations Using Evaluation Results

Building on all the above methods and collected data, the Evaluator calculated the first-year and lifetime electrical energy and peak demand savings per the calculation methodology presented in Subsection 3.2 below.

GHG Emission Reduction Calculations

To obtain net avoided GHG emissions in CO₂ eq for AMH, the Evaluator multiplied the net electrical energy savings by the latest Nova Scotia-specific factor for GHG emissions generated by electricity production. This factor was established using NS Power data.



3 AMH Impact Evaluation

The objectives of the 2025 AMH impact evaluation were to determine gross and net electrical energy and peak demand savings, annually avoided GHG emissions, as well as the EUL and associated lifetime electrical energy savings.

3.1 Tracking Sheet Audit

To ensure program results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1 as well as correcting the tracked savings as needed. The results are provided in Appendix I. The tracked savings results presented in this report, therefore, refer to the corrected tracked savings obtained by the Evaluator.

3.2 Gross Savings

Gross savings correspond to the change in energy consumption resulting from various electrical energy-saving upgrades such as building envelope measures, space heating measures, and domestic hot water (DHW) measures implemented by AMH participants compared to the consumption level had those upgrades not occurred.³

Since 2021, AMH savings have been generated by two types of projects: Comprehensive projects and prescriptive projects.

- › Comprehensive projects serve to implement measures that are modelled in HOT2000, RETScreen, or CANQuest. Electrical energy savings for comprehensive projects are calculated by comparing the energy models of the base case and the proposed case. Calculations are performed with project-specific parameters.
- › Prescriptive projects are not modelled, and electrical energy savings are calculated using the 2025 DSM MA.

The following subsections describe the methodology used to review AMH gross savings for 2025. Interactive effects and EUL values were also assessed.

3.2.1 Electrical Energy Savings

For AMH, the Evaluator typically multiplies tracked savings by adjustment ratios to establish evaluated savings. In 2025, no previously established adjustment ratios were applied to electrical energy savings since they either had margins of error above the 10% threshold or the main reason behind the adjustment ratio had been resolved.

³ Definition adapted from National Renewable Energy Laboratory, “Chapter 21: Estimating Net Savings – Common Practices”, The Uniform Methods Project, October 2017, p. 3, available at: <https://www.nrel.gov/docs/fy17osti/68578.pdf>.



Regarding prescriptive heat pump projects, in 2024, a new heating EFLH value for mini-split heat pumps was determined through the 2024 Green Heat billing analysis and was to be applied to AMH mini-split heat pump measures. However, the new value of 501 hours had not yet been applied at the time of the evaluation, so a one-time adjustment ratio of 1.016 was established to compensate for this and was applied to 2024 AMH prescriptive heat pump projects. For the 2025 evaluation, the Evaluator conducted desk reviews of five prescriptive heat pump projects completed as of April 1, 2025 to determine whether the new EFLH value was properly applied to AMH mini-split heat pump savings. After reviewing the five projects, the Evaluator confirms that they were properly applied to these projects. Therefore, the Evaluator elected to use the tracked electrical energy savings as the evaluated savings for prescriptive heat pump projects.

For other types of projects, previously established adjustment ratios had margins of error that were too high to be extrapolatable to future evaluations. Therefore, the Evaluator also elected to use the tracked electrical energy savings as the evaluated savings for these projects.

3.2.2 Peak Demand Savings

Peak demand savings correspond to the demand savings that coincide in time with the peak demand period of the electricity system. The projected electricity peak demand period in Nova Scotia is defined as the coldest days (with an on-peak temperature estimated at -15 °C) between 5 p.m. and 7 p.m. in the months of December to February on non-holiday weekdays.

For comprehensive projects, peak demand savings were obtained by multiplying the electrical energy savings by a peak demand-to-energy ratio of 0.283 W/kWh, as indicated in the 2025 DSM MA. For prescriptive projects, peak demand savings are calculated through equations in the 2025 DSM MA.

In the 2025 AMH evaluation, no previously established adjustment ratio was applied to peak demand savings of either comprehensive projects or prescriptive projects. As a result, the Evaluator used the tracked savings as the evaluated savings for all projects.

3.2.3 Interactive Effects

In a home, interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other factors such as heating and cooling. The interactive effects of space heating and DHW measures were already considered in the savings calculations of comprehensive projects since the engineering calculations or the simulation models encompass those effects. For prescriptive projects, the 2025 DSM MA includes interactive effects when applicable.

3.2.4 Effective Useful Life

Using the EUL values presented in the 2025 DSM MA and the proportion of savings for measures implemented through AMH in 2025, the Evaluator revised the EUL values for comprehensive projects. For prescriptive projects, EUL values for each measure were drawn from the 2025 DSM MA and remained the same as in the 2024 evaluation. For comprehensive projects, the weighted average EUL decreased from 20.5 years in 2024 to 17.3 years in 2025. Table 7 below outlines the shares of savings and the equivalent EUL values for each measure category used to calculate the weighted average EUL for comprehensive projects.

Table 7: 2025 AMH Equivalent EUL Values for Comprehensive Projects

Measure Category	Share of Savings [%]	Evaluated Equivalent EUL [years]	Reference
Heating System	61.7%	18	GDS, 2007 – Heat Pumps
Lighting	12.8%	5.7	Lifetime of 50,000 hours based on model specifications; assumption that lamps are in common zones and turned on 24/7
Building Envelope	10.9%	30	California Public Utilities Commission, 2023
Water Heating	7.1%	10	DEER, 2014 – Heat Pump Water Heaters
Fenestration	6.0%	20	DEER, 2014 – Windows
Other	1.5%	-	-
Weighted Average EUL	100%	17.3	Calculation

3.2.5 Evaluated Gross Savings

The annual gross savings at the generator are presented in Table 8 below.

The gross electrical energy savings at the generator were estimated by using different line loss factors for each participant based on their rate code. The line loss factors were updated in 2019 and correspond to the values submitted to the Nova Scotia Utility and Review Board (NSUARB), now named the Nova Scotia Energy Board (NSEB), as part of Nova Scotia Power 2014 Cost of Service Study Progress Update.⁴ With total gross electrical energy savings and lifetime electrical energy savings of 1.378 GWh and 23.345 GWh respectively, the average EUL value for AMH was 16.9 years in 2025.

Table 8: Evaluated 2025 AMH Gross Electrical Energy and Peak Demand Savings

	Comprehensive	Prescriptive		Total
		Heat Pumps	Lighting	
Number of Projects	32	61	5	98
Electrical Energy Savings				
Tracked Gross Electrical Energy Savings – at the Meter (GWh)	0.415	0.761	0.086	1.262
Adjustment Ratio for Energy Savings	1.000	1.000	1.000	-
Gross Electrical Energy Savings – at the Meter (GWh)	0.415	0.761	0.086	1.262
Line Loss Factor	1.0916	1.0916	1.0916	1.0916
Gross Electrical Energy Savings – at the Generator (GWh)	0.454	0.832	0.092	1.378
Equivalent Effective Useful Life (years)	17.3	18	5.7	16.9
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	7.849	14.970	0.526	23.345
Peak Demand Savings				
Tracked Gross Peak Demand Savings – at the Meter (MW)	0.117	0.431	0.020	0.569
Adjustment Ratio for Peak Demand Savings	1.000	1.000	1.000	-
Gross Peak Demand Savings – at the Meter (MW)	0.117	0.431	0.020	0.569
Line Loss Factor	1.1390	1.1390	1.1390	1.1390
Gross Peak Demand Savings – at the Generator (MW)	0.133	0.493	0.022	0.648

⁴ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix 1.

As presented in Table 9, GHG emission reductions were calculated by applying the Nova Scotia-specific factor⁵ for GHG emissions generated by electricity production to AMH gross savings results.

Table 9: Evaluated 2025 AMH Gross GHG Emission Reductions

	Total
Gross Electrical Energy Savings – at the Generator (GWh)	1.378
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO2 eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO2 eq)	647

3.3 Net Savings

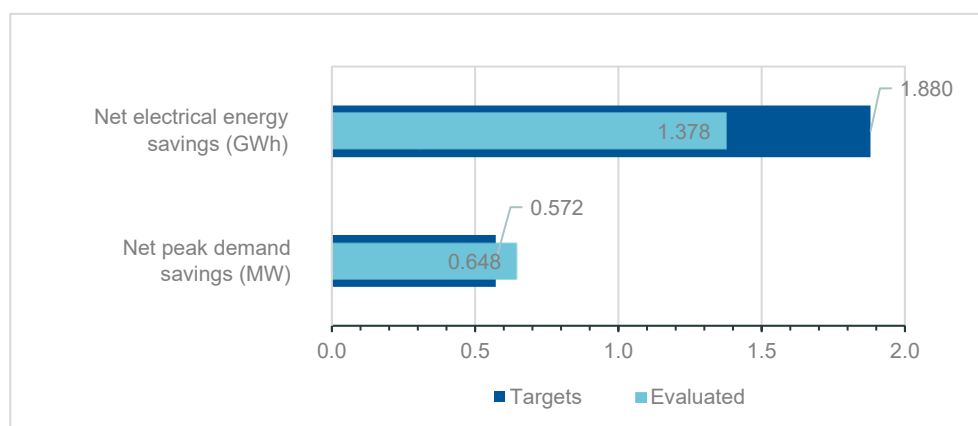
The Evaluator determined the net electrical energy and peak demand savings, i.e. the electrical energy and peak demand savings that can be reliably attributed to the program component, by estimating the net-to-gross ratio (NTGR). More precisely, the NTGR represents the positive or negative impacts of spillover and free-ridership effects on gross savings. For AMH, free-ridership and spillover effects were considered nil since participants are non-profits or low-income housing owners with limited budgets for building improvements. Therefore, a NTGR of 1.00 was applied.

3.3.1 Evaluated Net Savings

Net savings are defined as the changes in energy use that are specifically attributable to AMH. Since spillover and free-ridership effects were considered nil, the net electrical energy savings are equal to the gross savings generated by the program component. Likewise, net annual GHG emission reductions are equal to gross annual GHG emission reductions.

As outlined in Figure 4, AMH fell short of its electrical energy savings target by 27% and exceeded its peak demand savings targets by 13%.

Figure 4: 2025 AMH Targets and Evaluated Results



⁵ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO2 eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed August 26, 2025) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).

3.4 Realization Rate

Table 10 below compares the electrical energy and peak demand savings established through the 2025 evaluation to those calculated in the 2025 tracking sheet. It also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and at peak demand savings.

Table 10: Comparison of 2025 AMH Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR*	Net Savings		Realization Rate
	Value	Unit	Value	Value	Unit	Value
Electrical Energy Savings						
Tracked Savings by E1	1.378	GWh	1.00	1.378	GWh	100%
Evaluation Results	1.378	GWh	1.00	1.378	GWh	
Peak Demand Savings						
Tracked Savings by E1	0.648	MW	1.00	0.648	MW	100%
Evaluation Results	0.648	MW	1.00	0.648	MW	
* The NTGRs presented in this table correspond to the rounded averages obtained by dividing net savings by gross savings.						

The net evaluated electrical energy savings and net evaluated peak demand savings were equal to the values tracked by E1.



4 AMH Key Findings and Recommendations

As mentioned previously, the main objectives of the 2025 AMH evaluation were as follows:

- › Calculate AMH gross and net results, namely first-year and lifetime electrical energy savings, peak demand savings, as well as avoided GHG emissions

This section provides the Evaluator's key findings and recommendations in relation to the above objectives.

2025 AMH-Finding: While AMH fell short of its net electrical energy savings target, it exceeded its peak demand savings target.

In 2025, AMH achieved 1.378 GWh in net electrical energy savings and 0.648 MW in net peak demand savings at the generator, falling short of the planned net electrical energy savings of 1.880 GWh by 27% and exceeding the planned net peak demand savings of 0.572 MW by 13%.

2025 AMH-Finding: In 2025, AMH reached a new all-time participation high in terms of overall projects and comprehensive projects.

In 2025, AMH reached its highest participation rate since inception with 98 completed projects generating electrical savings, which represents an 18% increase compared to 2024 levels. Of the 98 projects, 66 were prescriptive and 32 were comprehensive projects. Similarly to 2024 levels, prescriptive projects generated 0.924 GWh and 0.514 MW in net electrical energy and peak demand savings respectively. Comprehensive projects generated 0.454 GWh and 0.133 MW in net electrical energy and peak demand savings respectively, which represents a 92% and 91% increase respectively compared to 2024 levels. Combined, AMH paths generated 19% and 14% more electrical energy and peak demand savings compared to 2024 levels. Electrical energy savings per project were similar for both paths, with 14.0 MWh per prescriptive project and 14.2 MWh per comprehensive project.

2025 AMH-Finding: Following desk reviews, the Evaluator confirmed that equivalent full load hour (EFLH) values had been properly applied to prescriptive heat pump projects.

In 2024, the Evaluator established a one-time adjustment ratio for prescriptive heat pump project savings because the EFLH value determined in the 2024 Green Heat evaluation had not been applied to AMH heat pump project savings. Therefore, the Evaluator conducted desk reviews of five 2025 prescriptive heat pump projects to determine whether the EFLH value was properly applied. The review confirmed that the EFLH value was correctly applied in all cases.

2025 AMH-Finding: Evaluated net electrical energy savings and peak demand savings were the same as the savings tracked by E1.

There were no differences between the savings tracked by E1 and the evaluated savings calculated by the Evaluator.



5 ASFH Overview

This section describes the Affordable Single-family Homes (ASFH) program component, follows up on past evaluation recommendations, and provides an overview of participation history.

5.1 ASFH Description

ASFH provides energy efficient retrofits and heat pump installations to income-qualified Nova Scotian owners of both electrically heated and non-electrically heated homes at no cost to participants. The program component is marketed under the HomeWarming brand and mainly provides building envelope measures such as draft-proofing and insulation for basements, crawl spaces, exposed floors, main walls, and attics. Heat pumps and smart thermostats are also offered under ASFH. Moisture management measures such as bathroom fans, dehumidifiers, and dirt floor coverings may also be provided. All retrofits are selected and implemented on a case-by-case basis.

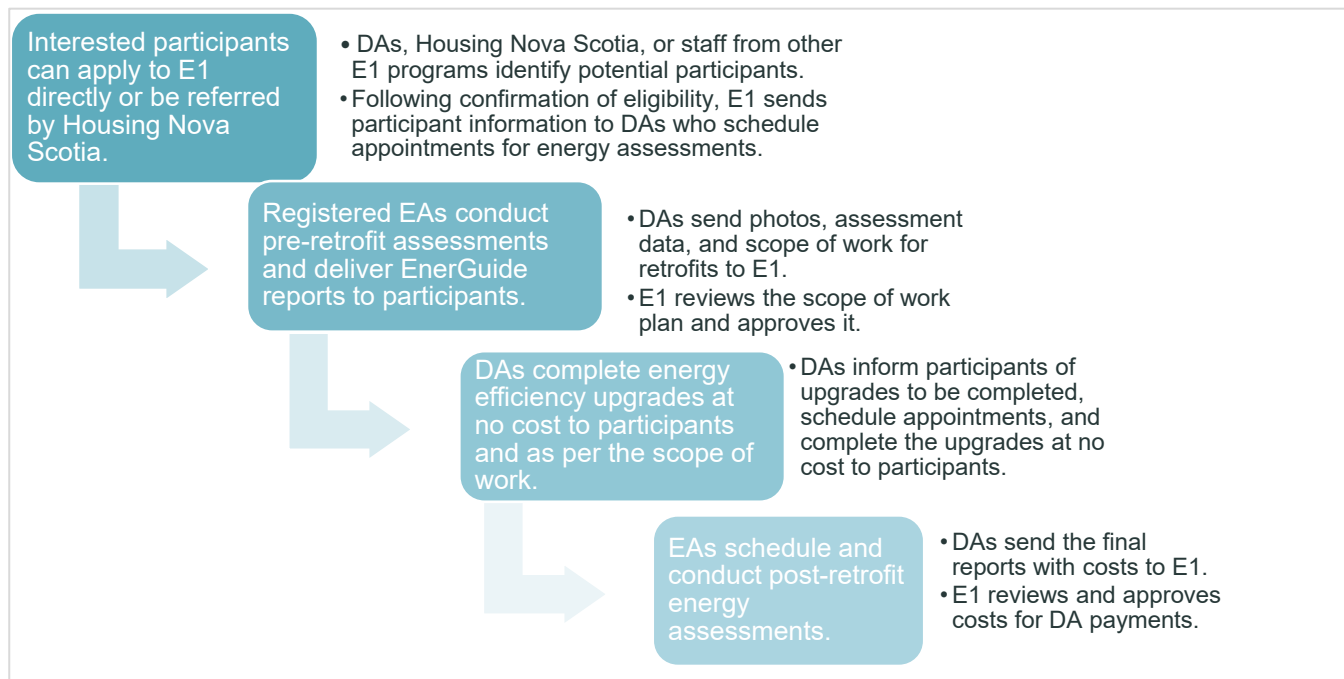
HomeWarming has evolved to provide energy efficiency services for both electrically and non-electrically heated homes. Initially launched in 2012, HomeWarming was focused on non-electrically heated homes through government funding, while ASFH, introduced in 2023 using DSM-approved funding, targets homes primarily heated with electricity.

Starting on 1 January 2023, E1 assumed full responsibility for HomeWarming delivery, regardless of heating source, and introduced a heat pump only stream for past participants to apply for the new heat pump measure; this stream excludes an energy assessment and any additional building envelope upgrades.

ASFH is supported across Nova Scotia by seven delivery agents (DAs) and 38 heat pump contractors who conduct most of the field work. DAs use energy advisors (EAs) to perform pre-retrofit and post-retrofit energy assessments. Pre-retrofit assessments (D assessments) serve to examine the house, provide homeowners with a better understanding of how their house functions in relation to space heating, and identify applicable energy efficient upgrades to be implemented. EAs generate home energy assessment reports that provide a high-level overview of energy usage and send them to homeowners. DAs then recommend retrofits to E1 and complete those approved by the latter. Lastly, EAs conduct post-retrofit assessments (E assessments) to verify implemented measures and provide a final EnerGuide rating calculated using HOT2000, a simulation tool developed by Natural Resources Canada (NRCan). In the heat pump only stream, heat pump contractors conduct an initial home visit and make recommendations for the heat pump measure to E1. Once approved by E1, the heat pump contractor manages the heat pump installation and any electrical upgrades required to facilitate the installation.

Figure 5 below illustrates the participation process.

Figure 5: ASFH Participation Process Summary



ASFH participants are also eligible for the Efficient Product Installation (EPI) program component through which energy efficient products are installed at no cost to participants. ASFH participants are internally referred to EPI and generally participate in EPI before receiving a pre-retrofit energy assessment under ASFH. Participants are referred to other programs in which they may participate to continue their journey, including EPI, Instant Savings, and Eco Shift, after completing their ASFH journey. In 2025, an additional step was introduced to account for measures installed through the EPI program. This adjustment is a one-time occurrence for the third quarter of 2025 and addresses the fact that certain products were tracked under EPI but funded by ASFH, meaning they should ultimately be reflected in ASFH reporting.

HomeWarming participants who currently heat their homes with oil can also take advantage of funding available through the Oil to Heat Pump Affordability (OHPA) program to transition from oil systems to electric cold climate heat pumps if they meet OHPA program eligibility criteria (e.g. minimum annual oil usage). OHPA is a federal government program delivered through specific Efficiency Nova Scotia programs. Some ASFH participants who receive DSM support and have electrical savings may also be eligible for the OHPA program and participate in both (e.g. this can occur when a home has electric and oil heating).

ASFH was aimed at achieving 2.863 GWh in net electrical energy savings and 0.825 MW in net peak demand savings at the generator in 2025.

5.2 Follow-up on Past Evaluation Report Recommendations

The Evaluator evaluated ASFH in previous years and issued improvement recommendations. Table 11 below provides a summary of the implementation status of past recommendations that were carried forward.

Table 11: Implementation Status of Past Recommendations for ASFH

#	Past Recommendations	Status	Comments
2024-ASFH-R1	To assess progress with participant wait times, E1 could track wait times as well as program delivery satisfaction levels (e.g. in quarterly customer satisfaction surveys) throughout 2025 to determine how strategies are performing and make adjustments if necessary.	Complete	E1 agrees with this recommendation. E1 has implemented tracking dashboards for E1 staff to ensure timely delivery to reduce wait times and project cycle times. The dashboards are reviewed regularly, and reviews with partners occur monthly. Customer satisfaction scores are reviewed monthly with program staff.
2024-ASFH-R2	Provide participants with more information about ASFH to help them understand program options, eligible measures, and participation steps by implementing the following: a) Investigate ways to inform participants about measures eligible for ASFH to ensure that other program options and their differences (i.e. Oil to Heat Pump Affordability [OHPA]) are clearly presented to participants both verbally and through marketing materials. b) Review the application template for clarity and adapt it to confirm with participants to which program they are applying (i.e. ASFH, OHPA). Ensure that the information in the application is shared with DAs/contractors. c) Once participants have submitted their application, clearly communicate (perhaps using a visual) the touchpoints that will occur along their journey (e.g. who will contact them, at what point, and what to expect).	Complete	E1 agrees with this recommendation. E1 staff explored ways to provide participants with more information about program options and have implemented the following: 1) Changes to the application form 2) Emails and Navigator calls to applicants to discuss options 3) Welcome letters with details on the applicant's choice 4) A new customer portal providing status updates E1 staff will continue to explore ways to provide program option information and participation steps to participants in 2025.
2024-ASFH-R3	Reinforce participant awareness about the Energy Solution Advisor's role as E1 program navigator to help participants better understand and navigate E1 programs (including ASFH).	Complete	E1 agrees with this recommendation. Applicants can call an Energy Solution Advisor at any time to talk through their application options. In 2025, E1 staff added a Navigator call to participant communications for ASFH to walk participants through their application and discuss the options available to them. E1 staff monitored results from this addition throughout 2025.
2024-ASFH-R4	To maximize energy savings, ensure that all participants receive the necessary information to operate and maintain the equipment installed in language that is easy to understand. Implement checklists for DAs and heat pump contractors if necessary.	Complete	E1 agrees with this recommendation. Delivery Agents are required to educate participants on all upgrades performed in homes and to leave additional materials behind, including heat pump operation manuals, warranty information, and E1 information materials. E1 staff utilize forms that require participant signature after a heat pump is installed and the Delivery Agent has explained the operation and maintenance of their new equipment as well as has provided manuals, warranty information, and supplementary E1 information. E1 has also demonstrated success in this area with reduced volumes of phone calls to Delivery Agents and E1.

#	Past Recommendations	Status	Comments
2024-ASFH-R5	Ensure that DAs/contractors provide a leave-behind so that participants know whom to contact in case of questions or difficulties or to better understand how to operate and maintain their heat pump.	Complete	E1 agrees with this recommendation. Providing leave-behind information (Your New Heat Pump and Using and Maintaining Your New Heat Pump information sheets) to participants is a program requirement for Delivery Agents. Once a Delivery Agent is assigned to a participant, they become the main point of contact for that participant. In Q4 of 2025, E1 created and distributed stickers for Delivery Agents to add to heat pump remotes, which include the contact company and phone number for any troubleshooting questions after installation. Educating participants and creating updated material will be an ongoing process of continual improvement.
2024-ASFH-R6	Look for opportunities to streamline record keeping/reporting processes to reduce the administrative burden for DAs and contractors while taking into account program tracking and evaluation needs.	Complete	E1 agrees with this recommendation. E1 staff have reduced the amount of paperwork that Delivery Agents are required to manage and have streamlined project submission processes. In 2025, E1 staff continued to review record keeping/reporting processes to identify further administrative streamlining opportunities.
2024-ASFH-R7	Update the DA/contractor training guides on the record keeping/reporting processes and use of the software tools to reflect current practices and offer regular training sessions to provide updates on any changes.	Complete	E1 agrees with this recommendation. E1 staff have updated training guides for Delivery Agents and contractors. In 2025, E1 staff implemented monthly meetings with Delivery Agents, heat pump installers, and building envelope contractors to discuss program changes, provide reminders on guidelines, and receive feedback on process improvements. E1 also provides training opportunities, including ad-hoc training related to CIS portal updates and available software/tools for calculations. E1 staff continued to engage with Delivery Agents and contractors by providing training and a forum for questions and feedback.

5.3 Participation History

For ASFH, participation is defined as participants (homes) that have completed a project and have positive electrical energy savings. As presented in Figure 6 below, 1,920 homes generated positive electrical energy savings through ASFH in 2025, representing a 59% increase in participation compared with 2024 levels. Building envelope measures were installed in 1,283 of those homes, with 729 of those homes also having a heat pump installed. In addition, 637 homes had only non-modelled measures installed. More precisely, 497 homes had a non-modelled heat pump installed, and 213 had non-modelled smart thermostats installed, while 73 of homes with non-modelled measures also had modelled savings.⁶ On top of this, 5,299 measures across 376 participant homes were installed through EPI, although those measures were funded and claimed under ASFH.⁷ The figure below also indicates that average savings per participant⁸ remained relatively stable compared to 2024 levels.

Figure 6: Overview of ASFH Participation, 2023-2025

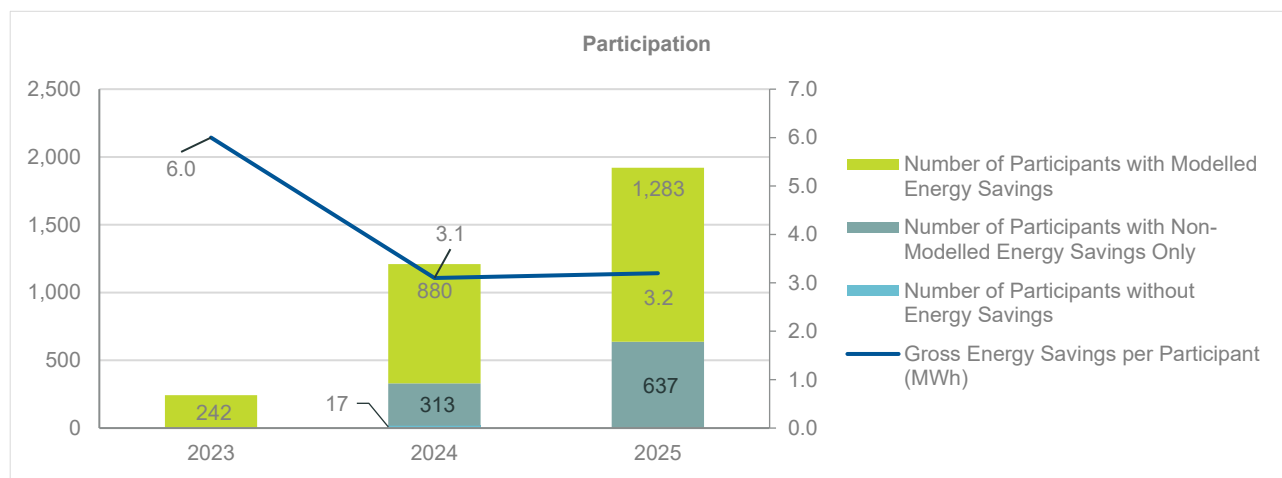
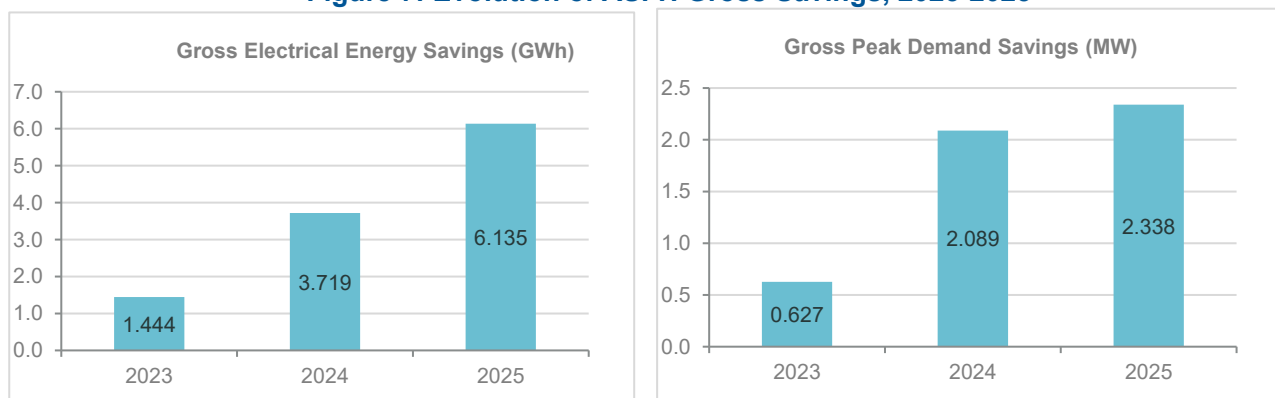


Figure 7 below provides an overview of the evolution of ASFH gross electrical energy and peak demand savings since inception in 2023. Total 2025 ASFH gross electrical energy and peak demand savings were respectively 65% and 12% higher than in 2024 mainly due to the increase in participation.

Figure 7: Evolution of ASFH Gross Savings, 2023-2025⁹



⁶ In Figure 2, participants with both modelled and non-modelled savings are included under Number of Participants with Modelled Energy Savings.

⁷ Participants with measures installed through EPI are not included separately in the participation counts as they are already accounted for in the ASFH participation number.

⁸ Average savings per participant are based on electrical energy savings from measures installed in 2025.

⁹ Electrical energy and peak demand savings reflect the evaluated savings achieved in 2025.

6 ASFH Evaluation Approach

The 2025 evaluation consisted of a condensed impact evaluation. The main objectives of the 2025 ASFH evaluation were as follows:

- › Calculate ASFH gross and net results, namely first-year and lifetime electrical energy savings, peak demand savings, as well as avoided GHG emissions

The Evaluator identified key research questions aimed at achieving the above objectives. Table 12 outlines the evaluation objectives and maps them to the Evaluator's research questions, methods, and sample sizes (n). Each method is described further below.

Table 12: 2025 ASFH Evaluation Approach

Evaluation Objectives	Research Questions	Methodology
Calculate gross results	› Are the data in the tracking sheet complete, accurate, and consistent? › What are the evaluated first-year and lifetime gross electrical energy and peak demand savings?	› Tracking sheet audit › Calculations using evaluation results
Calculate net results	› What are the evaluated first-year and lifetime net electrical energy and peak demand savings? › What are the net GHG emission reductions in CO2 eq?	› Use of a NTGR of 1 › Calculations using evaluation results › GHG emission reduction calculations

Tracking Sheet Audit

Prior to performing the savings calculation review, the Evaluator performed an audit of the final 2025 tracking sheet to ensure it was complete and the entered data were consistent. The detailed protocol used for the tracking sheet audit and the results obtained are presented in Appendix III.

Calculations Using Evaluation Results

Building on all the above methods and collected data, the Evaluator calculated the first-year and lifetime electrical energy and peak demand savings using the equations and parameters, presented in Section 7.2 below.

GHG Emission Reduction Calculations

To obtain net avoided GHG emissions in CO2 eq for ASFH, the Evaluator multiplied net electrical energy savings by the latest Nova Scotia-specific factor for GHG emissions generated by electricity production. This factor was established using Nova Scotia Power (NS Power) data.

7 ASFH Impact Evaluation

The objectives of the 2025 ASFH impact evaluation were to determine gross and net electrical energy and peak demand savings, annually avoided GHG emissions, as well as the EUL values and associated lifetime electrical energy savings.

7.1 Tracking Sheet Audit

To ensure program component results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1 as well as correcting the tracked savings as needed. The results are provided in Appendix III. The tracked savings results presented in this report, therefore, refer to the corrected tracked savings obtained by the Evaluator.

7.2 Gross Savings

For ASFH, the gross savings associated with building envelope and heat pump measures are calculated based on pre-retrofit and post-retrofit HOT2000 simulations, while the gross savings associated with smart thermostats are calculated using unitary savings values. When heat pumps are installed at a different time as building envelope measures, they are not included in the simulation. Gross electrical energy savings for the non-modelled heat pumps are determined using a semi-prescriptive calculation approach. This subsection describes the methodology used to review ASFH gross savings for 2025.

Since the following subsections are focused on ASFH gross savings, the ASFH-funded portion of EPI gross savings are only included in the total tables, while the detailed savings per measure are presented in Appendix IV.

It should also be noted that the Evaluator adjusted the calculation approach for non-modelled heat pumps after the 2024 DSM evaluation was completed. Although this adjustment occurred post-evaluation, the Evaluator agreed with E1 that the updated methodology should have been applied since April 2024. As a result, the Evaluator retroactively applied this methodology to the relevant portion of 2024 reporting and included, herein, the resulting difference in savings from that adjustment.

7.2.1 Electrical Energy Savings

For ASFH, electrical energy savings are calculated based on HOT2000 simulation results adjusted with billing analysis results and unitary savings values for prescriptive measures, as demonstrated in the equation below.

$$\begin{aligned} & \text{Gross Energy Savings (kWh)} \\ &= \left(\frac{(\text{Total Energy}_D(\text{GJ}) - \text{Total Energy}_E(\text{GJ}))}{0.0036 \text{ GJ/kWh}} \times \%_{Elec} \right) \times AR \\ &+ \text{Savings for Non-modelled Measures (kWh)} \end{aligned}$$

Where:

- › *Total Energy_D* and *Total Energy_E* correspond to the modelled energy consumption levels obtained in HOT2000 during the pre-retrofit (D) and post-retrofit (E) assessments respectively. Since modelled energy consumption levels were not directly available in the tracking sheet, participant EnerGuide ratings were used, which are based on modelled whole-home consumption. Also, if the final E assessment EnerGuide rating was not available, the projected final rating was used.
- › *AR* corresponds to the adjustment ratio (AR) established through a billing analysis and used to adjust the savings obtained from the difference between the modelled electrical energy consumption during the D and E assessments. ARs vary according to different space heating system scenarios. ARs were drawn from billing analyses conducted in 2024 as part of the HEA evaluation.
- › *%_{Elec}* corresponds to the percentage of electrical space heating estimated by the DA through the D assessment.
- › *Savings for Non-modelled Measures* are obtained by multiplying the prescriptive measures installed through ASFH by their respective unitary electrical energy savings value.

The energy savings methodology for modelled and non-modelled measures is presented below.

Modelled Energy Savings

After the D and E assessments, EAs model the house in the HOT2000 energy simulation software to obtain the initial and final EnerGuide ratings of houses. These ratings were used to determine the electrical energy savings for modelled measures. ASFH modelled energy savings correspond to the reduction in energy consumption between the D and E assessments.

Since 2024, the Evaluator made some changes to the savings calculation methodology to simplify it and make it more robust. As part of the 2024 HEA evaluation, the Evaluator conducted a billing analysis that provided savings values used to develop adjustment ratios (ARs). These ARs are now applied directly to modelled savings estimates from HOT2000 using whole-home consumption rather than only space heating.

The ARs obtained through the HEA billing analysis performed as part of the 2024 evaluation are presented in Table 13 below. The ARs were determined separately for three heat pump scenarios. It is worth noting that ARs are directly applied to the savings values obtained from the difference between the total initial assessment and total final assessment consumption values.

Table 13: 2025 Adjustment Ratios (ARs)

Scenario	Tracked	Evaluated
A participant who registered with a heat pump	1.24	No change
A participant who registered without a heat pump and who did not have one installed	0.58	No change
A participant who registered without a heat pump and then had one installed	0.43	No change

Participants with non-electrical space heating are eligible for the program component, meaning participants can generate both electrical and non-electrical savings. As indicated in the equation further above, the proportion of electrical energy savings for each participant is determined by multiplying total energy consumption by the proportion of space heating covered by electrical heating systems during the D assessment.



Non-modelled Energy Savings

Smart thermostats are not modelled in HOT2000. Instead, electrical energy savings are calculated based on unitary energy savings values from the 2025 Demand-side Management Measure Assessment (DSM MA),¹⁰ which provides detailed descriptions of inputs, references, and unitary savings calculations for non-modelled measures offered through ASFH.

For participants who installed a heat pump and had no modelled electrical energy savings, those savings were calculated using a semi-prescriptive calculation approach that relies on the specifications of each heat pump and equivalent full load hours derived from the 2024 Green Heat billing analysis. Unlike Green Heat for which savings are claimed entirely as either electrical or non-electrical, ASFH allocates these savings between electrical and non-electrical sources based on the home percentage of electric space heating. More details are provided in the 2025 DSM MA.

No unitary energy savings values for non-modelled ASFH measures were modified in the 2025 DSM MA in the course of the 2025 evaluation.

7.2.2 Peak Demand Savings

Peak demand savings correspond to the demand savings that coincide in time with the peak demand period of the electricity system. The projected electricity peak demand period in Nova Scotia is between 5 p.m. and 7 p.m. in the months of December to February on non-holiday weekdays.

For ASFH, modelled peak demand savings were calculated based on electrical savings using a peak demand-to-energy ratio of 0.283 MW/GWh (RES-Elect Space Heat & Cool) for space heating savings, as set by Navigant in the 2016-2018 DSM Plan. This ratio was established based on the modelled system coincident peak demand savings and electrical energy savings for a projected deployment of measures. Navigant used local data to establish the ratio. The Evaluator considered that the approach used by Navigant to establish the peak demand-to-energy ratio was still valid and, therefore, used it to estimate peak demand savings. An exception was made for modelled heat pump measures for which peak demand savings were calculated separately to ensure they were accounted for correctly.

For both modelled and non-modelled heat pumps, the specifications of each heat pump were used to obtain peak demand savings, as documented in the 2025 DSM MA, and peak demand savings were claimed only for households that were fully electrically heated.

The peak demand savings of smart thermostats are not modelled in HOT2000. Instead, peak demand savings are calculated based on unitary peak demand savings values. The detailed calculations for the unitary peak demand savings of each measure installed through ASFH are presented in the 2025 DSM MA.

In 2025, no revisions were applied to the unitary peak demand savings values for any ASFH measure.

¹⁰ The 2025 DSM MA is a reference document that provides an in-depth review of all parameters necessary to calculate the annual and lifetime gross electrical energy and peak demand savings of all prescriptive measures and most semi-prescriptive measures offered through E1's DSM program portfolio. In addition, the DSM MA includes effective useful life values for all measures offered in E1's program portfolio. For the evaluation conducted during the last year of the 2023-2025 DSM cycle, the Evaluator refers to the values presented in the 2025 DSM MA.

7.2.3 Interactive Effects

In a home, interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other factors such as heating and cooling. Since ASFH building envelope and heat pump measures target heating and cooling loads directly, the impact of these measures on heating and cooling is considered in the savings. Therefore, no additional interactive effects factors were applied to the savings of these measures.

For the 2025 evaluation, smart thermostat measures were not modelled in HOT2000. As presented in the 2025 DSM MA, they do not have an impact on the energy consumption of other elements in the home. Therefore, no interactive effects need to be considered for these measures.

7.2.4 Effective Useful Life

As part of the 2025 DSM MA activities, the Evaluator reviewed the EUL values used in the calculation of electrical energy savings that are expected to persist over time. The EUL values for building envelope upgrades and space heating equipment, i.e. the modelled savings for these measures, are based on the measures installed by HEA participants since HEA and ASFH participants install similar measures. The EUL values remained unchanged for all ASFH measures in 2025.

7.2.5 Evaluated Gross Savings

The annual gross electrical energy savings at the meter of modelled and non-modelled measures are presented in Table 14 and Table 15 below respectively.

Table 14: Evaluated 2025 ASFH Modelled Measure Gross Electrical Energy and Peak Demand Savings

Total	
Electrical Energy Savings	
Gross Electrical Energy Savings Without Adjustment Ratio (AR) – at the Meter (GWh)	6.237
Gross Electrical Energy Savings with AR – at the Meter (GWh)	4.661
Peak Demand Savings	
Peak Demand-to-energy Ratio (MW/GWh)*	0.362
Gross Peak Demand Savings – at the Meter (MW)	1.686
* Corresponds to the equivalent peak demand-to-energy ratio obtained by dividing gross peak demand savings by gross electrical energy savings. This value differs from the peak demand-to-energy ratio mentioned in Subsection 7.2.2 above (0.283 MW/GWh) because of the different calculation methodology applied for heat pumps.	

Table 15: Evaluated 2025 ASFH Non-modelled Measure Gross Electrical Energy and Peak Demand Savings

Measure Category	Non-modelled Heat Pumps	Smart Thermostats	Total
Number of Units Installed	497	221	718
Electrical Energy Savings			
Unitary Electrical Energy Savings (kWh)	-	479	-
Gross Electrical Energy Savings – at the Meter (GWh)	0.518	0.106	0.624
Peak Demand Savings			
Unitary Peak Demand Savings (W)	-	0	-
Gross Peak Demand Savings – at the Meter (MW)	0.323	0.000	0.323

Table 16 below presents ASFH total gross savings, combining the savings of all ASFH measures, ASFH-funded EPI measures, and retroactive 2024 savings claimed in 2025.

Gross electrical energy savings at the generator were estimated by using different line loss factors for each participant based on their rate code, which resulted in average factors of 1.0947 for electrical energy savings and 1.1465 for peak demand savings between the meter and the generator. The line loss factors were updated in 2019 and correspond to the values submitted to the Nova Scotia Utility and Review Board (NSUARB), now named the Nova Scotia Energy Board (NSEB), as part of the 2014 Cost of Service Study Progress Update.¹¹

With total gross electrical energy savings and lifetime electrical energy savings of 6.135 GWh and 118.611 GWh respectively, the average EUL value for ASFH was 19.3 years in 2025.

Table 16: Evaluated 2025 ASFH Gross Electrical Energy and Peak Demand Savings

Measure Category	Modelled Measures	2025 Non-modelled Heat Pumps	Smart Thermostats	EPI Measures*	Additional 2024 Non-modelled Heat Pumps**	Total
Number of Participants with Savings***	1,283	497	213	376	243	1,920
Electrical Energy Savings						
Gross Electrical Energy Savings – at the Meter (GWh)	4.661	0.518	0.106	0.251	0.069	5.604
Line Loss Factor	1.0947	1.0947	1.0947	1.0947	1.0947	-
Gross Electrical Energy Savings – at the Generator (GWh)	5.102	0.567	0.116	0.274	0.076	6.135
Effective Useful Life (years)	20.5	18.0	10.0	4.7	18.0	-
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	104.589	10.203	1.159	1.290	1.369	118.611
Peak Demand Savings						
Gross Peak Demand Savings – at the Meter (MW)	1.686	0.323	0.000	0.031	0.000	2.040
Line Loss Factor	1.1465	1.1465	1.1465	1.1465	1.1465	-
Gross Peak Demand Savings – at the Generator (MW)	1.933	0.371	0.000	0.035	0.000	2.338

* Savings from measures installed through EPI and financed by ASFH.

** Additional savings for non-modelled heat pumps recalculated for the period from April 1 to December 31, 2024. Following a post-evaluation adjustment to the calculation approach, the Evaluator retroactively applied the updated methodology to the savings from this period and included the resulting difference in electrical energy and peak demand savings.

*** The total number of participants does not correspond to the sum of all measure categories since participants may install modelled and non-modelled measures, participants who benefited from EPI measures also implemented additional ASFH measures, and participants with additional 2024 savings were already counted in 2024.

¹¹ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.

As presented in Table 17, GHG emission reductions were calculated by applying the Nova Scotia-specific factor¹² for GHG emissions generated by electricity production to ASFH gross savings results.

Table 17: Evaluated 2025 ASFH Gross GHG Emission Reductions

	Total
Gross Energy Savings – at the Generator (GWh)	6.135
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO2 eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO2 eq)	2,879

7.3 Net Savings

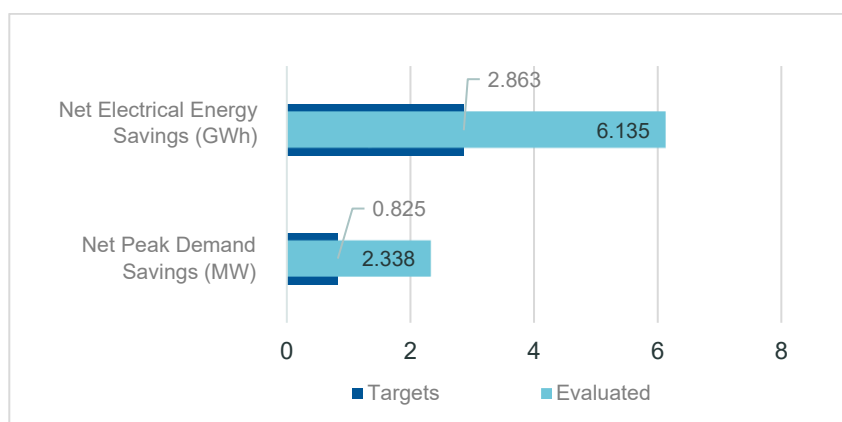
The Evaluator determined the net electrical energy and peak demand savings, i.e. the electrical energy and peak demand savings that can be reliably attributed to the program component, by estimating the net-to-gross ratio (NTGR). More precisely, the NTGR represents the positive or negative impacts of spillover and free-ridership effects on gross savings. For ASFH, free-ridership and spillover effects were considered to be nil since participants are non-profit organizations or low-income housing owners that traditionally have small housing budgets spread across many competing housing priorities. Therefore, a NTGR of 1.00 was applied.

7.3.1 Evaluated Net Savings

Net savings are defined as the changes in energy use that are specifically attributable to ASFH. Since spillover and free-ridership effects were considered nil, the net electrical energy savings are equal to the gross electrical energy savings generated by the program component. Likewise, the net annual GHG emission reductions are equal to the gross annual GHG emission reductions.

As outlined in Figure 8, ASFH exceeded its electrical energy and peak demand savings targets by 114% and 183% respectively.

Figure 8: 2025 ASFH Targets and Evaluated Results



¹² At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO2 eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed August 26, 2025) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).

7.4 Realization Rate

Table 18 below compares the electrical energy and peak demand savings established through this evaluation to those calculated in the 2025 tracking sheet. It also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings.

Table 18: Comparison of 2025 ASFH Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR	Net Savings		Realization Rate
	Value	Unit	Value	Value	Unit	Value
Electrical Energy Savings						
Tracked Savings by E1	6.059	GWh	1.00	6.059	GWh	101%
Evaluation Results	6.135	GWh	1.00	6.135	GWh	
Peak Demand Savings						
Tracked Savings by E1	2.338	MW	1.00	2.338	MW	100%
Evaluation Results	2.338	MW	1.00	2.338	MW	
*NTGRs varied for each product category. The NTGRs presented in this table correspond to the rounded averages obtained by dividing net savings by gross savings.						

The electrical energy savings determined by the Evaluator were approximately 1% higher than the savings initially tracked by E1 due to the addition of 2024 unclaimed savings from non-modelled heat pump measures. Since no additional peak demand savings were claimed for 2024 measures, the peak demand savings established by the Evaluator were identical to the values tracked by E1.



8 ASFH Key Findings and Recommendations

As previously mentioned, the main objectives of the 2025 ASFH evaluation were as follows:

- › Calculate gross and net ASFH results, namely electrical first-year and lifetime energy savings, peak demand savings, as well as avoided greenhouse gas (GHG) emissions

This section provides the Evaluator's key findings in relation to the above objectives.

2025 ASFH-Finding: ASFH exceeded its electrical energy and peak demand savings targets.

ASFH achieved 6.135 GWh in net electrical energy savings and 2.338 MW in net peak demand savings at the generator in 2025, thus exceeding the planned targets of 2.863 GWh and 0.825 MW respectively. This represents electrical energy savings 114% over ASFH targets and peak demand savings 183% over ASFH targets.

2025 ASFH-Finding: In 2025, 1,920 homes participated in ASFH, representing a 59% increase compared to 2024 levels, indicating continued growth after a substantial increase in 2024.

Among the 1,920 ASFH participants, 1,283 implemented building envelope measures, with 729 of these also installing a heat pump. Additionally, 497 participants installed a non-modelled heat pump and 213 installed smart thermostats, and a total of 5,299 ASFH-funded EPI measures were installed.

While average savings per participant remained stable, 2025 gross electrical energy and peak demand savings were respectively 65% and 12% higher than in 2024 primarily due to increased participation.

2025 ASFH-Finding: The evaluated net electrical energy and peak demand savings determined by the Evaluator were almost the same as the values tracked by E1.

While the Evaluator obtained the same peak demand savings as those tracked by E1, the electrical energy savings determined by the Evaluator were approximately 1% higher than the savings tracked by E1 due to the addition of 2024 unclaimed savings from non-modelled heat pump measures.

9 EPI Overview

This section describes the Efficient Product Installation (EPI) program component, follows up on past evaluation recommendations, and provides an overview of EPI participation history.

9.1 EPI Description

EPI provides participants with free-of-charge direct installations of energy efficient products. EPI has played a pivotal role in transforming the residential lighting market by making energy efficient products more affordable. Importantly, as light-emitting diode (LED) lamps have become the baseline, EPI phased out lighting measures in June 2025 and updated the program to focus only on electrician-installed energy efficient products. Electrician-installed measures will be key in delivering residential demand response activities. E1 contracts service providers to deliver EPI across the province. EPI is available to both homeowners and renters and also encourages participants to consider other E1 residential program components. Table 19 presents the products available for installation through EPI in 2025 and whether they were aimed at generating electrical savings, non-electrical savings, or both.

Table 19: 2025 EPI List of Eligible Products

Products	Electrical Savings	Non-electrical Savings
Lighting Products		
LED Lamps (A-types, Reflectors, and Chandeliers)	X	-
LED Nightlights	X	-
Solar Security Fixtures*	X	-
Motion Sensors*	X	-
Dimmer Switches*	X	-
Domestic Hot Water (DHW) Products		
Faucet Aerators	X	X
Low-flow Showerheads	X	X
Thermostatic Shower Valves	X	X
Pipe Insulation	X	X
Hot Water Tank Wraps	X	-
Smart and Advanced Learning Thermostats		
Smart Thermostats (for non-electrically heated homes)*	-	X
Smart Thermostats (for mini-split heat pumps [MSHPs])*	X	-
Smart Thermostats (for electric baseboards or in-floor systems)*	X	-
Smart Thermostats (for central electric heating)*	X	-
Air Sealing Products		
Foam Gaskets	X	X
Door Sweeps	X	X
Window Air Sealing	X	X
Door Weather Stripping	X	X
Window Film Kits	X	X

Products	Electrical Savings	Non-electrical Savings
Other Products		
Domestic Hot Water Heater Load Controllers ^{13 *}	X	
Humidity Sensors for bathroom fans*	X	
* Electrician-installed measures.		

Electrician-installed measures were introduced to EPI in 2024, except smart thermostats for electric baseboards and DHW heater load controllers that were introduced with a limited scope in 2023 as well as smart thermostats for MSHPs introduced in 2022. Advanced learning thermostats were initially selected for central electric heating and were replaced by smart thermostats in 2025 due to cost considerations.

EPI funding comes from two sources: (1) Electricity ratepayer funding is used for upgrades that reduce electricity consumption; and (2) funding from the Government of Nova Scotia using funds from the Green Fund for upgrades that reduce the use of other fuels. This report presents the evaluation results for the electricity ratepayer portion of EPI only.

EPI was aimed at achieving 13.426 GWh in net electrical energy savings and 1.581 MW in net peak demand savings at the generator in 2025.

9.2 Follow-up on Past Evaluation Report Recommendations

The Evaluator evaluated EPI in previous years and issued improvement recommendations. Table 20 summarizes the implementation status of evaluation recommendations from previous years.

Table 20: Implementation Status of Past Recommendations for EPI

#	Past Recommendations for EPI	Status	Comments
2024-EPI-R1	Recommendation #1: To improve the smart thermostat installation rate, explore and implement strategies to reduce the number of participants disconnecting this product due to dissatisfaction. For example, follow-up calls could be conducted, installers could educate more participants on this product, or additional educational material on this product could be shared with participants.	Complete	E1 created an automated educational email for customers who receive smart thermostats via EPI: › The marketing collateral is completed. › The first emails started reaching customers in late June 2025. It is an ongoing effort. › To help improve installation rates, a refresher training course on installation criteria and leave-behind educational materials for EPI service providers was scheduled in July 2025. › E1 made smart thermostat installations mandatory as part of program participation. › E1 has established communication protocols to provide participants with timely and consistent updates related to enrollment status, troubleshooting support, and incentive distribution. This process confirms that devices are installed on site as intended and that participants understand the functionality and benefits of their devices. › Also, quality checks are now being applied consistently, with continued refinement to ensure long-term effectiveness. E1 has also established a new quality assurance process for post-installation participant verifications. The Evaluator recognizes the improvements made.

¹³ While DHW heater load controllers were installed through EPI, savings are claimed under the Demand Response program.

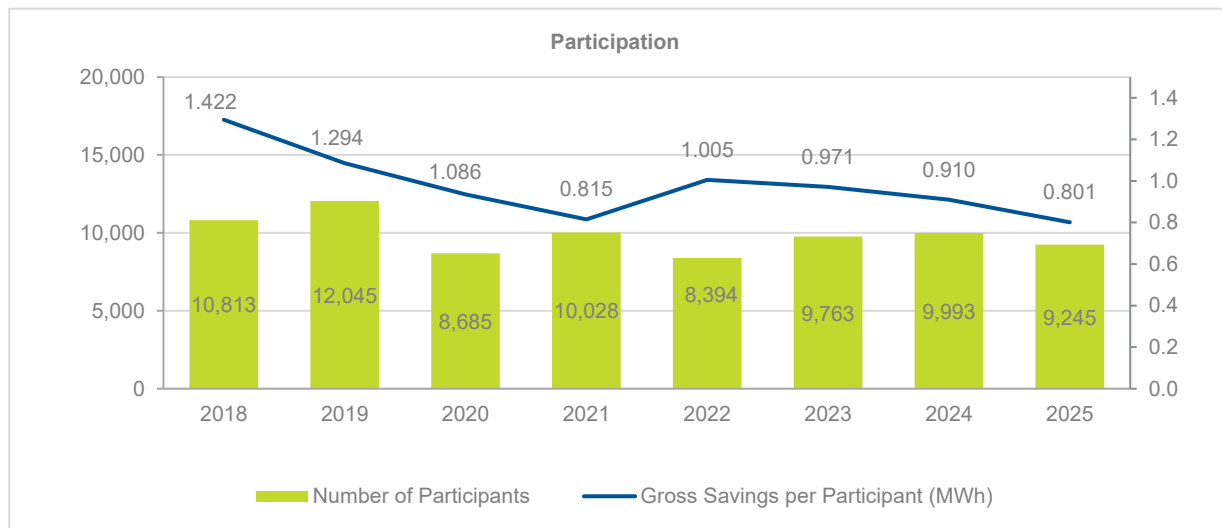
9.3 Participation History

As presented in Figure 9 below, EPI had 9,245 DSM participants, which represents a 7.5% decrease in participation compared to 2024 levels.¹⁴

In 2025, 90,666 efficient products were installed under EPI,¹⁵ which represents a 40% decrease compared to 2024 levels. On average, 9.8 products were installed per household, which is 35% lower than the average of 15.1 installed products in 2024. This decrease in the number of installed products is essentially due to the phasing out of lighting measures in June 2025. Even with the withdrawal of LED lamps in the middle of the year, this product category still represents 48% of the products installed in 2025.

Despite this significant decrease in the number of products installed, the average savings per participant only decreased by 12% in 2025 compared to 2024 levels due to the greater unitary savings associated with the electrician-installed energy efficient products. Smart thermostats now represent 11% of the products installed and account for 51% of gross electrical energy savings, while LED lamps account for only 21% of gross electrical energy savings with 48% of products installed.

Figure 9: Overview of EPI Participation, 2017-2025

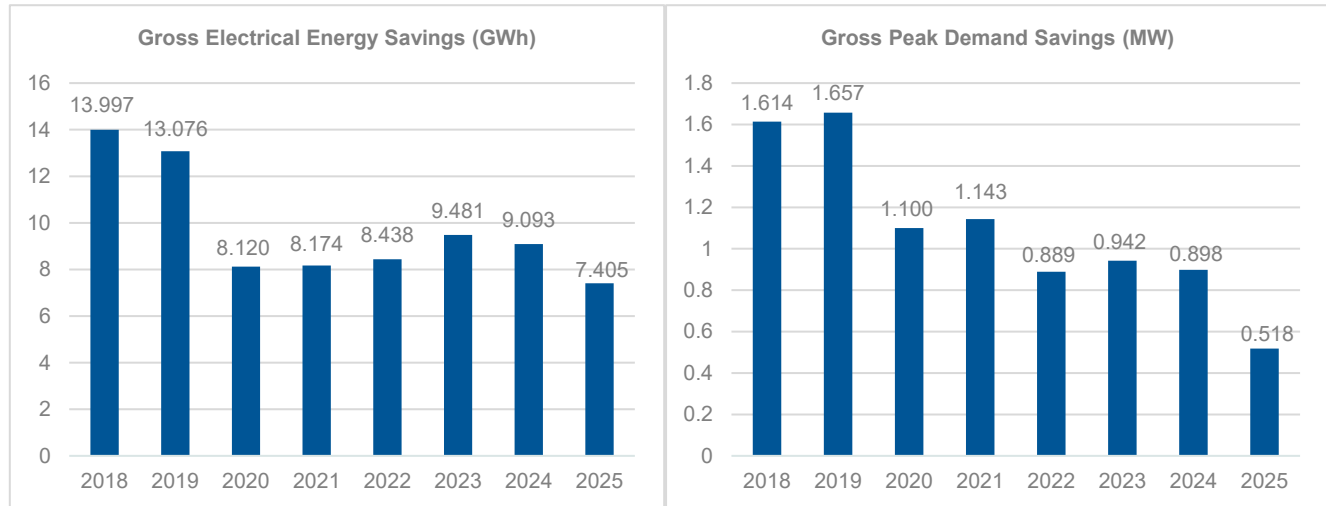


As illustrated in Figure 10 below, the 2025 gross electrical energy and peak demand savings were 19% and 42% lower respectively than those generated in 2024 due to the phasing out of LED products and lower participation levels.

¹⁴ The number of participants is based on the number of unique reference numbers of participants that generated electricity savings.

¹⁵ The number of efficient products installed does not include domestic hot water (DHW) controllers.

Figure 10: Evolution of EPI Gross Savings, 2018-2025



10 EPI Evaluation Approach

The 2025 EPI evaluation comprised a condensed impact evaluation. The main objectives of the 2025 EPI evaluation were as follows:

- › Calculate gross and net EPI results, namely electrical first-year and lifetime energy savings, peak demand savings, as well as avoided GHG emissions

The Evaluator identified key research questions aimed at achieving these objectives. Table 21 outlines the EPI evaluation objectives and maps them to the research questions and methods established by the Evaluator. Each method is described further below.

Table 21: 2025 EPI Evaluation Approach

Evaluation Objectives	Research Questions	Methodology
Calculate gross results	› Are the data in the tracking sheet complete, accurate, and consistent? › What are the evaluated first-year and lifetime gross electrical energy and peak demand savings?	› Tracking sheet audit › Calculations using evaluation results
Calculate net results	› What are the evaluated first-year and lifetime net electrical energy and peak demand savings? › What are the net GHG emission reductions in CO2 eq?	› Use of NTGR results from the 2024 survey › Use of a NTGR of 1 for low-income participants › Calculations using evaluation results › GHG emission reduction calculations

Tracking Sheet Audit

Prior to performing the savings calculation review, the Evaluator audited the final 2025 tracking sheet to ensure it was complete and the entered data were consistent. The results obtained are presented in Appendix VI.

Calculations Using Evaluation Results

Building on all the above methods and collected data, the Evaluator calculated first-year and lifetime electrical energy and peak demand savings per the calculation methodology presented in Subsection 11.2 below.

GHG Emission Reduction Calculations

To obtain net avoided GHG emissions in CO2 eq for EPI, the Evaluator multiplied net electrical energy savings by the latest Nova Scotia-specific factor for GHG emissions generated by electricity production. This factor was established using Nova Scotia Power (NS Power) data.



11 EPI Impact Evaluation

The objectives of the 2025 EPI impact evaluation were to determine gross and net electrical energy and peak demand savings, annually avoided GHG emissions, as well as effective useful life (EUL) values and associated lifetime electrical energy savings.

11.1 Tracking Sheet Audit

To ensure program component results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1. The verification and corrective actions taken by the Evaluator, where applicable, are described in Appendix VI. The tracked savings results presented in this report, therefore, refer to the corrected tracked savings obtained by the Evaluator.

11.2 Gross Savings

For EPI, gross savings correspond to the change in energy consumption resulting from installing energy efficient products in participant homes compared to the consumption level had those installations not occurred.¹⁶ The Evaluator relied on information from the 2025 Demand-side Management Measure Assessment (DSM MA)¹⁷ to calculate gross savings for EPI measures. The Evaluator also applied an adjustment ratio determined as part of the 2019 evaluation to correct observed discrepancies in tracked lamp replacements.

11.2.1 Installation Rates

Installation rates represent the proportions of products recorded in the tracking sheet that remain installed in participant homes. The Evaluator applied the installation rates outlined in the 2025 DSM MA.

11.2.2 Unitary Energy Savings

For EPI, E1 establishes separate unitary savings values for single-family homes and apartments. For the 2025 evaluation, the Evaluator used the unitary savings values from the 2025 DSM MA. That document provides a detailed description of inputs, references, and unitary savings calculations for all product types offered through EPI.

11.2.3 Unitary Peak Demand Savings

Peak demand savings correspond to the demand savings that coincide in time with the peak demand period of the electricity system. The projected electricity demand peak period in Nova Scotia is between 5 p.m. and 7 p.m. in the months of December to February on non-holiday weekdays.

The Evaluator established unitary peak demand savings for each product based on the peak demand-to-energy ratios presented in the 2025 DSM MA.

¹⁶ Definition adapted from National Renewable Energy Laboratory, "Chapter 21: Estimating Net Savings – Common Practices", The Uniform Methods Project, October 2017, p. 3, available at: <https://www.nrel.gov/docs/fy17osti/68578.pdf>.

¹⁷ The 2025 DSM MA is a reference document that provides an in-depth review of all parameters necessary to calculate the annual and lifetime gross electrical energy and peak demand savings of all prescriptive measures and most semi-prescriptive measures offered through E1's DSM program portfolio. In addition, the DSM MA includes effective useful life values for all measures offered in E1's program portfolio. For the evaluation conducted during the last year of the 2023-2025 DSM cycle, the Evaluator refers to the values presented in the 2025 DSM MA.



11.2.4 Interactive Effects

In a home, interactive effects occur when the implementation of energy efficiency products has an impact on the energy consumption of other elements such as heating and cooling. In the case of EPI, replacing lighting products with LED units causes an increase in the heating load during winter and a decrease in the cooling load during summer. The same effects occur for hot water insulation products.

For the 2025 evaluation, the Evaluator relied on the interactive effects factors presented in the 2025 DSM MA. For each entry in the EPI tracking sheet, electrical energy and peak demand interactive effects factors were determined based on product type, location, and home type and were applied to the unitary electrical energy and peak demand savings values.

11.2.5 Adjustment Ratio

As part of the 2019 evaluation, the Evaluator conducted on-site visits ($n = 28$) to establish an overview of the types of lamps used in homes and verify that replaced A-type lamps were properly tracked. The on-site visit results indicated that there were certain discrepancies in tracked savings. Comparing the revised savings to tracked savings, the Evaluator determined an adjustment ratio of 96% with a margin of error of 5%. This adjustment ratio was again applied to 2025 tracked savings for the remaining of A-type incandescent lamps replaced by LED lamps.

11.2.6 Effective Useful Life

The EUL values used in the calculation of electrical energy savings that are expected to persist over time are presented in the 2025 DSM MA.

The equivalent EUL values are applied to each product gross and net first-year electrical energy savings to obtain gross and net lifetime electrical energy savings. As a result, the weighted average EUL values of gross and net savings differ (see Subsections 11.2.7 and 11.3.4 below).

11.2.7 Evaluated Gross Savings

Table 22 and Table 23 below present the annual gross savings results per product category and dwelling for the main EPI offerings. Table 24 further below presents the breakdown of savings results for apartments, single-family homes, and EPI as a whole.

Overall, total gross electrical energy and peak demand savings respectively amounted to 7.405 GWh and 0.518 MW at the generator, which represent 54.400 GWh in lifetime electrical energy savings. As a result, the weighted average EUL value for gross electrical energy savings was established at 7.3 years.

The gross electrical energy savings at the generator were estimated using the appropriate line loss factors for each participant based on their rate code. The line loss factors were updated in 2019 and correspond to the values submitted to the Nova Scotia Utility and Review Board (NSUARB), now named the Nova Scotia Energy Board (NSEB), as part of the 2014 Cost of Service Study Progress Update.¹⁸

¹⁸ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1. For municipal utility participants, the line loss factor of the most similar NS Power rate code was assumed. If a municipal utility participant did not have a specific rate code, the average of participants for which the line loss was known was used.

Table 22: Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure - Single-family Homes

Product Category	LED Lamps							
	9 W Replacing							
	25 W	29 W	40 W	43 W	60 W	72 W	100 W	150 W
Number of Units								
Number of Units	238	244	7,833	498	21,651	175	625	6
Installation Rate (%)	94%	94%	94%	94%	94%	94%	94%	94%
Number of Units Installed	224	229	7,363	468	20,352	165	588	6
Electrical Energy Savings								
Unitary Electrical Energy Savings (kWh)	15.2	19.0	29.4	32.3	48.4	59.8	86.4	134
Energy Interactive Effects Factor*	-15.6%	-14.7%	-21.2%	-15.9%	-20.6%	-15.6%	-21.0%	-16.7%
Adjustment Ratio	0.960	0.960	0.960	0.960	0.960	0.960	0.960	0.960
Gross Electrical Energy Savings – at the Meter (GWh)	0.003	0.004	0.164	0.012	0.751	0.008	0.038	0.001
Line Loss Factor*	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.003	0.004	0.179	0.013	0.822	0.009	0.042	0.001
Effective Useful Life (years)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.003	0.004	0.179	0.013	0.822	0.009	0.042	0.001
Peak Demand Savings								
Unitary Peak Demand Savings (W)	2.46	3.08	4.76	5.23	7.84	9.69	14.0	21.7
Peak Demand Interactive Effects Factor*	-45.5%	-44.4%	-59.1%	-46.1%	-53.8%	-43.9%	-50.4%	-58.2%
Adjustment Ratio	0.960	0.960	0.960	0.960	0.960	0.960	0.960	0.960
Gross Peak Demand Savings – at the Meter (MW)	0.000	0.000	0.014	0.001	0.071	0.001	0.004	0.000
Line Loss Factor*	1.1466	1.1466	1.1466	1.1466	1.1465	1.1466	1.1466	1.1466
Gross Peak Demand Savings – at the Generator (MW)	0.000	0.000	0.016	0.001	0.081	0.001	0.004	0.000
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.								

Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure - Single-family Homes (Continued)

Product Category	LED Lamps				
	18 W Replacing 100 W	PAR20 7 W Replacing 50 W	PAR38 15 W Replacing 90 W	PAR38 15 W Replacing 120 W	PAR38 15 W Replacing 150 W
Number of Units					
Number of Units	188	1,710	113	27	382
Installation Rate (%)	94%	94%	94%	94%	94%
Number of Units Installed	177	1,607	106	25	359
Electrical Energy Savings					
Unitary Savings Value (kWh)	77.8	40.8	71.2	99.6	128
Interactive Effects Factor*	-18.2%	-23.7%	0.0%	0.0%	0.0%
Adjustment Ratio	0.960	1.000	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.011	0.050	0.008	0.003	0.046
Line Loss Factor*	1.0947	1.0945	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.012	0.055	0.008	0.003	0.050
Effective Useful Life (years)	1.0	1.0	1.0	1.0	1.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.012	0.055	0.008	0.003	0.050
Peak Demand Savings					
Unitary Peak Demand Savings (W)	12.6	6.61	11.5	16.1	20.7
Peak Demand Interactive Effects Factor*	-46.4%	-66.2%	0.0%	0.0%	0.5%
Adjustment Ratio	0.960	1.000	1.000	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	0.001	0.004	0.001	0.000	0.007
Line Loss Factor*	1.1466	1.1424	1.1466	1.1466	1.1466
Gross Peak Demand Savings – at the Generator (MW)	0.001	0.004	0.001	0.000	0.009
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.					

Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure - Single-family Homes (Continued)

Product Category	LED Lamps				
	Nightlights	GU10 7 W Replacing 35 W	GU10 7 W Replacing 50 W	G25 4.5 W Replacing 40 W	E12 5 W Chandeliers Replacing 40 W
Number of Units					
Number of Units	4,371	252	1,431	1,326	4,738
Installation Rate (%)	94%	94%	94%	94%	94%
Number of Units Installed	4,109	237	1,345	1,246	4,454
Electrical Energy Savings					
Unitary Savings Value (kWh)	29.3	26.6	40.8	33.7	33.2
Interactive Effects Factor*	-22.2%	-21.6%	-22.9%	-27.0%	-20.7%
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.094	0.005	0.042	0.031	0.117
Line Loss Factor*	1.0947	1.0947	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.103	0.005	0.046	0.034	0.128
Effective Useful Life (years)	1.0	1.0	1.0	1.0	1.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.103	0.005	0.046	0.034	0.128
Peak Demand Savings					
Unitary Peak Demand Savings (W)	4.75	4.31	6.61	5.46	5.38
Peak Demand Interactive Effects Factor*	-62.0%	-62.9%	-59.9%	-66.2%	-55.0%
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	0.007	0.000	0.004	0.002	0.011
Line Loss Factor*	1.1465	1.1466	1.1466	1.1466	1.1466
Gross Peak Demand Savings – at the Generator (MW)	0.009	0.000	0.004	0.003	0.012

* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.

Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure - Single-family Homes (Continued)

Product Category	Faucet Aerators	Thermostatic Shower Valves 2.5 gpm	Pipe Insulation (per foot)	Hot Water Tank Wraps	Low-flow Showerheads		
					0.5 gpm Reduction	0.75 gpm Reduction	1.0 gpm Reduction
Number of Units							
Number of Units	1,611	97	3,855	480	197	55	915
Installation Rate (%)	92%	89%	100%	100%	95%	95%	95%
Number of Units Installed	1,482	86	3,855	480	187	52	869
Electrical Energy Savings							
Unitary Savings Value (kWh)	118	124	12.7	157	197	296	395
Interactive Effects Factor*	0.0%	0.0%	-13.0%	-14.1%	0.0%	0.0%	0.0%
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.175	0.011	0.043	0.065	0.037	0.015	0.343
Line Loss Factor*	1.0947	1.0947	1.0947	1.0946	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.191	0.012	0.047	0.071	0.040	0.017	0.376
Effective Useful Life (years)	10.0	10.0	13.0	7.0	10.0	10.0	10.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	1.915	0.117	0.606	0.496	0.404	0.169	3.759
Peak Demand Savings							
Unitary Peak Demand Savings (W)	19.1	20.1	2.06	25.4	31.9	48.0	64.0
Peak Demand Interactive Effects Factor*	0.0%	0.0%	-62.0%	-65.6%	0.0%	0.0%	0.0%
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	0.028	0.002	0.003	0.004	0.006	0.003	0.056
Line Loss Factor*	1.1465	1.1466	1.1466	1.1461	1.1466	1.1466	1.1466
Gross Peak Demand Savings – at the Generator (MW)	0.032	0.002	0.003	0.005	0.007	0.003	0.064
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by the generator by gross savings at the meter.							

Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure - Single-family Homes (Continued)

Product Category	Smart Thermostats for Electric Central Heat Pumps	Smart Thermostats for Electric Forced Hot Air Furnaces	Smart Thermostats for Electric Baseboards	Smart Thermostats for Electric Radiant In-Floor	Smart Thermostats for MSHPs	Advanced Learning Thermostats for Central Electric Heating Without a Heat Pump	Advanced Learning Thermostats for Central Electric Heating with a Heat Pump
Number of Units							
Number of Units	2	5	5,891	9	4,447	13	33
Installation Rate (%)	100%	100%	100%	100%	84%	100%	100%
Number of Units Installed	2	5	5,891	9	3,735	13	33
Electrical Energy Savings							
Unitary Savings Value (kWh)	959	1,725	265	265	479	2,030	1,128
Interactive Effects Factor*	-	-	-	-	-	-	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.002	0.009	1.561	0.002	1.789	0.026	0.037
Line Loss Factor*	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.002	0.009	1.709	0.003	1.959	0.029	0.041
Effective Useful Life (years)	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.021	0.094	17.090	0.026	19.587	0.289	0.407
Peak Demand Savings							
Unitary Peak Demand Savings (W)	-	-	-	-	-	-	-
Peak Demand Interactive Effects Factor*	-	-	-	-	-	-	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	-	-	-	-	-	-	-
Line Loss Factor*	-	-	-	-	-	-	-
Gross Peak Demand Savings – at the Generator (MW)	-	-	-	-	-	-	-

* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.

Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure - Single-family Homes (Continued)

Product Category	Consumer Electronics and Accessory Lighting				
	Solar Security Fixtures	Indoor Motion Sensors	Outdoor Motion Sensors	Dimmer Switches	Humidity Sensors
Number of Units					
Number of Units	3,261	2,529	1,717	6,980	1,703
Installation Rate (%)	100%	100%	100%	100%	100%
Number of Units Installed	3,261	2,529	1,717	6,980	1,703
Electrical Energy Savings					
Unitary Savings Value (kWh)	92.6	9.22	19.7	3.42	143
Interactive Effects Factor*	-	-29.0%	-	-29.2%	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.302	0.017	0.034	0.017	0.244
Line Loss Factor*	1.0947	1.0947	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.331	0.018	0.037	0.019	0.267
Effective Useful Life (years)	2.5	10.0	10.0	10.0	9.5
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.826	0.181	0.370	0.185	2.533
Peak Demand Savings					
Unitary Peak Demand Savings (W)	15.0	-	-	0.554	14.3
Peak Demand Interactive Effects Factor*	-	-	-	-73.1%	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	0.049	-	-	0.001	0.024
Line Loss Factor*	1.1466	-	-	1.1466	1.1466
Gross Peak Demand Savings – at the Generator (MW)	0.056	-	-	0.001	0.028
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.					

Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure - Single-family Homes (Continued)

Product Category	Air Sealing Products – Electric Resistance Heating				
	Foam Gaskets (per pack of 10)	Door Sweeps	Window Air Sealing (per 15 ft)	Window Film Kits	Door Weather Stripping (per 17 ft)
Number of Units					
Number of Units	776	4	11	606	56
Installation Rate (%)	29%	100%	84%	57%	84%
Number of Units Installed	225	4	9	345	47
Electrical Energy Savings					
Unitary Savings Value (kWh)	90.0	173	149	334	196
Interactive Effects Factor*	-	-	-	-	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.020	0.001	0.001	0.115	0.009
Line Loss Factor*	1.0947	1.0947	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.022	0.001	0.002	0.126	0.010
Effective Useful Life (years)	15.0	15.0	15.0	1.0	15.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.333	0.011	0.023	0.126	0.151
Peak Demand Savings					
Unitary Peak Demand Savings (W)	25.5	49.0	42.0	94.5	55.3
Peak Demand Interactive Effects Factor*	-	-	-	-	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	0.006	0.000	0.000	0.033	0.003
Line Loss Factor*	1.1466	1.1466	1.1466	1.1466	1.1466
Gross Peak Demand Savings – at the Generator (MW)	0.007	0.000	0.000	0.037	0.003
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.					

Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure - Single-family Homes (Continued)

Product Category	Air Sealing Products – Heat Pump Heating					Total for Single-family Homes
	Foam Gaskets (per pack of 10)	Door Sweeps	Window Air Sealing (per 15 ft)	Window Film Kits	Door Weather Stripping (per 17 ft)	
Number of Units						
Number of Units	3,891	59	111	2,109	225	87,456
Installation Rate (%)	29%	100%	84%	57%	84%	91%
Number of Units Installed	1,128	59	93	1,202	189	79,250
Electrical Energy Savings						
Unitary Savings Value (kWh)	50.0	96.1	82.5	185	109	-
Interactive Effects Factor	-	-	-	-	-	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000	-
Gross Electrical Energy Savings – at the Meter (GWh)	0.056	0.006	0.008	0.222	0.021	6.574
Line Loss Factor*	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.062	0.006	0.008	0.243	0.022	7.196
Effective Useful Life (years)	15.0	15.0	15.0	1.0	15.0	7.36
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.926	0.093	0.126	0.243	0.337	52.963
Peak Demand Savings						
Unitary Peak Demand Savings (W)	14.2	27.2	23.4	52.4	30.8	-
Peak Demand Interactive Effects Factor	-	-	-	-	-	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000	-
Gross Peak Demand Savings – at the Meter (MW)	0.016	0.002	0.002	0.063	0.006	0.435
Line Loss Factor*	1.1465	1.1466	1.1466	1.1466	1.1466	1.1465
Gross Peak Demand Savings – at the Generator (MW)	0.018	0.002	0.003	0.072	0.007	0.499
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.						

Table 23: Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure – Apartments

Product Category	LED Lamps							
	9 W Replacing							
	25 W	29 W	40 W	43 W	60 W	72 W	100 W	150 W
Number of Units								
Number of Units	-	-	455	-	1,193	-	4	-
Installation Rate (%)	94%	94%	94%	94%	94%	94%	94%	94%
Number of Units Installed	-	-	428	-	1,121	-	4	-
Electrical Energy Savings								
Unitary Energy Savings (kWh)	15.2	19.0	29.4	32.3	48.4	59.8	86.4	134
Energy Interactive Effects Factor*	-	-	-50.9%	-	-29.7%	-	0.0%	-
Adjustment Ratio	0.960	0.960	0.960	0.960	0.960	0.960	0.960	0.960
Gross Electrical Energy Savings – at the Meter (GWh)	-	-	0.006	-	0.037	-	0.000	-
Line Loss Factor*	-	-	1.0907	-	1.0937	-	1.0947	-
Gross Electrical Energy Savings – at the Generator (GWh)	-	-	0.006	-	0.040	-	0.000	-
Effective Useful Life (years)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	-	-	0.006	-	0.040	-	0.000	-
Peak Demand Savings								
Unitary Peak Demand Savings (W)	2.46	3.08	4.76	5.23	7.84	9.69	14	21.7
Peak Demand Interactive Effects Factor*	-	-	-83.7%	-	-53.3%	-	0.0%	-
Adjustment Ratio	0.960	0.960	0.960	0.960	0.960	0.960	0.960	0.960
Gross Peak Demand Savings – at the Meter (MW)	-	-	0.000	-	0.004	-	0.000	-
Line Loss Factor*	-	-	1.1381	-	1.1417	-	1.1466	-
Gross Peak Demand Savings – at the Generator (MW)	-	-	0.000	-	0.004	-	0.000	-
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.								

Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure – Apartments (Continued)

Product Category	LED Lamps				
	18 W Replacing 100 W	PAR20 7 W Replacing 50 W	PAR38 15 W Replacing 90 W	PAR38 15 W Replacing 120 W	PAR38 15 W Replacing 150 W
Number of Units					
Number of Units	55	39	-	-	-
Installation Rate (%)	94%	94%	94%	94%	94%
Number of Units Installed	52	37	-	-	-
Electrical Energy Savings					
Unitary Savings Value (kWh)	77.8	40.8	71.2	99.6	128
Interactive Effects Factor*	-16.0%	-5.3%	-	-	-
Adjustment Ratio	0.960	1.000	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.003	0.001	-	-	-
Line Loss Factor*	1.0947	1.0945	-	-	-
Gross Electrical Energy Savings – at the Generator (GWh)	0.004	0.002	-	-	-
Effective Useful Life (years)	1.0	1.0	1.0	1.0	1.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.004	0.002	-	-	-
Peak Demand Savings					
Unitary Peak Demand Savings (W)	12.6	6.61	11.5	16.1	20.7
Peak Demand Interactive Effects Factor*	-46.0%	-18.5%	-	-	-
Adjustment Ratio	0.960	1.000	1.000	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	0.000	0.000	-	-	-
Line Loss Factor*	1.1466	1.1437	-	-	-
Gross Peak Demand Savings – at the Generator (MW)	0.000	0.000	-	-	-
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.					

Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure – Apartments (Continued)

Product Category	LED Lamps				
	Nightlights	GU10 7 W Replacing 35 W	GU10 7 W Replacing 50 W	G25 4.5 W Replacing 40 W	E12 5 W Chandeliers Replacing 40 W
Number of Units					
Number of Units	282	3	50	23	79
Installation Rate (%)	94%	94%	94%	94%	94%
Number of Units Installed	265	3	47	22	74
Electrical Energy Savings					
Unitary Savings Value (kWh)	29.3	26.6	40.8	33.7	33.2
Interactive Effects Factor*	-34.8%	-58.0%	-30.2%	-30.0%	-39.5%
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.005	0.000	0.001	0.001	0.001
Line Loss Factor*	1.094	1.0947	1.0947	1.0947	1.0941
Gross Electrical Energy Savings – at the Generator (GWh)	0.006	0.000	0.001	0.001	0.002
Effective Useful Life (years)	1.0	1.0	1.0	1.0	1.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.006	0.000	0.001	0.001	0.002
Peak Demand Savings					
Unitary Peak Demand Savings (W)	4.75	4.31	6.61	5.46	5.38
Peak Demand Interactive Effects Factor*	-61.6%	-90.0%	-64.8%	-70.4%	-75.2%
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	0.000	0.000	0.000	0.000	0.000
Line Loss Factor*	1.1432	1.1466	1.1466	1.1466	1.1458
Gross Peak Demand Savings – at the Generator (MW)	0.001	0.000	0.000	0.000	0.000

* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.

Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure – Apartments (Continued)

Product Category	Faucet Aerators	Thermostatic Shower Valves 2.5 gpm	Pipe Insulation (per foot)	Hot Water Tank Wraps	Low-flow Showerheads		
					0.5 gpm Reduction	0.75 gpm Reduction	1.0 gpm Reduction
Number of Units							
Number of Units	128	0	11	5	24	1	47
Installation Rate (%)	92%	89%	100%	100%	95%	95%	95%
Number of Units Installed	118	0	11	5	23	1	45
Electrical Energy Savings							
Unitary Savings Value (kWh)	128	141	12.7	117	225	338	450
Interactive Effects Factor*	-	-	-40.6%	-60.0%	-	-	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.015	-	0.000	0.000	0.005	0.000	0.020
Line Loss Factor*	1.0938	-	1.0947	1.0947	1.0904	1.0947	1.0940
Gross Electrical Energy Savings – at the Generator (GWh)	0.016	-	0.000	0.000	0.006	0.000	0.022
Effective Useful Life (years)	10.0	10.0	13.0	7.0	10.0	10.0	10.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.165	-	0.001	0.002	0.056	0.004	0.220
Peak Demand Savings							
Unitary Peak Demand Savings (W)	20.7	22.8	2.06	19.0	36.5	54.8	72.9
Peak Demand Interactive Effects Factor*	-	-	-73.6%	-90.0%	-	-	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	0.002	-	0.000	0.000	0.001	0.000	0.003
Line Loss Factor*	1.1391	-	1.1466	1.1466	1.1332	1.1466	1.145
Gross Peak Demand Savings – at the Generator (MW)	0.003	-	0.000	0.000	0.001	0.000	0.004
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.							

Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure – Apartments (Continued)

Product Category	Smart Thermostats for Electric Central Heat Pumps	Smart Thermostats for Electric Forced Hot Air Furnaces	Smart Thermostats for Electric Baseboards	Smart Thermostats for Electric Radiant In-Floor	Smart Thermostats for MSHPs	Advanced Learning Thermostats for Central Electric Heating without a Heat Pump	Advanced Learning Thermostats for Central Electric Heating with a Heat Pump
Number of Units							
Number of Units	-	-	258	1	49	-	-
Installation Rate (%)	100%	100%	100%	100%	84%	100%	100%
Number of Units Installed	-	-	258	1	41	-	-
Electrical Energy Savings							
Unitary Savings Value (kWh)	959	1,725	205	205	455	2,030	1,128
Interactive Effects Factor*	-	-	-	-	-	-	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	-	-	0.053	0.000	0.019	-	-
Line Loss Factor*	-	-	1.0947	1.0947	1.0947	-	-
Gross Electrical Energy Savings – at the Generator (GWh)	-	-	0.058	0.000	0.021	-	-
Effective Useful Life (years)	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	-	-	0.579	0.002	0.205	-	-
Peak Demand Savings							
Unitary Peak Demand Savings (W)	-	-	-	-	-	-	-
Peak Demand Interactive Effects Factor*	-	-	-	-	-	-	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	-	-	-	-	-	-	-
Line Loss Factor*	-	-	-	-	-	-	-
Gross Peak Demand Savings – at the Generator (MW)	-	-	-	-	-	-	-
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.							

Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure - Apartments (Continued)

Product Category	Consumer Electronics and Accessory Lighting				
	Solar Security Fixtures	Indoor Motion Sensors	Outdoor Motion Sensors	Dimmer Switches	Humidity Sensors
Number of Units					
Number of Units	37	57	16	164	34
Installation Rate (%)	100%	100%	100%	100%	100%
Number of Units Installed	37	57	16	164	34
Electrical Energy Savings					
Unitary Savings Value (kWh)	92.6	9.22	19.7	3.42	143
Interactive Effects Factor*	-	-37.1%	-	-39.6%	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.003	0.000	0.000	0.000	0.005
Line Loss Factor*	1.0947	1.0938	1.0947	1.0941	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.004	0.000	0.000	0.000	0.005
Effective Useful Life (years)	2.5	10.0	10.0	10.0	9.5
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.009	0.004	0.003	0.004	0.051
Peak Demand Savings					
Unitary Peak Demand Savings (W)	15.0	-	-	0.554	14.3
Peak Demand Interactive Effects Factor*	-	-	-	-78.5%	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	0.001	-	-	0.000	0.000
Line Loss Factor*	1.1466	-	-	1.1423	1.1466
Gross Peak Demand Savings – at the Generator (MW)	0.001	-	-	0.000	0.001
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.					

Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure – Apartments (Continued)

Product Category	Air Sealing Products – Electric Resistance Heating				
	Foam Gaskets (per pack of 10)	Door Sweeps	Window Air Sealing (per 15 ft)	Window Film Kits	Door Weather Stripping (per 17 ft)
Number of Units					
Number of Units	75	1	0	31	5
Installation Rate (%)	29%	100%	84%	57%	84%
Number of Units Installed	22	1	0	18	4
Electrical Energy Savings					
Unitary Savings Value (kWh)	90.0	173	149	334	196
Interactive Effects Factor*	-	-	-	-	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.002	0.000	-	0.006	0.001
Line Loss Factor*	1.0939	1.0947	-	1.0947	1.0884
Gross Electrical Energy Savings – at the Generator (GWh)	0.002	0.000	-	0.006	0.001
Effective Useful Life (years)	15.0	15.0	15.0	1.0	15.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.032	0.003	-	0.006	0.013
Peak Demand Savings					
Unitary Peak Demand Savings (W)	25.5	49.0	42.2	94.5	55.5
Peak Demand Interactive Effects Factor*	-	-	-	-	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	0.001	0.000	-	0.002	0.000
Line Loss Factor*	1.1446	1.1466	-	1.1466	1.1313
Gross Peak Demand Savings – at the Generator (MW)	0.001	0.000	-	0.002	0.000

* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.

Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings per Measure – Apartments (Continued)

Product Category	Air Sealing Products – Heat Pump Heating					Total for Apartments
	Foam Gaskets (per pack of 10)	Door Sweeps	Window Air Sealing (per 15 ft)	Window Film Kits	Door Weather Stripping (per 17 ft)	
Number of Units						
Number of Units	51	0	0	31	1	3,210
Installation Rate (%)	29%	100%	84%	57%	84%	92%
Number of Units Installed	15	0	0	18	1	2,943
Electrical Energy Savings						
Unitary Savings Value (kWh)	50.0	96.1	82.8	185	109	-
Interactive Effects Factor*	-	-	-	-	-	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000	-
Gross Electrical Energy Savings – at the Meter (GWh)	0.001	-	-	0.003	0.000	0.191
Line Loss Factor*	1.0947	-	-	1.0947	1.0947	1.0941
Gross Electrical Energy Savings – at the Generator (GWh)	0.001	-	-	0.004	0.000	0.209
Effective Useful Life (years)	15.0	15.0	15.0	1.0	15.0	6.88
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.012	-	-	0.004	0.001	1.437
Peak Demand Savings						
Unitary Peak Demand Savings (W)	14.2	27.2	23.4	52.4	30.8	-
Peak Demand Interactive Effects Factor*	-	-	-	-	-	-
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000	-
Gross Peak Demand Savings – at the Meter (MW)	0.000	-	-	0.001	0.000	0.017
Line Loss Factor*	1.1466	-	-	1.1466	1.1466	1.1428
Gross Peak Demand Savings – at the Generator (MW)	0.000	-	-	0.001	0.000	0.019
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.						

Table 24 presents total EPI results for single-family homes and apartments combined.

Table 24: Evaluated 2025 EPI Gross Electrical Energy and Peak Demand Savings

	Total for Single-family Homes	Total for Apartments	Grand Total
Number of Units			
Number of Units	87,456	3,210	90,666
Installation Rate (%)	91%	92%	91%
Number of Units Installed	79,250	2,943	82,193
Electrical Energy Savings			
Gross Electrical Energy Savings – at the Meter (GWh)	6.574	0.191	6.765
Line Loss Factor*	1.0947	1.0941	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	7.196	0.209	7.405
Effective Useful Life (years)*	7.4	6.9	7.3
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	52.963	1.437	54.400
Peak Demand Savings			
Gross Peak Demand Savings – at the Meter (MW)	0.435	0.017	0.452
Line Loss Factor*	1.1465	1.1428	1.1464
Gross Peak Demand Savings – at the Generator (MW)	0.499	0.019	0.518
* The installation rates, EUL values, and line loss factors correspond to the average for each offering weighted according to the proportion of each type of product and rate code. The installation rate is obtained by dividing the installed number of units by the total number of units. The EUL value is obtained by dividing lifetime gross electrical energy savings at the generator by gross electrical energy savings at the generator. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.			

Figure 11 below compares the tracked and evaluated gross electrical energy savings at the generator, while Figure 12 further below compares the tracked and evaluated gross peak demand savings at the generator. Tracked and evaluated savings are the same for all product categories.

Figure 11: 2025 EPI Tracked and Evaluated Gross Electrical Energy Savings at the Generator

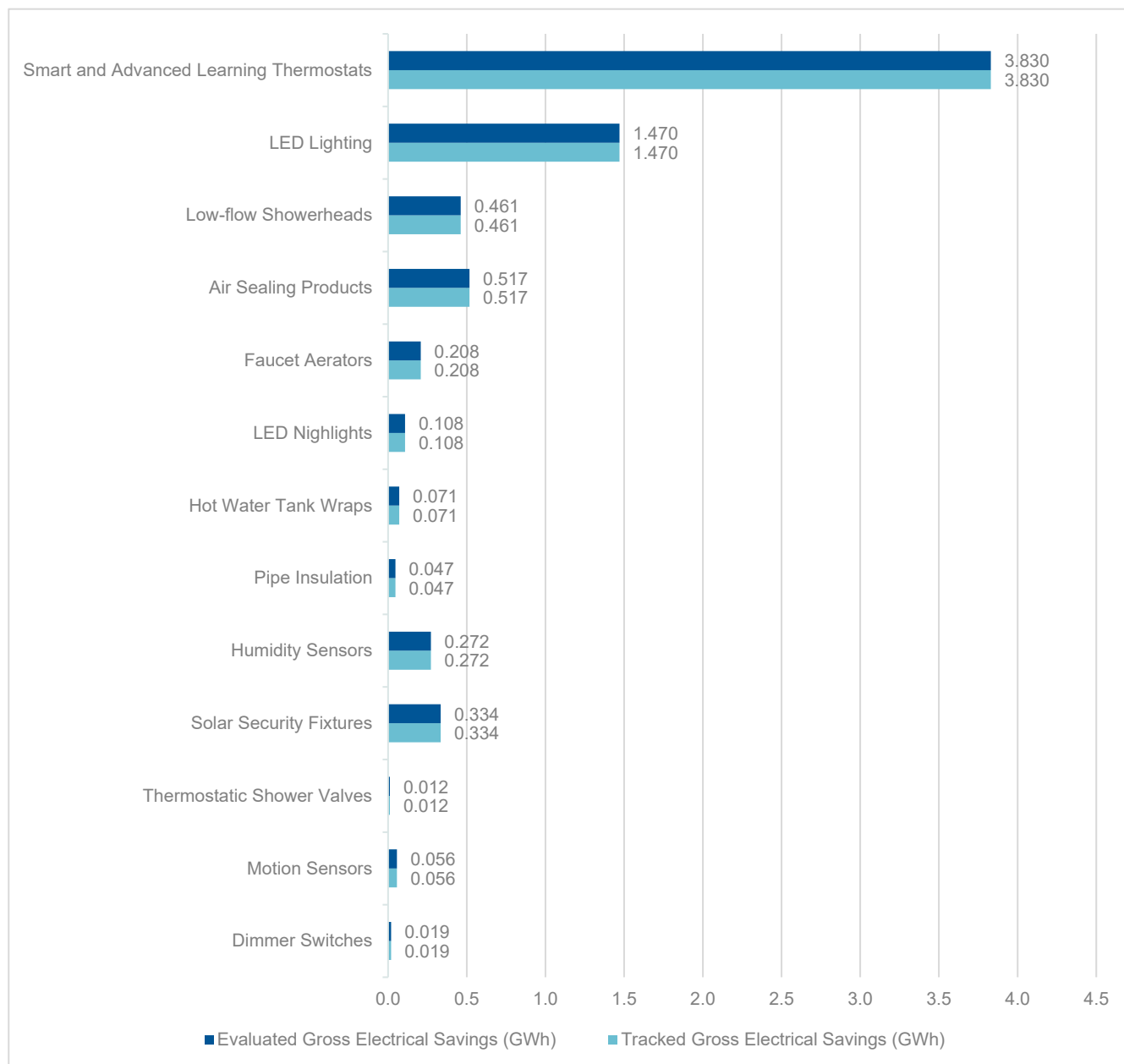
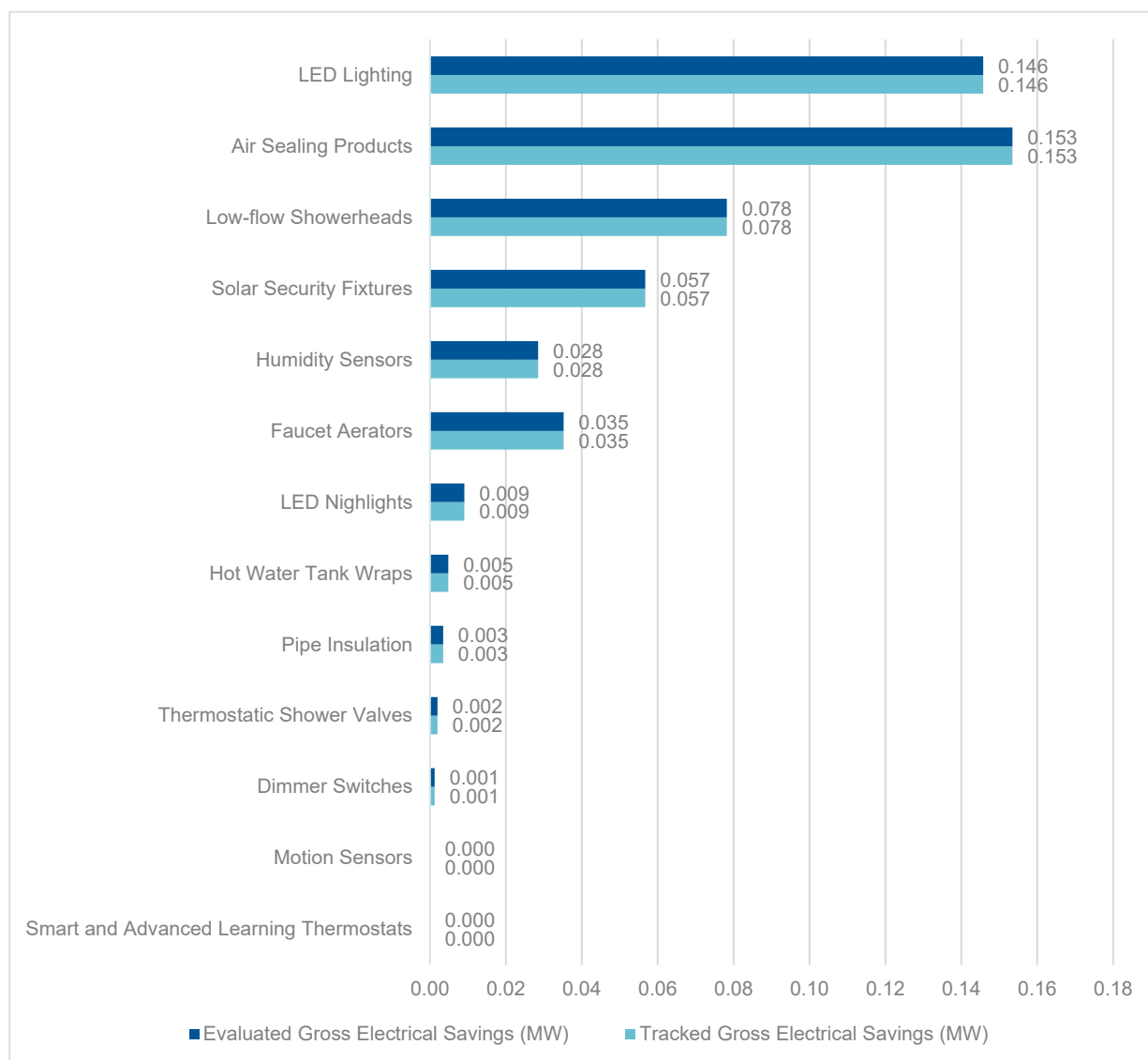


Figure 12: 2025 EPI Tracked and Evaluated Gross Peak Demand Savings at the Generator



GHG emission reductions were calculated by applying the Nova Scotia-specific factor¹⁹ for GHG emissions generated by electricity production to EPI gross savings results, the results of which are presented in Table 25.

Table 25: Evaluated 2025 EPI Gross GHG Emission Reductions

	Total
Gross Energy Savings – at the Generator (GWh)	7.405
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO2 eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO2 eq)	3,475

¹⁹ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO2 eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed August 26, 2025) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).

11.3 Net Savings

The Evaluator determined the net electrical energy and peak demand savings that can be reliably attributed to a program component by estimating the NTGR. In the case of EPI, the NTGR is established considering the free-ridership and participant spillover effects that positively or negatively affect energy savings.

11.3.1 Free-ridership

For EPI, free-ridership occurs when participants would have installed the same energy efficient products in the absence of the program component. For low-income participants, the free-ridership level is assumed to be nil, while free-ridership for non-low-income participants was assessed during the 2024 evaluation. Since no data-collection activities aimed at updating the free-ridership levels were conducted in 2025, the 2024 levels were used for the 2025 evaluation.

For LED lamps, smart thermostats, and DHW measures, free-ridership was measured using a self-report approach that involved asking a set of questions during a telephone survey to 100 non-low-income participants. The free-ridership level determined for LED lamps is also used for other lighting-related products (i.e. dimmer switches, indoor motion sensors, outdoor motion sensors, and solar security fixtures). Similarly, the free-ridership level determined for smart thermostats is used for advanced learning units.

For air sealing products, the Evaluator relied on the results of a literature review to select the most appropriate free-ridership level to be used.

Finally, for humidity sensors, which do not share similarities with other EPI products with an established free-ridership level, the Evaluator assumed a free-ridership level of 0% due to the rarity of the product and complexity of the installation.

Table 26 outlines the free-ridership levels established through the 2024 evaluation and that were used in the 2025 evaluation.

Table 26: 2025 EPI Participant Free-ridership Levels

	Average Free-ridership Level	Margin of Error	Source
Low-income Participants			
All Products	0%	N/A	Convention
Non-low-income Participants			
LED Lighting and Lighting Related Products	16%	3.2%	2024 participant survey
Smart and Advanced Learning Thermostats	9%	2.9%	2024 participant survey
DHW Products	11%	5.2%	2024 participant survey
Air Sealing Products	12%	N/A	Massachusetts 2022 Technical Reference Manual ²⁰
Humidity Sensors	0%	N/A	Assumption

²⁰ Guidehouse. *Residential Programs Net-to-Gross Research of RCD and Select Products Measures: Results Workbook*. 2021, retrieved from: <https://api-plus.anbetrack.com/etrm-gateway/etrm/api/v1/etrm/documents/6130ceae6933d4a3eeb9d0f/view?authToken=f20f0d437bdeaaafd3da64175dbb2ee0a1891776d21fca7d98da2350eba6ca493b93859bdd54814b92cb8e630fac359f56e61535ff4bb94ef13fb398049128721572dc3920feb>.

11.3.2 Participant Spillover

For EPI, participant spillover occurs when participants purchase and install additional energy efficient products due to the influence of having participated in the program component without receiving any additional support from an E1 program. For low-income participants, spillover is assumed to be nil. For non-low-income participants, spillover was assessed during the 2024 evaluation using a self-report approach that involved asking a set of questions during a telephone survey to 100 respondents.

Table 27 outlines the participant spillover levels established through the 2024 evaluation and that were used in the 2025 evaluation.

Table 27: 2025 EPI Participant Spillover Levels

	Average Participant Spillover Level	Margin of Error
Low-income Participants		
All Products	0%	N/A
Non-low-income Participants		
All Products	8%	3.8%

11.3.3 Net-to-gross Ratio Calculation

The NTGR values were calculated using the following equation.

$$NTGR = (1 - \% \text{ Free-ridership} + \% \text{ Internal Spillover})$$

Overall NTGR values were updated in 2025 using the specific NTGR value established per participant type and product category as part of the 2024 evaluation and the proportions of savings associated with each participant type in each product category in 2025.

Table 28 below outlines the overall NTGR values established through the 2025 evaluation. Since the proportions of savings associated with each participant type in each product category had not changed significantly, the overall NTGR values calculated in 2025 are very similar to those obtained in 2024.

Table 28: 2025 EPI Net-to-gross Ratios by Product Category

Products	Participant Type	NTGR	Proportion of Product Category Gross Savings by Participant Type	Overall NTGR Values
LED Lamps and Lighting Related Products	Non-low-income Participants	0.92	37%	0.97
	Low-income Participants	1.00	63%	
Smart and Advanced Learning Thermostats	Non-low-income Participants	0.99	55%	0.99
	Low-income Participants	1.00	45%	
DHW Products	Non-low-income Participants	0.97	38%	0.99
	Low-income Participants	1.00	62%	
Air Sealing Products	Non-low-income Participants	0.96	48%	0.98
	Low-income Participants	1.00	52%	
Humidity Sensors	Non-low-income Participants	1.08	56%	1.04
	Low-income Participants	1.00	44%	

11.3.4 Evaluated Net Savings

Net savings are defined as the energy use reductions that are specifically attributable to EPI. Net savings were estimated by applying the overall NTGR to gross savings as exemplified in the following equation.

$$\text{Net Savings} = \text{Gross Savings} \times \text{NTGR}$$

This equation was used to calculate both electrical energy savings and peak demand savings.

The detailed results per measure are presented in Table 29 below. The net electrical energy savings resulted in 3,426 tonnes of CO₂ eq in net annual GHG emission reductions.

Table 29: Evaluated 2025 EPI Net Electrical Energy and Peak Demand Savings per Measure

Product Category	LED Lamps							
	9 W Replacing							
	25 W	29 W	40 W	43 W	60 W	72 W	100 W	150 W
Electrical Energy Savings								
Gross Electrical Energy Savings – at the Meter (GWh)	0.003	0.004	0.170	0.012	0.787	0.008	0.039	0.001
NTGR	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Net Electrical Energy Savings – at the Meter (GWh)	0.003	0.003	0.165	0.012	0.764	0.008	0.038	0.001
Line Loss Factor*	1.0947	1.0947	1.0946	1.0947	1.0946	1.0947	1.0947	1.0947
Net Electrical Energy Savings – at the Generator (GWh)	0.003	0.004	0.180	0.013	0.836	0.008	0.041	0.001
Effective Useful Life (years)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	0.003	0.004	0.180	0.013	0.836	0.008	0.041	0.001
Peak Demand Savings								
Gross Peak Demand Savings – at the Meter (MW)	0.000	0.000	0.014	0.001	0.075	0.001	0.004	0.000
NTGR	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Net Peak Demand Savings –at the Meter (MW)	0.000	0.000	0.014	0.001	0.072	0.001	0.004	0.000
Line Loss Factor*	1.1466	1.1466	1.1464	1.1466	1.1463	1.1466	1.1466	1.1466
Net Peak Demand Savings – at the Generator (MW)	0.000	0.000	0.016	0.001	0.083	0.001	0.004	0.000
* The line loss factors correspond to the average for each product weighted according to the proportion of each rate code. These factors are obtained by dividing net savings at the generator by net savings at the meter.								

Evaluated 2025 EPI Net Electrical Energy and Peak Demand Savings per Measure (Continued)

Product Category	LED Lamps				
	18 W Replacing 100 W	PAR20 7 W Replacing 50 W	PAR38 15 W Replacing 90 W	PAR38 15 W Replacing 120 W	PAR38 15 W Replacing 150 W
Electrical Energy Savings					
Gross Electrical Energy Savings – at the Meter (GWh)	0.014	0.051	0.008	0.003	0.046
NTGR	0.97	0.97	0.97	0.97	0.97
Net Electrical Energy Savings – at the Meter (GWh)	0.014	0.050	0.007	0.002	0.045
Line Loss Factor*	1.0947	1.0945	1.0947	1.0947	1.0947
Net Electrical Energy Savings – at the Generator (GWh)	0.015	0.055	0.008	0.003	0.049
Effective Useful Life (years)	1.0	1.0	1.0	1.0	1.0
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	0.015	0.055	0.008	0.003	0.049
Peak Demand Savings					
Gross Peak Demand Savings – at the Meter (MW)	0.001	0.004	0.001	0.000	0.007
NTGR	0.97	0.97	0.97	0.97	0.97
Net Peak Demand Savings – at the Meter (MW)	0.001	0.004	0.001	0.000	0.007
Line Loss Factor*	1.1466	1.1425	1.1466	1.1466	1.1466
Net Peak Demand Savings – at the Generator (MW)	0.002	0.004	0.001	0.000	0.008
* The line loss factors correspond to the average for each product weighted according to the proportion of each rate code. These factors are obtained by dividing net savings at the generator by net savings at the meter.					

Evaluated 2025 EPI Net Electrical Energy and Peak Demand Savings per Measure (Continued)

Product Category	LED Lamps				
	Nightlights	GU10 7 W Replacing 35 W	GU10 7 W Replacing 50 W	G25 4.5 W Replacing 40 W	E12 5 W Chandeliers Replacing 40 W
Electrical Energy Savings					
Gross Electrical Energy Savings – at the Meter (GWh)	0.099	0.005	0.044	0.031	0.119
NTGR	0.97	0.97	0.97	0.97	0.97
Net Electrical Energy Savings – at the Meter (GWh)	0.096	0.005	0.042	0.030	0.115
Line Loss Factor*	1.0947	1.0947	1.0947	1.0947	1.0947
Net Electrical Energy Savings – at the Generator (GWh)	0.105	0.005	0.046	0.033	0.126
Effective Useful Life (years)	1.0	1.0	1.0	1.0	1.0
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	0.105	0.005	0.046	0.033	0.126
Peak Demand Savings					
Gross Peak Demand Savings – at the Meter (MW)	0.008	0.000	0.004	0.002	0.011
NTGR	0.97	0.97	0.97	0.97	0.97
Net Peak Demand Savings – at the Meter (MW)	0.008	0.000	0.004	0.002	0.011
Line Loss Factor*	1.1463	1.1466	1.1466	1.1466	1.1466
Net Peak Demand Savings – at the Generator (MW)	0.009	0.000	0.004	0.003	0.012
* The line loss factors correspond to the average for each product weighted according to the proportion of each rate code. These factors are obtained by dividing net savings at the generator by net savings at the meter.					



Evaluated 2025 EPI Net Electrical Energy and Peak Demand Savings per Measure (Continued)

Product Category	Faucet Aerators	Thermostatic Shower Valves 2.5 gpm	Pipe Insulation (per foot)	Hot Water Tank Wraps	Low-flow Showerheads		
					0.5 gpm Reduction	0.75 gpm Reduction	1.0 gpm Reduction
Electrical Energy Savings							
Gross Electrical Energy Savings – at the Meter (GWh)	0.190	0.011	0.043	0.065	0.042	0.016	0.363
NTGR	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Net Electrical Energy Savings – at the Meter (GWh)	0.188	0.011	0.042	0.064	0.042	0.016	0.360
Line Loss Factor*	1.0946	1.0947	1.0947	1.0946	1.0942	1.0947	1.0947
Net Electrical Energy Savings – at the Generator (GWh)	0.206	0.012	0.046	0.070	0.045	0.017	0.394
Effective Useful Life (years)	10.0	10.0	13.0	7.0	10.0	10.0	10.0
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	2.059	0.116	0.601	0.493	0.455	0.171	3.939
Peak Demand Savings							
Gross Peak Demand Savings – at the Meter (MW)	0.031	0.002	0.003	0.004	0.007	0.003	0.059
NTGR	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Net Peak Demand Savings – at the Meter (MW)	0.030	0.002	0.003	0.004	0.007	0.003	0.058
Line Loss Factor*	1.1459	1.1466	1.1466	1.1461	1.1450	1.1466	1.1465
Net Peak Demand Savings – at the Generator (MW)	0.035	0.002	0.003	0.005	0.008	0.003	0.067
* The line loss factors correspond to the average for each product weighted according to the proportion of each rate code. These factors are obtained by dividing net savings at the generator by net savings at the meter.							



Evaluated 2025 EPI Net Electrical Energy and Peak Demand Savings per Measure (Continued)

Product Category	Smart Thermostats for Electric Central Heat Pumps	Smart Thermostats for Electric Forced Hot Air Furnaces	Smart Thermostats for Electric Baseboards	Smart Thermostats for Electric Radiant In-Floor	Smart Thermostats for MSHPs	Advanced Learning Thermostats for Central Electric Heating Without a Heat Pump	Advanced Learning Thermostats for Central Electric Heating with a Heat Pump
Electrical Energy Savings							
Gross Electrical Energy Savings – at the Meter (GWh)	0.002	0.009	1.614	0.003	1.808	0.026	0.037
NTGR	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Net Electrical Energy Savings – at the Meter (GWh)	0.002	0.009	1.598	0.003	1.790	0.026	0.037
Line Loss Factor*	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947
Net Electrical Energy Savings – at the Generator (GWh)	0.002	0.009	1.749	0.003	1.959	0.029	0.040
Effective Useful Life (years)	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	0.021	0.093	17.492	0.028	19.594	0.286	0.403
Peak Demand Savings							
Gross Peak Demand Savings – at the Meter (MW)	-	-	-	-	-	-	-
NTGR	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Net Peak Demand Savings – at the Meter (MW)	-	-	-	-	-	-	-
Line Loss Factor*	-	-	-	-	-	-	-
Net Peak Demand Savings – at the Generator (MW)	-	-	-	-	-	-	-
* The line loss factors correspond to the average for each product weighted according to the proportion of each rate code. These factors are obtained by dividing net savings at the generator by net savings at the meter.							

Evaluated 2025 EPI Net Electrical Energy and Peak Demand Savings per Measure (Continued)

Product Category	Consumer Electronics and Accessory Lighting				
	Solar Security Fixtures	Indoor Motion Sensors	Outdoor Motion Sensors	Dimmer Switches	Humidity Sensors
Electrical Energy Savings					
Gross Electrical Energy Savings – at the Meter (GWh)	0.305	0.017	0.034	0.017	0.248
NTGR	0.97	0.97	0.97	0.97	1.04
Net Electrical Energy Savings – at the Meter (GWh)	0.296	0.016	0.033	0.017	0.258
Line Loss Factor*	1.0947	1.0947	1.0947	1.0947	1.0947
Net Electrical Energy Savings – at the Generator (GWh)	0.324	0.018	0.036	0.018	0.283
Effective Useful Life (years)	2.5	10.0	10.0	10.0	9.5
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	0.811	0.179	0.363	0.183	2.687
Peak Demand Savings					
Gross Peak Demand Savings – at the Meter (MW)	0.049	-	-	0.001	0.025
NTGR	0.97	0.97	0.97	0.97	1.04
Net Peak Demand Savings – at the Meter (MW)	0.048	-	-	0.001	0.026
Line Loss Factor*	1.1466	-	-	1.1465	1.1466
Net Peak Demand Savings – at the Generator (MW)	0.055	-	-	0.001	0.030
* The line loss factors correspond to the average for each product weighted according to the proportion of each rate code. These factors are obtained by dividing net savings at the generator by net savings at the meter.					

Evaluated 2025 EPI Net Energy and Peak Demand Savings per Measure (Continued)

Product Category	Air Sealing Products – Electric Resistance Heating				
	Foam Gaskets	Door Sweeps	Window Air Sealing	Window Film Kits	Door Weather Stripping
Electrical Energy Savings					
Gross Electrical Energy Savings – at the Meter (GWh)	0.022	0.001	0.001	0.121	0.010
NTGR	0.98	0.98	0.98	0.98	0.98
Net Electrical Energy Savings – at the Meter (GWh)	0.022	0.001	0.001	0.119	0.010
Line Loss Factor*	1.0946	1.0947	1.0947	1.0947	1.0942
Net Electrical Energy Savings – at the Generator (GWh)	0.024	0.001	0.001	0.130	0.011
Effective Useful Life (years)	15.0	15.0	15.0	1.0	15.0
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	0.357	0.014	0.022	0.130	0.161
Peak Demand Savings					
Gross Peak Demand Savings – at the Meter (MW)	0.006	0.000	0.000	0.034	0.003
NTGR	0.98	0.98	0.98	0.98	0.98
Net Peak Demand Savings – at the Meter (MW)	0.006	0.000	0.000	0.034	0.003
Line Loss Factor*	1.1464	1.1466	1.1466	1.1466	1.1453
Net Peak Demand Savings – at the Generator (MW)	0.007	0.000	0.000	0.039	0.003
* The line loss factors correspond to the average for each product weighted according to the proportion of each rate code. These factors are obtained by dividing net savings at the generator by net savings at the meter.					

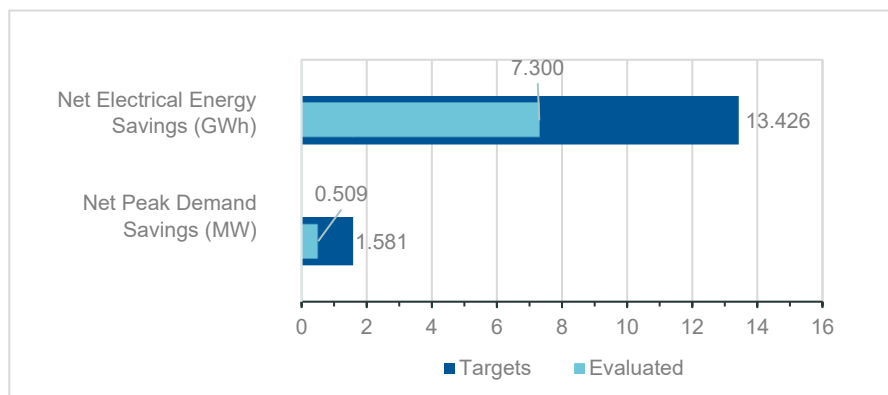
Evaluated 2025 EPI Net Energy and Peak Demand Savings per Measure (Continued)

Product Category	Air Sealing Products – Heat Pump Heating					Grand Total
	Foam Gaskets	Door Sweeps	Window Air Sealing	Window Film Kits	Door Weather Stripping	
Electrical Energy Savings						
Gross Electrical Energy Savings – at the Meter (GWh)	0.057	0.006	0.008	0.226	0.021	6.765
NTGR	0.98	0.98	0.98	0.98	0.98	-
Net Electrical Energy Savings – at the Meter (GWh)	0.056	0.006	0.008	0.221	0.020	6.669
Line Loss Factor*	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947
Net Electrical Energy Savings – at the Generator (GWh)	0.061	0.006	0.008	0.242	0.022	7.300
Effective Useful Life (years)	15.0	15.0	15.0	1.0	15.0	7.4
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	0.920	0.091	0.124	0.242	0.332	53.898
Peak Demand Savings						
Gross Peak Demand Savings – at the Meter (MW)	0.016	0.002	0.002	0.064	0.006	0.452
NTGR	0.98	0.98	0.98	0.98	0.98	-
Net Peak Demand Savings – at the Meter (MW)	0.016	0.002	0.002	0.063	0.006	0.444
Line Loss Factor*	1.1465	1.1466	1.1466	1.1466	1.1466	1.1464
Net Peak Demand Savings – at the Generator (MW)	0.018	0.002	0.002	0.072	0.007	0.509
* The line loss factors correspond to the average for each product weighted according to the proportion of each rate code. These factors are obtained by dividing net savings at the generator by net savings at the meter.						



As outlined in Figure 13, EPI fell short of its electrical energy and peak demand savings targets by 46% and 68% respectively.

Figure 13: 2025 EPI Targets and Net Evaluated Savings



11.4 Realization Rate

Table 30 below compares the electrical energy and peak demand savings established through the 2025 evaluation to those outlined in the 2025 tracking sheet. It also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings.

Table 30: Comparison of 2025 EPI Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR*	Net Savings		Realization Rate Value
	Value	Unit	Value	Value	Unit	
Electrical Energy Savings						
Tracked Savings by E1	7.405	GWh	0.99	7.338	GWh	99%
Evaluation Results	7.405	GWh	0.99	7.300	GWh	
Peak Demand Savings						
Tracked Savings by E1	0.518	MW	0.98	0.509	MW	100%
Evaluation Results	0.518	MW	0.98	0.509	MW	
*NTGRs varied for each product category. The NTGRs presented in this table correspond to the rounded averages obtained by dividing net savings by gross savings.						

The tracked and evaluated gross electrical energy and peak demand savings are the same since no change was made to the gross savings calculation parameters as part of the 2025 evaluation.

For net electrical energy savings, the evaluation results were 1% lower than the tracked values due to the overall NTGR values updated with the proportions of each product category per participant type. This update only impacts the overall NTGR value used for smart thermostats that do not generate any peak demand savings, which explains why tracked net peak demand savings are the same as evaluated results.



12 EPI Key Findings and Recommendations

As mentioned previously, the main objectives of the 2025 EPI evaluation were as follows:

- › Calculate gross and net EPI results, namely first-year and lifetime electrical energy savings, peak demand savings, as well as avoided GHG emissions.

This section provides the Evaluator's key findings and recommendations in relation to the above objectives.

2025 EPI-Finding: EPI net electrical energy savings and peak demand savings fell short of targets.

EPI achieved 7.300 GWh in net electrical energy savings and 0.509 MW in net peak demand savings at the generator in 2025, thus falling short of the planned net electrical energy savings of 13.426 GWh and net peak demand savings of 1.581 MW.

2025 EPI-Finding: Participation decreased in 2025 compared to 2024 levels.

The number of participants decreased in 2025 by 7.5% compared to 2024 levels, while the number of measures installed through EPI decreased by 40% compared to 2024 levels. This decrease in the number of installed products is essentially due to the phasing out of lighting measures in June 2025. Even with the withdrawal of LED lamps in the middle of the year, the product category still represents 48% of the products installed in 2025.

Despite this significant decrease in the number of products installed, the average savings per participant only decreased by 12% in 2025 compared to 2024 savings due to the greater unitary savings associated with the electrician-installed energy efficient products.

2025 EPI-Finding: Evaluated net electrical energy and peak demand savings were almost identical to the values tracked by E1.

The gross corrected tracked values were identical to the gross evaluated values since no gross savings calculation parameters were updated as part of the 2025 evaluation. The only update in the 2025 evaluation was the calculation of the overall 2025 NTGR values based on the proportions of savings associated with each participant type for each product category, which was very minor. Due to this update, the net electrical energy and peak demand savings have realization rates of 99% and 100% respectively.

13 Green Heat Overview

This section presents Green Heat, follows up on previous evaluation recommendations, and presents an overview of participation history.

13.1 Green Heat Description

The Green Heat program component of the Existing Residential program is designed to promote the installation of energy efficient heating systems and systems that use renewable fuel sources in Nova Scotia homes. Specifically, Green Heat provides financial incentives to homeowners for high-efficiency heat pumps, biomass heating systems, solar space and water heating systems, and demand reduction measures.

The program component is managed and administered by E1 staff. Figure 14 illustrates the main steps in the Green Heat participation process.

Figure 14: Overview of Green Heat Participation Process

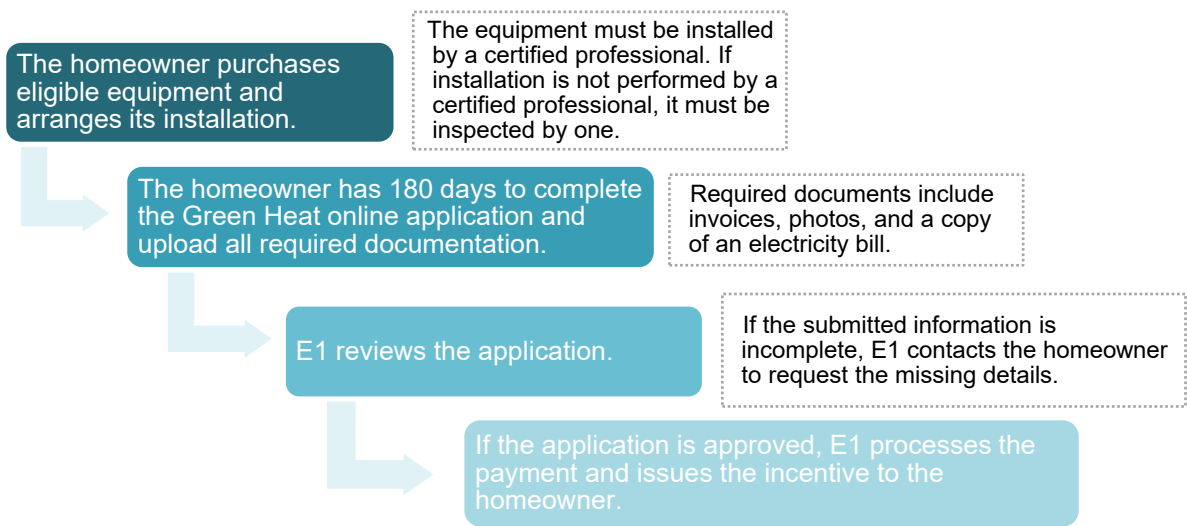


Table 31 below summarizes the current Green Heat incentives for each eligible system type.

Table 31: 2025 Green Heat Incentives

Measure	Incentive
Heat Pumps	
Ductless Mini-split Heat Pumps	\$200/refrigeration tonne
Centrally Ducted Air-source Heat Pumps	\$400/refrigeration tonne
Air-to-water Heat Pumps	\$400/refrigeration tonne
Ground-source Heat Pumps	\$500/refrigeration tonne
Biomass	
Wood/Pellet Stoves	\$500/unit
Wood/Pellet Boilers or Centrally Ducted Forced Air Furnaces	\$1,000/unit
Demand Reduction	
Electric Thermal Storage (ETS, listed room unit)	\$316-\$1,600/unit*
Electric Thermal Storage (unlisted model room unit)	\$40/kWh
Electric Thermal Storage (central system)	\$2,000/unit
Domestic Hot Water (DHW) Heater Timers	\$20/unit
* There were thirteen eligible ETS room units offered through Green Heat. The incentive level varies depending on the model.	

As of May 1, 2025, wood and pellet fireplace insert, solar thermal air heating, and solar water heating measures were discontinued from Green Heat. Installations completed within 180 days of the May 1 cut-off remained eligible for a rebate.

As of December 31, 2025, Green Heat was discontinued due to declining participation and reduced energy savings. E1 is now focusing on supporting homeowners through its broader and more comprehensive rebate offerings. Any applications submitted on or after January 1, 2026, will not be accepted.

Incentives for 2025 were adjusted compared to 2024 as follows. Incentives for mini-split heat pumps (MSHPs) were reduced from \$300 to \$200 per tonne, while incentives for centrally ducted air-source heat pumps (CASHPs) and air-to-water heat pumps were reduced from \$500 to \$400 per tonne and incentives for wood and pellet stoves were lowered from \$750 to \$500/unit.

Since July 2018, through the addition of funds from the federal Low Carbon Economy Fund (LCEF) and provincial Green Fund, Green Heat has offered heating system rebates for non-electrically heated homes. The rebate amounts and criteria remain unchanged whether the home is electrically or non-electrically heated except for demand reduction measures. This report presents the evaluation results for measures generating electrical savings only. The savings associated with measures that displace non-electrical energy consumption are reported in the Government-funded Evaluation report and are therefore not included herein.

Green Heat was aimed at achieving net electrical energy savings of 3.571 GWh and net peak demand savings of 2.717 MW at the generator in 2025.

13.2 Follow-up on Past Evaluation Report Recommendations

The Evaluator evaluated Green Heat in previous years and issued improvement recommendations. Table 32 below provides a summary of the implementation status of past recommendations that were carried forward.

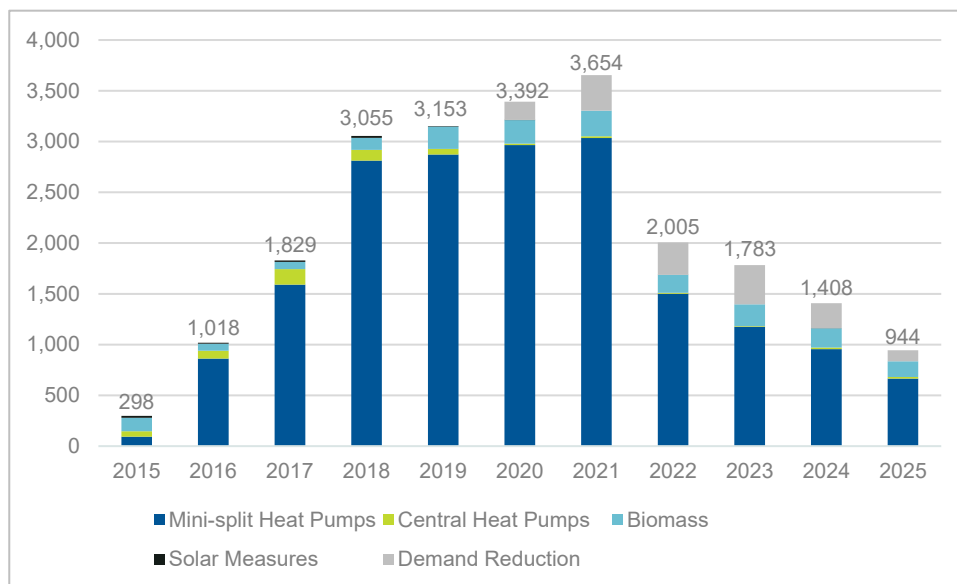
Table 32: Implementation Status of Past Recommendations for Green Heat

#	Past Recommendations	Status	Comments
2024-GH-R1	In light of their very low savings and considering their low uptake, consider removing wood fireplace inserts and pellet fireplace inserts from the Green Heat offer.	Complete	E1 staff reviewed the eligibility of wood and pellet fireplace inserts and decided to remove these measures from the Green Heat program effective May 1, 2025. Any installations within 180 days of the May 1st cut-off will remain eligible for a rebate.
2023-GH-R1	It would be in E1's best interest to ensure that Green Heat marketing materials are available to contractors and participants.	Complete	E1 staff distribute marketing materials and program guides at Home Shows to participants. These resources are also available upon request—both digitally and in print—for participants, EPP members, and industry professionals. They provide detailed explanations of the differences between E1's residential programs, including GH.
2023-GH-R4	Consider offering increased incentives to low and moderate-income households and incentivizing heat pump replacements for those households.	Deferred	In 2024, E1 staff evaluated opportunities to increase rebates for low- and moderate-income households and considered incentives for heat pump replacements. However, findings from the 2024 GH Billing Analysis significantly reduced estimated energy savings for mini-split heat pumps, prompting the need for further review by E1 staff.

13.3 Participation History

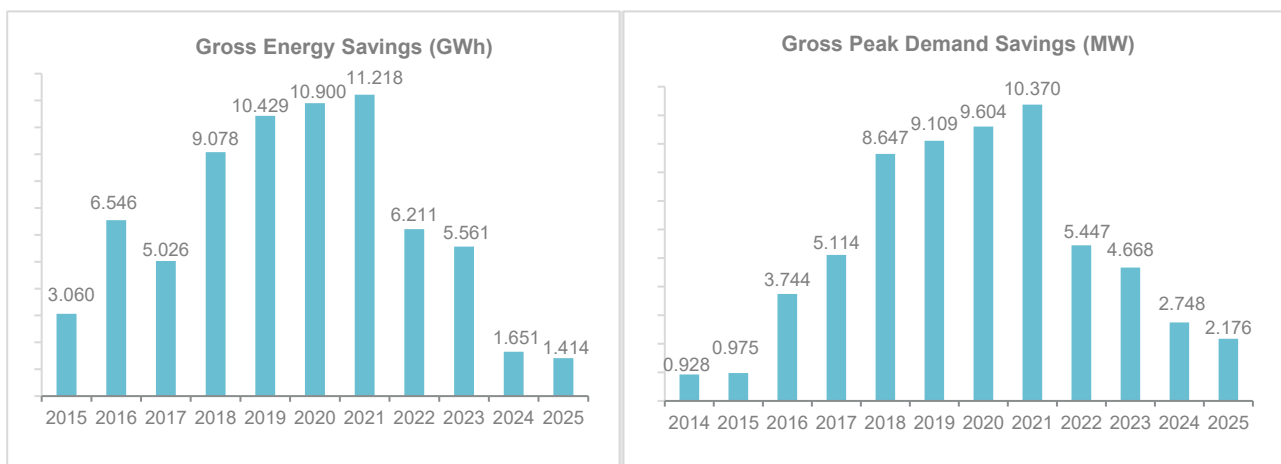
In 2025, the number of Green Heat measures installed decreased by 33% compared to 2024 levels primarily due to a 30% drop in the number of installed MSHPs and a 56% drop in the number of installed demand reduction measures, as illustrated in Figure 15 below. The decrease in installed measures has been observed for four consecutive years now and has been attributed to the launch of the Canada Greener Homes Grant (CGH Grant) by the federal government in May 2021. During those years, a portion of participants opted to enroll in HEA and the CGH Grant rather than Green Heat to access higher federal incentives. Since the CGH Grant was closed to new applicants on February 5, 2024, the expectation was that Green Heat participation would increase – a trend that did not materialize in 2025.

Figure 15: Overview of Green Heat Participation, 2015-2025



As indicated in Figure 16 below, Green Heat recorded its lowest gross energy savings levels in more than 10 years in 2025, which was 14% lower than 2024 levels due to the lower number of measures installed.

Figure 16: Evolution of Green Heat Gross Savings, 2014-2025



14 Green Heat Evaluation Approach

The 2025 Green Heat evaluation included a condensed impact evaluation.

Its primary objectives were to calculate gross and net results, including first-year and lifetime electrical energy savings, peak demand savings, and avoided GHG emissions.

In 2025, the Evaluator developed key research questions to address these objectives. Table 33 presents the evaluation objectives and links them to the corresponding research questions and methods.

Table 33: 2025 Green Heat Evaluation Approach

Evaluation Objectives	Research Questions	Methodology
Calculate gross results	› Are the data in the tracking sheet complete, accurate, and consistent? › What are the evaluated first-year and lifetime gross electrical energy and peak demand savings?	› Tracking sheet audit › Calculations using evaluation results
Calculate net results	› What are the evaluated first-year and lifetime net electrical energy and peak demand savings? › What are the net GHG emission reductions in CO₂ eq?	› Use of 2023 NTGR results › Calculations using evaluation results › GHG emission reduction calculations

Tracking Sheet Audit

Before conducting the savings review, the Evaluator audited the final 2025 tracking sheet to verify its completeness and ensure data consistency. The detailed audit protocol and corresponding results are provided in Appendix VIII.

Calculations Using Evaluation Results

The Evaluator calculated the first-year and lifetime energy and peak demand savings in accordance with the methodology outlined in Section 3 and using the unitary savings values from the 2025 Demand-side Management Measure Assessment (2025 DSM MA).²¹

GHG Emission Reduction Calculations

To calculate net avoided GHG emissions (in CO₂ equivalent) for Green Heat, the Evaluator multiplied net energy savings by the most recent Nova Scotia-specific GHG emission factor for electricity generation, derived from Nova Scotia Power (NS Power) data.

²¹ The 2025 DSM MA is a reference document that provides an in-depth review of all parameters necessary to calculate the annual and lifetime gross electrical energy and peak demand savings of all prescriptive measures and most semi-prescriptive measures offered through E1's DSM program portfolio. In addition, the DSM MA includes effective useful life values for all measures offered in E1's program portfolio. For the evaluation conducted during the last year of the 2023-2025 DSM cycle, the Evaluator refers to the values presented in the 2025 DSM MA.



15 Green Heat Impact Evaluation

The objectives of the 2025 Green Heat impact evaluation were to determine gross and net electrical energy and peak demand savings, annually avoided GHG emissions, as well as effective useful life (EUL) values and associated lifetime energy savings.

15.1 Tracking Sheet Audit

To ensure program component results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1. The verification and corrective actions taken by the Evaluator, where applicable, are described in detail in Appendix VIII. The tracked savings results presented in this report, therefore, refer to the corrected tracked savings obtained by the Evaluator.

15.2 Gross Savings

For Green Heat, gross savings correspond to the change in energy consumption resulting from actions taken by participants compared to the consumption level had those actions not occurred.²² For the 2025 evaluation, the Evaluator relied on the values presented in the 2025 DSM MA.

15.2.1 Installation Rates

Installation rates represent the proportion of measures recorded in the tracking sheet and that remains installed in participants' homes. Installation rates for all energy efficient heating systems under Green Heat were estimated at 100% due to their relatively high cost, and this assumption was not changed as part of the 2025 DSM MA update.

15.2.2 Unitary Energy Savings

To establish Green Heat unitary savings, the Evaluator relied on a combination of billing analyses, energy models, engineering algorithms, and literature reviews. The 2025 DSM MA provides a detailed description of inputs, references, and unitary savings calculations for all measure categories. There were no updates to unitary energy savings values in the 2025 DSM MA.

15.2.3 Unitary Peak Demand Savings

Peak demand savings correspond to the demand savings that coincide in time with the peak demand period of the electricity system. The projected electricity peak demand period in Nova Scotia is defined as the coldest days (with an on-peak temperature estimated at -15 °C) between 5 p.m. and 7 p.m. in the months of December to February on non-holiday weekdays. There were no updates to unitary peak demand savings values in the 2025 DSM MA.

²² Definition adapted from National Renewable Energy Laboratory, "Chapter 21: Estimating Net Savings – Common Practices", The Uniform Methods Project, October 2017, p. 3, available at: <https://www.nrel.gov/docs/fy17osti/68578.pdf>.



15.2.4 Interactive Effects

In a home, interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling. Since Green Heat high-efficiency heating measures directly target heating and cooling loads, the impact of those measures on heating and cooling is considered in the unitary savings. Therefore, no additional interactive effects factors were applied to the savings of all measures because the interactive effects factor for each measure is assumed to be nil. This assumption remained valid in 2025.

15.3 Effective Useful Life

As part of the 2025 DSM MA activities, the Evaluator reviewed the EUL values used in the calculations of electrical energy savings that are expected to persist over time. All EUL values used in previous years remained unchanged in the 2025 DSM MA.

The equivalent EUL values are applied to the gross and net first-year electrical energy savings of each measure to obtain the gross and net lifetime electrical energy savings. As a result, the weighted average EUL values for gross and net savings differ (see Subsections 15.4 and 15.5 below). The gross weighted average EUL value is equal to 18.0 years.

15.4 Evaluated Gross Savings

The annual gross savings for each category of measure installed through Green Heat in 2025 are listed in Table 34 below.

Gross savings at the generator were estimated by using the line loss factor associated to the rate code of each participant for electrical energy savings and peak demand savings. The line loss factors were updated in 2019 and correspond to the values submitted to the Nova Scotia Utility and Review Board (NSUARB), now named the Nova Scotia Energy Board (NSEB), as part of the 2014 Cost of Service Study Progress Update.²³

²³ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1. For municipal utility participants, the line loss factor of the most similar NS Power rate code was assumed. If a municipal utility participant did not have a specific rate code, the average of participants for which the line loss was known was used.

Table 34: Evaluated 2025 Green Heat Gross Electrical Energy and Peak Demand Savings

Measure	MSHPs		CASHPs	Air-to-water Heat Pumps	Wood Stoves	Pellet Stoves
	Fully Electrical	Mainly Electrical				
Number of Units	649	16	16	1	121	29
Electrical Energy Savings						
Unitary Electrical Energy Savings (kWh)	1,525*	-	3,926	5.858	1,461	1,461
Gross Electrical Energy Savings – at the Meter (GWh)	0.990	-	0.063	0.006	0.177	0.042
Line Loss Factor	1.0947	-	1.0947	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	1.083	-	0.069	0.006	0.194	0.046
Effective Useful Life (years)	18	18	18	18	18	18
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	19.503	-	1.238	0.115	3.483	0.835
Peak Demand Savings						
Unitary Peak Demand Savings (W)	2,456	-	3,989	3,989	828	828
Gross Peak Demand Savings – at the Meter (MW)	1.594	-	0.064	0.004	0.100	0.024
Line Loss Factor	1.1465	-	1.1466	1.1466	1.1466	1.1466
Gross Peak Demand Savings – at the Generator (MW)	1.827	-	0.073	0.005	0.1149	0.028
*Unitary savings for MSHPs are expressed in kWh/BTU/h and are applied to the heating capacity of individual MSHPs to obtain unitary savings specific to each MSHP. The value presented in kWh represents the average per MSHP in 2025.						

Evaluated 2025 Green Heat Gross Electrical Energy and Peak Demand Savings (Continued)

Measure	Wood Fireplace Inserts	Wood Furnaces/Boilers – Electric Resistance Baseline	ETS	DHW Heater Timers	Total
Number of Units	3	1	79	29	944
Electrical Energy Savings					
Unitary Electrical Energy Savings (kWh)	232	13,804	N/A	N/A	-
Gross Electrical Energy Savings – at the Meter (GWh)	0.001	0.014	-	-	1.292
Line Loss Factor	1.0947	1.0947	-	-	-
Gross Electrical Energy Savings – at the Generator (GWh)	0.001	0.015	-	-	1.414
Effective Useful Life (years)	18	18	18	15	-
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.014	0.272	N/A	N/A	25.460
Peak Demand Savings					
Unitary Peak Demand Savings (W)	132	7,660	1,135	500	-
Gross Peak Demand Savings – at the Meter (MW)	0.000	0.008	0.090	0.015	1.898
Line Loss Factor	1.1466	1.1466	1.1466	1.1466	-
Gross Peak Demand Savings – at the Generator (MW)	0.000	0.009	0.103	0.017	2.176

Figure 17 below compares tracked gross electrical energy savings to evaluated gross electrical energy savings at the generator. As outlined in the figure, tracked and evaluated electrical energy savings were the same for all measures in 2025.

Figure 17: 2025 Green Heat Tracked and Evaluated Gross Electrical Energy Savings – at the Generator (GWh)

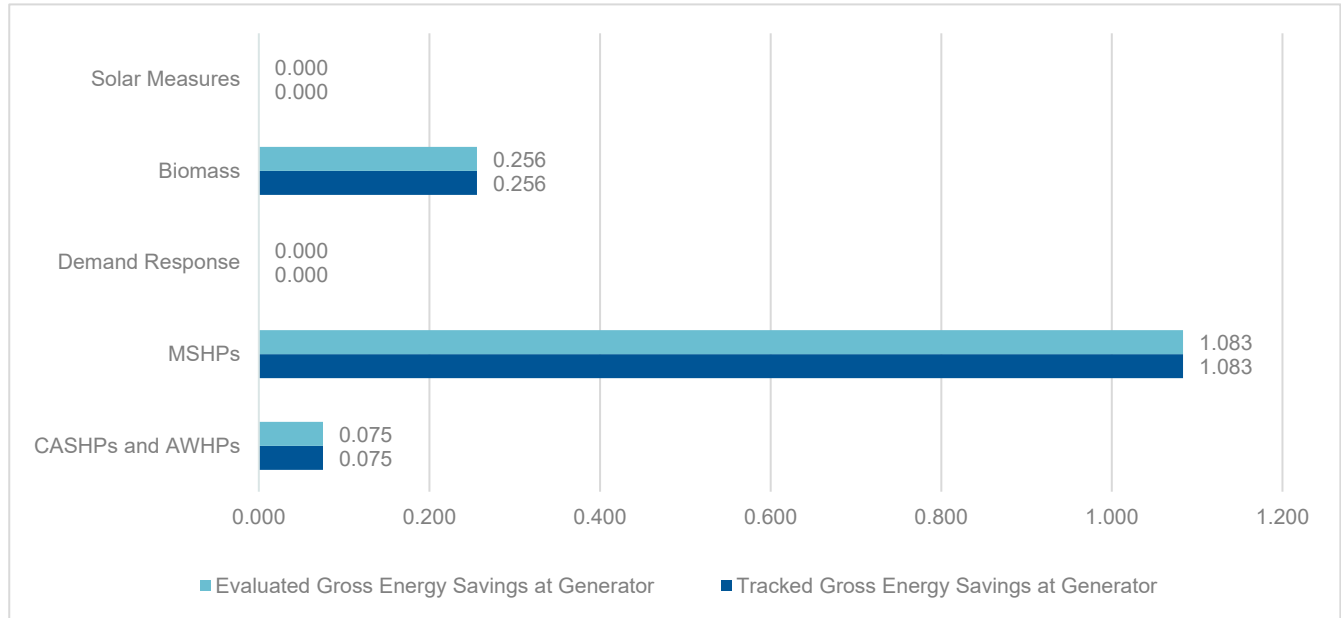
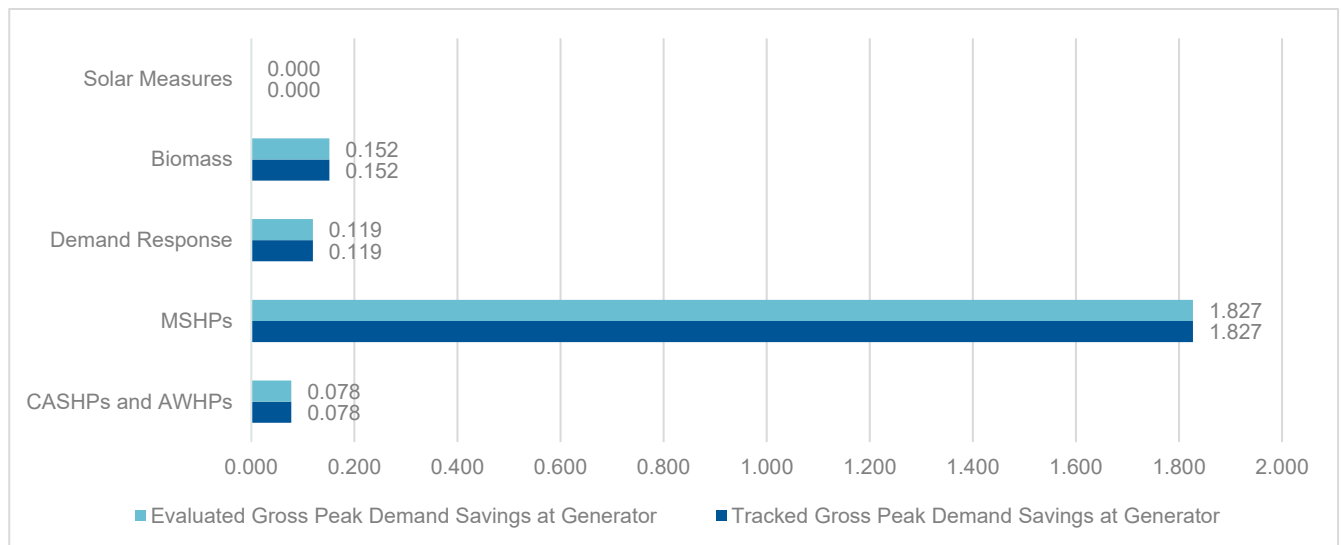


Figure 18 below compares tracked gross peak demand savings to evaluated gross peak demand savings at the generator. A similar trend as for electrical energy savings is illustrated in this figure; tracked and evaluated electrical energy savings were the same for all measures in 2025.

Figure 18: 2025 Green Heat Tracked and Evaluated Gross Peak Demand Savings – at the Generator (MW)



As presented in Table 35, GHG emission reductions were calculated by applying the Nova Scotia-specific factor²⁴ for GHG emissions generated by electricity production to Green Heat gross electrical energy savings.

Table 35: Evaluated 2025 Green Heat GHG Gross Emission Reductions

	Total
Gross Electrical Energy Savings – at the Generator (GWh)	1.414
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO2 eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO2 eq)	664

15.5 Net Savings

The Evaluator determined the net electrical energy and peak demand savings, i.e. the electrical energy and peak demand savings that can be reliably attributed to a program component, by estimating the NTGR. More precisely, the NTGR includes effects such as free-ridership and spillover that positively or negatively affect both the electrical energy savings and peak demand savings generated by a program component. In the case of Green Heat, only free-ridership is considered.

15.5.1 Free-ridership

For Green Heat, free-ridership occurs when participants would have still installed a new, more efficient heating system in the absence of the program component.

Free-ridership was assessed during the 2023 evaluation using a self-reporting approach with participants. Since no data-collection activities aimed at updating the free-ridership levels were conducted for 2025, the 2023 levels were used for the 2025 evaluation for all measures.

Table 36 outlines the free-ridership levels used for 2025 along with 2023 survey parameters.

Table 36: 2025 Green Heat Average Free-ridership Levels

Measure	Average Free-ridership Level	Sample Size	Population Size	Margin of Error
MSHPs	48%	90	1,132	5.5%
Biomass Measures	47%	29	213	8.2%
Demand Reduction Measures	9%	5	314	13.4%
Centrally Ducted Air-Source Heat Pumps (CASHPs) and Air-to-Water Heat Pumps (AWHPs)*	33%	30	54	7.6%
*CASHP and AWHP free-ridership levels were not measured in 2023 due to the very low number of participants that installed this measure. The free-ridership results presented above for these two measures were established as part of the 2021 evaluation.				

²⁴ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO2 eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed January 15, 2026) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed January 15, 2026).

15.5.2 Net-to-gross Ratio Calculation

The NTGR was calculated using the following equation.

$$NTGR = (1 - \% \text{ Free-ridership})$$

Using the free-ridership level established for each measure category, the Evaluator calculated the NTGR values presented in Table 37.

Table 37: 2025 Green Heat NTGRs

Measure	Free-ridership	NTGR
MSHPs	48%	0.52
Biomass and Solar Measures	47%	0.53
Demand Reduction Measures	9%	0.91
CASHPs and AWHPs	33%	0.67

15.5.3 Evaluated Net Savings

Net savings are defined as the energy use reductions specifically attributable to Green Heat. Net savings were estimated by applying the NTGRs listed above to the evaluated gross savings using the following equation.

$$\text{Net Savings} = \text{Gross Savings} \times \text{NTGR}$$

This equation was used to calculate both electrical energy savings and peak demand savings.

The detailed results are presented in Table 38 below. The net electrical energy savings resulted in 352 tonnes of CO₂ eq in net annual GHG emission reductions.

Table 38: Evaluated 2025 Green Heat Net Electrical Energy and Peak Demand Savings

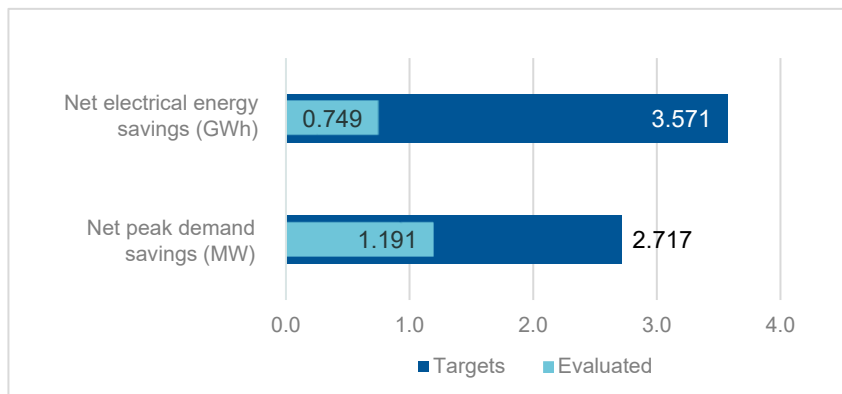
Measure	MSHPs		CASHPs	AWHPs	Wood Stoves	Pellet Stoves
	Fully Electrical	Mainly Electrical				
Electrical Energy Savings						
Gross Electrical Energy Savings – at the Meter (GWh)	0.990	-	0.063	0.006	0.177	0.042
NTGR	0.52	0.52	0.67	0.67	0.53	0.53
Net Electrical Energy Savings – at the Meter (GWh)	0.515	-	0.042	0.004	0.094	0.022
Line Loss Factor	1.0947	-	1.0947	1.0947	1.0947	1.0947
Net Electrical Energy Savings – at the Generator (GWh)	0.563	-	0.046	0.004	0.103	0.025
Effective Useful Life (years)	18	18	18	18	18	18
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	10.142	-	0.829	0.077	1.846	0.442
Peak Demand Savings						
Gross Peak Demand Savings – at the Meter (MW)	1.594	-	0.064	0.004	0.100	0.024
NTGR	0.52	0.52	0.67	0.67	0.53	0.53
Net Peak Demand Savings – at the Meter (MW)	0.829	-	0.043	0.003	0.053	0.013
Line Loss Factor	1.1465	-	1.1466	1.1466	1.1466	1.1466
Net Peak Demand Savings – at the Generator (MW)	0.950	-	0.049	0.003	0.061	0.015

Evaluated 2025 Green Heat Net Electrical Energy and Peak Demand Savings (Continued)

Measure	Wood Fireplace Inserts	Wood Furnaces/Boilers - Electric Resistance Baseline	ETS	DHW Heater Timers	Total
Electrical Energy Savings					
Gross Electrical Energy Savings – at the Meter (GWh)	0.001	0.014	-	-	1.292
NTGR	0.53	0.53	0.91	0.91	-
Net Electrical Energy Savings – at the Meter (GWh)	0.000	0.007	-	-	0.685
Line Loss Factor	1.0947	1.0947	-	-	-
Net Electrical Energy Savings – at the Generator (GWh)	0.000	0.008	N/A	N/A	0.749
Effective Useful Life (years)	18	18	18	15	-
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	0.007	0.144	-	-	13.488
Demand Savings					
Gross Peak Demand Savings – at the Meter (MW)	0.000	0.008	0.090	0.015	1.898
NTGR	0.53	0.53	0.91	0.91	-
Net Peak Demand Savings – at the Meter (MW)	0.000	0.004	0.082	0.013	1.039
Line Loss Factor	1.1466	1.1466	1.1466	1.1466	-
Net Peak Demand Savings – at the Generator (MW)	0.000	0.005	0.094	0.015	1.191

As outlined in Figure 19, Green Heat fell short of both its electrical energy and peak demand savings targets by 79% and 56% respectively.

Figure 19: 2025 Green Heat Targets and Evaluated Savings



15.6 Realization Rate

Table 39 below compares the electrical energy and peak demand savings established through the 2025 evaluation to those calculated in the 2025 tracking sheet. It also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings.

Table 39: Comparison of 2025 Green Heat Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR*	Net Savings		Realization Rate
	Value	Unit		Value	Unit	
Electrical Energy Savings						
Tracked Savings by E1	1.414	GWh	0.53	0.749	GWh	100%
Evaluation Results	1.414	GWh	0.53	0.749	GWh	
Peak Demand Savings						
Tracked Savings by E1	2.176	MW	0.55	1.191	MW	100%
Evaluation Results	2.176	MW	0.55	1.191	MW	
*NTGRs varied for each measure category. The NTGRs presented in this table correspond to the rounded averages obtained by dividing net savings by gross savings.						

The evaluated gross and net electrical energy and peak demand savings determined by the Evaluator were the same as the gross and net savings tracked by E1.



16 Green Heat Key Findings and Recommendations

As previously mentioned, the main objectives of the 2025 Green Heat evaluation were as follows:

- › Calculate gross and net results, namely first-year and lifetime electrical energy savings, peak demand savings, as well as avoided GHG emissions

This section provides the Evaluator's key findings in relation to the above objectives.

2025 Green Heat-Finding: Green Heat fell short of its net savings targets, achieving 21% and 44% of its electrical energy and peak demand targets respectively.

Green Heat achieved 0.749 GWh in net electrical energy savings and 1.191 MW in net peak demand savings at the generator in 2025, thus falling short of the planned net electrical energy savings of 3.571 GWh and net peak demand savings of 2.717 MW. Lower than expected participation explains the missed targets.

2025 Green Heat-Finding: Green Heat participation decreased for the fourth consecutive year.

Green Heat participation levels decreased by 33% compared to 2024 levels, particularly for MSHPs (30% reduction) and demand reduction measures (56% reduction). This decrease in the number of installed measures has been observed for four consecutive years. Historically, this trend has been attributed to the launch of the CGH Grant by the federal government in May 2021. During those years, a portion of participants opted to enroll in HEA and the CGH Grant rather than Green Heat to access higher federal incentives. Since the CGH Grant was closed to new applicants on February 5, 2024, Green Heat participation was expected to increase – a trend that did not materialize in 2025. This stagnation may also partly be explained by the fact that rebates were reduced in 2025 following lower electrical energy savings reported in the 2024 evaluation.

2025 Green Heat-Finding: The Evaluator determined that the gross and net electrical energy savings as well as peak demand savings were the same as the tracked gross and net savings reported by E1.

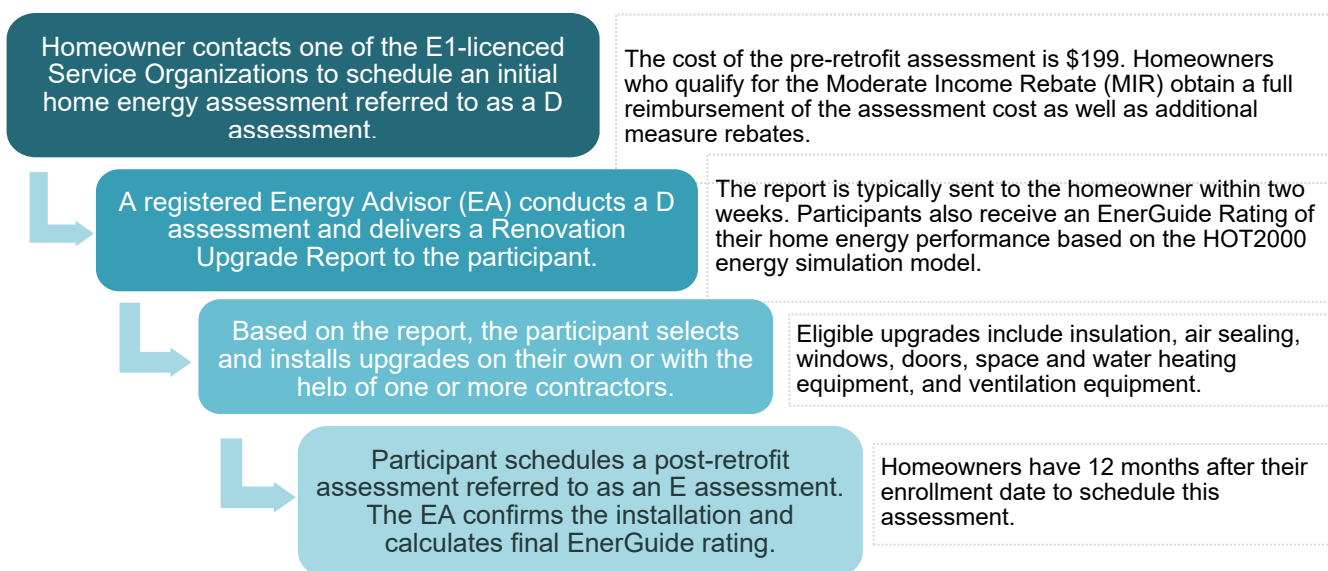
17 HEA Overview

This section describes Home Energy Assessment (HEA), follows up on past evaluation recommendations, and provides an overview of participation history.

17.1 HEA Description

HEA is a home energy evaluation-based program component that encourages homeowners to improve the energy efficiency and comfort of their homes by providing them with related information and financial incentives in the form of rebates. HEA uses the EnerGuide home evaluation framework and is administered in collaboration with Natural Resources Canada (NRCan). Figure 20 illustrates the participation process along with details about the program component.

Figure 20: HEA Participation Process Summary



Since 2018, HEA has offered the same services to non-electrically heated homes. This report presents the evaluation results for electrical measures only.

In May 2021, the federal government announced the launch of the Canada Greener Homes (CGH) Grant. That initiative offered grants of up to \$5,000 to help homeowners implement energy efficiency retrofits in their primary residences. In Nova Scotia, the CGH Grant was co-delivered by E1 through HEA. On 5 February 2024, the CGH Grant was closed to new applications, which meant that measures solely funded by the CGH Grant, namely resiliency measures (batteries for solar photovoltaic [PV], roofing membranes, foundation water proofing, and moisture proofing), solar PV, and smart thermostats, are no longer available for applicants after that date. Homeowners who enrolled in the program component prior to CGH Grant closure had until the end of November 2025 to complete their final assessment. All CGH Grant applications are required to be processed before the end of March 2026.

HEA was aimed at achieving 8.580 GWh in net electrical energy savings and 4.325 MW in net peak demand savings at the generator in 2025.

17.2 Follow-up on Past Evaluation Report Recommendations

The Evaluator evaluated HEA in previous years and issued improvement recommendations. Table 40 below provides a summary of the implementation status of past recommendations that were carried forward. The Evaluator notes that the implementation of all remaining recommendations were completed in 2024.

Table 40: Implementation Status of Past Recommendations for HEA

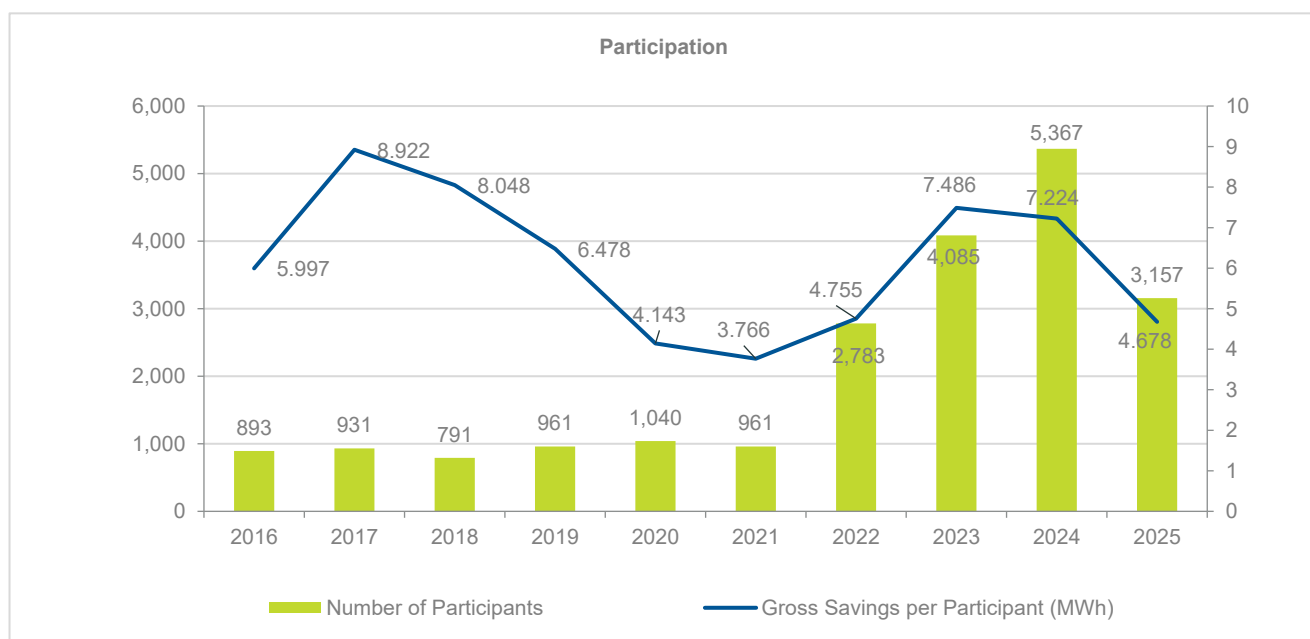
#	Past Recommendations	Status	Comments
2024-HEA-R1	In light of their very low savings and considering their low uptake, consider removing wood fireplace inserts and pellet fireplace inserts from the HEA offer.	Complete	E1 agrees with this recommendation, and wood fireplace inserts and pellet fireplace inserts were removed from the HEA offering by the end of Q3 2025.

17.3 Participation History

As presented in Figure 21 below, HEA participation levels²⁵ have constantly and significantly increased since 2022, which is likely due to the introduction of the CGH Grant in May 2021. In 2025, this trend was reversed with HEA participation decreasing by 41% compared to 2024 levels. This decrease may be explained by the closure of the CGH Grant,²⁶ even though CGH Grant applicants had until the end of November 2025 to complete their E assessment.

Average gross electrical energy savings per participant significantly decreased by 35% in 2025 compared to 2024 levels. Solar PV measures offered through the CGH Grant has been responsible for the increase in average gross electrical energy savings per participant over the previous few years. They had represented 74% of gross electrical energy savings in 2024, while they represented 56% in 2025.

Figure 21: Overview of HEA Participation, 2015-2024



²⁵ In this DSM evaluation report, the number of participants refers to those participants whose projects generated electrical energy savings regardless of whether their homes are primarily electrically heated.

²⁶ The CGH Grant was closed to new applications in 2024 due to overwhelming demand and fully committed funding. Canadians had until the end of November 2025 to complete their E assessment. CGH loans remain available to Canadian homeowners.

Figure 22 below provides an overview of the evolution of HEA gross electrical energy and peak demand savings from 2016 to 2025. In 2025, a decrease of 62% in gross electrical energy savings was observed compared to 2024 levels, a year in which record savings were achieved. Finally, peak demand savings decreased by 52% compared to 2024 levels.

Figure 22: Evolution of HEA Gross Savings, 2015-2025



18 HEA Evaluation Approach

The 2025 HEA evaluation comprised a condensed impact evaluation.

The main objectives of the 2025 HEA evaluation were to:

- › Calculate gross and net results, namely electrical first-year and lifetime energy savings, peak demand savings, as well as avoided GHG emissions

The Evaluator identified key research questions aimed at achieving the above objectives. Table 41 outlines the evaluation objectives and maps them to the Evaluator's research questions and methods. Each method is described further below.

Table 41: 2025 HEA Evaluation Approach

Evaluation Objectives	Research Questions	Methodology
Calculate gross results	› Are the data in the tracking sheet complete, accurate, and consistent? › What are the evaluated first-year and lifetime gross electrical energy and peak demand savings?	› Tracking sheet audit › Calculations using evaluation results
Calculate net results	› What are the evaluated first-year and lifetime net electrical energy and peak demand savings? › What are the net GHG emission reductions in CO₂ eq?	› Use of 2023 NTGR results › Use of the 2024 unconverted D assessment savings parameters › Calculations using 2024 evaluation results › GHG emission reduction calculations

Tracking Sheet Audit

Prior to conducting the savings calculation review, the Evaluator performed an audit of the final 2025 tracking sheet to ensure it was complete and the entered data were consistent. The detailed protocol used for the tracking sheet audit and the results obtained are presented in Appendix X.

Calculations Using Evaluation Results

The Evaluator calculated the first-year and lifetime electrical energy and peak demand savings as per the calculation methodology presented in Section 19 below and using the unitary savings values from the 2025 Demand-side Management Measure Assessment (2025 DSM MA).²⁷

²⁷ The 2025 DSM MA is a reference document that provides an in-depth review of all parameters necessary to calculate the annual and lifetime gross electrical energy and peak demand savings of all prescriptive measures and most semi-prescriptive measures offered through E1's DSM program portfolio. In addition, the DSM MA includes effective useful life values for all measures offered in E1's program portfolio. For the evaluation conducted during the last year of the 2023-2025 DSM cycle, the Evaluator refers to the values presented in the 2025 DSM MA.



GHG Emission Reduction Calculations

To obtain net avoided GHG emissions in CO₂ eq for HEA, the Evaluator multiplied the net electrical energy savings by the latest Nova Scotia-specific factor for GHG emissions generated by electricity production. This factor was established using Nova Scotia Power (NS Power) data.²⁸

Note on Margin of Error

For evaluation activities that yield quantitative results based on a sample, the Evaluator aimed to achieve a maximum margin of error of 10% at a confidence level of 90%. This means that, if measurements were conducted many times with different samples, the data would be within 10 percentage points above or below the percentage reported 90% of the time. Thus, the margin of error indicates the relative level of precision of a measurement, while its associated confidence level indicates the probability of a measurement falling within the margin of error.

²⁸ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO₂ eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed August 26, 2025) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).



19 HEA Impact Evaluation

The objectives of the 2025 HEA impact evaluation were to determine gross and net electrical energy and peak demand savings, annually avoided GHG emissions, as well as weighted average EUL values and associated lifetime energy savings.

19.1 Tracking Sheet Audit

To ensure program component results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1. The verification and corrective actions taken by the Evaluator, where applicable, are described in detail in Appendix X. The tracked savings results presented in this report, therefore, refer to the corrected tracked savings obtained by the Evaluator.

The HEA tracking sheet is very complex. For 2025, HEA tracking had been fully transitioned into E1's Customer Information System (CIS), which helped, to some extent, standardize data tracking. Despite that, there are still areas in which consistent data tracking could be improved, the most important of which are:

- › The adjustment to the calculation of electrical energy savings from modelled measures, which is now calculated using total electricity consumption at the D and E assessments instead of using the total energy consumption from all fuel sources at the D and E assessments and the percentage of heating from electric sources at D assessment.
- › The addition of a column to track the adjustment ratio (AR) used for each participant, which is a fundamental part of modelled savings calculations and is currently not visible to the Evaluator.
- › The adjustment of the programming for peak demand savings calculations so that mini-split heat pump (MSHP) peak demand savings are calculated separately from other modelled measures using parameters specific to each MSHP. While the transition to the CIS has helped with the tracking of heat pump parameters required for peak demand savings calculations, it is still not perfect, and issues remain with calculations and tracking.
- › The addition of a summary tab that includes total gross and net savings, provided separately from the main tracking sheet. The summary tab should also include EPI and Green Heat total net savings deductions as well as total unconverted D assessment spillover savings.

These adjustments will help significantly with the tracking sheet audit process in future evaluations.

19.2 Gross Savings

For HEA, gross savings correspond to the change in energy consumption resulting from measures implemented by HEA participants compared to the consumption level had those measures not occurred.²⁹ The following subsections describe how HEA gross savings are calculated and how each parameter of the methodology was determined.

19.2.1 Installation Rates

Installation rates represent the proportion of products recorded in the tracking sheet and that remain installed in participant homes. Based on the 2025 DSM MA, installation rates for all HEA measures were estimated at 100% because they are confirmed by EAs at the time of the E assessment.

²⁹ Definition adapted from National Renewable Energy Laboratory, "Chapter 21: Estimating Net Savings – Common Practices", The Uniform Methods Project, October 2017, p. 3, available at: <https://www.nrel.gov/docs/fy17osti/68578.pdf>.

19.2.2 Energy Savings

HEA energy savings are calculated based on HOT2000 simulation results adjusted with billing analysis results and unitary savings values for prescriptive measures, as presented in the equation below.

$$\begin{aligned} \text{Gross Energy Savings (kWh)} = \\ \text{MAX}[0; \text{Total Elec}_D(\text{kWh}) - \text{Total Elec}_E(\text{kWh}) - \text{HPWH (kWh)}] \times \text{AR} \\ + \text{Savings for Prescriptive Measures (kWh)} \end{aligned}$$

Where:

- › *Total Elec_D* and *Total Elec_E* correspond to the modelled total electrical energy consumption levels respectively obtained in HOT2000 during the D and E assessments.
- › *HPWH (kWh)* correspond to the unitary savings value established for heat pump water heaters (HPWHs).
- › *AR* corresponds to the adjustment ratio established through a billing analysis and used to adjust the savings obtained from the difference between the modelled electrical energy consumption during the D and E assessments. Adjustment ratios vary according to different space heating system scenarios.
- › *Savings for Prescriptive Measures* are obtained by multiplying the number of prescriptive measures installed through HEA by their respective unitary electrical energy savings value and the percentage of heating from electric sources at the D assessment in the case of wood burning equipment.

Measures Modelled in HOT2000

After the D and E home energy assessments, EAs model the given house in the HOT2000 energy simulation software to obtain the initial and final EnerGuide ratings of the house. Energy consumption levels obtained from HOT2000 simulation results are used to determine the electrical energy savings for modelled measures. They correspond to the reduction in total electricity consumption between the D and E assessments.

Electrical energy savings are then multiplied by the ARs developed as part of the 2024 evaluation through a billing analysis and maintained for the 2025 evaluation. That billing analysis was conducted on 100% electrically heated HEA participants who only implemented modelled measures, and ARs were determined separately for three heat pump scenarios. The ARs are presented in Table 42.

Table 42: 2025 HEA Adjustment Ratios

Scenario	AR
A participant who registered with a heat pump	1.24
A participant who registered without a heat pump and who did not have one installed	0.58
A participant who registered without a heat pump and then had one installed	0.43



Prescriptive Measures

For some measures installed under HEA, instead of using a performance approach based on energy simulation results, electrical energy savings are calculated using a prescriptive approach based on unitary electrical energy savings values. This is the case for:

- › Wood burning equipment
- › Smart thermostats
- › Solar PV systems
- › HPWHs

Wood burning equipment, smart thermostats, and solar PV systems are not modelled in HOT2000, which is why unitary savings are used. For HPWH measures, although modelled in HOT2000, savings are deducted from the modelled savings (according to their unitary savings value) before applying the AR to the remaining modelled savings. HPWH savings are then added up as a prescriptive measure, again according to their unitary savings value. This approach avoids applying the AR on HPWH savings considering this measure was not captured in the billing analysis due to its low number of installations and will facilitate future savings accounting in conjunction with E1's HPWH market transformation pilot.

The detailed descriptions of inputs, references, and unitary savings calculations for all prescriptive measures are presented in the 2025 DSM MA.

- › For wood burning equipment, unitary savings values are defined separately for stoves and fireplace inserts. Since the HEA tracking sheet does not track these measures separately (i.e. "Wood stoves/fireplace inserts" are tracked as a single measure), it is not possible to allocate different unitary savings values for these products. Considering the small number of wood burning equipment installations in HEA (173 installations out of 7,747 participants), the Evaluator applied the unitary energy savings value for stoves from Green Heat to all stoves/fireplace inserts in HEA. As recommended in the 2024 evaluation, fireplace inserts were removed from the HEA offer in 2025, meaning this will no longer be an issue in future evaluations. Lastly, unitary savings for wood burning equipment are multiplied by the percentage of heating from electric sources at the D assessment to maintain consistency with funding allocations and to simplify calculations.
- › For smart thermostats introduced in HEA through the CGH Grant, the unitary savings value for HEA is assumed to be nil considering the relatively high risk of double counting with Instant Savings given smart thermostats are also incented year-round through that program component.
- › For HPWHs, electrical energy savings are claimed only if the primary fuel for domestic hot water is electrical at the D assessment.

Reporting Requirements

HEA incentives originate from three sources of funding: Nova Scotia Power ratepayers for DSM, the Province of Nova Scotia, and the Government of Canada (CGH Grant). The inclusion of the CGH Grant as a co-funder of energy assessments and measures covered under both DSM and Province of Nova Scotia funding has not changed anything in E1's evaluation reporting structure. Therefore, HEA savings are reported to two different parties, the Nova Scotia Energy Board (NSEB) and the Province of Nova Scotia respectively via DSM evaluation reports and government-funded evaluation reports.

The DSM evaluation is focused on reporting electrical savings achieved with electrical DSM investments, while the government-funded evaluation reporting requirements for HEA are focused on participation and GHG emission reductions achieved with government funding regardless of fuel type. To avoid double counting and determine the most appropriate way to report associated savings, equations for each possible scenario were developed. The equations and their rationales are presented in Appendix XI.

As for the solar PV measures introduced through HEA with the CGH Grant, since solar PV generation offsets electricity use and results in savings to the electric grid, solar PV measure savings are included in the DSM evaluation report for HEA regardless of participant heating source.

19.2.3 Peak Demand Savings

Peak demand savings correspond to the demand savings that coincide in time with the peak demand period of the electricity system. The projected electricity demand peak period in Nova Scotia is defined as the coldest days (with an on-peak temperature estimated at -15 °C) between 5 p.m. and 7 p.m. in the months of December to February on non-holiday weekdays.

For HEA, peak demand savings are calculated using a different approach for measures modelled in HOT2000 and prescriptive measures.

Measures Modelled in HOT2000

For measures modelled in HOT2000, peak demand savings are calculated by differentiating between MSHP savings and all other modelled measure savings using the following procedure:

- › For participants who installed a MSHP and are considered as fully electrically heated at the D assessment (% Elec Heat_D = 100% regardless of if they already had a heat pump or not), MSHP peak demand savings are calculated using the following equation. The parameters used in this equation are outlined in Table 43 further below.

$$MSHP \text{ Peak Demand Savings } (W) = \frac{1,000}{3.412} \times HC_{min} \times \left(\frac{1}{COP_{base\_min}} - \frac{1}{COP_{ee\_min}} \right)$$

- › For participants who do not meet the conditions described above, peak demand savings are calculated by multiplying the total electrical energy savings of modelled measures by a peak demand-to-energy ratio of 0.283 MW/GWh. The details of this peak demand-to-energy ratio are presented in the 2025 DSM MA.
- › For participants who meet the conditions described above, i.e. for which a separate peak demand savings value is calculated for their MSHP, the peak demand savings for all other modelled measures are obtained by subtracting the electrical energy savings associated with the MSHP from the electrical energy savings of all modelled measures and then applying the peak demand-to-energy ratio.
 - › The electrical energy savings associated with the MSHP are calculated using the 2024 billing analysis results conducted for HEA. These correspond to an average electrical energy savings value per capacity installed of 0.0760 kWh/BTU/h.
 - › Electrical energy savings for all other modelled measures are calculated by subtracting MSHP electrical energy savings from total modelled measure electrical energy savings (with the appropriate adjustment ratio applied).
 - › Peak demand savings for all other modelled measures are calculated by multiplying the electrical energy savings for all other modelled measures by the peak demand-to-energy ratio of 0.283 MW/GWh.

Table 43: Unitary Peak Demand Savings Values for Mini-split Heat Pumps

Variable	Symbol	Value
Rated Heating Capacity of the New Heat Pump at Outdoor Air Temperature of -15 °C [kBtu/h]	HC_{min}	Specification data for each installed system
Coefficient of Performance of the Assumed Baseline Equipment (electric resistance) at -15 °C [kW/kW]	COP_{base_min}	1
Coefficient of Performance of the New Heat Pump at -15 °C [kW/kW]	COP_{ee_min}	Specification data for each installed system
Conversion Factor [BTU/W·h]	-	3.412
Conversion Factor [W/kW]	-	1,000

Prescriptive Measures

For prescriptive measures, specific unitary peak demand savings values are used. The detailed calculations are presented in the 2025 DSM MA. Similarly to electrical energy savings for stoves and fireplace inserts, the Evaluator applied the unitary peak demand savings value for stoves from Green Heat since HEA does not track stoves and fireplace inserts separately.

19.2.4 Supplemental File Adjustments

Supplemental files refer to a new entry in the tracking sheet due to a participant having an approved application that was reopened and reprocessed following changes to the project file. Supplemental files occur for multiple reasons that may or may not result in incremental electrical energy savings. In previous years, E1 performed an analysis and compiled the incremental savings from all supplemental files (i.e. the difference between what was claimed in the original file and what should have been claimed according to the updated supplemental file). The Evaluator reviewed the results of this analysis, and incremental savings were claimed as part of HEA. Due to the time-consuming nature of this process and the relatively low associated savings, supplemental file savings are no longer claimed in HEA moving forward.

19.2.5 Interactive Effects

In a home, interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling. Since most HEA measure savings are obtained from simulation results that already consider interactions between the heating and cooling systems, no additional interactive effects need to be accounted. For wood burning equipment, since it directly targets heating loads, the impact of these prescriptive measures on heating is already considered in the unitary savings calculations. As for solar PV systems, savings are not impacted by interactive effects.

19.2.6 Effective Useful Life

The EUL values used in the calculation of electrical energy savings that are expected to persist over time are presented in the 2025 DSM MA. For the electrical energy savings that come from measures modelled in HOT2000, an average EUL value was established by calculating the weighted average of EUL values associated with the main building envelope measures and space heating equipment installed under HEA in 2025. For the prescriptive measures, the EUL values are directly applied to the unitary savings value.

The equivalent EUL values are applied to the gross and net first-year electrical energy savings of each measure category to obtain gross and net lifetime electrical energy savings. As a result, the weighted average EUL values of gross and net savings differ (see Subsections 19.2.7 and 19.3.6 below). The HEA gross weighted average EUL value is equal to 24.6 years for 2025.

19.2.7 Evaluated Gross Savings

The annual gross savings for each category of measure installed through HEA in 2025 are listed in Table 44 below.

Gross savings at the generator were estimated by using the appropriate line loss factors for electrical energy and peak demand savings according to each participant's rate code. The line loss factors were updated in 2019 and correspond to the values submitted to the Nova Scotia Utility and Review Board (NSUARB), now named the Nova Scotia Energy Board (NSEB), as part of the 2014 Cost of Service Study Progress Update.³⁰

³⁰ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.

Table 44: Evaluated 2025 HEA Gross Electrical Energy and Peak Demand Savings

Measure Category	HOT2000 Modelled Measures*	Wood Burning Equipment***	HPWHs***	Energy Efficiency Measure Subtotal	Solar PV Measures	Total
Number of Participants**	2,775	173	37	-	611	3,157
Total Installed Capacity (kW)	-	-	-	-	6,953	
Evaluated Electrical Energy Savings						
Unitary Electrical Energy Savings (kWh)	-	-	-	-	1,086	-
Gross Electrical Energy Savings Without Adjustment Ratio (AR) – at the Meter (GWh)	8.000	0.083	0.050	-	7.550	15.683
Gross Electrical Energy Savings with AR – at the Meter (GWh)	5.809	0.083	0.050	5.941	7.550	13.491
Line Loss Factor	1.0947	1.0947	1.0947	1.0947	1.0947	1.0947
Gross Electrical Energy Savings with AR – at the Generator (GWh)	6.359	0.090	0.054	6.504	8.265	14.769
Effective Useful Life (years)	20.5	18.0	15.0	-	30.0	25.8
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	130.359	1.627	0.814	132.800	247.964	380.764
Peak Demand Savings						
Unitary Peak Demand Savings Value (W)	-	-	-	-	-	-
Gross Peak Demand Savings – at the Meter (MW)	4.050	0.027	0.008	4.086	-	4.086
Line Loss Factor	1.147	1.147	1.147	1.147	-	1.147
Gross Peak Demand Savings – at the Generator (MW)	4.644	0.031	0.009	4.684	-	4.684
* HOT2000 modelled measures include all heat pump and building envelope measures.						
**The number of participants who install measures modelled in HOT2000 and the number of prescriptive measures are not mutually exclusive. The number of participants for solar PV measures corresponds to the number of participants who generated savings from solar PV.						
***Unitary savings for wood burning equipment and HPWHs vary according to the type of equipment (wood stove, wood furnace, etc.), baseline, and space heating type.						

As presented in Table 45, GHG emission reductions were calculated by applying the Nova Scotia-specific factor³¹ for GHG emissions generated by electricity production to HEA net savings.

Table 45: Evaluated 2025 HEA Gross GHG Emission Reductions

	Total
Gross Energy Savings – at the Generator (GWh)	14.769
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO2 eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO2 eq)	6,931

19.3 Net Savings

The Evaluator determined net electrical energy and peak demand savings, that is the electrical energy and peak demand savings that can be reliably attributed to the program component, by estimating the net-to-gross ratio (NTGR). In the case of HEA, the NTGR is established considering free-ridership and participant spillover, which positively or negatively affect energy savings.

In addition to the NTGR, unconverted D assessment spillover savings as well as savings deductions for participation in other residential programs are also accounted for in the net savings calculation.

19.3.1 Free-ridership

For HEA, free-ridership occurs when participants would have implemented energy efficiency measures and/or solar PV systems in the absence of the program component.

Free-ridership was assessed in 2023 through a participant survey with HEA participants. Since no data-collection activities aimed at updating the free-ridership levels were conducted in 2025, the 2023 levels were used for the 2025 evaluation.

Table 46 outlines the free-ridership levels used for HEA for the 2025 evaluation along with the survey parameters.

Table 46: 2025 HEA Free-ridership Levels

Measure	Average Free-ridership Level	Sample Size	Population Size	Margin of Error
Energy Efficiency Measures	17%	77	3,995	4.20%
Solar PV Measures	26%	29	1,520	6.50%

³¹ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO2 eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed August 26, 2025) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).

19.3.2 Participant Spillover

For HEA, participant spillover occurs when participants implement additional measures recommended in their initial energy assessments after their participation in the program component, that is after having completed the final energy assessment and due to the influence of having participated in the program component as well as without receiving any additional support from the program component.

Similarly to free-ridership, no data collection aimed at updating the 2023 participant spillover level was conducted in 2025. Therefore, the 2023 spillover level was used as part of the 2025 evaluation for all measures.

Table 47 outlines the participant spillover level measured for HEA.

Table 47: 2025 HEA Participant Spillover Level

Measure	Number of Participants Generating Spillover	Average Participant Spillover Level
All Measures	11	1%

19.3.3 Net-to-gross Ratio Calculation

The NTGR is calculated using the following equation.

$$NTGR = (1 - \% \text{ Free-ridership} + \% \text{ Participant Spillover})$$

The NTGR values calculated with the free-ridership and spillover levels established for HEA are presented in Table 48.

Table 48: 2025 HEA NTGR Values

Measure	Free-ridership	Participant Spillover	NTGR
Energy Efficiency Measures	17%	1%	0.84
Solar PV Measures	26%		0.75

19.3.4 Unconverted Assessment Spillover

The unconverted D assessment savings spillover effect corresponds to the savings associated with those measures implemented by electrical participants who did not complete an E assessment by the end of the allocated 12-month period (referred to as expired participants or unconverted D assessment participants). It should be noted that only expired participants who use electricity as their primary heating source are considered in the analysis.

Unconverted D assessment savings parameters were assessed in 2024 through an expired participant survey and site visits. Since no data-collection activities aimed at updating the unconverted D assessment savings parameters were conducted in 2025, the 2024 parameters were used for the 2025 evaluation.

Table 49 below outlines the parameters used to establish the unconverted D assessment spillover level for 2025. A total of 2,069 unconverted D assessment participants who use electricity as their primary heating source were included in the 2025 tracking sheet. Total unconverted D assessment spillover savings were calculated by multiplying the number of unconverted D assessment participants by both the proportion of participants who completed at least one upgrade and the associated savings.

Table 49: 2025 HEA Unconverted D Assessment Spillover Savings

Parameters	Values
Total Number of Unconverted D Assessment Participants	2,069
Ratio of Unconverted D Assessment Participants Who Implemented at Least One Measure	54%
Total Number of Unconverted D Assessment Participants Who Implemented at Least One Measure	1,117
Average Electrical Energy Savings per Participant in kWh (with influence from E1)	2,097
Total Unconverted D Assessment Spillover Electrical Energy Savings – at the Meter (GWh)	2.343
Demand-to-energy Ratio (MW/GWh)	0.283
Total Unconverted D Assessment Spillover Peak Demand Savings – at the Meter (MW)	0.663

Unconverted D assessment spillover reversals are expired participants from previous years and whose savings had been claimed but who ended up participating in HEA by completing their E assessment after the allocated 12-month period. To avoid double counting savings, the savings that were attributed to them as unconverted D assessment spillover in previous years are reversed, meaning they are deducted from total net savings.

Prior to 2024, these savings were deducted by simply subtracting the number of participants who ended up participating in HEA from the number of unconverted D assessment spillover participants. Since the savings parameters were updated in 2024, reversals are now calculated separately based on the year they were claimed as unconverted D assessment spillovers.

A total of 255 unconverted D assessment spillover reversal participants were identified in the tracking sheet for 2025. The calculated associated deductions outlined in Table 50 are based on the savings parameters used when the spillover savings were initially claimed.

Table 50: 2025 HEA Unconverted D Assessment Spillover Reversals

Parameters	Spillover Savings Claimed Prior to 2024	Spillover Savings Claimed in 2024	Total
Total Number of Unconverted D Assessment Spillover Participants from Previous Years Who Completed Participation to HEA in 2025	58	197	255
Ratio of Unconverted D Assessment Participants Who Implemented at Least One Measure	54%	54%	-
Average Electrical Energy Savings per Participant in kWh (with influence from E1)*	2,283	2,097	-
Total Unconverted D Assessment Spillover Reversal Electrical Energy Savings – at the Meter (GWh)	0.072	0.223	0.295
Demand-to-energy Ratio (MW/GWh)	0.283	0.283	-
Total Unconverted D Assessment Spillover Reversal Peak Demand Savings – at the Meter (MW)	0.020	0.063	0.083
*To determine the savings to be deducted for reversals, the parameters need to correspond to those that were used at the time they were claimed as unconverted D assessment spillover savings.			

Unconverted D assessment spillover savings are presented in energy units rather than as a percentage of annual gross savings. They are added to gross savings minus the reversal savings to be deducted.

19.3.5 Savings Deductions for Participation in Other Residential Programs

Several measures are offered under both HEA and Green Heat. In addition, Efficient Product Installation (EPI) introduced air sealing measures in 2019, and Solar Homes offers solar PV. To ensure that energy savings are not claimed twice for the same upgrade, the net electrical energy savings that were already claimed under Green Heat or EPI are deducted from HEA net electrical savings for those participants who participated in HEA, Green Heat, or EPI during the same period. The savings deductions are presented in Table 51 below.

E1 is responsible for identifying these overlaps and calculating the associated savings deductions since the customer information in the different tracking sheets do not allow the Evaluator to easily identify participation overlaps. For SolarHomes, savings deductions are already taken into account by E1. When approving HEA project files, E1 removes solar PV savings that were already claimed in SolarHomes during the same period.

Table 51: 2025 Program Overlap Savings Deducted from HEA

Overlap	Net Electrical Energy Savings at the Generator (GWh)	Net Peak Demand Savings at the Generator (MW)
Overlap with Green Heat	(0.008)	(0.009)
Overlap with EPI	(0.077)	(0.013)
Total	(0.085)	(0.021)

19.3.6 Evaluated Net Savings

Net savings are defined as the energy use reductions specifically attributable to HEA. Net savings were calculated by applying the NTGR value, adding unconverted D assessment spillover savings, and subtracting Green Heat and EPI savings, as illustrated in the following equation.

$$\text{Net Savings} = \text{Gross Savings} \times \text{NTGR} + \text{Unconverted D Assessment Spillover Savings} - \text{Green Heat Net Savings Deductions} - \text{EPI Net Savings Deductions}$$

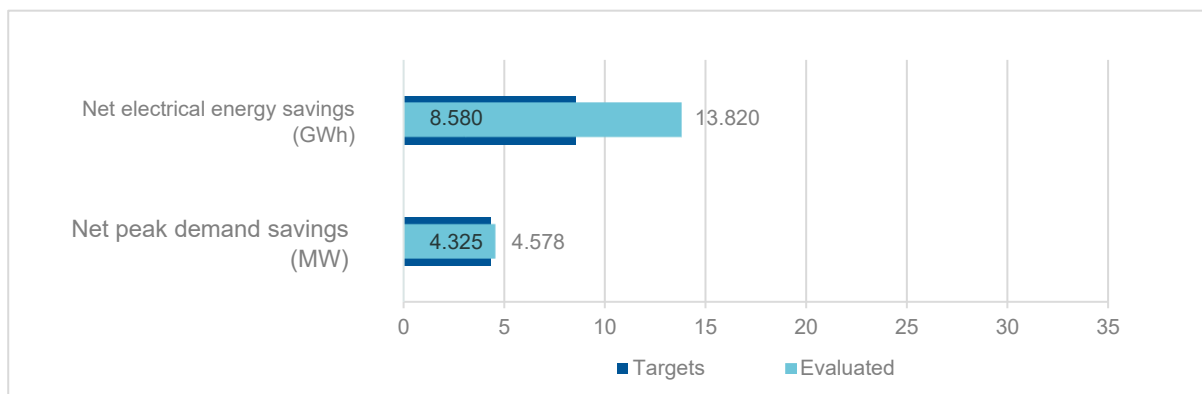
The detailed net savings results are presented in Table 52 below. The net electrical energy savings resulted in 6,486 tonnes of CO₂ eq in net annual GHG emission reductions.

Table 52: Evaluated 2025 HEA Net Electrical Energy and Peak Demand Savings

	Energy Efficiency Measures	Solar PV Measures	Total
Electrical Energy Savings			
Gross Electrical Energy Savings – at the Meter (GWh)	5.941	7.550	13.491
Unconverted D Assessment Spillover Energy Savings (GWh)	2.343	-	-
Unconverted D Assessment Spillover Reversal Energy Savings (GWh)	(0.295)	-	-
NTGR	84%	75%	-
Net Electrical Energy Savings Without Savings Deductions – at the Meter (GWh)	7.039	5.663	12.702
Line Loss Factor	1.0947	1.0947	1.0947
Green Heat Net Electrical Energy Savings Deductions (GWh)	(0.008)	-	0.008
EPI Net Electrical Energy Savings Deductions (GWh)	(0.077)	-	0.077
Net Electrical Energy Savings with Savings Deductions – at the Generator (GWh)	7.621	6.199	13.820
Effective Useful Life (years)	20.5	30.0	24.8
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	156.222	185.973	342.195
Peak Demand Savings			
Gross Peak Demand Savings – at the Meter (MW)	4.086	-	4.086
Unconverted D Assessment Spillover Peak Demand Savings (MW)	0.663	-	0.663
Unconverted D Assessment Spillover Reversal Peak Demand Savings (MW)	(0.083)	-	(0.083)
NTGR	84%	-	-
Net Peak Demand Savings Without Savings Deductions – at the Meter (MW)	4.012	-	4.012
Line Loss Factor	1.147	-	-
Net Peak Demand Savings Without Savings Deductions – at the Generator (MW)	4.600	-	4.600
Green Heat Net Peak Demand Savings Deductions (MW)	(0.009)	-	(0.009)
EPI Net Peak Demand Savings Deductions (MW)	(0.013)	-	(0.013)
Net Peak Demand Savings – at the Generator (MW)	4.578	-	4.578

As outlined in Figure 23 below, HEA surpassed the electrical energy and peak demand savings targets by 61% and 6% respectively.

Figure 23: 2025 HEA Targets and Evaluated Savings



19.4 Realization Rate

Table 53 below compares the electrical energy and peak demand savings established through this evaluation to those calculated in the 2025 tracking sheet. It also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings.

Table 53: Comparison of 2025 HEA Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR*	Net Savings		Realization Rate
	Value	Unit	Value	Value	Unit	Value
Electrical Energy Savings						
Tracked Savings by E1	14.769	GWh	0.94	13.820	GWh	100%
Evaluation Results	14.769	GWh	0.94	13.820	GWh	
Peak Demand Savings						
Tracked Savings by E1	4.684	MW	0.98	4.578	MW	100%
Evaluation Results	4.684	MW	0.98	4.578	MW	
*NTGR values in this table include the impacts of unconverted D assessment spillover savings as well as Green Heat and EPI savings deductions. The NTGRs presented in this table correspond to the rounded averages obtained by dividing net savings by gross savings, which explains why the NTGR values differ from those presented in the sections above.						

The net evaluated electrical energy and peak demand savings determined by the Evaluator were equal to the net results tracked by E1.



20 HEA Key Findings and Recommendations

As mentioned previously, the main objectives of the 2025 HEA evaluation were as follows:

- › Calculate gross and net results, namely electrical first-year and lifetime energy savings, peak demand savings, as well as avoided GHG emissions

This section provides the Evaluator's key findings in relation to the above objectives.

2025 HEA-Finding: HEA exceeded both its net electrical energy savings and peak demand savings.

HEA achieved 13.820 GWh in net electrical energy savings and 4.578 MW in net peak demand savings at the generator in 2025, thus exceeding the planned net electrical energy savings of 8.580 GWh and the planned net peak demand savings of 4.325 MW.

2025 HEA-Finding: Participation decreased in 2025, which is likely explained by the closure of the CGH Grant.

With 3,157 projects, 2025 participation significantly decreased compared to 2024 levels. This decrease may be explained by the closure of the CGH Grant, even though CGH Grant applicants had until November 2025 to complete their E assessments.

2025 HEA-Finding: Average gross electrical energy savings per home and overall gross electrical energy savings significantly decreased in 2025 compared to 2024 levels.

The average gross electrical energy savings per home were 4,678 kWh in 2025, a significant decrease of 35% compared to 2024 levels. This decrease is mainly explained by the lower proportion of solar PV measures that accounted for 56% of gross electrical energy savings in 2025 compared to 74% in 2024. Considering solar PV is only incentivized through the CGH Grant, the decrease in gross savings due to the closure of the CGH Grant should be more significant in upcoming years.

2025 HEA-Finding: The evaluated electrical energy and peak demand savings were equal to the savings tracked by E1.

Realization rates of 100% were achieved for both electrical energy savings and peak demand savings.

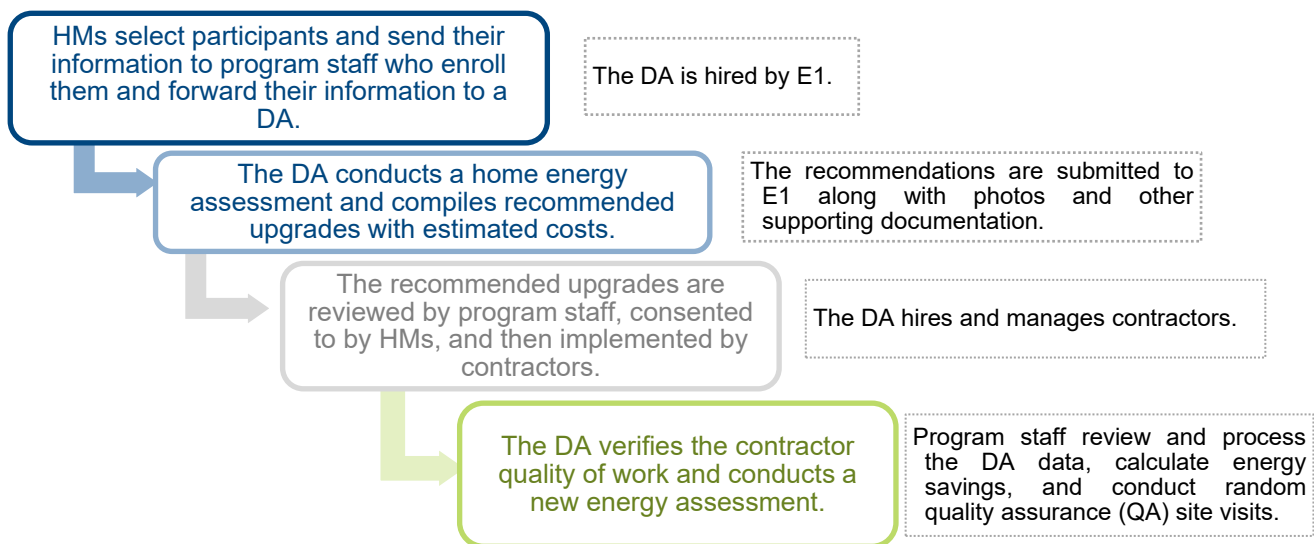
21 MHEEP Overview

This section describes the Mi'kmaw Home Energy Efficiency Project (MHEEP or the Project) program component, follows up on past evaluation recommendations, and provides an overview of MHEEP participation history.

21.1 MHEEP Description

MHEEP provides energy efficiency upgrades to homes in Mi'kmaw communities at no cost to participants or communities. E1 works with community housing managers (HMs), two delivery agents (DAs), and Mi'kmaw-preferred contractors to deliver the Project across all 13 Mi'kmaw communities in Nova Scotia. Figure 24 illustrates the participation process along with details about the Project.

Figure 24: MHEEP Participation Process Summary



MHEEP consists of conducting home energy assessments using the EnerGuide home evaluation framework, and each participating home receives an EnerGuide rating upon completion. MHEEP also provides building envelope upgrades such as draft proofing and insulation as well as upgrades for space heating equipment, and programmable thermostats. Moisture management measures such as bathroom fans and heat recovery ventilators along with other measures such as carbon monoxide detectors may also be provided.

HMs identify and enroll participants and assist with program component requirements. DAs conduct pre-retrofit assessments (D assessments), recommend energy-saving measures, assign the work to contractors, and perform post-retrofit assessments (E assessments) to ensure that measures are implemented according to industry standards and that residents understand how to operate any new equipment.

MHEEP was launched in June 2018 as the First Nations Home Energy Efficiency Pilot. After the pilot stage in early 2019, MHEEP began work in participating homes in June 2019, and communications materials were developed to better inform HMs and participants. As of early 2024, privately owned homes located in First Nations communities also became eligible under amended eligibility criteria.

MHEEP funding comes from two sources: (1) Electricity ratepayer DSM funding is used for standard upgrades that reduce electricity consumption; and (2) funding from the Province of Nova Scotia (PNS) is used for upgrades that reduce non-electrical fuel consumption as well as a portion of upgrades that reduce electricity consumption. In 2023, a third type of allocation referred to as non-standard was introduced; it is considered non-standard because all savings (electrical and non-electrical) from this type of participant are attributed entirely to PNS funding. This report presents all electrical savings achieved by MHEEP and attributed to DSM funding under the standard allocation only.

MHEEP was aimed at achieving 0.548 GWh in net electrical energy savings and 0.156 MW in net peak demand savings at the generator in 2025.

21.2 Follow-up on Past Evaluation Report Recommendations

No recommendations were made for MHEEP in the 2024 evaluation.

21.3 Participation History

As presented in Figure 25 below, 157 participants completed projects and achieved electrical energy savings under MHEEP in 2025, representing an 18% decrease in participation (i.e. participants who achieved electrical energy savings attributable to DSM funding) compared to 2024 levels. The figure also indicates that average gross electrical energy savings per participant remained stable compared to 2024 levels.

Figure 25: Overview of MHEEP Participation, 2019-2025

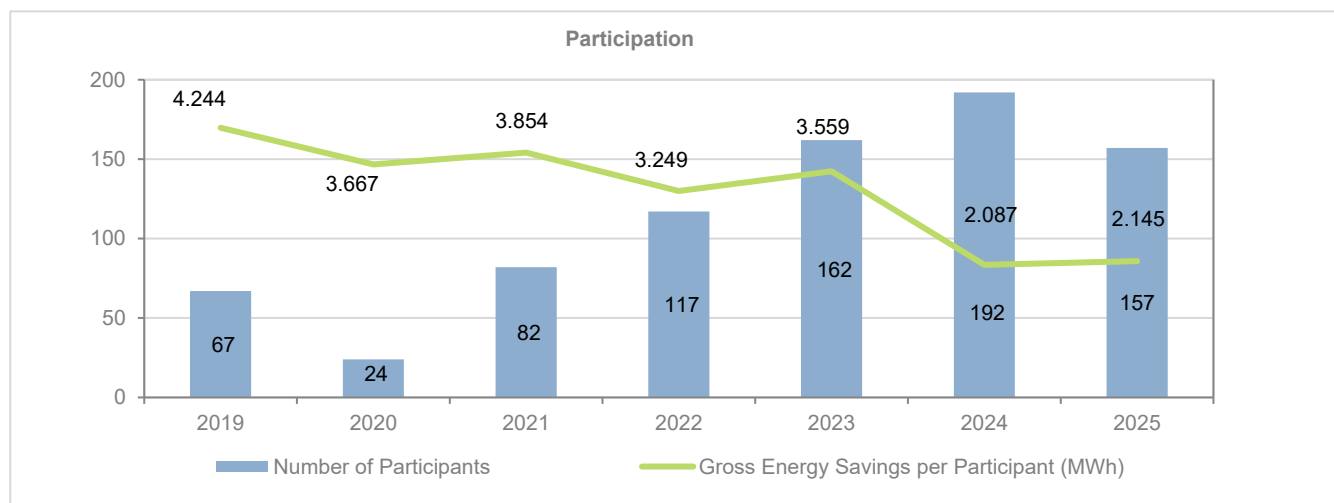
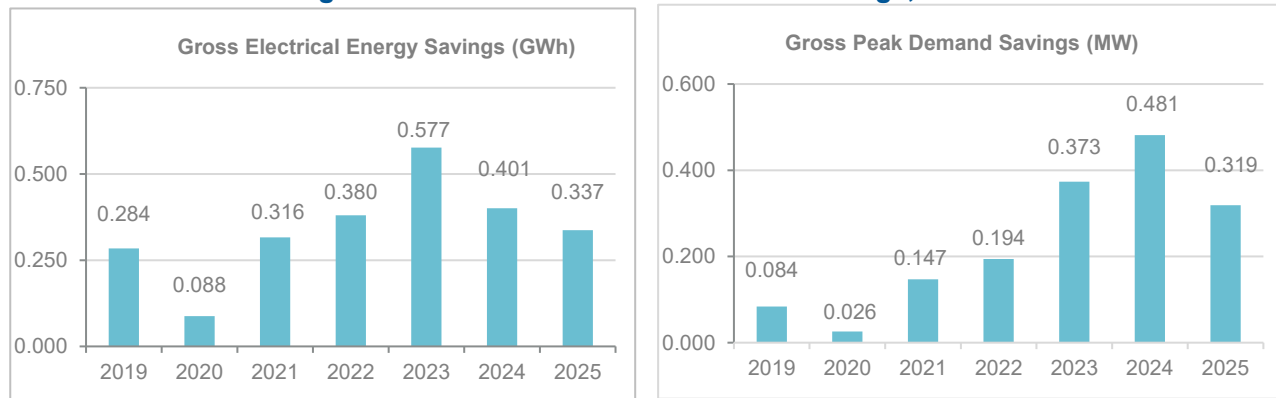


Figure 26 below provides an overview of the evolution of MHEEP gross electrical energy and peak demand savings from 2019 to 2025. The decrease in 2025 participation mostly explains the reduction in total program savings, with total electrical energy savings decreasing by 16% and peak demand savings by 34% relative to 2024 results.

Figure 26: Evolution of MHEEP Gross Savings, 2019-2025



22 MHEEP Evaluation Approach

The 2025 MHEEP evaluation comprised a condensed impact evaluation. The main objectives of the 2025 MHEEP evaluation were as follows:

- › Calculate MHEEP gross and net results, namely first-year and lifetime electrical energy savings, peak demand savings, as well as avoided GHG emissions

Table 54 outlines the evaluation objectives and maps them to the research questions and methods established by the Evaluator. Each method is described further below.

Table 54: 2025 MHEEP Evaluation Approach

Evaluation Objectives	Research Questions	Methodology
Calculate gross results	› Are the data in the tracking sheet complete, accurate, and consistent? › What are the evaluated first year and lifetime gross electrical energy and peak demand savings?	› Tracking sheet audit › Calculations using evaluation results
Calculate net results	› What are the evaluated first-year and lifetime net electrical energy and peak demand savings? › What are the net GHG emission reductions in CO2 eq?	› Use of a NTGR of 1 › Calculations using evaluation results › GHG emission reduction calculations

Tracking Sheet Audit

Prior to performing the savings review, the Evaluator performed an audit of the final 2025 tracking sheet to ensure it was complete and the entered data were consistent. The detailed protocol used for the tracking sheet audit and the results obtained are presented in Appendix XIII.

Calculations Using Evaluation Results

Building on all the above methods and collected data, the Evaluator calculated the first-year and lifetime electrical energy and peak demand savings using the equations and parameters, presented in Subsection 23.2 below.

GHG Emission Reduction Calculations

To obtain net avoided GHG emissions in CO2 eq for MHEEP, the Evaluator multiplied net energy savings by the latest Nova Scotia-specific factor for GHG emissions generated by electricity production. This factor was established using Nova Scotia Power (NS Power) data.

23 MHEEP Impact Evaluation

The objectives of the 2025 MHEEP condensed impact evaluation were to determine gross and net electrical energy and peak demand savings, annually avoided GHG emissions, as well as EUL values and associated lifetime energy savings. While the measures installed under MHEEP generate both electrical and non-electrical energy savings, only the standard allocation electrical portion is covered in this report.

23.1 Tracking Sheet Audit

To ensure project results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1. The results obtained from the tracking sheet audit are presented in Appendix XIII. The tracked savings results presented in this report therefore refer to the corrected tracked savings obtained by the Evaluator.

23.2 Gross Savings

MHEEP gross savings correspond to the change in energy consumption resulting from the measures implemented by participants compared to the consumption level had those measures not occurred.³² In 2025, MHEEP participants received building envelope upgrades and/or space heating upgrades.

MHEEP gross savings are obtained through HOT2000 modelling except for programmable thermostats, which are non-modelled measure and for which gross savings are calculated using unitary savings values.

The methodologies used to evaluate gross savings are described in the following subsections.

23.2.1 Electrical Energy Savings

For MHEEP, electrical energy savings are calculated based on HOT2000 simulation results adjusted with billing analysis results and unitary savings values for prescriptive measures, as shown in the equation below.

Gross Energy Savings (kWh)

$$= \left(\frac{(Total\ Energy_D(GJ) - Total\ Energy_E(GJ))}{0.0036 \frac{GJ}{kWh}} \times \%_{Elec} \right) \times AR + Savings\ for\ Prescriptive\ Measures\ (kWh)$$

Where:

- › *Total Energy_D* and *Total Energy_E* correspond to the modelled energy consumption levels respectively obtained in HOT2000 during the pre-retrofit (D) and post-retrofit (E) assessments. When modelled energy consumption levels were not available, the participant EnerGuide rating, which is a rating based on the modelled whole-home consumption, was used. Also, if the final E assessment consumption levels were not available, projected final consumption levels were used.
- › *AR* corresponds to the adjustment ratio (AR) established through a billing analysis and used to adjust the savings obtained from the difference between the modelled electrical energy consumption during the D and E assessments. ARs vary according to different space heating system scenarios. ARs were drawn from billing analyses conducted in 2024 as part of the HEA evaluation.

³² Definition adapted from National Renewable Energy Laboratory, "Chapter 21: Estimating Net Savings – Common Practices", The Uniform Methods Project, October 2017, p. 3, available at: <https://www.nrel.gov/docs/fy17osti/68578.pdf>.

- › $\%_{Elec}$ corresponds to the percentage of electrical space heating estimated by the DA through the D assessment.
- › *Savings for Prescriptive Measures* are obtained by multiplying the prescriptive measures installed through MHEEP by their respective unitary electrical energy savings value.

Measures Modelled in HOT2000

After the D and E assessments, the DAs model the house in the HOT2000 energy simulation software to obtain the initial and final EnerGuide ratings of that house. Energy consumption levels obtained from HOT2000 simulation results are used to determine the electrical energy savings for modelled measures. Those savings correspond to the reduction in consumption between the D and E assessments.

In 2024 the Evaluator made some changes to the savings calculation methodology to simplify it and make it more robust. As part of the 2024 HEA evaluation, the Evaluator conducted a billing analysis that provided savings values used to develop adjustment ratios (ARs). These ARs are now applied directly to modelled savings estimates from HOT2000 using whole-home consumption rather than only space heating.

The ARs obtained through the HEA billing analysis performed as part of the 2024 evaluation are presented in Table 55 below. The ARs determined separately for three heat pump scenarios. It is worth noting that ARs are directly applied to the savings values obtained from the difference between the total initial assessment and total final assessment consumption values.

Table 55: 2025 MHEEP Adjustment Ratios

Scenario	Tracked	Evaluated
	AR	AR
A participant who registered with a heat pump	1.24	No change
A participant who registered without a heat pump and who did not have one installed	0.58	No change
A participant who registered without a heat pump and then had one installed	0.43	No change

Participants with non-electrical space heating are eligible for the program component, meaning participants can generate both electrical and non-electrical savings. As indicated in the equation further above, the proportion of electrical savings for each participant is determined by multiplying total energy consumption by the proportion of space heating covered by electrical heating systems during the D assessment.

Non-modelled Measures

Programmable thermostats are not modelled in HOT2000. Instead, resulting energy savings are calculated based on unitary electrical energy savings values from the 2025 Demand-side Management Measure Assessment (DSM MA).³³ That document provides a detailed description of inputs, references, and unitary savings calculations for non-modelled measures offered through MHEEP.

No unitary energy savings values for non-modelled MHEEP measures were modified in the 2025 DSM MA in the course of the 2025 evaluation.

³³ The 2025 DSM MA is a reference document that provides an in-depth review of all parameters necessary to calculate the annual and lifetime gross electrical energy and peak demand savings of all prescriptive measures and most semi-prescriptive measures offered through E1's DSM program portfolio. In addition, the DSM MA includes effective useful life values for all measures offered in E1's program portfolio. For the evaluation conducted during the last year of the 2023-2025 DSM cycle, the Evaluator refers to the values presented in the 2025 DSM MA.



23.2.2 Peak Demand Savings

Peak demand savings correspond to the demand savings that coincide in time with the peak demand period of the electricity system. The projected electricity peak demand period in Nova Scotia is between 5 p.m. and 7 p.m. in the months of December to February on non-holiday weekdays.

For MHEEP, modelled peak demand savings were calculated based on electrical energy savings using a peak demand-to-energy ratio of 0.283 MW/GWh for space heating savings (RES-Elect Space Heat & Cool), as set by Navigant in the 2016-2018 DSM Plan. This ratio was established based on the modelled system coincident peak demand savings and electrical energy savings for a projected deployment of measures. Navigant used local data to establish the ratio. The Evaluator considered that the approach used by Navigant to establish the peak demand-to-energy ratio was still valid and, therefore, used it to estimate peak demand savings.

An exception was made for heat pump measures. Starting in 2021, unitary peak demand savings were calculated separately for heat pump measures. As documented in the 2025 DSM MA, heat pump peak demand savings in fully electrically heated households are determined by multiplying an average unitary peak demand savings per capacity factor of 0.138 W/(BTU/hr) by the average installed capacity for each MSHP configuration. For not fully electrically heated households, no peak demand savings for heat pump measures were claimed through MHEEP to align with the 2024 Green Heat billing analysis findings and with similar program component (HEA and ASFH) methodologies; this represents a change compared to the 2024 methodology.

Programmable thermostats are not modelled in HOT2000. Instead, related peak demand savings are calculated based on unitary peak demand savings value. The detailed calculations for the unitary peak demand savings of programmable thermostats installed through MHEEP are presented in the 2025 DSM MA. In 2025, no revisions were applied to the unitary peak demand savings value of any MHEEP measure.

23.2.3 Interactive Effects

In a home, interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling. The interactive effects of the space heating measures modelled in HOT2000 were already considered in the savings calculations since the simulation models encompass the total energy consumption of the house.

For the 2025 evaluation, programmable thermostats were a measure not modelled in HOT2000. As presented in the 2025 DSM MA, they do not have an impact on the energy consumption of other elements in the home. Therefore, no interactive effects need to be considered for this measure.

23.2.4 Effective Useful Life

As part of the 2025 DSM MA activities, the Evaluator reviewed the EUL values used in the calculation of electrical energy savings that are expected to persist over time. The EUL values for building envelope upgrades and space heating equipment, i.e. the modelled savings, are based on the measures installed by HEA participants since HEA and MHEEP participants install similar measures. The EUL values remained unchanged for all MHEEP measures in 2025.

23.2.5 Evaluated Gross Savings

Non-modelled measures were not installed under MHEEP in 2025. Accordingly, all MHEEP annual gross savings are generated from modelled measures, the results of which are presented in Table 56 below.

Table 56: Evaluated 2025 MHEEP Gross Electrical Energy and Peak Demand Savings

	Total
Number of Participants	157
Electrical Energy Savings	
Gross Electrical Energy Savings Without Adjustment Ratio (AR) – at the Meter (GWh)	0.545
Gross Electrical Energy Savings with AR – at the Meter (GWh)	0.308
Line Loss Factor	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.337
Effective Useful Life (years)	20.5
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	6.905
Peak Demand Savings	
Peak Demand-to-energy Ratio (MW/GWh)*	0.904
Gross Peak Demand Savings – at the Meter (MW)	0.278
Line Loss Factor	1.1466
Gross Peak Demand Savings – at the Generator (MW)	0.319
* Corresponds to the equivalent peak demand-to-energy ratio obtained by dividing gross peak demand savings by gross electrical energy savings. This value differs from the peak demand-to-energy ratio that was formerly used (0.283 MW/GWh) because of the different calculation methodology applied for heat pumps and the addition of non-modelled prescriptive measures.	

Gross savings at the generator were estimated by using a line loss factor of 1.0947 for electrical energy savings and 1.1466 for peak demand savings between the meter and the generator. These line loss factors were provided by NS Power and correspond to the values used for residential consumers. The line loss factors were updated in 2019 and correspond to the values submitted to the Nova Scotia Utility and Review Board (NSUARB), now named the Nova Scotia Energy Board (NSEB), as part of the 2014 Cost of Service Study Progress Update.³⁴

With total gross energy and lifetime energy savings of 0.337 GWh and 6.905 GWh, respectively, the average EUL value for MHEEP was 20.5 years in 2025.

GHG emission reductions were calculated by applying the Nova Scotia-specific factor³⁵ for GHG emissions generated by electricity production to MHEEP gross savings results, the results of which are presented in Table 57.

Table 57: Evaluated 2025 MHEEP Gross GHG Emission Reductions

	Total
Gross Energy Savings – at the Generator (GWh)	0.337
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO ₂ eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO₂ eq)	158

³⁴ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.

³⁵ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO₂ eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed August 26, 2025) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).

23.3 Net Savings

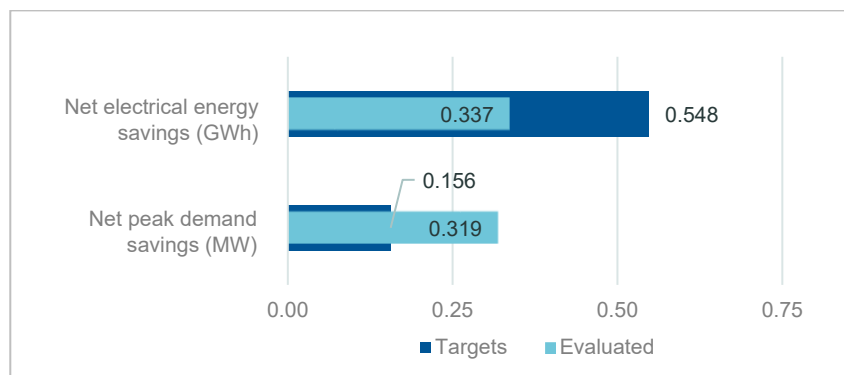
The Evaluator determined the net energy and peak demand savings, i.e. the electrical energy and peak demand savings that can be reliably attributed to the program component, by estimating a net-to-gross ratio (NTGR). More precisely, the NTGR represents the positive or negative impacts of spillover and free-ridership effects on gross savings. A NTGR of 1.00 was used since participating homes are owned by Mi'kmaw communities that traditionally have small housing budgets spread across many competing housing priorities.

23.3.1 Evaluated Net Savings

Net savings are defined as the electrical energy savings specifically attributable to MHEEP. Since spillover and free-ridership effects were considered nil, net MHEEP impacts are equal to the gross savings generated by the program component. Overall, total net electrical energy and peak demand savings amounted to 0.337 GWh and 0.319 MW at the generator respectively. Similarly, net annual GHG emission reductions are equal to gross annual GHG emission reductions.

As outlined in Figure 27, MHEEP fell short of its electrical energy savings target by 39% and exceeded its peak demand savings target by 104%.

Figure 27: 2025 MHEEP Targets and Evaluated Savings



23.4 Realization Rate

A comparison of the gross and net electrical energy and peak demand savings values established through this evaluation and those tracked by E1 is presented in Table 58 below. The table also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings.

Table 58: Comparison of Tracked and Evaluated 2025 MHEEP Savings at the Generator

	Gross Savings		NTGR	Net Savings		Realization Rate
	Value	Unit		Value	Unit	
Energy Savings						
Tracked Savings by E1	0.337	GWh	1.00	0.337	GWh	100%
Evaluation Results	0.337	GWh	1.00	0.337	GWh	
Peak Demand Savings						
Tracked Savings by E1	0.420	MW	1.00	0.420	MW	76%
Evaluation Results	0.319	MW	1.00	0.319	MW	
*NTGRs varied for each product category. The NTGRs presented in this table correspond to the rounded averages obtained by dividing net savings by gross savings.						

The net evaluated electrical energy savings were the same as the values tracked by E1, while the evaluated peak demand savings were 24% lower than those tracked by E1. This difference in peak demand savings reflects the impacts of the change in methodology to align with the 2024 Green Heat billing analysis findings and with similar program component methodologies.



24 MHEEP Key Findings and Recommendations

As previously mentioned, the main objectives of the 2025 MHEEP evaluation were as follows:

- › Calculate gross and net MHEEP results, namely electrical first-year and lifetime electrical energy savings, peak demand savings, as well as avoided GHG emissions

This section provides the Evaluator's key findings in relation to the above objectives. The Evaluator has no specific recommendation for MHEEP.

2025 MHEEP-Finding: MHEEP net electrical energy savings fell short of targets while peak demand savings exceeded targets.

MHEEP achieved 0.337 GWh in net electrical energy savings and 0.319 MW in net peak demand savings at the generator in 2025, thus not attaining the planned net electrical energy savings of 0.548 GWh while exceeding the planned net peak demand savings of 0.156 MW. Although the average gross electrical energy savings per participant slightly increased compared to 2024 levels, this increase was not sufficient to reach the electrical energy savings target.

2025 MHEEP-Finding: Participation declined in 2025, while average gross electrical energy savings per participant slightly increased, resulting in lower total gross electrical energy savings compared to 2024 results.

Compared to 2024 levels, 157 participants completed projects under MHEEP in 2025, representing an 18% decrease in participation. At the same time, average gross electrical energy savings per participant remained stable. Overall, the decrease in participation explains the reduction in total program savings in 2025, with total electrical energy savings decreasing by 16% and peak demand savings by 34% relative to 2024 results.

2025 MHEEP-Finding: The evaluated net electrical energy savings determined by the Evaluator were identical to the net savings tracked by E1, while evaluated peak demand savings were lower than those tracked by E1

While the evaluated net electrical energy savings were equal to the values tracked by E1, the evaluated net peak demand savings were lower than those tracked by E1 due to a change in methodology to align with the 2024 Green Heat billing analysis findings and with similar program component methodologies.



25 Residential Behaviour Overview

This section describes the Residential Behaviour program component, follows up on past evaluation recommendations, and provides an overview of participation history.

25.1 Description

Residential Behaviour, publicly branded as Efficiency Insights, is designed to help Nova Scotia Power (NS Power) residential customers reduce their electricity consumption. The component provides a subset of customers with detailed usage data enabling them to compare their energy use with similar homes and includes behaviour change tips and recommendations related to Efficiency Nova Scotia (ENS) programs to encourage the adoption of energy-conscious habits and practices.

E1's service provider, Bidgely, processes NS Power data using proprietary algorithms to create personalized Home Energy Reports (HERs) in both paper and electronic formats. E1 integrates its Efficiency Insights tools into NS Power's MyEnergy Insights (MEI) online platform to ensure a seamless experience for customers. Customers are encouraged to use the MEI platform to complete a survey about energy use in their home, the results of which help improve HER personalization.

To enhance customer engagement, E1 employs Energy Solutions Advisors (ESAs) who assist customers in understanding and applying insights from their HERs and the MEI platform. They also guide customers toward suitable ENS programs.

Residential Behaviour was launched in May 2024. It is funded under E1's 2023-2025 Demand-side Management Plan. ENS previously delivered a similar initiative, known as the Home Energy Report program, from 2013 to 2015.

Energy savings are assessed annually through a billing analysis that serves to compare the energy usage of program participants with that of a control group not enrolled in the program. E1 treatment customers receive up to six reports per year, which is aligned with NS Power's bi-monthly billing cycles. HERs are distributed continuously in weekly batches given the variability in customers' billing cycles. Additionally, two of the reports are tailored to reflect the heating and cooling seasons.

In 2025, program participants received reports between January and May. Due to a cybersecurity incident at NS Power in Spring 2025, AMI data were no longer available to E1 or the service provider after April. Since customer consumption AMI data from NS Power are required to generate home energy reports for Residential Behaviour participants, access to the MEI platform and the submission of HERs were stopped in May 2025 and the program was paused for the remainder of 2025.

25.2 Follow-up on Past Evaluation Report Recommendations

There are no past recommendations since this is the first evaluation of Residential Behaviour.

25.3 Participation History

Residential Behaviour is an opt-out program component, which means that E1 enrolls customers, and customers remain in the program until they opt out online or by contacting E1.

The targeted population for Residential Behaviour is NS Power residential customers with rate codes 02B and 03B, which include most residential customers who had an active account and sufficient billing to constitute the baseline period. Prior to program launch, the Evaluator was mandated to identify eligible customers and randomly assign them to a control or treatment group. The population was split into three waves corresponding to high, medium, and low electricity users.

Table 59 presents the number of selected participants (treatment groups) and those selected to be in the control groups when the group selection was made in March 2024.

Table 59: Treatment and Control Group Sizes at the Time of Selection (March 2024)

Wave	Population Size (N)	Treatment Group Size	Control Group Size
1 – High Users	119,132	101,273	17,859
2 – Medium Users	103,752	93,233	10,519
3 – Low Users	95,403	66,708	28,695
Total	318,287	261,214	57,073

Over time, residential behaviour programs experience **attrition**, i.e. they lose participating customers because of account closures or participants moving. These are considered inactive accounts. Moreover, in the case of E1 Residential Behaviour, customers who switch to a solar rate code due to the installation of solar photovoltaic systems are also removed because they no longer offer a valid billing analysis comparison to non-solar customers. Together, these customer losses constitute the attrition rate. Treatment participants do not receive Efficiency Insights reports after their accounts become inactive or they switch to solar.

This **attrition** explains why the number of customers has reduced every year since the treatment and control group selection in March 2024. Figure 28, Figure 29, and Figure 30 below illustrate, for each wave, the number of active treatment participants at the time of participant selection (March 2024) and at the beginning of each evaluation period (May 2024 for program year 2024 and January 2025 for program year 2025) and those who became inactive or switched to solar throughout the period. Participants who became inactive are responsible for a large portion of the attrition rate. Between January and April 2025 (the last month for which AMI data are available), the attrition rate was of 1.1%, 1.2%, and 1.8% for waves 1, 2, and 3 respectively. A similar attrition rate is also observed with control group customers, although this is not reflected in the participation history figures.

Figure 28: Number of Wave 1 Active Treatment Customers and Attrition Rate Since Participant Selection

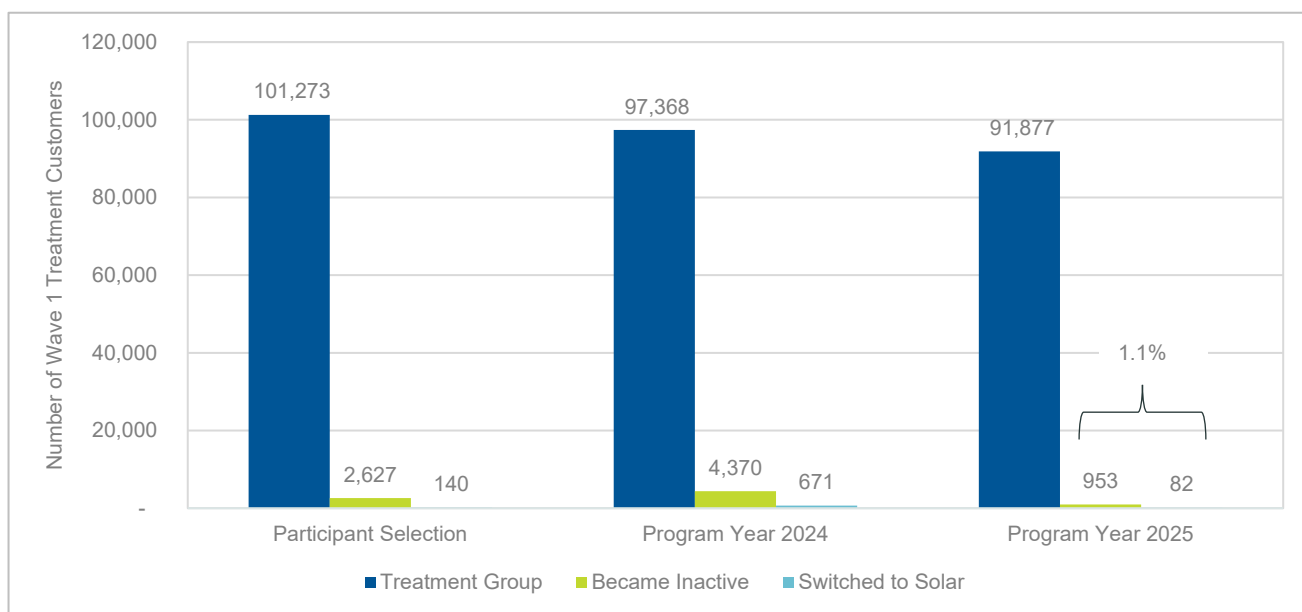


Figure 29: Number of Wave 2 Active Treatment Customers and Attrition Rate Since Participant Selection

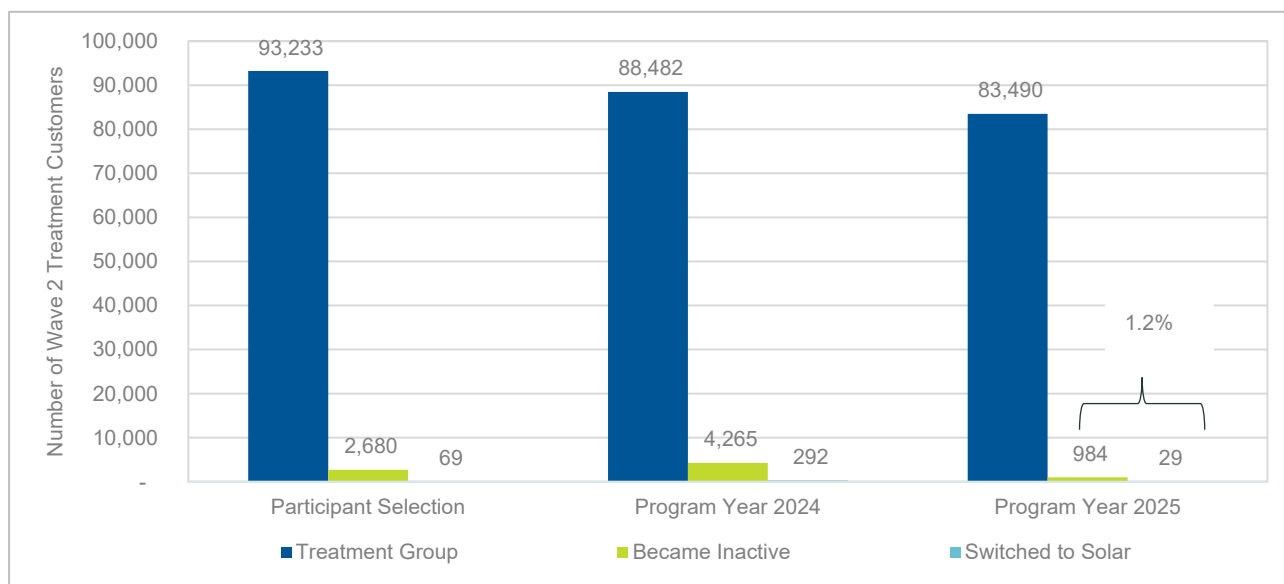
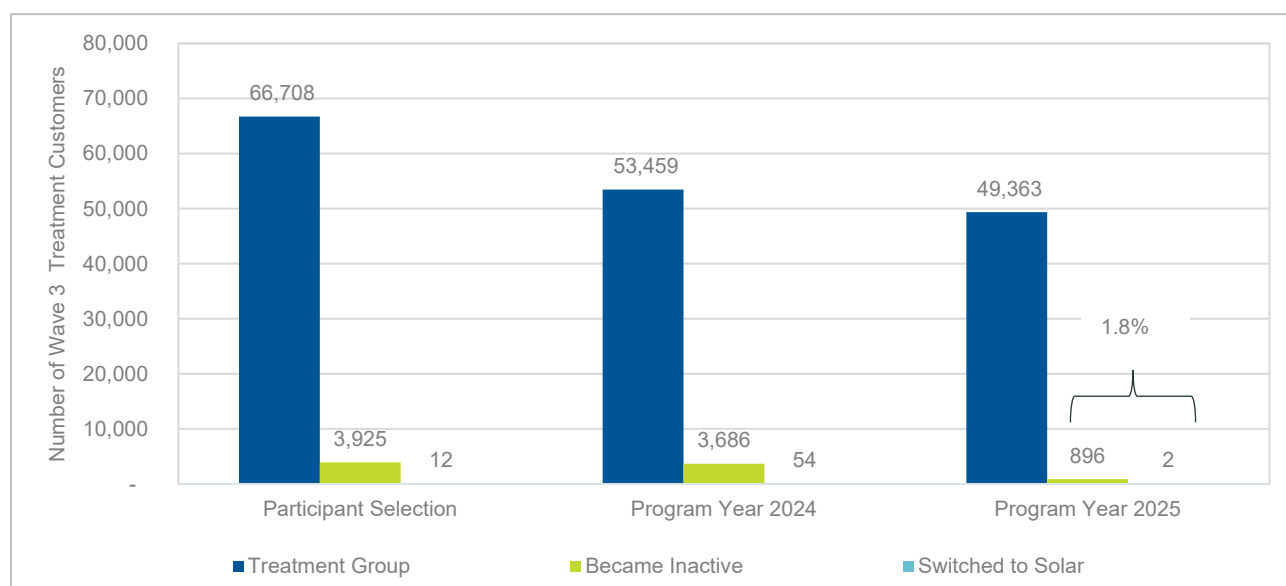
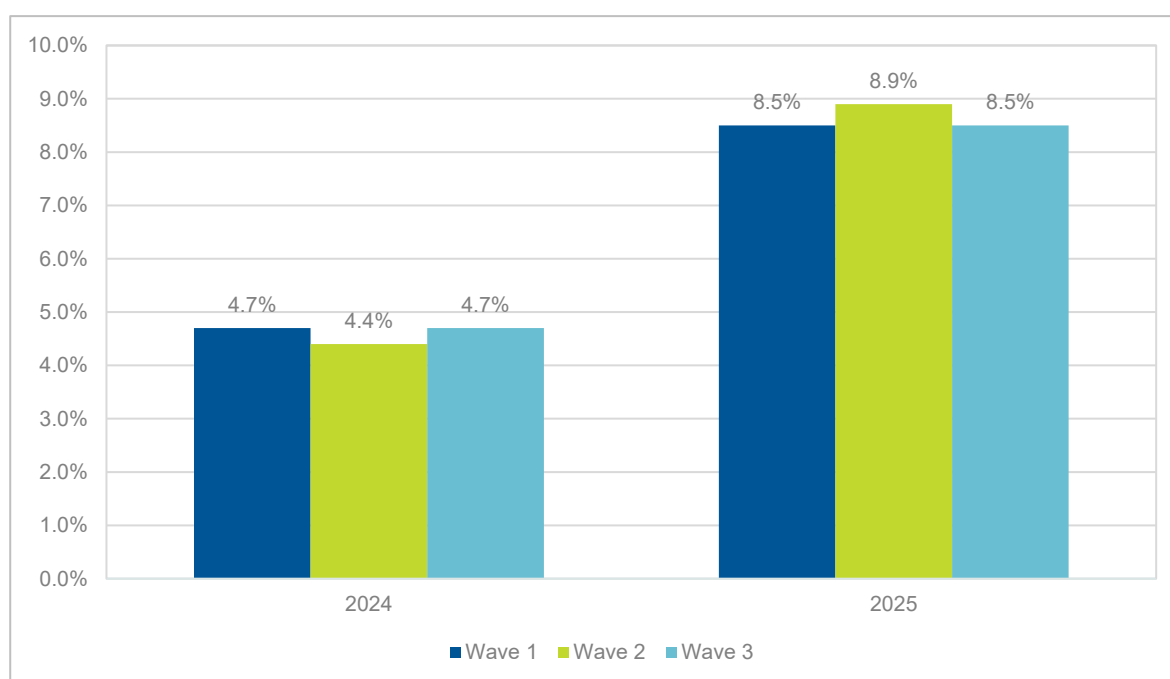


Figure 30: Number of Wave 3 Active Treatment Customers and Attrition Rate Since Participant Selection



Every year, treatment participants can also decide to **opt out** of the program component, i.e. ask to stop receiving HERs. Figure 31 below presents, for each wave, the opt-out rate observed among treatment participants in 2024 (May to December 2024) and in 2025 (January to April 2025).³⁶ The opt-out rate is still similar in each wave.

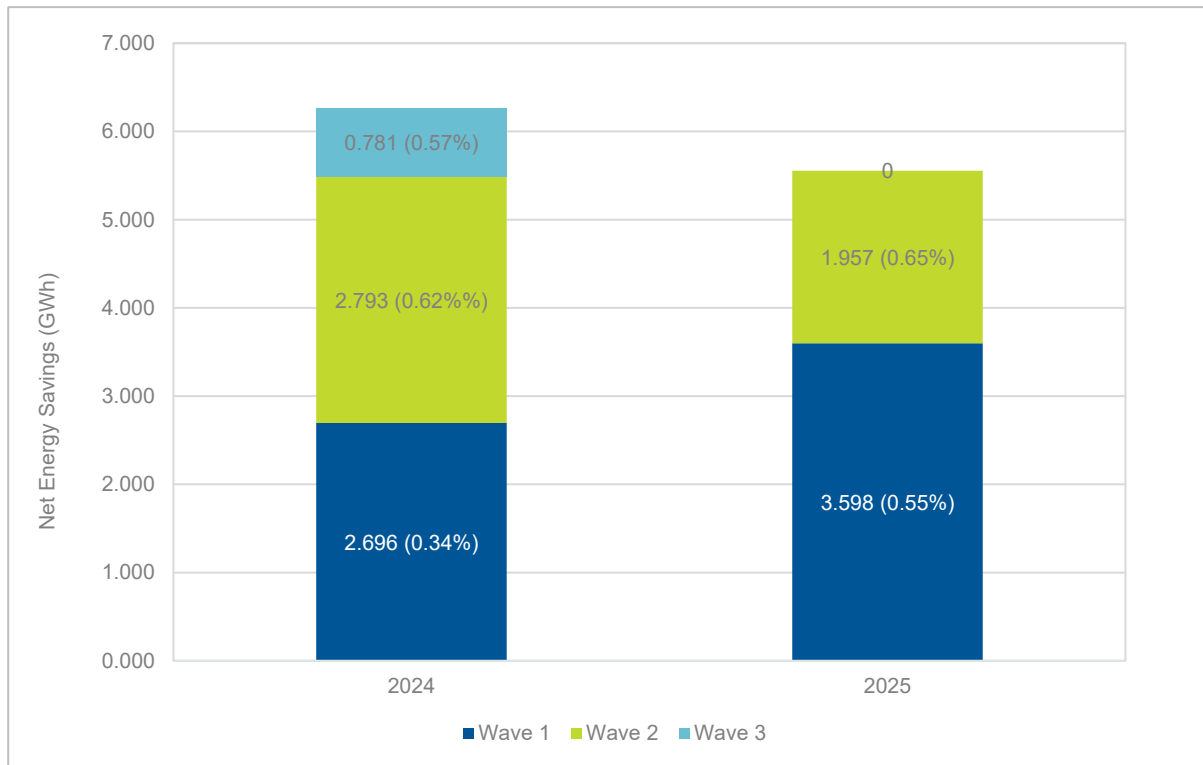
Figure 31: Proportion of Treatment Customers Who Opted Out of the Program Component Since Program Launch



³⁶ In 2024, the opt-out rate also includes treatment participants who did not receive electronic or paper HERs because of an invalid address.

Figure 32 presents the evolution of Residential Behaviour **savings** since program launch.

Figure 32: Overview of Residential Behaviour Electricity Savings, 2024-2025³⁷



³⁷ Wave 3 savings in 2025 were considered zero because they were not statistically significant.

26 Residential Behaviour Evaluation Approach

The 2025 Residential Behaviour evaluation consisted of an impact evaluation using a billing analysis for the months in 2025 for which AMI data were available (i.e. January to April 2025). The process evaluation initially planned for 2025 was postponed until participants begin receiving reports at regular intervals again.

The main objective of the 2025 Residential Behaviour evaluation was as follows:

- › Calculate net results, namely electrical first-year energy savings and avoided GHG emissions

The Evaluator identified key research questions aimed at achieving the above objective. Table 60 outlines the evaluation objective and maps it to the Evaluator's research questions and methods. Each method is described further below.

Table 60: 2025 Residential Behaviour Evaluation Approach

Evaluation Objectives	Research Questions	Methodology
Calculate net results	› What are the evaluated first-year net electrical energy savings? › Is the participation level in other ENS residential programs significantly higher among treatment participants? If yes, what savings deductions should be made? › What are the net GHG emission reductions in CO₂ eq?	› Billing analysis (only for January to April 2025 for which AMI data are available) › GHG emission reduction calculations

Billing Analysis

Using the months in 2025 for which AMI data were available, the Evaluator conducted a billing analysis that included comparing the treatment group and control group electricity consumption levels using a difference-in-difference approach to calculate net electrical energy savings.

Analysis of Participation in Other Programs

The Evaluator compared the participation levels between the treatment and control groups in other residential program components offered by E1, namely Efficient Product Installation (EPI), Green Heat, and Home Energy Assessment (HEA), to verify if higher participation levels are observed in those treatment groups and deduct savings to avoid double counting.

GHG Emission Reduction Calculation

To obtain net avoided GHG emissions in CO₂ eq for Residential Behaviour, the Evaluator multiplied the net energy savings by the latest Nova Scotia-specific factor for GHG emissions generated by electricity production. This factor was established using NS Power data.

Note on Margin of Error

For evaluation activities that yield quantitative results based on a sample, the Evaluator aimed to achieve a maximum margin of error of 10% at a confidence level of 90%. This means that, if measurements were conducted many times with different samples, the data would be within 10 percentage points above or below the percentage reported 90% of the time. Thus, the margin of error indicates the relative level of precision³⁸ of a measurement, while its associated confidence level indicates the probability of a measurement falling within the margin of error.³⁹

As part of the 2025 Residential Behaviour evaluation, the Evaluator calculated the margins of error for savings values obtained from the billing analysis. The margins of error are listed alongside results in the applicable sections below. All margins of error are calculated at a confidence level of 90%.

³⁸ Precision refers to how reproducible a set of measurements is. It does not take into account how close the measured values are to the true values since this would refer to accuracy.

³⁹ As part of this evaluation, confidence levels and margins of error only take random sampling errors into account; they do not reflect non-sampling errors or biases such as data entry errors, inaccurate responses from respondents, or the inability to contact certain people.



27 Residential Behaviour Impact Evaluation

The objectives of the 2025 Residential Behaviour impact evaluation were to determine net electrical energy savings.

The savings calculation methodology for Residential Behaviour is based on evaluation protocols commonly used in North America to assess savings resulting from residential behaviour programs based on a randomized controlled trial (RCT) design.^{40,41} A RCT is a program design through which households in a given population are randomly assigned to two groups – a treatment group and a control group – and the outcomes for the two groups are compared, resulting in unbiased program savings estimates. Residential Behaviour is based on a RCT design.

27.1 Tracking Sheet Audit

Considering Residential Behaviour relies on a random selection of treatment group participants among all residential customers, the program component does not have a tracking sheet. Therefore, no tracking sheet audit was conducted for this evaluation.

27.2 Net Savings

For Residential Behaviour, savings are obtained from the change in electricity consumption resulting from behaviours adopted by treatment group participants compared with the change in electricity consumption observed among control group participants. According to the Uniform Methods Project (UMP), net savings are defined by the difference in energy consumption with the program in place versus the consumption that would have occurred in the absence of the program.⁴² Subtracting the energy consumption change that is not attributable to the program, as represented by the control group energy consumption change, from the treatment group energy consumption change provides a robust estimate of the net change in energy consumption directly attributed to the program. Therefore, savings already correspond to net savings that can be directly attributable to the program component, and no additional free-ridership or spillover effects need to be applied. The only additional consideration to be taken into account is if Residential Behaviour results in increased participation in other residential programs to avoid any double counting between ENS programs.

The following subsections describe the steps used to calculate program net savings.

27.2.1 Treatment and Control Group Selection and Equivalency Check

To yield accurate and unbiased results when calculating savings under a RCT approach, the treatment and control groups must be selected properly so that the two groups are similar. Although the initial selection was conducted by the Evaluator, thereby guaranteeing impartiality and alignment with best practices throughout the selection process, an equivalency check was performed as part of the 2024 DSM evaluation. The Evaluator compared the pre-program energy consumption data and the geographical locations of the treatment and control groups of each wave to ensure that the selected groups were statistically equivalent.

⁴⁰ NREL (2020). Chapter 17: Residential Behaviour Evaluation Protocol, The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures: September 2011 – August 2020.

⁴¹ State and Local Energy Efficiency Action Network (2012). Evaluation, Measurement, and Verification (EM&V) of Residential Behaviour-Based Energy Efficiency Programs: Issues and Recommendations.

⁴² NREL (2020). Chapter 21: Estimating Net Savings – Common Practices, The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures: September 2011 – August 2020.

No changes were made to the treatment and control groups in 2025, except for participants who became inactive or switched to solar rate codes that needed to be removed from the groups. To ensure that the treatment and control groups, composed of households still active at the beginning of the evaluation period (January 2025), remained statistically equivalent, the Evaluator performed another equivalency check.

Table 61 below presents the average pre-program consumption levels of households in the treatment and control groups and that are still active in 2025 and the variation between both groups. The pre-program period goes from May 2023 to April 2024.

Table 61: Pre-program Average Electricity Consumption Values of Households Active in 2025

Wave	Group	Pre-Program Average Daily Consumption (kWh/day)	Variation Between Control and Treatment Groups
1 – High Users	Control	46.2539	0.16%
	Treatment	46.3286	
2 – Medium Users	Control	24.8348	0.25%
	Treatment	24.7718	
3 – Low Users	Control	11.7400	0.50%
	Treatment	11.6814	

As outlined in Table 61 above, the difference in average daily electricity consumption between the control and treatment group for each wave is still very minor. This analysis therefore confirms that both groups continue to demonstrate similar consumption patterns.

Table 62 compares the geographical locations of active households in each group using postal codes provided by E1.

Table 62: Distribution of Geographical Locations of Households Active in 2025

Wave	Region	Control	Treatment
1 – High Users	Number of Accounts ⁴³	16,204	91,877
	HRM	38.83%	38.90%
	Cape Breton	14.20%	14.23%
	Rest of Mainland NS	46.97%	46.87%
2 – Medium Users	Number of Accounts	9,383	83,490
	HRM	35.77%	35.32%
	Cape Breton	16.93%	17.00%
	Rest of Mainland NS	47.30%	47.68%
3 – Low Users	Number of Accounts	21,161	49,363
	HRM	53.98%	55.02%
	Cape Breton	13.47%	13.56%
	Rest of Mainland NS	32.55%	31.41%

⁴³ The numbers of customers indicated here differ from those indicated in Table 59 because of account closures and the use of filters to exclude outliers and customers with missing information.



The Evaluator conducted statistical tests to verify whether the small differences in home locations between the control and treatment groups were statistically significant. In all cases, the difference was found to be insignificant, thereby confirming that home locations remained comparable between the control and treatment groups.

27.2.2 Installation Rates

Since a billing analysis is used to calculate Residential Behaviour savings, the savings already take into account installation rates. Therefore, installation rates are already taken into account in the savings calculations.

27.2.3 Energy Savings

The difference-in-difference (DiD) model is used to calculate savings for Residential Behaviour, which serves to compare **the average change in electricity consumption** in the treatment group prior to and during program participation to the change in energy use in the control group for the same periods. The **pre-program period** consists of the 12-month period prior to program launch, i.e. **from May 2023 to April 2024**. The **post-program period** corresponds to any evaluation year after program launch.

For the 2025 evaluation, the post-program period covers January to December 2025. However, considering AMI data were available only for the months of January, February, March, and April due to the aforementioned cybersecurity incident, energy savings are calculated for the period **from January to April 2025**.

Using the DiD model, the Evaluator calculated both monthly savings and cumulative savings. The monthly savings approach serves to visualize energy savings trends month by month. The cumulative approach serves to directly calculate the savings for the whole evaluation period, in this case from January to April 2025. While the monthly savings approach presents savings estimates for each month of the year, it can lead to results that are not statistically significant for certain months of the year due to larger margins of error. For this reason, the Evaluator elected to use the cumulative approach for official program component reporting while also presenting monthly savings for indicative purposes.

Data Preparation

Before calculating savings, the Evaluator cleaned and prepared the AMI data provided by E1.

The received AMI data contained consumption data aggregated on a monthly basis. The pre-program data cover the 12-month period prior to program launch, i.e. from May 2023 to April 2024. The post-program data for the 2025 evaluation period cover the months of January 2025 to April 2025 inclusively.

When developing the data preparation procedure, the Evaluator asked the service provider to share their data cleaning procedure to ensure that their criteria were consistent. The data preparation procedure applied by the Evaluator included the following actions:

- › Remove outlier data
- › Remove duplicate data
- › Remove customer accounts that became inactive as of the month when they became inactive (the list of inactive accounts, essentially corresponding to customers having moved or who closed their account, was provided by the service provider)
- › Remove customer accounts that were switched to solar rate codes as of the month when the switch occurred⁴⁴

⁴⁴ Customer accounts that were switched to a rate code other than solar were kept in the analysis. Solar rate codes were removed because these accounts are now net metering and the corresponding household electricity consumption is not reported separately.

After applying these data preparation steps to each treatment and control group customer, 1.3% of customers were removed at some point during the evaluation period (corresponding to the overall attrition rate for all waves), and 0.3% of observations (monthly consumption data) were also removed.

It should be noted that treatment group customers who opted out or who did not receive electronic or paper HERs because of an invalid address or not being registered with NS Power My Account were kept in the analysis to avoid both unbalancing the treatment and control groups (since these situations only occur in the treatment group) and causing bias in the savings estimates. Keeping opted-out accounts is the recommended approach in behaviour program evaluation protocols. Conversely, inactive accounts or accounts that switched to solar could be removed from the analysis as they occur equally in both the treatment and control groups.

Savings Calculation

The equation presented below was used to calculate the cumulative savings for 2025, i.e. using the average daily consumption over the entire period (January to April in this case). The Evaluator also calculated monthly savings to observe monthly trends, the details of which are presented in Appendices XV and XVI.

$$\begin{aligned} \text{Cumulative Savings} &= [(Post\_kWh_{Control} - Post\_kWh_{Treat}) - (Pre\_kWh_{Control} - Pre\_kWh_{Treat})] \\ &\times \sum_{i=1}^N Nb\_Days \end{aligned}$$

Where:

- › $Post\_kWh_{Control}$ = The average control group daily consumption over the given post-program period
- › $Post\_kWh_{Treat}$ = The average treatment group daily consumption over the given post-program period
- › $Pre\_kWh_{Control}$ = The average control group daily consumption over the pre-program period
- › Pre_kWh_{Treat} = The average treatment group daily consumption over the pre-program period
- › $\sum_{i=1}^N Nb\_Days$ = The total number of active treatment days in the given year for each participating household (i)

Since the number of participating households in the treatment group with available AMI data varies from month to month, the Evaluator needed to adjust the cumulative savings calculation to properly account for this and obtain the total savings value. Instead of multiplying the average daily savings by the number of participating households, the average daily savings obtained using the cumulative approach were multiplied by the total number of treatment days of each participating household.

Table 63 below presents the 2025 electrical energy savings values established by the Evaluator based on the cumulative approach using months for which AMI data were available. The percentages of savings achieved are still below 1%. After only 12 months since the launch of Residential Behaviour, such results are expected as the program component is still ramping up.

Table 63: 2025 Evaluated Cumulative Electrical Energy Savings

Parameters and Results	Cumulative Savings
Wave 1 – High Users	
Initial Number of Active Participants - Treatment Group	91,877
Attrition Rate (%)	1.1%
Total Number of Treatment Days*	10,962,845
Baseline Average Daily Consumption (kWh/day) **	61.2
Average Daily Savings (kWh/day)	0.339
Percentage of Savings (%) ***	0.55%
Margin of Error (%)	0.38%
Total Savings (GWh)	3.716
Wave 2 – Medium Users	
Initial Number of Active Participants - Treatment Group	83,490
Attrition Rate (%)	1.2%
Total Number of Treatment Days*	9,957,942
Baseline Average Daily Consumption (kWh/day) **	30.6
Average Daily Savings (kWh/day)	0.200
Percentage of Savings (%) ***	0.65%
Margin of Error (%)	0.41%
Total Savings (GWh)	1.992
Wave 3 – Low Users	
Initial Number of Active Participants - Treatment Group	49,363
Attrition Rate (%)	1.8%
Total Number of Treatment Days*	5,869,632
Baseline Average Daily Consumption (kWh/day) **	13.1
Average Daily Savings (kWh/day)	0.088
Percentage of Savings (%) ***	0.67%
Margin of Error (%)	0.70%
Total Savings (GWh)	0.000
*The total number of treatment days is calculated by multiplying the number of active participants in each month by the number of days in the given month, then summing these values across all months. ** This corresponds to the average daily consumption of the control group for the pre-program period (from January to April in this case). ****The percentage of monthly savings is calculated by dividing the average daily savings by the baseline average daily consumption.	

As mentioned at the beginning of Subsection 27.2.3 above, the savings obtained through the cumulative approach represented the savings achieved from January to April 2025 and are used for official program component reporting because they are more inclusive of the monthly fluctuations in the margins of error that occur over the four-month evaluation period. With the cumulative approach, savings values for the first four months of 2025 are statistically significant for waves 1 and 2.



27.2.4 Peak Demand Savings

No peak demand savings targets were set for Residential Behaviour and no peak demand savings were calculated as part of the 2025 evaluation.

27.2.5 Interactive Effects

Interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling. For Residential Behaviour, interactive effects are already taken into account in the savings calculations since the billing analysis is conducted using whole house energy consumption data.

27.2.6 Effective Useful Life

For Residential Behaviour, energy savings are assessed annually through a billing analysis that serves to calculate the change in electricity consumption between the program evaluation year (post-program period) with the pre-program period. The pre-program period remains the same throughout the years, meaning that the resulting savings correspond to both first-year savings and savings that persist over time. Therefore, an EUL of one year is used.

In the literature, behavioural programs typically use an EUL of one year across various jurisdictions, including Massachusetts, Illinois, Vermont, and New York, for the same reason.

27.2.7 Savings Deductions for Participation in Other Residential Programs

A secondary aim of Residential Behaviour is to encourage customers to engage with other ENS programs tailored to their usage profiles. Therefore, treatment group customers are more encouraged to participate in other residential programs than control group customers. To avoid double counting Residential Behaviour savings already counted through other ENS program evaluations, the Evaluator compared, for each wave, the treatment and control group levels of participation in EPI, Green Heat, and HEA. Considering no information is collected on participants in Instant Savings, it was not possible to include that program component in the analysis.

If a statistically significant higher program participation level is observed in one of the treatment groups, savings deductions need to be calculated for that program. To calculate these deductions, the Evaluator estimates an average per household net annual savings value associated with each program with a higher participation level. The total savings deduction for each program consists of multiplying the difference in percentage of the participation level between the treatment and control groups by the average per household net annual savings value and the number of participants in the treatment group. If no statistically significant difference is found, no savings deduction is necessary.

This analysis is performed every year to calculate first-year savings deductions. In subsequent years, these savings deductions are transformed into lifetime savings deductions to be accounted for over the program EUL.

First-year Savings Deductions

As outlined in Table 64 below, between January and April 2025, there was statistically significant differences in participation levels between the treatment and control groups in Green Heat for medium users of wave 2.

Table 64: Other Residential Program Participation Levels for 2025

Program Component	Treatment Participation Level	Control Participation Level	Difference (%)	Is the Difference Statistically Significant?
Wave 1 – High Users				
HEA	0.49%	0.55%	-0.1%	No
Green Heat	0.13%	0.10%	0.0%	No
EPI	1.1%	1.1%	-0.1%	No
Wave 2 – Medium Users				
HEA	0.83%	0.76%	0.1%	No
Green Heat	0.14%	0.05%	0.1%	Yes
EPI	1.1%	0.9%	0.2%	No
Wave 3 – Low Users				
HEA	0.57%	0.59%	0.0%	No
Green Heat	0.06%	0.06%	0.0%	No
EPI	0.65%	0.69%	0.0%	No

The higher participation level in Green Heat for wave 2 involves calculating first-year savings deductions as presented in Table 65.

Table 65: First-year Savings Deductions Calculation for 2025

Wave	Program Component	Average Net Savings per Household (GWh) ⁴⁵	Proportion of Increased Participation in Treatment Group (%)	Average Number of Active Treatment Participants in 2025	Savings Deductions (GWh)
Wave 2 – Medium Users	Green Heat	0.000793	0.0821%	91,358	0.0198

Lifetime Savings Deductions

When a first-year savings deduction is required for a program, the program EUL needs to be considered. Indeed, because savings from increased participation will persist over the lifetime of the measures installed through this participation, the corresponding deductions must be applied annually for the full length of the program EUL. This ensures that overlapping savings are consistently removed and that attribution remains accurate throughout the benefit period.

In **2024**, there were statistically significant differences in Waves 1 for Green Heat and EPI as well as in Wave 2 for Green Heat. The EUL associated with EPI is 5.9 years and 18 years for Green Heat. This means that the 2024 savings deductions for EPI will be applied until 2029 and the 2024 savings deductions for Green Heat will be applied until 2041 as long as the Residential Behaviour program exists.

⁴⁵ Average net savings per household were obtained by dividing the 2025 total net evaluated electrical energy savings of the program component, in this case Green Heat, by the number of participants in that program component.

Savings Deductions to Be Applied in 2025

Table 66 below presents the total savings deduction to be applied in 2025 for increased participation in other programs, which corresponds to the sum of 2025 first-year savings deductions and the lifetime savings deduction that persist over time. Considering savings for Residential Behaviour were only calculated for the first four months of 2025, savings deductions to be applied in 2025 were adjusted accordingly, i.e. by a factor of 4/12.

Table 66: 2025 Savings Deductions

Program Component	Savings Deduction Year of the Program EUL	Savings Deduction to Be Applied in 2025
Wave 1 – High Users		
Lifetime Savings Deductions		
Green Heat 2024	Year 2 of 18.0	0.0181 GWh
EPI 2024	Year 2 of 5.9	0.0999 GWh
First-year Savings Deductions		
No statistically significant higher program participation level in 2025		
Total	-	0.118 GWh
Wave 2 – High Users		
Lifetime Savings Deductions		
Green Heat 2024	Year 2 of 18.0	0.0148 GWh
First-year Savings Deductions		
Green Heat 2025	Year 1 of 18.0	0.0198 GWh
Total	-	0.035 GWh
Wave 3 – Low Users		
Lifetime Savings Deductions		
No statistically significant higher program participation level in previous years		
First-year Savings Deductions		
No statistically significant higher program participation level in 2025		
Total	-	0 GWh

27.2.8 Evaluated Net Savings

The Residential Behaviour net electrical energy savings were estimated using the following equation:

$$\text{Net Savings} = \sum \text{Monthly Savings} - \text{Savings Deductions for Participation in Other Programs}$$

The detailed results are listed in Table 67 below. The net electrical energy savings resulted in 2,607 tonnes of CO₂ eq in net annual GHG emission reductions as presented in Table 68 below. The GHG emission reductions were calculated by applying the Nova Scotia-specific factor⁴⁶ for GHG emissions generated by electricity production to Residential Behaviour electrical energy savings.

Table 67: Evaluated 2025 Residential Behaviour Net Electrical Energy Savings

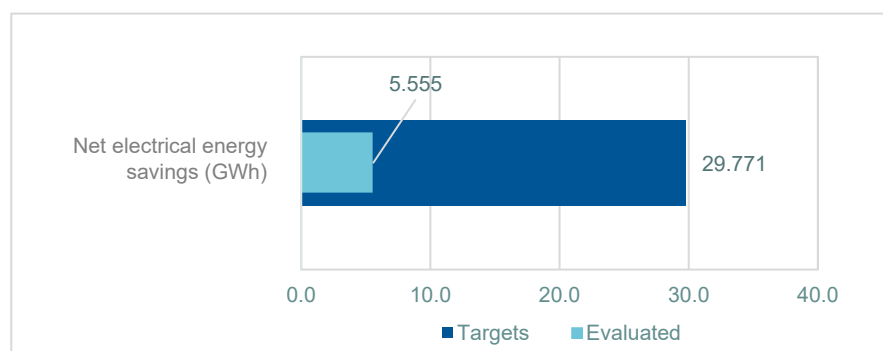
Cohort	Wave 1	Wave 2	Wave 3	Total
Electrical Energy Savings				
Electrical Energy Savings (GWh)	3.716	1.992	0.000	5.078
Savings Deductions (GWh)	0.118	0.035	0.000	0.153
Net Electrical Energy Savings (GWh)	3.598	1.957	0.000	5.555
Effective Useful Life (years)	1.0	1.0	1.0	1.0
Net Lifetime Electrical Energy Savings (GWh)	3.598	1.957	0.000	5.555

Table 68: Evaluated Residential Behaviour Net GHG Emission Reductions

	Total
Gross Electrical Energy Savings – at the Generator (GWh)	0.337
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO ₂ eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO₂ eq)	158

As outlined in Figure 33 below, Residential Behaviour fell short by 81% of its 29.771 GWh target in net electrical energy savings.

Figure 33: 2025 Residential Behaviour Targets and Evaluated Results



27.3 Realization Rate

No tracked savings were calculated for Residential Behaviour; therefore, there is no realization rate.

⁴⁶ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO₂ eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed January 15, 2026) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed January 15, 2026).



28 Residential Behaviour Key Findings and Recommendations

The main objective of the 2025 Residential Behaviour evaluation was as follows:

- › Calculate net results, namely electrical first-year energy savings as well as avoided GHG emissions

This section provides the Evaluator's key findings in relation to the above objective. Pursuant to the 2025 evaluation, the Evaluator has no recommendations for Residential Behaviour.

2025 Residential Behaviour-Finding: Residential Behaviour has been paused since May 2025.

Due to a cybersecurity incident at NS Power in Spring 2025, AMI data were no longer available to E1 or the service provider. Since customer consumption AMI data from NS Power are required to generate home energy reports for Residential Behaviour participants, access to the MEI platform and HER submissions were stopped in May 2025, and the evaluation was limited to the four months in 2025 (January to April) for which AMI data were available.

2025 Residential Behaviour-Finding: With only four months of operation in 2025, Residential Behaviour fell short of the net electrical energy savings target.

Residential Behaviour achieved 5.555 GWh in net electrical energy savings in the four months of operation in 2025, thus falling short of the planned net electrical energy savings of 29.771 GWh. High electricity users (wave 1) and medium electricity users (wave 2) respectively achieved 3.598 GWh and 1.957 GWh in savings for 2025. Low electricity users (wave 3) did not achieve statistically significant savings in 2025. These results are explained by the program component only operating for four months in 2025 and having been paused in its ramp-up phase.

CONCLUSION

Table 69 presents the participation levels, net-to-gross ratios (NTGRs), evaluated gross and net savings at the generator, annual greenhouse gas (GHG) emission reductions, as well as effective useful life (EUL) values for each program component and for Existing Residential as a whole.

Table 69: Overall 2025 Existing Residential Participation and Evaluated Savings

	Participation Level		Gross Savings		NTGR	Net Savings	
	Value	Unit	Value	Unit	Value*	Value	Unit
AMH							
Electrical Energy Savings	98	Projects	1.378	GWh	1.00	1.378	GWh
Lifetime Electrical Energy Savings			23.345	GWh	1.00	23.345	GWh
Peak Demand Savings			0.648	MW	1.00	0.648	MW
Annual GHG Emission Reductions			647	Tonnes of CO2 eq	1.00	647	Tonnes of CO2 eq
EUL			16.9	Years		16.9	Years
ASFH							
Electrical Energy Savings	1,920	Participants	6.135	GWh	1.00	6.135	GWh
Lifetime Electrical Energy Savings			118.611	GWh	1.00	118.611	GWh
Peak Demand Savings			2.338	MW	1.00	2.338	MW
Annual GHG Emission Reductions			2,879	Tonnes of CO2 eq	1.00	2,879	Tonnes of CO2 eq
EUL			19.3	Years		19.3	Years
EPI							
Electrical Energy Savings	9,245	Participants	7.405	GWh	0.99	7.300	GWh
Lifetime Electrical Energy Savings			54.400	GWh	0.99	53.898	GWh
Peak Demand Savings			0.518	MW	0.98	0.509	MW
Annual GHG Emission Reductions			3,475	Tonnes of CO2 eq	0.99	3,426	Tonnes of CO2 eq
EUL			7.3	Years		7.4	Years
Green Heat							
Electrical Energy Savings	944	Measures installed	1.414	GWh	0.53	0.749	GWh
Lifetime Electrical Energy Savings			25.460	GWh	0.53	13.488	GWh
Peak Demand Savings			2.176	MW	0.55	1.191	MW
Annual GHG Emission Reductions			664	Tonnes of CO2 eq	0.53	352	Tonnes of CO2 eq
EUL			18.0	Years		18.0	Years



	Participation Level		Gross Savings		NTGR	Net Savings	
	Value	Unit	Value	Unit	Value*	Value	Unit
HEA							
Electrical Energy Savings	3,157	Participants	14.769	GWh	0.94	13.820	GWh
Lifetime Electrical Energy Savings			380.764	GWh	0.90	342.195	GWh
Peak Demand Savings			4.684	MW	0.98	4.578	MW
Annual GHG Emission Reductions			6,931	Tonnes of CO2 eq	0.94	6,486	Tonnes of CO2 eq
EUL			25.8	Years		24.8	Years
MHEEP							
Electrical Energy Savings	157	Participants	0.337	GWh	1.00	0.337	GWh
Lifetime Electrical Energy Savings			6.905	GWh	1.00	6.905	GWh
Peak Demand Savings			0.319	MW	1.00	0.319	MW
Annual GHG Emission Reductions			158	Tonnes of CO2 eq	1.00	158	Tonnes of CO2 eq
EUL			20.5	Years		20.5	Years
Residential Behaviour							
Electrical Energy Savings	224,730	Treatment participants		GWh		5.555	GWh
Lifetime Electrical Energy Savings				GWh		5.555	GWh
Peak Demand Savings				MW		0.000	MW
Annual GHG Emission Reductions				Tonnes of CO2 eq		2,607	Tonnes of CO2 eq
EUL				Years		1.00	Years
Total							
Electrical Energy Savings			31.438	GWh		35.274	GWh
Lifetime Electrical Energy Savings			609.485	GWh		563.997	GWh
Peak Demand Savings			10.684	MW		9.584	MW
Annual GHG Emission Reductions			14,754	Tonnes of CO2 eq		16,554	Tonnes of CO2 eq
EUL			19.4	Years		16.0	Years
* The average NTGR values presented in this table correspond to the ratios of net savings to gross savings by program component and then for the entire program							

As presented in the tables below, the program fell short of achieving planned net electrical energy and peak demand savings respectively. AMH, EPI, Green Heat, MHEEP and Residential Behaviour fell short of electrical energy targets, while ASFH and HEA exceeded targets. Notably, Residential Behaviour has been paused since May 2025 due to a cybersecurity incident, and evaluation was limited to the four months in 2025, which affected program electrical energy savings. EPI and Green Heat also fell short of peak demand targets, while AMH, ASFH, HEA, and MHEEP exceeded targets. AMH and ASFH participation levels reached their highest point in 2025. HEA was the largest contributor to total program net electrical energy (39%) and peak demand savings (48%).

Figure 34: 2025 Existing Residential Program Targeted and Evaluated Net Electrical Energy Savings

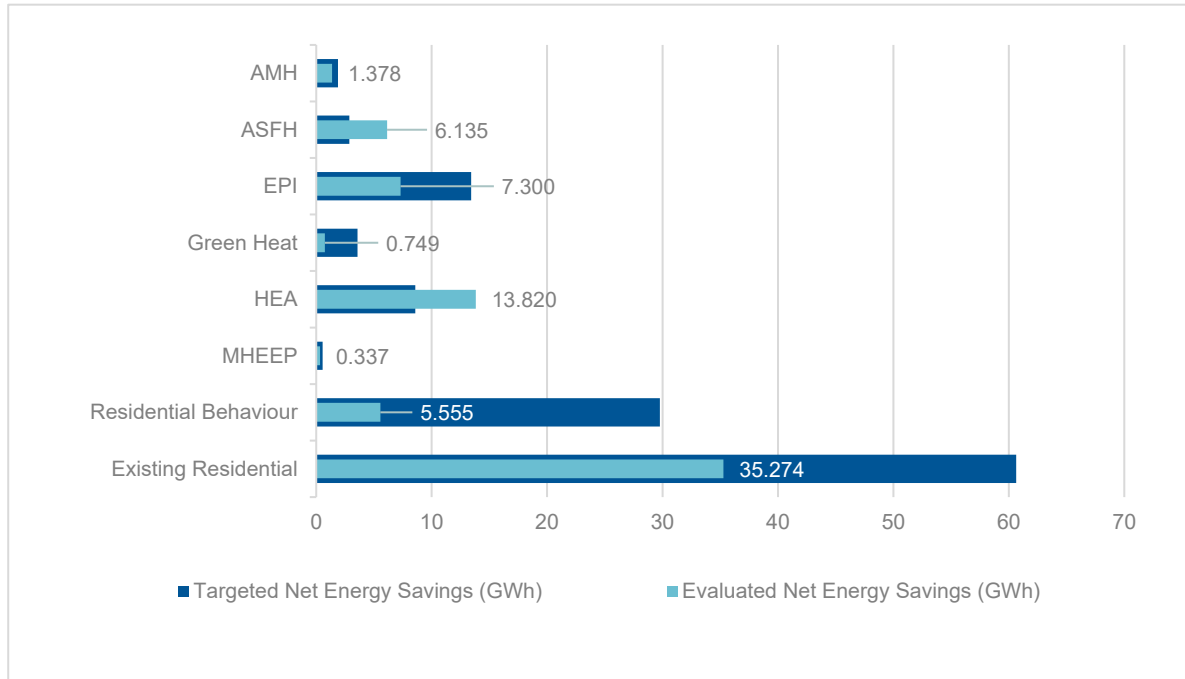
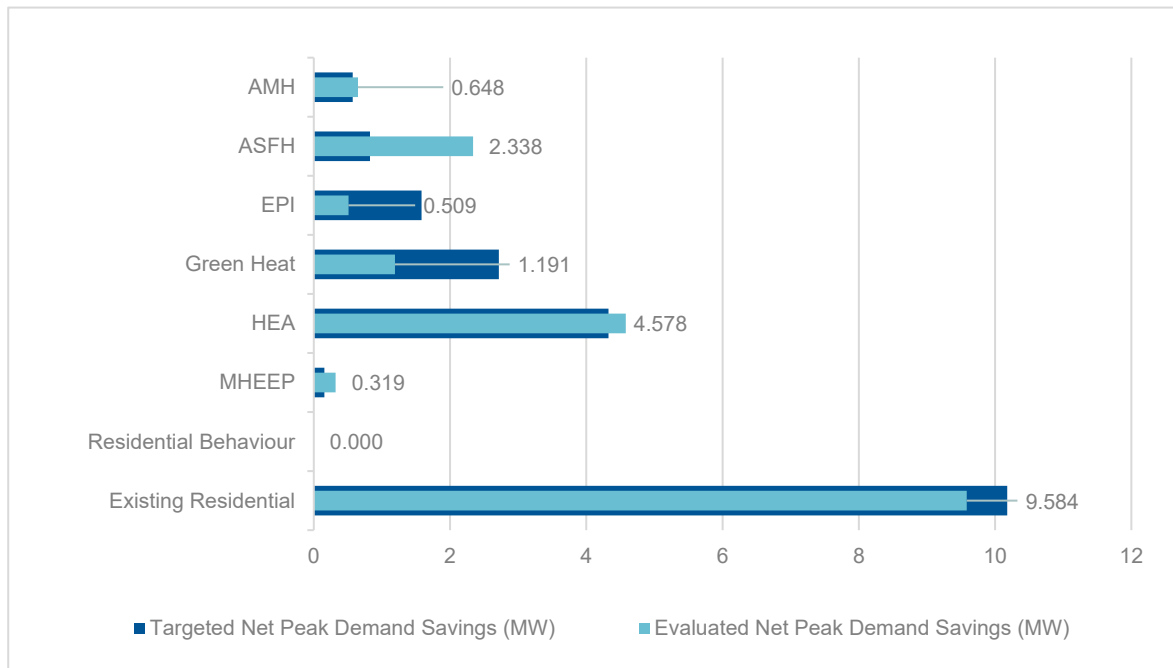


Figure 35: 2025 Existing Residential Program – Targeted and Evaluated Net Peak Demand Savings





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EXISTING RESIDENTIAL PROGRAM

Final Appendix Report

2025 DSM EVALUATION

March 13, 2026



ECONOLUX

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APPENDIX I

AMH Tracking Sheet Audit

This appendix presents the main results of the tracking sheet audit performed by the Evaluator, which was aimed at:

- › Verifying that all data fields required for the evaluation were included and filled out in the tracking sheet submitted by EfficiencyOne (E1)
- › Ensuring that tracked results were accurate by:
 - › Verifying that parameters used to calculate program component results (gross and net electrical energy and peak demand savings at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were performed consistently

Table 1 presents the corrected tracked savings resulting from the tracking sheet audit conducted by the Evaluator.

Table 1: 2025 AMH Corrected Tracked Savings

Program Component Results	Value Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	Value
AMH					
Gross Electrical Energy Savings at the Generator	1.348	GWh	1.378	GWh	2.2%
Gross Peak Demand Savings at the Generator	0.651	MW	0.648	MW	-0.5%
Net Electrical Energy Savings at the Generator	1.348	GWh	1.378	GWh	2.2%
Net Peak Demand Savings at the Generator	0.651	MW	0.648	MW	-0.5%

The difference between tracked and corrected electrical energy savings is due to an incorrect line loss factor used by E1 for residential participants. As for peak demand savings, the difference comes from certain comprehensive projects not using a peak demand-to-energy ratio of 0.283 W/kWh.



APPENDIX II

AMH 2025 Recommendations

The Evaluator made no specific recommendation as part of the 2025 AMH evaluation.

APPENDIX III

ASFH Tracking Sheet Audit

This appendix presents the main results of the tracking sheet audit performed by the Evaluator, which was aimed at:

- › Verifying that all data fields required for the evaluation were included and filled out in the tracking sheet submitted by E1
- › Ensuring that tracked results were accurate by:
 - › Verifying that parameters used to calculate program results (gross and net energy and peak demand savings at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were performed consistently

Table 1 presents the corrected tracked savings resulting from all changes made by the Evaluator.

Table 1: 2025 ASFH Corrected Tracked Savings

Program Component Result	Value Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	Value
ASFH					
Gross Electrical Energy Savings at the Generator	5.858	GWh	5.785	GWh	-1.24%
Gross Peak Demand Savings at the Generator	3.193	MW	2.304	MW	-27.85%
Net Electrical Energy Savings at the Generator *	5.858	GWh	5.785	GWh	-1.24%
Net Peak Demand Savings at the Generator *	3.193	MW	2.304	MW	-27.85%
ASFH-EPI					
Gross Electrical Energy Savings at the Generator	0.276	GWh	0.274	GWh	-0.73%
Gross Peak Demand Savings at the Generator	0.035	MW	0.035	MW	0.24%
Net Electrical Energy Savings at the Generator *	0.276	GWh	0.274	GWh	-0.73%
Net Peak Demand Savings at the Generator *	0.035	MW	0.035	MW	0.24%
Total					
Gross Electrical Energy Savings at the Generator	6.134	GWh	6.059	GWh	-1.22%
Gross Peak Demand Savings at the Generator	3.228	MW	2.338	MW	-27.55%
Net Electrical Energy Savings at the Generator *	6.134	GWh	6.059	GWh	-1.22%
Net Peak Demand Savings at the Generator *	3.228	MW	2.338	MW	-27.55%
* Net savings are not included as a separate value in the tracking sheet since net savings are equal to gross savings.					

The minor discrepancies between tracked and corrected ASFH electrical energy savings primarily resulted from E1 using an outdated calculation methodology in some cases. The Evaluator corrected adjustment ratios, line loss factors, and unitary savings values for a few projects and added unclaimed savings that had no apparent reason for not being claimed. These adjustments included both upward and downward changes, which partially offset each other.



Differences in peak demand savings for ASFH measures were primarily driven by heat pumps in homes with electric heating shares below 100%, for which the Evaluator set peak demand at zero. Additional minor variances arose from entries for which E1 applied outdated calculation methodologies, notably the use of incorrect adjustment ratios. In some cases, E1 did not report demand savings, and the Evaluator could not identify the reason; as a result, the Evaluator calculated savings for those entries.

Additional differences arose from discontinued projects for which E1 reported electrical energy savings for eight lines and demand savings for nine lines as well as one line with negative savings, all of which the Evaluator set to zero.

Minor discrepancies between tracked and corrected savings for EPI primarily stemmed from nine rows in which no electrical energy or demand savings were reported without a reason; for these entries, the Evaluator calculated and added the appropriate savings.

APPENDIX IV

ASFH Results from EPI Measures Implemented Under the Program Component

Table 1: Evaluated 2025 ASFH Allocation of EPI Gross Electrical Energy and Peak Demand Savings per Measure

Product Category	LED Lamps			
	9 W Replacing 60 W	18 W Replacing 100 W	PAR20 7 W Replacing 50 W	PAR38 15 W Replacing 150 W
Number of Units				
Number of Units	2,502	26	41	137
Installation Rate (%)	94%	94%	94%	94%
Number of Units Installed	2,352	24	39	129
Electrical Energy Savings				
Unitary Savings Value (kWh)	48.4	77.8	40.8	128
Interactive Effects Factor*	-15.4%	-18.8%	-12.0%	0.0%
Adjustment Ratio	0.960	0.960	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.092	0.001	0.001	0.016
Line Loss Factor*	1.0947	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.101	0.002	0.002	0.018
Effective Useful Life (years)	1.0	1.0	1.0	1.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.101	0.002	0.002	0.018
Peak Demand Savings				
Unitary Peak Demand Savings (W)	7.84	12.6	6.61	20.7
Peak Demand Interactive Effects Factor*	-42.8%	-50.4%	-30.7%	0.5%
Adjustment Ratio	0.960	0.960	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	0.010	0.000	0.000	0.003
Line Loss Factor*	1.1466	1.1466	1.1466	1.1466
Gross Peak Demand Savings – at the Generator (MW)	0.012	0.000	0.000	0.003
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.				

Evaluated 2025 ASFH Allocation of EPI Gross Electrical Energy and Peak Demand Savings per Measure (Continued)

Product Category	LED Lamps			
	Nightlights	GU10 7 W Replacing 50 W	G25 4.5 W Replacing 40 W	E12 5 W Chandeliers Replacing 40 W
Number of Units				
Number of Units	800	81	142	566
Installation Rate (%)	94%	94%	94%	94%
Number of Units Installed	752	76	133	532
Electrical Energy Savings				
Unitary Savings Value (kWh)	29.3	40.8	33.7	33.2
Interactive Effects Factor*	-18.8%	-19.5%	-18.1%	-18.7%
Adjustment Ratio	1.000	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.018	0.003	0.004	0.014
Line Loss Factor*	1.0947	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.020	0.003	0.004	0.016
Effective Useful Life (years)	1.0	1.0	1.0	1.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.020	0.003	0.004	0.016
Peak Demand Savings				
Unitary Peak Demand Savings (W)	4.75	6.61	5.46	5.38
Peak Demand Interactive Effects Factor*	-51.9%	-55.6%	-55.1%	-51.8%
Adjustment Ratio	1.000	1.000	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	0.002	0.000	0.000	0.001
Line Loss Factor*	1.1466	1.1466	1.1466	1.1466
Gross Peak Demand Savings – at the Generator (MW)	0.002	0.000	0.000	0.002
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.				

Evaluated 2025 ASFH Allocation of EPI Gross Electrical Energy and Peak Demand Savings per Measure (Continued)

Product Category	Faucet Aerators	Thermostatic Shower Valves 2.5 gpm	Pipe Insulation	Hot Water Tank Wraps	Low-flow Showerheads 1.0 gpm Reduction
Number of Units					
Number of Units	208	6	245	32	126
Installation Rate (%)	92%	89%	100%	100%	95%
Number of Units Installed	191	5	245	32	120
Electrical Energy Savings					
Unitary Savings Value (kWh)	118	124	12.7	157	395
Interactive Effects Factor*	0.0%	0.0%	-9.4%	-11.1%	0.0%
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.023	0.001	0.003	0.004	0.047
Line Loss Factor*	1.0947	1.0947	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.025	0.001	0.003	0.005	0.052
Effective Useful Life (years)	10.0	10.0	13.0	7.0	10.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.247	0.007	0.040	0.034	0.518
Peak Demand Savings					
Unitary Peak Demand Savings (W)	19.1	20.1	2.06	25.4	64.0
Peak Demand Interactive Effects Factor*	0.0%	0.0%	-48.5%	-56.3%	0.0%
Adjustment Ratio	1.000	1.000	1.000	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	0.004	0.000	0.000	0.000	0.008
Line Loss Factor*	1.1466	1.1466	1.1466	1.1466	1.1466
Gross Peak Demand Savings – at the Generator (MW)	0.004	0.000	0.000	0.000	0.009
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.					

Evaluated 2025 ASFH Allocation of EPI Gross Electrical Energy and Peak Demand Savings per Measure (Continued)

Product Category	Smart Thermostats for MSHPs	Air Sealing Products – Electric Resistance Heating	Air Sealing Products – Heat Pump Heating	
		Foam Gaskets	Foam Gaskets	Door Weather Stripping
Number of Units				
Number of Units	41	66	277	3
Installation Rate (%)	84%	29%	29%	84%
Number of Units Installed	34	19	80	3
Electrical Energy Savings				
Unitary Savings Value (kWh)	479	90.0	50.0	109
Interactive Effects Factor*	0.0%	0.0%	0.0%	0.0%
Adjustment Ratio	1.000	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.016	0.002	0.004	0.000
Line Loss Factor*	1.0947	1.0947	1.0947	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.018	0.002	0.004	0.000
Effective Useful Life (years)	10.0	15.0	15.0	15.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.181	0.028	0.066	0.004
Peak Demand Savings				
Unitary Peak Demand Savings (W)	0.00	25.5	14.2	30.8
Peak Demand Interactive Effects Factor*	0.0%	0.0%	0.0%	0.0%
Adjustment Ratio	1.000	1.000	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	0.000	0.000	0.001	0.000
Line Loss Factor*	-	1.1466	1.1466	1.1466
Gross Peak Demand Savings – at the Generator (MW)	0.000	0.001	0.001	0.000
* The interactive effects and line loss factors correspond to the average for each product weighted according to the proportion of each type of home and rate code. The interactive effects factor is obtained by dividing gross savings at the meter by the unitary savings value, installation rate, number of units, and adjustment ratio when applicable. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.				

Evaluated 2025 ASFH Allocation of EPI Gross Electrical Energy and Peak Demand Savings

	Grand Total
Number of Units	
Number of Units	5,299
Installation Rate (%)*	90%
Number of Units Installed	4,766
Electrical Energy Savings	
Gross Electrical Energy Savings – at the Meter (GWh)	0.251
Line Loss Factor*	1.0947
Gross Electrical Energy Savings – at the Generator (GWh)	0.274
Effective Useful Life (years)*	4.7
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	1.290
Peak Demand Savings	
Gross Peak Demand Savings – at the Meter (MW)	0.031
Line Loss Factor*	1.1466
Gross Peak Demand Savings – at the Generator (MW)	0.035
* The installation rates, line loss factors, and effective useful life (EUL) values correspond to the average for each offering weighted according to the proportion of each type of product and rate code. The installation rate is obtained by dividing the installed number of units by the total number of units. The EUL value is obtained by dividing lifetime gross electrical energy savings at the generator by gross electrical energy savings at the generator. The line loss factor is obtained by dividing gross savings at the generator by gross savings at the meter.	



APPENDIX V

ASFH 2025 Recommendations

The Evaluator made no specific recommendation as part of the 2025 ASFH evaluation.

APPENDIX VI

EPI Tracking Sheet Audit

This appendix presents the results of the EPI tracking sheet audit performed by the Evaluator, which was aimed at:

- › Verifying that all data fields required for the evaluation were included and filled out in the tracking sheet submitted by E1
- › Ensuring that tracked results were accurate by the following:
 - › Verifying that parameters used to calculate program results (gross and net electrical energy and peak demand savings at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were consistently performed

Table 1 presents the corrected tracked savings resulting from all changes made by the Evaluator. More details follow further below.

Table 1: 2025 EPI Corrected Tracked Savings

Program Component Results	Value Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	Value
EPI					
Gross Electrical Energy Savings at the Generator	8.344	GWh	7.405	GWh	-11.26%
Gross Peak Demand Savings at the Generator	0.554	MW	0.518	MW	-6.46%
Net Electrical Energy Savings at the Generator	8.212	GWh	7.338	GWh	-10.64%
Net Peak Demand Savings at the Generator	0.541	MW	0.509	MW	-5.88%

The differences between tracked and corrected savings are explained by two main factors:

- › The removal of Home Warming (HW) projects, representing 3% of gross savings and 6% of peak demand savings
- › An adjustment to the unitary savings values for smart thermostats to align with the values updated immediately following the 2024 evaluation (sent by the Evaluator in a memo)

Other changes include:

- › An adjustment to a nil line loss factor to that of the residential rate code to avoid having nil savings at the generator
- › An adjustment to the unitary savings values for air sealing measures according to the heating system (electric resistance or heat pump)
- › An adjustment to the interactive effects factors for dimmer switches and indoor motion sensors
- › The use of the overall NTGR values from the 2024 evaluation (minor differences with the overall net-to-gross ratio [NTGR] values that were tracked)
- › The use of rounded values for installation rates, adjustment ratios, interactive effects, NTGRs, etc.



APPENDIX VII

EPI 2025 Recommendations

The Evaluator made no specific recommendation as part of the 2025 EPI evaluation.

APPENDIX VIII

Green Heat Tracking Sheet Audit

This document summarizes the results of the tracking sheet audit conducted by the Evaluator. The audit was aimed at:

- › Confirming that all data fields required for the evaluation were included and filled out in the tracking sheet submitted by E1
- › Ensuring the accuracy of tracked results by:
 - › Verifying that parameters used to calculate program results (gross and net electrical energy and peak demand savings at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were performed consistently

Table 1 below presents the corrected tracked savings values reflecting all adjustments made by the Evaluator as outlined in this document.

Table 1: 2025 Green Heat Corrected Tracked Savings

Program Component Result	Value Tracked by EOne		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	Value
Green Heat					
Gross Electrical Energy Savings at the Generator	1.502	GWh	1.414	GWh	-5.84%
Gross Peak Demand Savings at the Generator	2.840	MW	2.176	MW	-23.38%
Net Electrical Energy Savings at the Generator	0.795	GWh	0.749	GWh	-5.79%
Net Peak Demand Savings at the Generator	1.537	MW	1.191	MW	-22.47%

The differences between the tracked and corrected values are due to corrections made by the Evaluator.

For electrical energy savings:

- › An adjustment to the unitary savings value for ductless mini-split heat pumps (0.179 kWh/Btu/h instead of 0.0855 kWh/Btu/h) for 22 participants
- › An adjustment to the discrepancies between unitary savings and reported electrical energy savings for two ductless mini-split heat pump units (Project ID: GH-2705-MH2AY),
- › An adjustment to the unitary savings value for pellet stoves (1,461 kWh instead of 8,959 kWh) for two participants
- › An adjustment to the baseline for one wood forced-air furnace to electrical resistance according to their primary and secondary heating systems
- › An adjustment to the unitary savings value for wood stoves (1,461 kWh instead of 10,440 kWh) for six participants and to discrepancies between unitary savings and reported electrical energy savings

For peak demand savings:

- › An adjustment to the nominal heating capacity for 382 ductless mini-split heat pumps based on values found in NEEP Cold Climate Heat Pump list
- › An adjustment to the peak demand savings calculation for ductless mini-split heat pumps: On one hand, E1 seems to have used an incorrect baseline efficiency (COP_{base_min} of 0.84 instead of 1.00) in the peak demand savings calculations. On the other hand, peak demand savings have been claimed for some participants that did not have fully electrically heated households
- › An adjustment to the unitary savings value for pellet stoves and wood stoves (828 W instead of 4,000 W) for two and six participants respectively
- › An adjustment to the baseline for one wood forced-air furnace to electrical resistance according to their primary and secondary heating systems



APPENDIX IX

Green Heat 2025 Recommendations

The Evaluator made no specific recommendation as part of the 2025 evaluation of Green Heat.

APPENDIX X

HEA Tracking Sheet Audit

This appendix presents the main results of the tracking sheet audit performed by the Evaluator, which was aimed at:

- › Verifying that all data fields required for the evaluation were included and filled out in the tracking sheet submitted by E1
- › Ensuring that tracked results were accurate by:
 - › Verifying that parameters used to calculate program results (gross and net electrical energy and peak demand savings at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were performed consistently

Table 2 presents the corrected tracked savings resulting from all changes made by the Evaluator.

Table 2 : 2025 HEA Corrected Tracked Savings

Program Component Results	Value Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	Value
HEA					
Gross Electrical Energy Savings at the Generator	18.286	GWh	14.769	GWh	-19.23%
Gross Peak Demand Savings at the Generator	7.027	MW	4.684	MW	-33.34%
Net Electrical Energy Savings at the Generator	14.609	GWh	13.820	GWh	-5.40%
Net Peak Demand Savings at the Generator	5.903	MW	4.578	MW	-22.44%

The differences between the values tracked by E1 and the values corrected by the Evaluator are mainly explained by corrections made to the savings calculations:

- › Electrical energy savings from modelled measures should be calculated using the total electricity consumption at the D and E assessments. Instead, E1 used the total energy consumption from all fuel sources at the D and E assessments multiplied by the percentage of heating from electric sources at the D assessment to track electrical energy savings from modelled measures in 2025. This resulted in a significant discrepancy between the savings tracked by E1 and the corrected tracked value.
- › For electrical energy savings, E1 included multiple projects with negative savings instead of capping savings at zero and did not claim any savings for biomass measures.
- › For peak demand savings, MSHP savings should be calculated separately from the other modelled measures and using the specifications of each MSHP at -15 °C. Peak demand savings for the other modelled measures should be calculated for each project by first calculating all non-MSHP modelled electrical energy savings (if any) and then applying the peak demand-to-energy ratio. This calculation is described in more detail in Subsection 19.2.3 of the 2025 DSM evaluation report.
- › For the net savings, E1 neither added the unconverted D assessment spillover to their total, nor applied the EPI savings deductions. As for the Green Heat net savings deductions, they were taken into account in the gross savings instead of the net savings.



To summarize the findings and actions taken by the Evaluator above, the following changes are required in the Customer Information System (CIS):

- › Adjust the calculation of electrical energy savings for modelled measures.
- › Add a field to track the adjustment ratios (ARs) in the CIS for each project.
- › Cap modelled energy savings at a minimum of 0.
- › Adjust the CIS to enable separate MSHP peak demand savings calculations (with the MSHP heating capacity and COP at -15 °C) and deduct MSHP electrical **energy** savings from the modelled savings to calculate the remaining peak demand savings using the peak-demand-to-energy ratio.

Furthermore, the following changes should also be made to the presentation of the results in the final tracking sheet provided by E1:

- › Separate the Green Heat savings deductions from the gross savings calculation and ensure deductions correspond to the Green Heat net savings.
- › Add a summary tab with gross and net savings, including the application of EPI and Green Heat savings deductions and the addition of the unconverted D assessment spillover to net savings.



APPENDIX XI

HEA Reporting Requirements

HEA incentives originate from three sources of funding and are thus reported to different parties via the DSM evaluation and government-funded evaluation. The DSM evaluation is focused on reporting electrical savings funded by electrical DSM funds, while the government-funded evaluation is focused on participation and GHG emission reductions generated from government funding regardless of the type of fuel. To avoid double counting and determine the most appropriate way to report savings, EfficiencyOne developed the equations and rationales presented in Table 1 below for all participants who implemented building envelope measures or installed new space heating equipment. Solar PV measures are excluded from these equations. All solar PV measures are claimed in the DSM evaluation report as they offset electricity use.

The equations were updated in 2019 to better reflect both the energy savings associated to fuel switching (i.e. from fossil fuel space heating energy sources to electrical heat pumps or wood burning equipment) and the distribution of savings between DSM-funded and government-funded programs for households that use multiple energy sources. When a fuel switch occurs from a non-electrical heating system in the D assessment to an electrical heating system in the E assessment, electrical energy savings are capped at 0 kWh and the overall savings, taking into account the increase in electrical consumption, are claimed as non-electrical savings.

The incorporation of the Canada Greener Homes Grant in 2021 as a co-funder of energy assessments and measures for both DSM and government funding of HEA has not changed anything in the reporting structure.

In 2024, the equations were updated to reflect the change in the overall savings calculation methodology, namely new ARs obtained from a billing analysis and to be directly applied to savings obtained from the difference in total electrical energy consumption instead of being applied to the space heating electrical energy consumption at the D and E assessments separately. No changes were made to the distribution of savings between DSM-funded and government-funded programs.

In 2025, no change was made to the reporting structure described below. While transitioning to CIS, E1 started using an equation based on the percentage of electric heating at the D assessment to calculate DSM savings, which was corrected by the Evaluator in the tracking sheet audit to reflect the approach described below. Discussions on the two approaches led to the identification of differences between how funding is allocated and how savings are distributed among the two sources of funding.

The equations reference the following parameters:

- › Total electrical energy consumption (Elec_Consumption_D and Elec_Consumption_E) obtained from HOT2000 during the D and E assessments
- › Total energy consumption from all fuel sources (Total_Consumption_D and Total_Consumption_E) obtained from HOT2000 during the D and E assessments
- › Savings from wood burning equipment that are not modelled in HOT2000 (wood savings). These savings are reported in either the HEA DSM evaluation report or government-funded evaluation report, or a combination of both depending on the %ElecHeating_D.
- › Savings from HPWHs (HPWH savings). These savings are reported in either the HEA DSM evaluation report or government-funded evaluation report depending on the baseline DHW heating system energy source.

Table 1: 2025 Reporting Requirements for Different Energy Savings Scenarios¹

Scenarios	1	2	3	4
Change in Overall Electrical Energy Consumption	Increase	Increase	Decrease	Decrease
Change in Overall Non-electrical Energy Consumption	Increase	Decrease	Decrease	Increase
Reporting	N/A	Government-funded Report	DSM and Government-funded Reports	DSM Report
Equation Used to Calculate DSM Savings	N/A	$\%ElecHeating_D * Wood\ Savings + HPWH\ Savings$ (if baseline DHW = electric)	$Electric\_Consumption_D - Electric\_Consumption_E + \%ElecHeating_D * Wood\ Savings + HPWH\ Savings$ (if baseline DHW = electric)	$Electric\_Consumption_D - Electric\_Consumption_E + \%ElecHeating_D * Wood\ Savings + HPWH\ Savings$ (if baseline DHW= electric)
Equation Used to Calculate Government-funded Savings	N/A	$Total\_Consumption_D - Total\_Consumption_E - (Electric\_Consumption_D - Electric\_Consumption_E) + (1 - \%ElecHeating_D) * Wood\ Savings + HPWH\ Savings$ (if baseline = non-electric)	$Total\_Consumption_D - Total\_Consumption_E - (Electric\_Consumption_D - Electric\_Consumption_E) + \%ElecHeating_D * Wood\ Savings + HPWH\ Savings$ (if baseline DHW = non-electric)	$\%ElecHeating_D * Wood\ Savings + HPWH\ Savings$ (if baseline DHW = non-electric)
Rationale	This situation never occurs in HEA.	These projects are government-funded with no DSM funding.	The savings are included in the appropriate report based on the equations above. DSM savings are subtracted from government-funded savings to avoid double counting.	These projects are entirely DSM-funded with no government funding

¹ To simplify the equations in Table 1, adjustment ratios and HPWH savings deductions from modelled savings are omitted.



APPENDIX XII

HEA 2025 Recommendations

The Evaluator made no specific recommendation as part of the 2025 HEA evaluation.

APPENDIX XIII

MHEEP Tracking Sheet Audit

This appendix presents the main results of the tracking sheet audit performed by the Evaluator, which was aimed at:

- › Verifying that all data fields required for the evaluation were included and filled out in the tracking sheet submitted by E1
- › Ensuring that tracked results were accurate by:
 - › Verifying that parameters used to calculate program results (gross and net energy and peak demand savings at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were performed consistently

Table 1 presents the corrected tracked savings resulting from all changes made by the Evaluator.

Table 1: 2025 MHEEP Corrected Tracked Savings

Program Component Results	Value Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	Value
MHEEP					
Gross Electrical Energy Savings at the Generator	0.337	GWh	0.337	GWh	0.0%
Gross Peak Demand Savings at the Generator	0.430	MW	0.420	MW	-2.4%
Net Electrical Energy Savings at the Generator	0.337	GWh	0.337	GWh	0.0%
Net Peak Demand Savings at the Generator	0.430	MW	0.420	MW	-2.4%

The difference between the tracked and corrected peak demand savings values is due solely to three records that appeared with demand savings despite not being DSM-allocated participants and having no corresponding electrical energy savings. These records were, therefore, excluded by the Evaluator, resulting in the small downward adjustment in corrected peak demand savings.



APPENDIX XIV

MHEEP 2025 Recommendations

The Evaluator made no specific recommendation as part of the 2025 MHEEP evaluation.

APPENDIX XV

Residential Behaviour: Monthly Savings Approach

While they are not used to claim savings, monthly savings were calculated to observe monthly trends and the ramp-up period in more detail. An equation similar to that of the cumulative approach is used for the monthly approach. For a given month, the DiD model serves to compare the difference in the average daily consumption between the treatment group and the control group before and after program participation. The equation is expressed as follows.

$$\text{Monthly Savings} = [(Post\_kWh_{Control,m} - Post\_kWh_{Treat,m}) - (Pre\_kWh_{Control,m} - Pre\_kWh_{Treat,m})] \\ \times Households_{TG,m} \times Nb\_Days_m$$

Where:

- › m = A number between 1 and 12 to identify the given month
- › $Post\_kWh_{Control,m}$ = The control group average daily consumption in a given month of the post-program period
- › $Post\_kWh_{Treat,m}$ = The treatment group average daily consumption in a given month of the post-program period
- › $Pre\_kWh_{Control,m}$ = The control group average daily consumption in a given month of the pre-program period
- › $Pre\_kWh_{Treat,m}$ = The treatment group average daily consumption in a given month of the pre-program period
- › $Households_{Treat,m}$ = The total number of active participating households in the treatment group in a given month
- › Nb_Days_m = The total number of treatment days in a given month

Table 1 below presents the 2025 monthly electricity savings calculated by the Evaluator for high, medium, and low users.

Table 1: 2025 Residential Behaviour Evaluated Monthly Electrical Energy Savings

	January 2025	February 2025	March 2025	April 2025	Total
Wave 1 – High users					
Number of Active Participants - Treatment	91,877	91,558	91,154	90,842	-
Attrition Rate (%)	-	0.3%	0.4%	0.3%	1.1%
Baseline Average Daily Consumption (kWh/day) *	70.9	68.5	57.8	47.5	-
Average Daily Savings (kWh/day/participant)	0.369	0.219	0.381	0.386	
Average Monthly Savings (kWh/participant)	11.4	6.13	11.8	11.6	-
Percentage of Monthly Savings (%)**	0.52%	0.32%	0.66%	0.81%	-
Margin of Error (%)***	0.71%	0.74%	0.66%	0.67%	
Total Monthly Savings (GWh)****	0.000	0.000	0.000	1.054	1.054
Wave 2 – Medium users					
Number of Active Participants - Treatment	83,490	83,168	82,798	82,477	-
Attrition Rate (%)	-	0.4%	0.4%	0.4%	1.2%
Baseline Average Daily Consumption (kWh/day) *	34.8	33.6	29.2	24.9	-
Average Daily Savings (kWh/day/participant)	0.137	0.208	0.225	0.226	
Average Monthly Savings (kWh/participant)	4.24	5.81	6.98	6.78	-
Percentage of Monthly Savings (%)**	0.39%	0.62%	0.77%	0.91%	-
Margin of Error (%)***	1.08%	1.15%	0.97%	0.95%	-
Total Monthly Savings (GWh)****	0.000	0.000	0.000	0.000	0.000
Wave 3 – Low users					
Number of Active Participants - Treatment	49,363	49,090	48,739	48,465	-
Attrition Rate (%)	-	0.6%	0.7%	0.6%	1.8%
Baseline Average Daily Consumption (kWh/day) *	14.4	14.0	12.7	11.3	-
Average Daily Savings (kWh/day/participant)	0.130	0.080	0.039	0.099	
Average Monthly Savings (kWh/participant)	4.01	2.25	1.20	2.98	-
Percentage of Monthly Savings (%)**	0.90%	0.57%	0.30%	0.88%	-
Margin of Error (%)***	1.20%	1.30%	1.07%	1.03%	-
Total Monthly Savings (GWh)****	0.000	0.000	0.000	0.000	0.000
*Corresponds to the average daily consumption of the control group for the pre-period (from January to April in this case). **For each month, the percentage of monthly savings is calculated by dividing the average daily savings by the average daily consumption of the control group. *** The margins of error were calculated at a 90% confidence level. **** The values indicated in red are not statistically significant, meaning that the results for those months are inconclusive and are considered nil.					

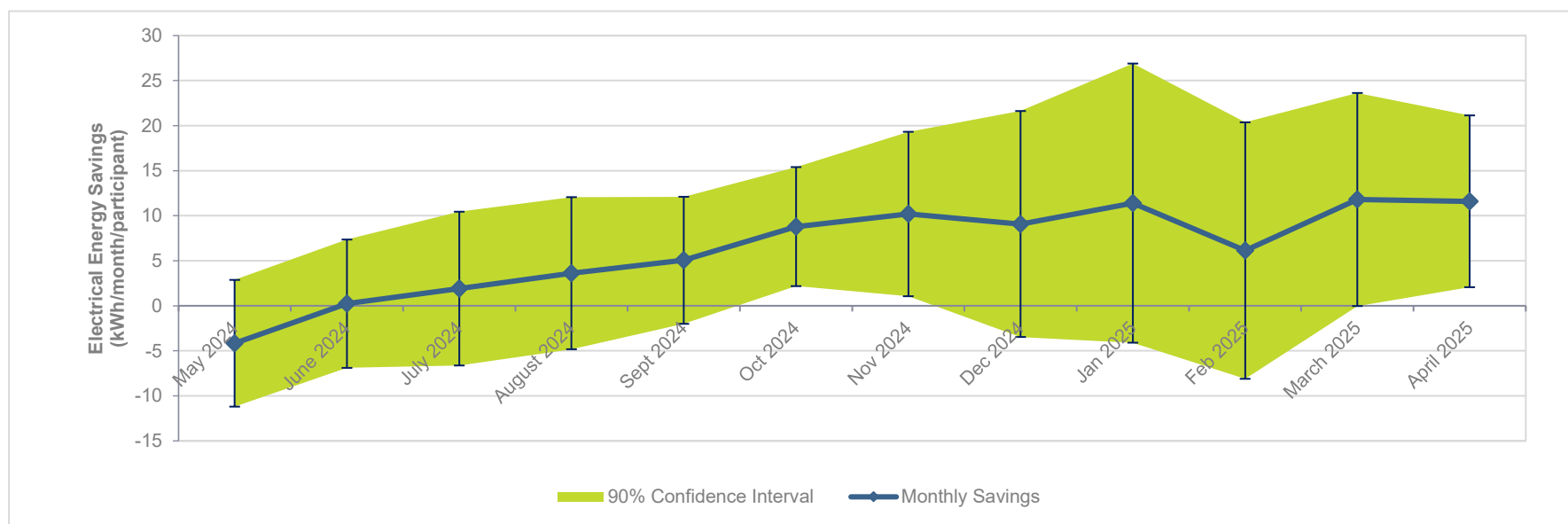
The sum of the savings calculated using the monthly approach differs from that obtained with the cumulative savings results because of the statistically insignificant savings for almost every month from January to April.

Figure 1, Figure 2, Figure 3 below present, for each wave respectively, the evolution of the monthly savings values and their margins of error since program launch. When the margins of errors include zero savings, it means that the average savings values for those months are uncertain and not statistically significant.

As outlined in the figures and details below, the program component was still in its ramp-up period in 2025:

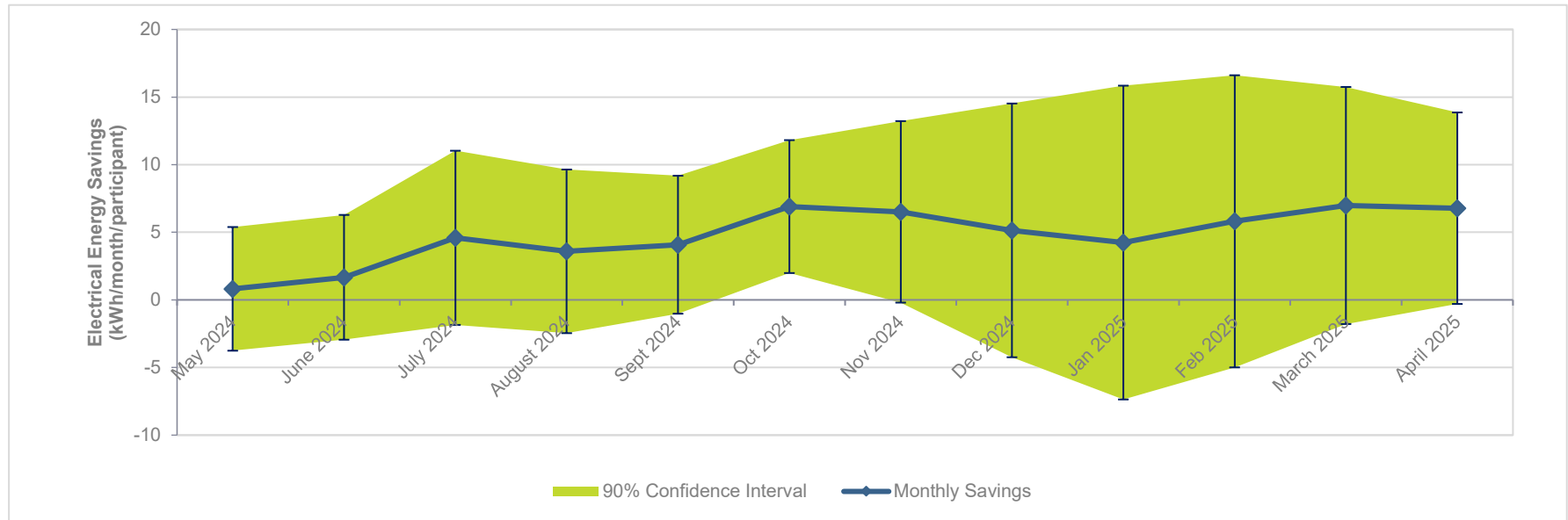
- › High electricity users (Wave 1) achieved 1.054 GWh in 2025, with statistically significant savings during the month of April only. In 2024, savings were statistically significant in October and November.
- › Medium electricity users (Wave 2) did not achieve monthly savings in the four months of operation of the program in 2025. Up to now, monthly savings were statistically significant in October 2024.
- › Low electricity users (Wave 3) did not achieve statistically significant monthly savings in 2025. In 2024, they achieved statistically significant monthly savings in December.

Figure 1: High User Monthly Electrical Energy Savings



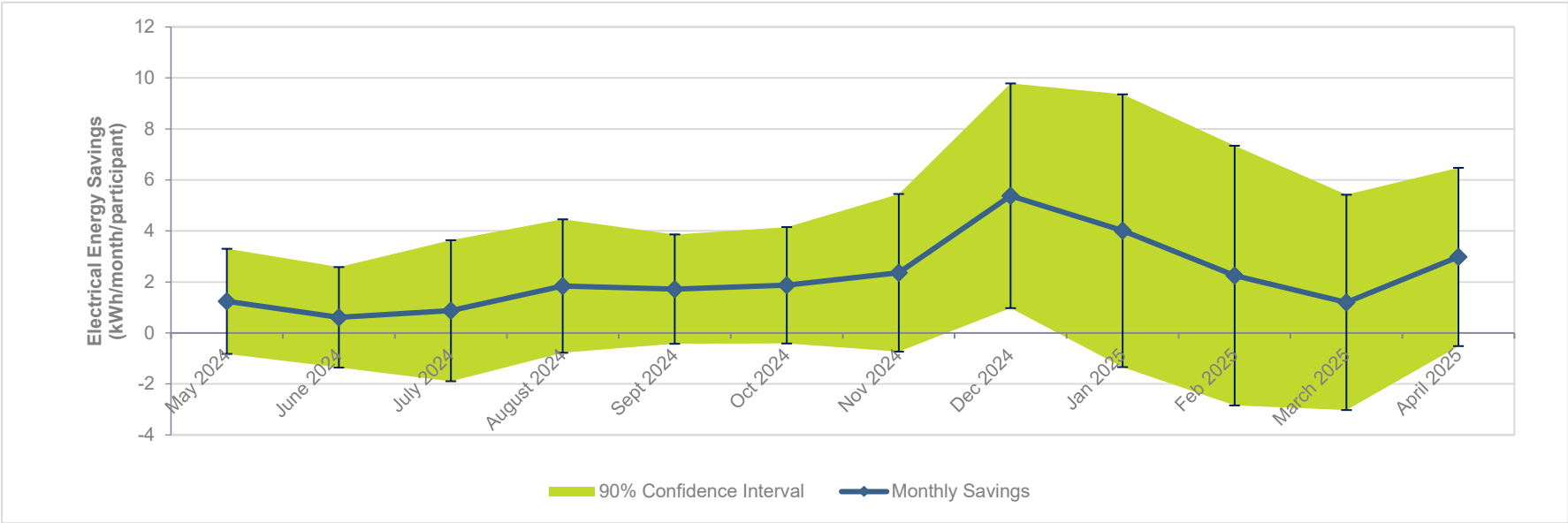
Note: When the confidence interval includes values below zero, savings are not statistically significant, which is the case for all months except for October and November 2024 as well as April 2025.

Figure 2: Medium User Monthly Electrical Energy Savings



Note: When the confidence interval includes values below zero, savings are not statistically significant, which is the case for all months except for October 2024.

Figure 3: Low User Monthly Electrical Energy Savings



Note: When the confidence interval includes values below zero, savings are not statistically significant, which is the case for all months except for December 2024.

APPENDIX XVI

Residential Behaviour: Monthly Raw Data for Monthly Savings Calculations

Table 1: Wave 1 2025 Monthly Raw Data for Monthly Savings Calculations

Parameters	January 2025	February 2025	March 2025	April 2025
Number of Observations - Control Pre	17,228	17,228	17,228	17,228
Number of Observations - Control Post	16,186	16,144	16,069	16,011
Number of Observations - Treatment Pre	97,364	97,367	97,366	97,365
Number of Observations - Treatment Post	91,760	91,441	91,051	90,730
Average Daily Consumption - Control Pre (kWh/day)	70.9	68.5	57.8	47.5
Number of Active Customer Accounts - Control Pre	17,228	17,228	17,228	17,228
Number of Active Customer Accounts - Control Post	16,204	16,162	16,090	16,035
Number of Active Customer Accounts - Treatment Pre	97,368	97,368	97,368	97,368
Number of Active Customer Accounts - Treatment Post	91,877	91,558	91,154	90,842
Average Daily Consumption - Control Post (kWh/day)	73.4	76.4	58.0	51.0
Average Daily Consumption - Treatment Pre (kWh/day)	71.0	68.5	57.9	47.6
Average Daily Consumption - Treatment Post (kWh/day)	73.1	76.2	57.7	50.8
Standard Deviation – Control Pre (kWh/day)	28.6	27.7	22.5	17.8
Standard Deviation – Control Post (kWh/day)	30.9	32.5	22.9	19.8
Standard Deviation – Treatment Pre (kWh/day)	28.3	27.2	22.4	18.0
Standard Deviation – Treatment Post (kWh/day)	30.3	32.1	22.7	19.8
Standard Error – Control Pre (kWh/day)	0.201	0.194	0.158	0.125
Standard Error – Control Post (kWh/day)	0.223	0.236	0.166	0.144
Standard Error – Treatment Pre (kWh/day)	0.035	0.034	0.028	0.022
Standard Error – Treatment Post (kWh/day)	0.039	0.041	0.029	0.025
Combined Standard Error (kWh/day)	0.305	0.310	0.233	0.194



Table 2: Wave 2 2025 Monthly Raw Data for Monthly Savings Calculations

Parameters	January 2025	February 2025	March 2025	April 2025
Number of Observations - Control Pre	9,926	9,926	9,926	9,927
Number of Observations - Control Post	9,360	9,315	9,278	9,235
Number of Observations - Treatment Pre	88,470	88,465	88,476	88,475
Number of Observations - Treatment Post	83,242	82,912	82,561	82,231
Number of Active Customer Accounts - Control Pre	9,927	9,927	9,927	9,927
Number of Active Customer Accounts - Control Post	9,383	9,339	9,303	9,264
Number of Active Customer Accounts - Treatment Pre	88,482	88,482	88,482	88,482
Number of Active Customer Accounts - Treatment Post	83,490	83,168	82,798	82,477
Average Daily Consumption - Control Pre (kWh/day)	34.8	33.6	29.2	24.9
Average Daily Consumption - Control Post (kWh/day)	36.8	38.2	30.1	27.1
Average Daily Consumption - Treatment Pre (kWh/day)	34.6	33.5	29.1	24.8
Average Daily Consumption - Treatment Post (kWh/day)	36.5	37.8	29.7	26.8
Standard Deviation – Control Pre (kWh/day)	15.4	14.8	11.7	9.3
Standard Deviation – Control Post (kWh/day)	17.7	19.0	13.2	11.4
Standard Deviation – Treatment Pre (kWh/day)	15.4	15.0	11.8	9.6
Standard Deviation – Treatment Post (kWh/day)	17.7	19.1	13.1	11.3
Standard Error – Control Pre (kWh/day)	0.146	0.141	0.112	0.088
Standard Error – Control Post (kWh/day)	0.173	0.186	0.130	0.112
Standard Error – Treatment Pre (kWh/day)	0.016	0.016	0.013	0.010
Standard Error – Treatment Post (kWh/day)	0.019	0.021	0.014	0.013
Combined Standard Error (kWh/day)	0.228	0.235	0.172	0.144

Table 3: Wave 3 2025 Monthly Raw Data for Monthly Savings Calculations

Parameters	January 2025	February 2025	March 2025	April 2025
Number of Observations - Control Pre	22,822	22,845	22,940	22,960
Number of Observations - Control Post	20,460	20,135	20,470	20,407
Number of Observations - Treatment Pre	53,048	53,150	53,387	53,419
Number of Observations - Treatment Post	47,698	46,931	47,761	47,627
Number of Active Customer Accounts - Control Pre	22,976	22,976	22,976	22,976
Number of Active Customer Accounts - Control Post	21,161	21,048	20,900	20,776
Number of Active Customer Accounts - Treatment Pre	53,459	53,459	53,459	53,459
Number of Active Customer Accounts - Treatment Post	49,363	49,090	48,739	48,465
Average Daily Consumption - Control Pre (kWh/day)	14.4	14.0	12.7	11.3
Average Daily Consumption - Control Post (kWh/day)	16.2	16.8	13.7	12.6
Average Daily Consumption - Treatment Pre (kWh/day)	14.4	14.0	12.6	11.2
Average Daily Consumption - Treatment Post (kWh/day)	16.0	16.7	13.5	12.5
Standard Deviation – Control Pre (kWh/day)	10.6	10.5	8.7	7.0
Standard Deviation – Control Post (kWh/day)	13.5	14.6	10.3	9.1
Standard Deviation – Treatment Pre (kWh/day)	10.4	10.1	8.4	6.9
Standard Deviation – Treatment Post (kWh/day)	13.2	14.4	10.2	8.8
Standard Error – Control Pre (kWh/day)	0.0583	0.0579	0.0480	0.0387
Standard Error – Control Post (kWh/day)	0.0775	0.0843	0.0596	0.0530
Standard Error – Treatment Pre (kWh/day)	0.0246	0.0240	0.0198	0.0163
Standard Error – Treatment Post (kWh/day)	0.0326	0.0355	0.0253	0.0218
Combined Standard Error (kWh/day)	0.1052	0.1109	0.0830	0.0710

APPENDIX XVII

Residential Behaviour: Examples of Statistical Significance Testing

Savings Calculation

The following provides an example of how the monthly savings margin of error was calculated for high users in January 2025 to determine if they were statistically significant or not. This methodology is applied consistently across all other months for every wave. The same calculation process is used under the cumulative approach.

The relative margin of error is calculated using the equation below with a 90% confidence level.

$$MoE_{Jan25} = \frac{z \times SE_{combined}}{Pre\_kWh_{Control,Jan25}} = \frac{1.64 \times 0.305}{70.9} = 0.71\%$$

Where $SE_{combined}$ is the combined standard error accounting for the propagation of the error within the difference-in-difference (DiD) calculation and is obtained using the following formula.

$$\begin{aligned} SE_{combined,Jan25} &= \sqrt{(SE_{Control,pre})^2 + (SE_{Control,post})^2 + (SE_{Treatment,pre})^2 + (SE_{Treatment,post})^2} \\ &= \sqrt{(0.201)^2 + (0.223)^2 + (0.035)^2 + (0.039)^2} = 0.305 \end{aligned}$$

Where $SE_{Control,pre}$ is calculated using the standard deviation (σ) obtained directly from JMP.² The same calculation approach is used for the three other standard error terms ($SE_{Control,post}$, $SE_{Treatment,pre}$, $SE_{Treatment,post}$).

$$SE_{Control,pre} = \frac{\sigma_{Control,pre}}{\sqrt{n_{Control,pre}}} \times \sqrt{\frac{N - n_{Control,pre}}{N - 1}} = \frac{28.6}{\sqrt{17,228}} \times \sqrt{\frac{114,596 - 17,228}{114,596 - 1}} = 0.201$$

The savings are statistically significant when the percentage of savings is larger than the margin of error, meaning that zero is not included in the confidence interval.

Participation in Other Programs

Statistical significance testing for participation in other programs is performed directly in JMP. The Evaluator used the Adjusted Wald Test, which serves to determine if there is a statistically significant difference between the proportion of control group participants who participated in another program and the same proportion in the treatment group. The characteristics of the test are as follows:

- › It is a two-tailed test.
- › The power of the test is 100%.
- › All participants are considered.
- › A 10% significance level was tested.

² JMP is the statistical software used by the Evaluator to perform the calculation for Residential Behaviour.

An example for Green Heat and medium users is provided below. The highlighted line expresses the indicator to determine if there is a statistically significant difference. In this case, the p-value (“Prob” in the picture) is lower than 0.1 (10% significance test), meaning that the difference between the two proportions is statistically significant.

Two Sample Test for Proportions			
Description	Proportion Difference	Lower 90%	Upper 90%
$P(0 0)-P(0 1)$	0.000821	0.000248	0.001204
Adjusted Wald Test (Null Hypothesis)		Prob	
$P(0 0)-P(0 1) \leq 0$		0.0062*	
$P(0 0)-P(0 1) \geq 0$		0.9938	
$P(0 0)-P(0 1) = 0$		0.0124*	
Response Participation in GH category of interest			
☒ 0			
☐ 1			

APPENDIX XVIII

Residential Behaviour 2025 Recommendations

The Evaluator made no specific recommendation as part of the 2025 Residential Behaviour evaluation.



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EfficiencyOne

EFFICIENT PRODUCT REBATES PROGRAM

Final Report

2025 DSM EVALUATION

March 18, 2026

In collaboration with:





ABBREVIATIONS

BER	Business Energy Rebates
BER-AR	Application Rebates
BER-IR	Instant Rebates
BNI	Business, non-profit, and institutional
CEF	Cooling Efficiency Factor
CFL	Compact fluorescent lamp
CIS	Customer Information System
COP	Coefficient of performance
DLC	DesignLights Consortium
DR	Demand response
DSM	Demand-side management
DSM MA	Demand-side Management Measure Assessment
E1	EfficiencyOne
ENS	Efficiency Nova Scotia
EPP	E1 Preferred Partner (network)
ESF	Energy Saving Factor
EUL	Effective useful life
GHG	Greenhouse gas
HEF	Heating Efficiency Factor
HOU_s	Hours of use
HSPF	Heating Seasonal Performance Factor
HVAC	Heating, ventilation, and air conditioning
HVLS	High-volume low-speed
IESO	Independent Electricity System Operator
ISR	In-service rate
IT	Information technology
LED	Light-emitting diode
MBRP	Midstream Business Rebate Program
N.B.	New Brunswick
NEMA	National Electrical Manufacturers Association
NS Power	Nova Scotia Power
NSEB	Nova Scotia Energy Board



NSUARB	Nova Scotia Utility and Review Board
NTGR	Net-to-gross ratio
PCF	Peak coincidence factor
PSE	Puget Sound Energy
PV	Photovoltaic
SBES	Small Business Energy Solutions
TRM	Technical reference manual
UMP	Uniform Methods Project
VFD	Variable frequency drive

DEFINITIONS

Accuracy	Reflects the proximity of measurements to the true value.
Adjustment ratio	The ratio of evaluated results to tracked results. This ratio expresses the adjustment made to tracked savings or other tracked values such as effective useful life.
Available demand response (DR) capacity	The capacity which is available to Nova Scotia Power (NS Power) to reduce system peak demand. This capacity is calculated based on the first two hours of all events called between December and February, excluding weekends and holidays. If an event is shorter than two hours, only the first hour is used to measure the available DR capacity. Available DR capacity is evaluated on a per-participant basis, based on the average demand reduction observed for each event that the participant was scheduled to participate in. E1's total available DR capacity is the sum of each participant's available DR capacity.
Baseline	To determine gross savings, a baseline (or base case) is established providing detailed information about the reference (e.g. pre-existing or standard) measure or equipment chosen to be compared with the efficient measure or equipment. For the reference measure or equipment, the baseline may include such information as the hours of operation, wattage, and base consumption.
Bias	Systematic deviations of measurements from the true value.
Billing calibration	An activity that consists of adjusting the expected energy savings based on the relative difference between the results of energy simulations and the actual energy consumption of a building or system.
Confidence interval	The estimated range of values that is likely to include unknown population parameters.
Demand response	Demand response measures generate savings in the form of available capacity or load reduction in response to events called by the electric utility (Nova Scotia Power) to reduce the load at strategic moments. These events can be called at any time and for any duration, although they are usually called for one to four hours during peak periods.
Displaced wattage	The displaced wattage is defined as the difference between the wattage values of the baseline equipment or product and the efficient equipment or product.
EnerGuide rating	An EnerGuide (official brand of Natural Resources Canada) rating is a standard measure of home energy performance. It is a measure of the efficiency of the building only and does not take into account occupant behaviour. It shows how energy efficient a home is through modelled home heat losses based on several factors including building envelope characteristics, heated volume, heating systems, and air leakage.
Effective useful life	The period a measure is expected to be in service and provide both energy and peak demand savings. This value combines equipment life and measure persistence, which includes factors such as business turnover or early retirement.
Equipment life	The number of years installed equipment will operate before it fails.

Equivalent CO2	A unit of measurement indicating the amount of carbon dioxide to which various kinds of emitted greenhouse gases are equivalent in terms of warming effects. In this report, gas global-warming potential is estimated over a timescale of 100 years.
Equivalent effective useful life	The number of years by which the first-year savings estimate is multiplied to obtain lifetime energy savings. This value takes into account variations in annual energy savings throughout the effective useful life due to increased baselines.
Evaluated savings	Gross and net energy or peak demand savings calculated by the Evaluator using the parameters (unitary savings values, installation rates, interactive effects, net-to-gross ratios, etc.) validated or measured during the evaluation process. Unless otherwise specified, evaluated savings are first-year savings.
Evaluation plan	The evaluation plan summarizes the program description, objectives, base cases, documentation, evaluation methodology, budget, and schedule.
First-year savings	The first full year of energy or peak demand savings generated by an energy efficiency measure.
Free-ridership	Percentage of gross savings attributable to participants who would have implemented the same or similar energy efficiency measures, with no change in timing, in the absence of the program.
Gross savings	Change in energy consumption and/or demand that results directly from program-related actions taken by participants in an efficiency program regardless of why they participated.
Induced consumption	Energy consumption of appliances that would have been unplugged and not replaced by participants in the absence of the program.
Interactive effects	Effects on the energy consumption of other systems in a building (such as heating and cooling) due to the installation of an energy-efficient measure.
In-service rate	The proportion of incentivized products that are installed and operating. This rate is usually applied to programs through which rebates are offered in-store and products are likely to be stored for a certain period before being installed, such as light-emitting diode (LED) lamps.
Installation rate	The proportion of incentivized products reported as installed and that remain installed and operating at the time of evaluation. This rate is usually applied to direct install or mail-in rebate programs through which measures are expected to be installed immediately at the time of participation.
Lifetime energy savings	The energy savings that occur over the lifetime of an energy efficiency measure. Lifetime energy savings account for a measure's effective useful life and any increase in the baseline efficiency level (which reduces attributable annual savings) over its lifetime.
Line loss factor	The multiplier to convert savings at the customer meter to savings at the utility generator. It accounts for the electrical losses of the transmission and distribution system.
Margin of error	The amount of random sampling error.

Market effects	The impact of a program on the market (in terms of product availability, practices, and prices) that extends beyond changing program participant behaviours. This includes spillover among non-participants.
Net savings	Energy or peak demand savings that can be reliably attributed to a program. This includes effects such as free-ridership and spillover that negatively or positively affect the savings attributable to a program.
Net-to-gross ratio	The ratio of net energy savings to gross energy savings.
Non-sampling error	Errors arising during all survey activities other than sampling. Non-sampling errors tend to lead to bias in measurements and are very difficult to quantify.
Peak coincidence factor	The percentage of measure demand savings that coincide in time with the annual peak demand of the entire electricity system.
Peak demand savings	The demand savings that coincide in time with the expected annual peak demand period of the entire electricity system. For industrial participants on an interruptible rate, peak demand savings may include savings on non-firm loads, i.e. loads that may be interrupted when Nova Scotia Power's 10-minute reserve is low.
Precision	The extent to which repeated measurements agree with one another.
Random sampling error	An error in measurement because measurements are taken from a subset of the population and not the entire population.
Realization rate	The ratio of evaluated savings to tracked savings.
Sample size	The number of observations or replicates included in a statistical sample.
Secondary market impacts	Energy consumption of appliances that would have been transferred to the secondary market if said appliances had not been retired.
Spillover	Savings attributable to participants who implement the energy efficiency measure(s) introduced by a program after participating in it once, without participating in the program a second time.
Tracked savings	Gross and net savings calculated based on various parameters such as number of participants or units installed or sold, unitary savings values, installation rates, interactive effects, and net-to-gross ratios. Those parameters, except the number of participants or units installed or sold, are obtained from the previous evaluation.
Unitary savings	Energy or peak demand savings established on a unitary basis. A unit can either be a product (e.g. an 8 W LED lamp), a capacity (e.g. one-tonne capacity of an air-source heat pump), or a participant (e.g. one participant taking part in a behaviour-based program).



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EXECUTIVE SUMMARY

This report presents the 2025 demand-side management (DSM) results of the Efficient Product Rebates program administered by EfficiencyOne (E1). This program comprises the Business Energy Rebates (BER) program component. Through the Application Rebates (BER-AR) and Instant Rebates (BER-IR) services, BER provides financial incentives in the form of prescriptive rebates or financing to business, non-profit, and institutional (BNI) participants to encourage reductions in electricity consumption and demand.

Evaluation Approach

The 2025 evaluation was focused on calculating both gross and net results for the BER program component, including first-year and lifetime electrical energy savings, peak demand savings, and avoided greenhouse gas (GHG) emissions. Table 1 summarizes the evaluation types conducted and the corresponding methodologies.

Table 1: 2025 BER Evaluation Approach

Component	Service	Evaluation Type			Methodology
		Impact	Process	Market	
BER	Application Rebates	Comprehensive			› Tracking sheet audit › Project reviews with site visits › Application of 2024 Demand-side Management Measure Assessment (DSM MA)¹ lighting interactive effects methodology to 2025 results › Participant survey › Interviews during site visits › Calculations using evaluation results › GHG emission reduction calculations
	Instant Rebates	Condensed		X	› Tracking sheet audit › Calculations using evaluation results › Use of 2024 net-to-gross ratio (NTGR) results › GHG emission reduction calculations › New Brunswick distributor interviews › Non-participating distributor interviews in Atlantic Canada › Jurisdictional scan of BNI lighting programs in North America (including an interview with Mass Save staff)

¹ The 2025 DSM MA is a reference document that provides an in-depth review of all parameters necessary to calculate the annual and lifetime gross electrical energy savings and peak demand savings of all prescriptive measures and most semi-prescriptive measures offered through E1's DSM program portfolio. In addition, the DSM MA includes effective useful life values for all measures offered in E1's program portfolio. For the evaluation conducted during the last year of the 2023-2025 DSM cycle, the Evaluator refers to the values presented in the 2025 DSM MA.



Program Performance

Table 2 below presents participation levels, NTGRs, evaluated gross and net savings at the generator, annual GHG emission reductions, and effective useful life (EUL) values for each service as well as for BER overall.

Table 2: Evaluated 2025 BER Program Savings and Participation

	Participation Level		Gross Savings		NTGR	Net Savings	
	Value	Unit	Value	Unit	Value*	Value	Unit
Application Rebates							
Electrical Energy Savings	143	Projects	9.214	GWh	0.93	8.586	GWh
Lifetime Electrical Energy Savings			145.644	GWh	0.94	137.476	GWh
Peak Demand Savings			0.815	MW	0.90	0.737	MW
Annual GHG Emission Reductions			4,324	Tonnes of CO2 eq	0.93	4,029	Tonnes of CO2 eq
EUL			15.8	Years		16.0	Years
Instant Rebates							
Electrical Energy Savings	317,312	Products sold	35.867	GWh	0.88	31.658	GWh
Lifetime Electrical Energy Savings			177.221	GWh	0.89	157.309	GWh
Peak Demand Savings			5.231	MW	0.88	4.595	MW
Annual GHG Emission Reductions			16,832	Tonnes of CO2 eq	0.88	14,857	Tonnes of CO2 eq
EUL			4.9	Years		5.0	Years
Total (BER)							
Electrical Energy Savings			45.081	GWh	0.89	40.244	GWh
Lifetime Electrical Energy Savings			322.865	GWh	0.91	294.786	GWh
Peak Demand Savings			6.046	MW	0.88	5.332	MW
Annual GHG Emission Reductions			21,156	Tonnes of CO2 eq	0.89	18,886	Tonnes of CO2 eq
EUL			7.2	Years		7.3	Years
* The total NTGR values correspond to the ratios of net savings to gross savings for both Application Rebates and Instant Rebates.							

BER targeted 38.451 GWh in net electrical energy savings and 7.241 MW in net peak demand savings at the generator in 2025. The program exceeded the planned net electrical energy savings by 5% and fell short of the planned peak demand savings target by 26%. Instant Rebates was the largest contributor to total program net electrical energy and peak demand savings.

The following subsections present the evaluation results at the program component level.



BER Findings and Recommendations

This subsection highlights the key findings and provides recommendations from the 2025 BER evaluation.

2025 BER-Finding: In 2025, BER achieved 40.244 GWh in net electrical energy savings and 5.332 MW in net peak demand savings at the generator, exceeding by 5% the planned net electrical energy savings of 38.451 GWh and falling 26% short of planned net peak demand savings of 7.241 MW.

2025 BER-Finding: There was a 36% reduction in business participation in Application Rebates compared to 2024 levels, while Instant Rebates saw an increase of 79% in participation compared to 2024 levels. This increase was largely driven by the promotion of T8 LED linear lamps in the first quarter of 2025. As a result of the reduced participation in Application Rebates, BER gross electrical energy savings and peak demand savings decreased by 4% and 11% respectively compared to 2024 levels.

2025 BER-Finding: Following Application Rebates site visits, the Evaluator established updated adjustment ratios to track electrical energy and peak demand savings. For lighting and heating, ventilation, and air-conditioning (HVAC) measures, these ratios are 1.117 and 1.006 for electrical energy savings respectively and 1.031 and 1.027 for peak demand savings respectively. For agriculture, motor, pumping, refrigeration, and commercial kitchen measures, a combined adjustment ratio of 0.951 was calculated for electrical energy savings and 0.514 for peak demand savings. The 0.514 adjustment ratio has a higher margin of error than anticipated, which means this value may not be reliable for future years.

Recommendation #1: Use the calculated adjustment ratios to track gross electrical energy and peak demand savings moving forward, with the exception of the 0.514 adjustment ratio for peak demand savings for non-lighting and non-HVAC measures. Reassess the electrical energy and demand adjustment ratios for agriculture, motor, pumping, refrigeration, and commercial kitchen measures in the 2026 evaluation after sampling additional projects in this group of measures. Recalculate adjustment ratio for electrical energy and demand savings specifically for agriculture and motor measures to determine whether standalone ratios are warranted.

2025-BER-AR Finding: In 2025, Application Rebates average free-ridership levels decreased relative to the last time they were evaluated in 2021 while spillover remained nil. Consequently, NTGR values for Application Rebates increased to 0.83 for HVAC, 0.94 for lighting, and 0.91 for all other measure categories compared to an overall NTGR of 0.74 in 2021.

Recommendation #2: Moving forward, use the updated measure-level NTGR values to convert gross electrical energy and peak demand savings into net savings for reporting and evaluation purposes.

2025 BER-Finding: Application Rebates evaluated net electrical energy and peak demand savings were respectively 25% and 27% higher than the values tracked by E1, mainly due to the decrease in free-ridership levels and updated adjustment ratios. For Instant Rebates, evaluated net electrical energy savings were 4% higher than tracked results, while evaluated net peak demand savings were 6% lower than tracked results, mainly due to updated line loss factors, interactive effects factors, and unitary energy savings values.



2025 BER-Finding: Revisions to the Application Rebates tracking sheet led to increases of 0.06% in gross tracked electrical energy savings and 0.02% and gross tracked peak demand savings. These changes mostly come from updated interactive effects factors for recessed fixtures that consisted exclusively of troffers and corrections to wattage values for multi-wattage fixtures for which DesignLights Consortium (DLC) values were verified as reliable.

Recommendation #3: Continue using DLC wattages as the efficient values for multi-wattage products. Rather than track whether each fixture is multi-wattage, conduct periodic spot checks, particularly on large applications, to confirm the accuracy of DLC wattage listings and identify any cases that may require correction.

Recommendation #4: Rather than track whether a fixture is recessed in Application Rebates, adopt an assumption that recessed fixtures are limited to troffers, which is consistent with practices in Small Business Energy Solutions (SBES) and Business Energy Rebates – Instant Rebates (BER-IR), and apply the recessed interactive effect factors to troffers only.

2025 BER-Finding: Application Rebates adjustment ratios were embedded within the gross electrical energy savings and peak demand savings fields in the tracking sheet, which can increase the risk of errors.

Recommendation #5: Apply adjustment factors separately rather than embedding them in gross values and record the adjusted results in dedicated fields in the tracking sheet to enhance transparency and reduce the risk of errors.

2025 BER-Finding: Average interactive effects factors calculated for Instant Rebates were similar to those used in the 2024 evaluation.

2025 BER-Finding: According to distributors, the New Brunswick commercial lighting market has become more energy efficient and diverse over the past three years, with prices remaining stable.

2025 BER-Finding: All distributors interviewed reported that the fixture market has been transformed to LED (99%+ of inventory for outdoor, high-bay, and linear fixtures are LED).

2025 BER-Finding: The New Brunswick market research findings indicate that a rebound effect is unlikely from discontinuing incentives under BER-IR for LED fixtures in Nova Scotia.

Recommendation #6: Update the baseline for LED fixtures in 2026 to reflect that the market stocking practice has become LED only. This baseline would apply to all LED fixtures rebated through BER-IR.

2025 BER-Finding: Nearly all fixtures offered by participating distributors are DLC-certified. Given this finding, the Evaluator hereby updates its 2024 recommendation on the LED baseline.

Recommendation #7: When the new LED baseline is applied, it should be at the efficiency level of DLC-certified standard LED fixtures. Explore the possibility of continuing to offer rebates for DLC Premium products and lighting controls in midstream programs with updated savings assumptions based on a LED baseline.

2025 BER-Finding: According to New Brunswick distributors, the lamp market lags the fixture market, with LEDs representing 76-78% of the stock depending on the lamp type, and distributors anticipate that LED lamps will represent 80-89% of the stock by 2027.

Recommendation #8: The 2024 recommendation that the current non-LED baseline for lamps be maintained for BER-IR remains valid and should be reassessed in 2026. Given trends, E1 should plan for a baseline change for BER-IR lamps starting in 2028.

2025 BER-Finding: Some New Brunswick distributors continue stocking non-LED inventory (mainly lamps) to serve customers who have not yet undertaken a full LED retrofit and instead seek replacement lamps or fixtures (mainly non-profits, institutions, and small organizations).

2025 BER-Finding: DSM program administrators are shifting their programs in the face of LED market transformation, with some exiting the BNI sector completely and others adapting their offers.

Recommendation #9: Focus LED fixture rebates on application-based and direct install programs in the near-to-medium term to target early replacements in the laggard market segments (small businesses, institutions, non-profits, etc.).

2025 BER-Finding: For application-based and direct install programs, jurisdictions have updated their baselines to reflect LED market transformation using either a market blend baseline or dual baseline. The approach varies depending on the project type (e.g. early replacement or end of life).

Recommendation #10: For SBES, given the target population of small businesses, the Evaluator assumes that many projects are early replacement. Hence, implement a dual baseline approach for LED fixtures, notably by using the existing baseline for one-third of the lifetime of the existing measure and a LED baseline for the remainder of the efficient measure lifetime.

Recommendation #11: For BER-AR, consider two options:

Option 1: Focus Business Energy Rebates – Application Rebates (BER-AR) on market laggards and adopt eligibility criteria to ensure projects are early replacement (as seen in ComEd). If this is feasible, the Evaluator recommends using the UMP approach of developing a dual baseline by using the existing baseline for one-third of the lifetime of the existing measure and a LED baseline for the remainder of the efficient measure lifetime.

Option 2: If developing and enforcing eligibility criteria to ensure all projects are early replacement, a market blend baseline should be used and that accounts for the proportion of projects aimed at early replacement versus end of life. The blended baseline would assume a LED baseline for the proportion of projects assumed to be at end of life.

Recommendation #12: Monitor the market and plan for full market transformation in the next three to four years. Assume that there will be no further opportunities, including early lamp and fixture replacement projects, under SBES and BER-AR after 2028.

2025 BER-Finding: Based on the findings of this market study, the following dates for the implementation of lighting baseline changes were identified in collaboration with E1 to provide sufficient market notice periods.

Program	Measure	Date an Early Replacement Baseline Calculation Approach Comes into Effect	Date of LED Baseline Expected to Come into Effect for All Projects
BER-IR	Fixtures	N/A – midstream program	June 30, 2026
	Lamps	N/A – midstream program	January 1, 2028*
SBES	Fixtures	June 30, 2026	January 1, 2029
	Lamps	January 1, 2028*	January 1, 2029
BER-AR	Fixtures	June 30, 2026	January 1, 2029
	Lamps	January 1, 2028*	January 1, 2029
	New Construction**		June 15, 2025
*To be confirmed through 2026 market study.			
**All lighting			

Program Tracked and Evaluated Savings

Table 3 below summarizes the electrical energy savings and peak demand savings tracked by E1 compared to the evaluated savings at the generator. It also presents the realization rates, representing the proportions of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings. NTGRs are also presented, calculated as rounded averages obtained by dividing net savings by gross savings. This approach explains why the NTGR values differ from those outlined in other sections herein.

Table 3: Comparison of Tracked and Evaluated 2025 BER Savings at the Generator

		Gross Savings		NTGR*	Net Savings		Realization Rate
		Value	Unit		Value	Unit	
BER	Electrical Energy Savings						
	Tracked Savings by E1	44.659	GWh	0.85	38.065	GWh	106%
	Evaluation Results	45.081	GWh	0.89	40.244	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	6.181	MW	0.86	5.328	MW	100%
	Evaluation Results	6.046	MW	0.88	5.332	MW	
*Different NTGRs were established for Application Rebates and Instant Rebates. The average NTGR values presented in this table correspond to the ratios of net savings to gross savings for both services.							

While the evaluated net electrical energy savings established through this evaluation were 6% higher than the value tracked by E1, the evaluated net electrical peak demand savings were almost identical to the value tracked by E1. The differences are due to updated NTGR values and adjustment ratios for Application Rebates as well as updated line loss factors, interactive effects factors, and unitary energy savings values for Instant Rebates.

INTRODUCTION

EfficiencyOne (E1), an independent and non-profit organization, is responsible for helping Nova Scotians improve the energy efficiency of their homes and workplaces by designing, marketing, and delivering demand-side management (DSM) for Nova Scotians. E1 provides energy efficiency, demand response (DR), and carbon mitigation services through the Efficiency Nova Scotia (ENS) franchise. Regulatory oversight of its DSM activities is provided by the Nova Scotia Energy Board (NSEB). E1 receives funding for its electricity DSM activities from Nova Scotia Power (NS Power) ratepayers.

E1 has a DSM portfolio of three residential programs, three business, non-profit, and institutional (BNI) programs, and one DR program that are marketed to Nova Scotians through the ENS franchise. Each program has one or more program components. Econoler was commissioned by E1 to evaluate E1's 2025 DSM program portfolio.

This evaluation report covers the Efficient Product Rebates program, which includes the Business Energy Rebates (BER) program component with two services: Application Rebates and Instant Rebates. Table 4 below outlines the program components and the type of evaluations conducted for 2025. A comprehensive impact evaluation involves reviewing four key elements: (1) baseline definition; (2) savings calculation methodology; (3) parameter values used to calculate savings and (4) net-to-gross ratios (NTGRs). A condensed impact evaluation relies on some of the parameters from the previous year's evaluation such as unitary savings values, adjustment ratios, installation rates, and NTGRs to produce evaluated results.

Table 4: Types of Evaluations Conducted for Each BER Service in 2025

Program	Component	Service	2025		
			Process	Market	Impact
Efficient Product Rebates	Business Energy Rebates (BER)	Application Rebates (AR)			Comprehensive
		Instant Rebates (IR)			Condensed

For each service, the Evaluator prepared a DSM evaluation report presenting key findings, first-year and lifetime electrical energy savings, peak demand savings, and avoided greenhouse gas (GHG) emissions.²

² Unless specified otherwise, electrical energy savings refer to first-year energy savings rather than lifetime energy savings throughout this report.

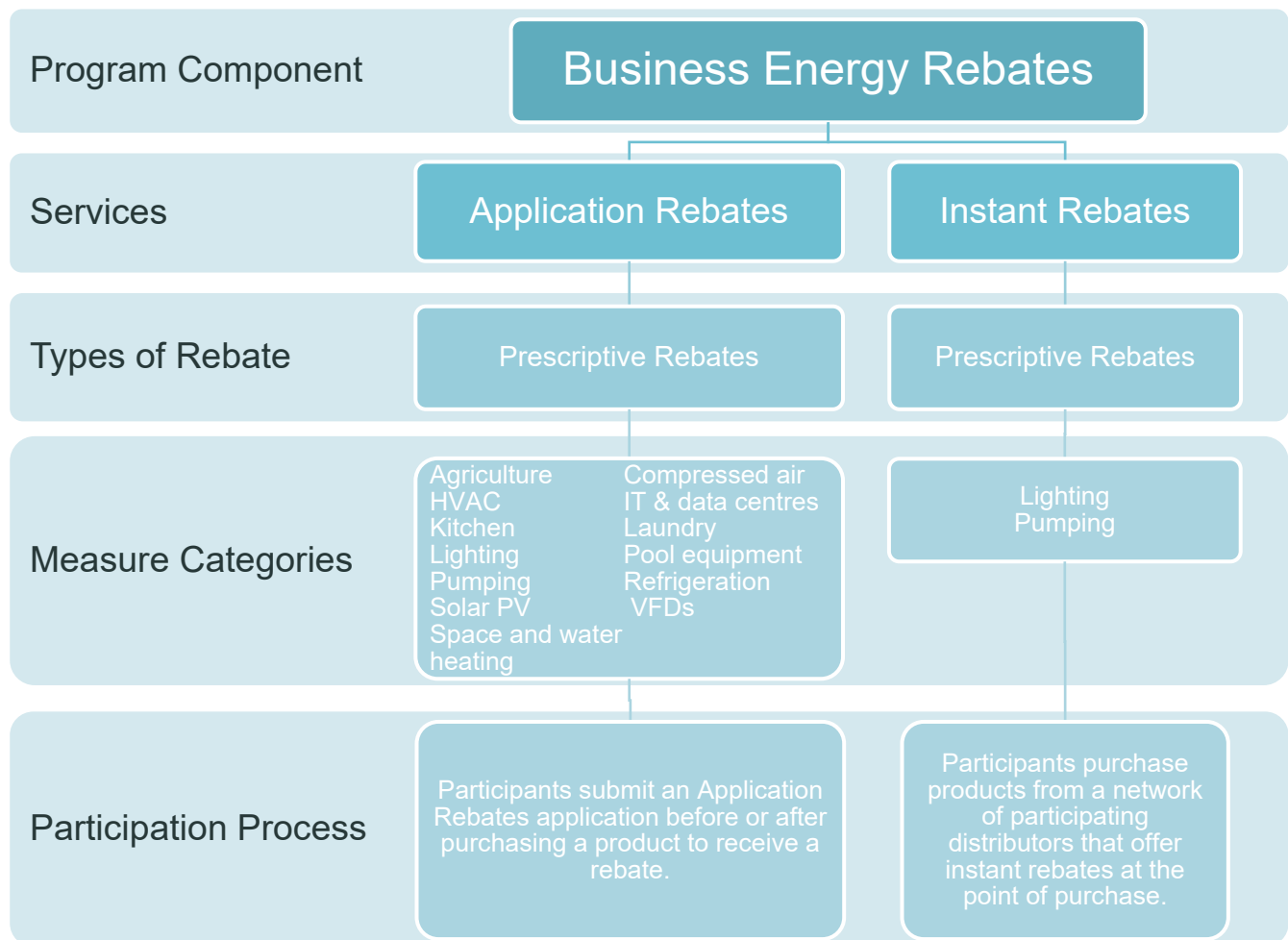
1 BER Overview

This section describes the Business Energy Rebates (BER) program component, follows up on past evaluation recommendations, and presents participation history.

1.1 BER Description

BER provides financial incentives in the form of prescriptive rebates or interest-free financing to business, non-profit, and institutional (BNI) participants to reduce electricity consumption and peak demand in Nova Scotia. Figure 1 presents an overview of BER.

Figure 1: 2025 BER Overview



**Applications for solar photovoltaic (PV) projects were no longer accepted after April 30, 2025.*

The term prescriptive rebate refers to a predefined financial incentive offered for purchasing and installing eligible efficient equipment or technologies. The rebate amount is set in advance based on the expected energy savings of the measure.

Measures offered through BER must comply with specific criteria, including minimum efficiency and efficacy thresholds as well as recognized industry standards such as ENERGY STAR® certification, DesignLights Consortium (DLC) specifications, and guidelines from the National Electrical Manufacturers Association (NEMA).

Rebates offered through BER are delivered through two services, Application Rebates (AR) and Instant Rebates (IR). Instant Rebates reaches a greater number of participants and offers quick and convenient access to BER but is limited in tracking participant details. Conversely, Application Rebates allows for better project-level control since more participant details are provided to E1. All BER technologies are available through Application Rebates, while only certain lighting and pumping technologies are eligible through Instant Rebates.

Instant Rebates is delivered through a network of 15 participating distributors in the Province of Nova Scotia. These distributors play a key role in promoting Instant Rebates to end users. Distributors also provide customer services for measures that are only eligible through Application Rebates by sharing their expertise and assisting with completing applications.

In 2025, BER-AR introduced high-volume low-speed (HVLS) fans for commercial use along with variable frequency drives (VFDs) for pumps. As of April 30, 2025, rebates for solar PV projects were discontinued. As of June 15, 2025, T8 linear ambient lighting was also no longer eligible. Additionally, rebate levels were reduced from up to 75% to 50% of the purchase price, effective April 15, 2025. Based on Evaluator recommendations from the 2024 evaluation, BER-AR no longer offers rebates for New Construction lighting projects as of June 2025.

BER was targeted at achieving 38.451 GWh in net electrical energy savings and 7.241 MW in net peak demand savings at the generator in 2025.

1.2 Follow-up on Past Evaluation Report Recommendations

The Evaluator evaluated BER for 2024 and provided improvement recommendations. Table 5 below outlines the status of those recommendations that were carried forward.

Table 5: Implementation Status of Past Recommendations for BER

#	Recommendation	Status	Comments
2024-BER-R1	Undertake additional research to further validate market evaluation results to establish, no later than Q3, when the LED baseline for BER-IR LED fixtures should take effect. Research should be focused on the potential risk of the fixture market rebounding from reducing or removing the Instant incentives from the Nova Scotia market.	Complete	E1 agrees with this recommendation. E1 has worked with the Evaluator to perform additional research to identify when the LED baseline for BNI LED fixtures should take effect, and E1 has communicated program changes to distributor partners. The results of the additional research will be presented in the 2025 DSM Efficient Product Rebates Evaluation Report to be filed with the Nova Scotia Energy Board (NSEB) on March 31, 2026.
2024-BER-R2	Review the eligibility criteria for LED lighting in new construction projects in BER-AR given evidence that LEDs are the baseline for this market.	Complete	E1 has reviewed the eligibility criteria for LED lighting in new construction projects in BER-AR. As of June 15, 2025, BER-AR no longer accepts lighting projects from New Construction customers. This eligibility change has been communicated internally to On-site Energy Managers and Business Development Managers and externally to participating BER-IR distributors, E1 Preferred Partner (EPP) network members, and the commercial community through the Switch for Business newsletter.

#	Recommendation	Status	Comments
2024-BER-R3	In line with recommendation 2024-BER-R1, research should also serve to investigate the efficiency level of a LED baseline for LED fixtures.	Complete	E1 is conducting additional research with the Evaluator to investigate the efficiency level of a LED baseline for LED fixtures.
2024-BER-R4	The current non-LED baseline for lamps should be maintained for BER-IR and reassessed in 2026. Given trends, E1 should plan for a baseline change starting in 2027.	Complete	E1 has maintained the current non-LED baseline for lamps for BER-IR through 2025 and will work with the Evaluator to reassess the non-LED baseline for lamps in 2026.
2024-BER-R5	Plan for a shift in the product offer for LED fixtures in BER-IR to BER-AR to capture remaining retrofit opportunities once a LED baseline is adopted for BER-IR.	Complete	E1 conducted further research with the Evaluator to determine the effective date for the LED baseline for BNI LED fixtures. Program changes were communicated to distributor partners, and the research results will be included in the 2025 DSM Efficient Product Rebates Evaluation Report that will be filed with the NSEB on March 31, 2026.
2024-BER-R6	Focus efforts on BER-AR to target market laggards for early lighting replacement retrofits.	Complete	E1 collaborated with the Evaluator to determine the effective date for the LED baseline for BNI fixtures. After the baseline changes, E1 will target marketing toward laggards.
BER-R7	A LED baseline should be applied to the EUL of LED fixtures rebated through BER-AR and Small Business Energy Systems (SBES) to reflect the fact that existing fixtures are replaced with LED fixtures at the end of their life. The baseline should consider the proportion of projects targeted for early replacement versus replace on burn-out as well as an estimated remaining EUL.	Complete	The effective useful life (EUL) values for lighting products have been updated in accordance with the 2025 Demand-side Management Measure Assessment (DSM MA) scheduled for submission to the NSEB on March 31, 2026.
BER-R8	Analyze opportunities for increasing interest around controlled lighting products.	Complete	E1 has explored opportunities to increase interest in controlled lighting products and has concluded that the Business Development team is best positioned to identify key lighting control measures suitable for inclusion in the BER program to help focus on the Nova Scotia business community. The E1 team is now being engaged to help drive awareness and adoption of these technologies within Nova Scotia's business community.
BER-R9	Ensure that multi-wattage products are identified in the tracking sheet. Update applications for BER-AR and SBES to identify multi-wattage products and confirm the wattage being used. Select the mid-range wattage (i.e. not the lowest or highest) as the tracked wattage when information is not available from the participant.	Complete	E1 used model numbers to track multi-wattage lighting in the 2025 DSM tracking sheet. E1 and the Evaluator will assess if DesignLights Consortium (DLC) variables can serve to automate tracking instead of relying on manual identification by model number.

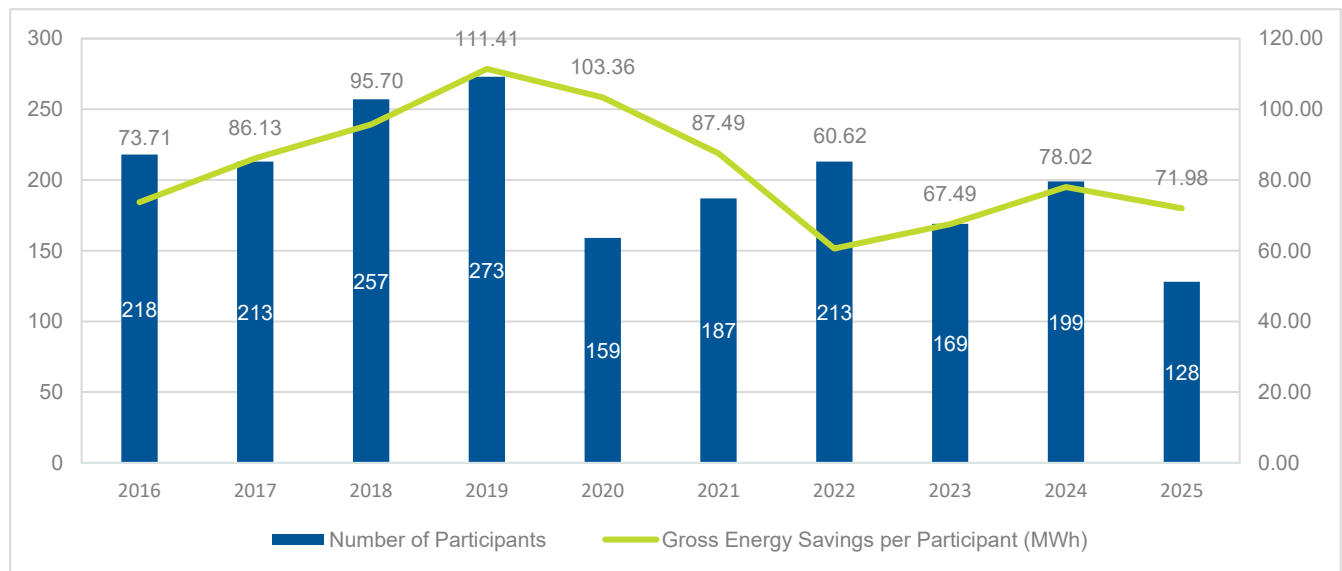
1.3 Participation History

BER Application Rebates

In 2025, a total of 4,340 units were rebated through 143 projects implemented by 128 distinct participants³ under Application Rebates. Figure 2 below illustrates the trends in Application Rebates participation since 2016. The number of participating businesses decreased by 36% in 2025. This represents a 45% decrease in the number of completed Application Rebates projects compared to 2024 levels. This decline was influenced by budgetary restrictions introduced in Q4 2025, which required BER-AR to cap the number of approved projects.

Finally, the gross electrical energy savings achieved per participant decreased by 8%.

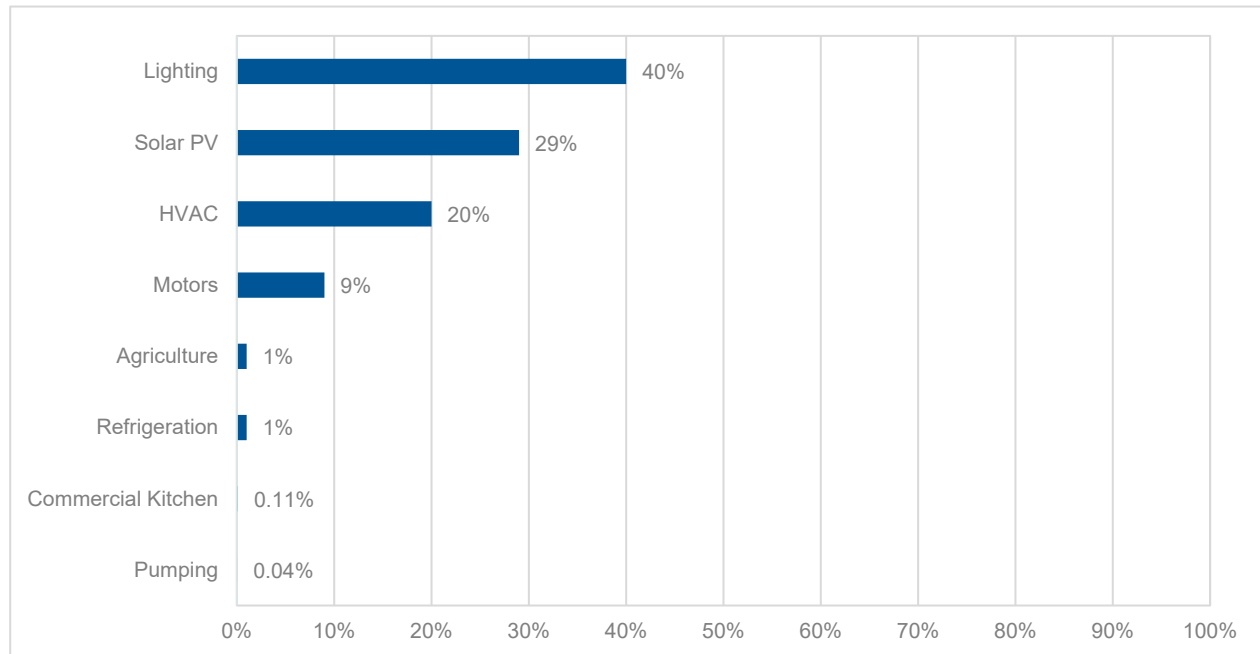
Figure 2: Evaluated 2025 Application Rebates Savings and Participation



³ The number of distinct participants in Application Rebates corresponds to the number of businesses that participated.

Figure 3 below illustrates the distribution of gross electrical energy savings among the measure categories in Application Rebates. The lighting, solar PV, HVAC, and motor measure categories accounted for most savings (98% in total). The commercial kitchen, agriculture, refrigeration, and pumping measure categories accounted for the remaining 2% of total savings. In Figure 4, savings are provided as whole-number percentages, while values under 1% are provided in two decimal points to display savings for smaller categories. The information technology (IT) and data centre, water heating, pool, compressed air, and laundry measure categories are not included in Figure 3 since no projects in those measure categories were submitted in 2025.

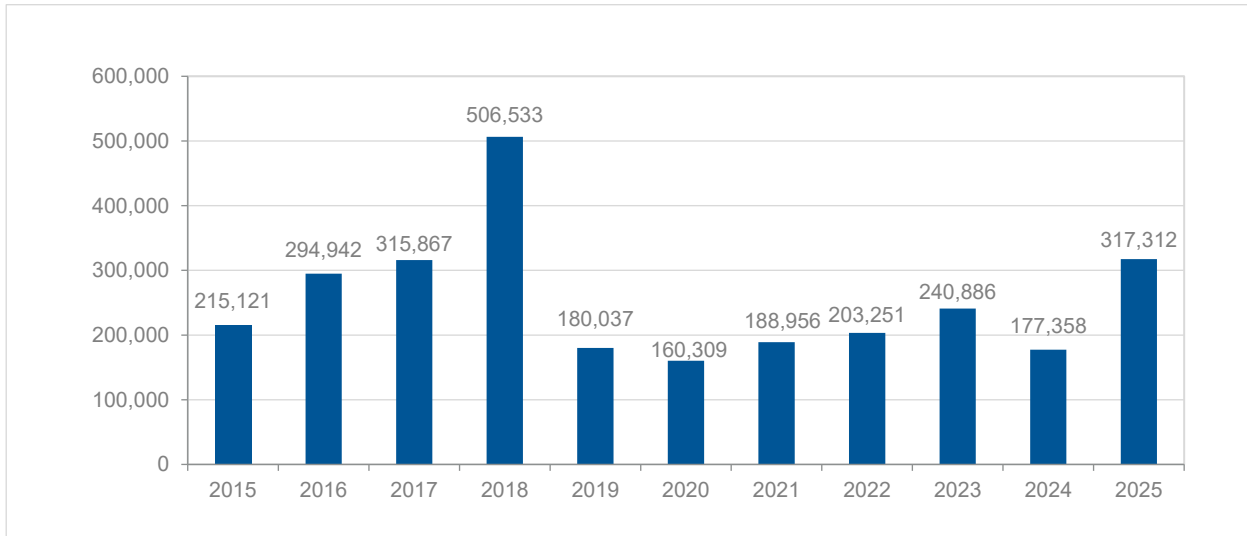
Figure 3: Distribution of 2025 Application Rebates Gross Electrical Energy Savings by Measure Category



BER Instant Rebates

Although participant tracking has improved in recent years and the tracking sheet captures the total number of rebated measures, data collected from distributors do not enable the for identification of unique Instant Rebates participants. As a result, participation is measured by the number of rebated measures. As illustrated in Figure 4 below, a total of 317,312 measures were rebated through Instant Rebates in 2025, representing a 79% increase compared to 2024 levels.

Figure 4: History of Total Annual Measures Rebated Through Instant Rebates (2015-2025)



As outlined in Figure 5 below, participation levels decreased for almost all product categories yet substantially increased by 196% for LED linear lamps compared to 2024 levels. Conversely, LED linear fixtures saw a decrease of 21% compared to 2024 levels. The change in participation levels for these two product categories is due to the promotion of T8 LED linear lamps in the first quarter of the year and their subsequent removal from the program offering as of June 15, 2025. Regarding other product categories, participation levels for LED directional and architectural fixtures decreased by 52%, LED outdoor fixtures decreased by 27%, and circulator pumps and occupancy/motion sensors decreased by 14% compared to 2024 levels.

Figure 5: Rebated Products Sold Through Instant Rebates (2024-2025)

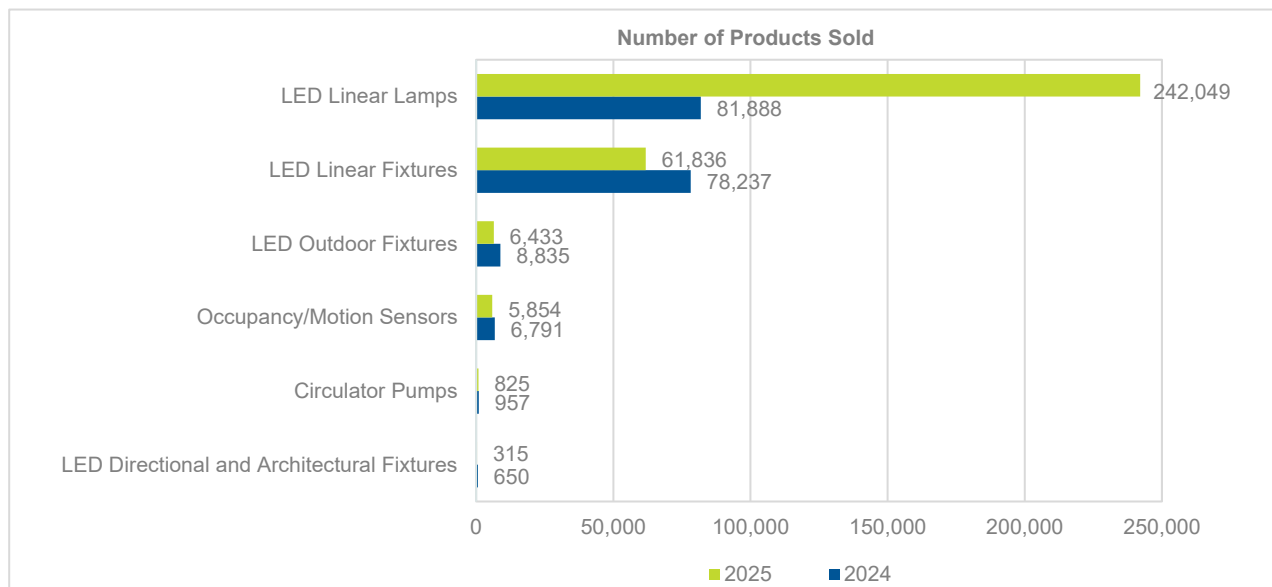
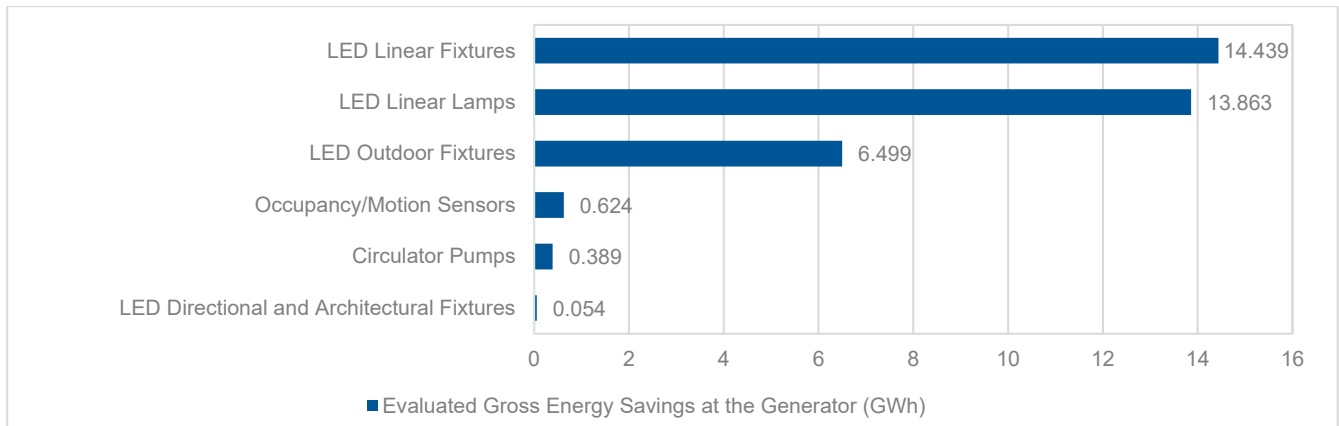


Figure 6 below illustrates the distribution of gross electrical energy savings from Instant Rebates across pumping and lighting measures. In 2025, LED linear fixtures accounted for the largest share of savings (40%), followed by LED linear lamps (39%) and LED outdoor fixtures (18%).

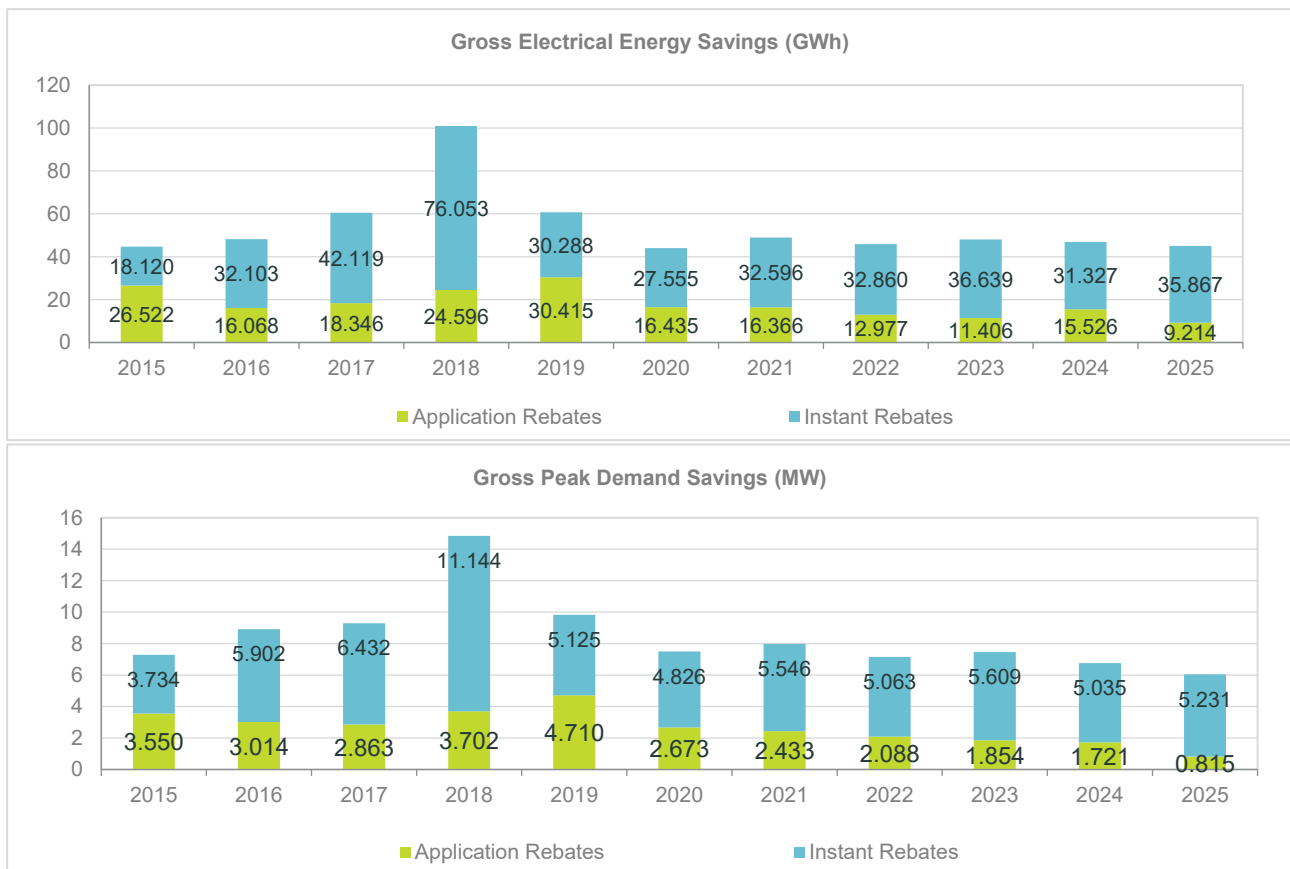
Figure 6: 2025 Instant Rebates Distribution of Gross Electrical Energy Savings by Measure Category



BER Overall

As presented in Figure 7 below, BER generated a total of 45.081 GWh in gross electrical energy savings at generator in 2025, which represents a 4% decrease compared to 2024 results. In 2025, gross peak demand savings totalled 6.046 MW for Application Rebates and Instant Rebates, representing a 11% decrease from 2024 levels. This decrease was mainly due to a lower participation in Application Rebates.

Figure 7: Evolution of BER Gross Savings, 2015-2025





2 BER Evaluation Approach

The 2025 BER-AR evaluation consisted of a comprehensive impact evaluation. In contrast, BER-IR consisted only of a condensed impact evaluation. The objectives of the 2025 BER evaluation were as follows:

- › Calculate BER gross and net results, namely first-year and lifetime electrical energy savings, peak demand savings, as well as avoided GHG emissions
- › Identify the implications of a baseline change for BER-AR and SBES
- › Validate 2024 market evaluation results and determine timing for when a LED baseline for BER-IR LED fixtures should take effect

The objectives of the 2025 BER-IR market study were as follows:

- › Validate the 2024 market evolution assessment results and determine timing for when an LED baseline for BER-IR LED fixtures should take effect
- › Identify the implications of baseline changes for LED fixtures in BER-AR and SBES

The Evaluator formulated key research questions aimed at achieving the above objectives. Table 6 below outlines the evaluation objectives and maps them to the Evaluator's research questions, methods, and sample sizes (n). Each method is described further below.

Table 6: 2025 BER Evaluation Approach

Evaluation Objectives	Research Questions	Methodology
Calculate gross results	› Are the data in the tracking sheet complete, accurate, and consistent? › Are the gross savings calculated for a sample of projects consistent with both E1 savings calculation methods and the measures observed on site for BER-AR? › What are the average interactive effect factors considering updated factors for recessed fixtures for BER-AR? › What are the appropriate EUL values for retrofit lighting measures for BER-AR? › What are the evaluated first-year and lifetime gross electrical energy and peak demand savings?	› Tracking sheet audit › Application Rebates project reviews with site visits › Calculations using evaluation results › Application of 2024 MA lighting interactive effects methodology to 2025 BER-AR results
Calculate net results	› What is the free-ridership level for BER-AR in 2025? › What is the spillover level for BER-AR in 2025? › What are the evaluated first-year and lifetime net electrical energy and peak demand savings? › What are the net GHG emission reductions in CO2 eq?	› Application Rebates participant survey (n=57) › Interviews during site visits for Application Rebates (n=40) › Use of 2024 NTGR results for BER-IR › Calculations using evaluation results › GHG emission reduction calculations
Validate 2024 market evaluation results and determine timing for when a LED baseline for BER-IR LED fixtures should take effect	› To what extent are LED products (linear lamps, linear fixtures, outdoor fixtures, outdoor replacement lamps) available in New Brunswick compared to non-LED products? How does that compare to Nova Scotia? › For LED products, what proportion does not meet DesignLights Consortium (DLC) specification criteria? (Noting any differences between DLC standard and DLC premium inventory practices in New Brunswick.) › Why do New Brunswick distributors still carry non-LED products and for which markets? › What are trends in new technologies and product offerings in the BNI lighting sector? › Do distributors order non-LED fixtures and lamps for their clients? Why or why not? What proportion of their business comes from orders of non-LED fixtures and lamps? › To what extent are LED products available in non-participating distributors in Nova Scotia? › Why do non-participating distributors in Nova Scotia still carry non-LED products and for which markets? › What is the experience and lessons learned in Massachusetts where instant rebates have recently been removed for LED lighting? › What is the outlook for the commercial lighting baseline for LED fixtures in Nova Scotia? When should a baseline for BER-IR LED fixtures take effect?	› New Brunswick distributor interviews (n=6) › Non-participating distributor interview (Atlantic Canada) (n=1) › Interview with Mass Save staff (n=1)
Identify implications of baseline changes for BER-AR and SBES	› How should an LED baseline be applied to the effective useful life (EUL) of LED fixtures incented by BER-AR and SBES?	› Jurisdictional scan of programs available and baseline/EUL used in BNI lighting programs as well as assumptions used for defining EUL



Tracking Sheet Audit

Prior to reviewing the savings calculations, the Evaluator performed an audit of the final 2025 tracking sheets to ensure they were complete and the entered data were consistent. The detailed protocols used for the Application Rebates and Instant Rebates tracking sheet audits and the results obtained are presented in Appendix I and Appendix II respectively.

Application Rebates Participant Survey

In the fall of 2025, Narrative Research conducted a telephone survey with a total of 57 Application Rebates participants to collect information on free-ridership. An online version of the survey was completed by two additional participants who expressed such a preference.

The average length of the telephone survey was 11 minutes, while the online survey lasted five minutes. The participant interview guide is presented in Appendix III, while the algorithm for calculating the free-ridership level for BER-AR measures is presented in Appendix IV.

Application Rebates Project File Reviews and Participant Site Visits

In the fall of 2025, Equilibrium Inc. carried out a full technical review of project documentation for 47 BER-AR projects implemented by 40 participants. Pursuant to the desk reviews, site visits were conducted with all 40 participants to finalize the project reviews. Interviews during site visits were also conducted to assess spillover levels. The protocol presented in Appendix V was used to review BER-AR projects.

Unitary Savings Review

Drawing on findings from both a literature review and the analysis of tracking sheet data, the Evaluator examined the equations, parameters, and assumptions used to calculate unitary savings for BER-AR measures. Additionally, assumptions for unitary savings values were reviewed for two new measures, namely VFDs for pumps and HVLS fans for commercial applications.

Effective Useful Life Update

The Evaluator reviewed the EUL values for all measure categories and recalculated the EUL values of lighting measures for which baseline changes are anticipated during the measure lifetimes.

Calculations Using Evaluation Results

Building on the aforementioned methods and collected data, the Evaluator calculated first-year and lifetime electrical energy savings and peak demand savings whose calculation methodologies are respectively presented in Section 3 and Section 4 herein.

GHG Emission Reduction Calculations

To obtain net avoided GHG emissions in CO₂ eq for BER, the Evaluator multiplied the net electrical energy savings by the latest Nova Scotia-specific factor for GHG emissions generated by electricity production. This factor was established using NS Power data.



Note on Margin of Error

For evaluation activities that yield quantitative results based on a sample, the Evaluator aimed to achieve a maximum margin of error of 10% at a confidence level of 90%. This means that, if measurements were conducted many times with different samples, the data would be within 10 percentage points above or below the percentage reported 90% of the time. Thus, the margin of error indicates the relative level of precision⁴ of a measurement, while its associated confidence level indicates the probability of a measurement falling within the margin of error.⁵

For BER-AR, the Evaluator calculated the margins of error for free-ridership levels and adjustment ratios. The margins of error are listed alongside results in Section 3. Examples of calculations used to establish margins of error are provided in Appendix II of the 2025 DSM Program Evaluation Executive Summary.

As part of the condensed BER-IR evaluation, no data-collection activities warranted the establishment of margins of error.

Interviews with New Brunswick Distributors

The Evaluator selected to use the New Brunswick market as a comparator as, up until very recently, New Brunswick Power (NB Power), the DSM program administrator for the Province of New Brunswick, did not have a BNI midstream lighting program in market. In late spring 2025, NB Power launched the Midstream Business Rebates Program (MBRP), an instant rebates program similar to BER-IR, offering rebates for LED lighting products. Given the program had just been launched prior to data collection for this study, the Evaluator deemed the Province of New Brunswick a suitable comparator. A structured data collection approach was implemented to ensure the analysis would capture the market prior to the launch of the MBRP.

In July-August 2025, the Evaluator conducted a 30-minute telephone survey with six New Brunswick-based lighting distributors that had joined the MBRP earlier in 2025. Participants were recruited from a list of distributors provided by the MBRP program delivery agent.

Of the six interviewed distributors, three have an international footprint, one has nationwide coverage, one is regional, and one operates only in New Brunswick. While four of these distributors serve all regions of New Brunswick, one focuses on the Moncton area up to Bathurst, while the other distributor caters mainly to clients located in or near the urban centres of Moncton, Saint John, and Fredericton in addition to smaller communities in the northwestern part of the province.

At the time the interviews were conducted, five participating distributors were actively offering incentives to their customers through the MBRP, while one had a signed agreement with NB Power but had not yet begun to deliver the program.

The aim of the interviews was to collect information on distributor perspectives regarding the market evolution of business lighting. The Evaluator confirmed the decision-maker by verifying that the person interviewed was the most knowledgeable about stocking and supplying specific products eligible for rebates under the program. The methodology used to identify the decision-maker was consistent with that of previous market evolution assessments. The guide used for the interviews is presented in Appendix VII.

⁴ Precision refers to how reproducible a set of measurements is. However, it does not consider how close the measured values are to the true values as this would refer to accuracy.

⁵ As part of this evaluation, the confidence levels and margins of error only take random sampling errors into account; they do not reflect non-sampling errors or biases such as data entry errors, inaccurate responses from respondents, or the inability to contact certain people.

Interview with a Non-participating Distributor

The Evaluator conducted one interview with an Atlantic Canada distributor that does not participate in BER-IR or MBRP but operates in both Nova Scotia and New Brunswick. That non-participating distributor supplies linear fixtures, linear lamps, outdoor fixtures, and outdoor replacement lamps across Atlantic Canada. The guide used for the interviews is presented in Appendix VIII.

Distributor Market Representation

The Evaluator considers that the seven interviewed distributors represent an acceptable reflection of the overall market in New Brunswick. The non-participating distributor interviewed is a large multi-national distributor who supplies lighting to Atlantic Canada distributors. Of the two distributors on the study's contact list who did not respond to the survey, one is a smaller local distributor with the other being a large distributor. The remaining six participating distributors who participated in the study represent a large majority of the lighting distribution market in New Brunswick.

Interview with Mass Save

The Evaluator conducted an interview with Mass Save staff who have worked on Mass Save BNI lighting programs to understand the decision to remove lighting from their midstream program, lessons learned, and whether they have observed any changes in the market (e.g. decrease in LED stocking) since they have removed incentives.

Jurisdictional Scan

The Evaluator reviewed eight Canadian and American utilities' and program administrators' energy efficiency programs to document their BNI lighting offers, which measures are included, and whether the programs are instant or based on an application. The jurisdictional scan also included a review of publicly available technical reference manuals (TRMs) to identify what baseline and EUL programs use for BNI LED fixtures and lamps.



3 Impact Evaluation for Application Rebates

The objectives of the 2025 Application Rebates impact evaluation were to determine gross and net electrical energy savings and peak demand savings.

3.1 Tracking Sheet Audit

To ensure program component results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1. The results obtained from the tracking sheet audit are presented in Appendix I. The tracked savings results presented in this report, therefore, refer to the corrected tracked savings obtained by the Evaluator.

3.2 Gross Savings

Gross savings refer to changes in energy consumption resulting from actions taken by participants compared to the consumption level had those actions not occurred.⁶ Gross electrical savings values are tracked by E1 using the Customer Information System (CIS).⁷

3.2.1 Adjustment Ratios

As part of the 2025 evaluation, the Evaluator conducted on-site visits (n=40) to establish adjustment ratios and determine evaluated savings. The visits were focused on lighting and HVAC measures as these respectively accounted for 40% and 20% of Application Rebates gross electrical energy savings in 2025. Agriculture, motor, refrigeration, and commercial kitchen measures were also sampled. Overall, the Evaluator sampled and reviewed 54% of Application Rebates gross electrical energy savings in 2025.

Based on the observations made on-site and an analysis of the calculations, the Evaluator calculated the evaluated savings of each project and then established an average adjustment ratio for lighting, HVAC and for the remaining measure categories. The average adjustment ratios correspond to the evaluated savings divided by the tracked savings for all sampled projects. These were extrapolated to all savings (by multiplying the average adjustment ratio by the tracked savings of the given category) when the margins of error were below the targets of 10% at a confidence level of 90%. An adjustment ratio calculation example is presented in Appendix VI.

The sections below present the main findings and adjustments from the project reviews.

Lighting

Based on the comprehensive review of 18 lighting projects, the most common adjustment for lighting measures was revising hours of use (HOUs) and peak coincidence factors using the data collected on site. This was mostly due to applications providing hours of operation for the business in general instead of HOUs specific to fixture operation.

⁶ Definition adapted from National Renewable Energy Laboratory, “Chapter 21: Estimating Net Savings – Common Practices”, The Uniform Methods Project, October 2017, p. 3, available at: <https://www.nrel.gov/docs/fy17osti/68578.pdf>.

⁷ CIS equations are defined in the internal E1 BER CIRx Screening Tool (version 1.6), which standardizes savings calculation methodologies, assumptions, and equipment parameters across measure categories.



HVAC

Adjustments to HVAC measures were minimal overall. Most changes involved correcting the coefficient of performance (COP) for high efficiency heat pump technology at -15°C ($\text{COP}_{\text{ee\_min}}$), the Heating Seasonal Performance Factor (HSPF_{ee}), the Heating Efficiency Factor (HEF_{ee}), and the Cooling Efficiency Factor (CEF_{ee}). These corrections were based on Air-Conditioning, Heating, and Refrigeration Institute submittals found in the project folders, which clarified cases where non-ducted indoor units were specified but ducted units were installed and vice versa.

Of the 12 HVAC projects reviewed, one project was removed from the calculation of adjustment ratios because it was not representative of a typical project due to significant discrepancies between the application details and actual site conditions. The savings for that project were adjusted separately.

Other Measure Categories

Data collection to update adjustment ratios for the remaining measure categories, namely agriculture (4 projects), motor (8 projects), refrigeration (4 projects), and commercial kitchen (1 project), was also carried out in 2025.

For agriculture measures, most variables in the sample were well documented, with the exception of livestock capacity and the number of cows milked. All measures in this category required adjustments based on participant declarations.

For commercial kitchen measures, two ovens and two dishwashers under a single project were evaluated. According to participant declarations, the days of operation, hours of use, and racks washed per day were all reduced, leading to significant adjustments since the original application listed the business's general operating hours rather than equipment specific hours of use.

The motor category experienced reductions in both electrical energy savings and peak demand savings. These reductions were driven by several project-specific adjustments, including one instance of pump quantity being revised from two to one based on primary and back-up operation and five instances of adjusting motor efficiency based on nameplate data collected on site. One project involving 14 variable frequency drive (VFD) measures was removed from the calculation of adjustment ratios due to inconsistencies between the application information and actual site conditions. The Energy Saving Factor (ESF) for these VFDs was adjusted from 0.87 (low load) to 0.78 (medium load) because several units were verified on site to be operating at 100%. In addition, participant declarations confirmed that these VFDs were manually controlled. As a result, the savings for that project were adjusted separately.

For refrigeration measures, the large increases in both electrical energy and peak demand savings when comparing tracked values to revised values were primarily driven by one large custom refrigeration compressor measure that required customized calculations. The measure was evaluated using the methodology for efficient refrigeration compressors that E1 tracks in the CIS,⁸ resulting in significantly higher savings due to the unique application.

No data collection was performed in 2025 to update adjustment ratios for pumping and renewable generation measures. Only one small pumping project was submitted, and renewable generation measures had been discontinued for future years. For measure categories with no 2025 project submissions, including IT and data centres, water heating, compressed air, pools, and laundry, an adjustment ratio of 1.000 was applied.

⁸ The Evaluator used E1's internal CIRx Screening Tool for efficient refrigeration compressors.

Summary

Table 7 below outlines the adjustment ratios applied in the 2025 evaluation.

Table 7: 2025 Application Rebates Adjustment Ratios

Measure Category	Electrical Energy Savings		Peak Demand Savings	
	Adjustment Ratio	Margin of Error	Adjustment Ratio	Margin of Error
Lighting	1.117	8.3%	1.031	10.4%
Heating, Ventilation, and Air Conditioning (HVAC)	1.006	3.3%	1.027	8.5%
Motor	0.951	5.8%	0.514	21.9%
Pumping				
Refrigeration				
Agriculture				
Kitchen				
Renewable Generation	1.000	-	1.000	-
IT & Data Centres	1.000	-	1.000	-
Water Heating	1.000	-	1.000	-
Compressed Air	1.000	-	1.000	-
Pools	1.000	-	1.000	-
Laundry	1.000	-	1.000	-

For lighting and HVAC, the adjustments led to positive adjustment ratios of 1.117 and 1.006 for electrical energy savings and 1.031 and 1.027 for peak demand savings respectively.

For the agriculture, motor, pumping, refrigeration, and commercial kitchen measure categories, the Evaluator calculated a combined adjustment ratio of 0.951 for this group of measures. This grouped ratio provides a more statistically reliable value to estimate electrical energy savings than evaluating each measure category individually or using alternative groupings. This approach also helps distribute total program savings more evenly across the three ratios (i.e. lighting, HVAC, combined grouping) applied by the Evaluator.

For peak demand savings, the Evaluator applied an adjustment ratio of 0.514 to the savings of all non-lighting and non-HVAC measures. Moreover, due to a higher-than-expected margin of error of 21.9%, the Evaluator recommends reassessing this adjustment ratio in the 2026 evaluation after sampling additional projects in this group of measures. This would also allow the Evaluator to recalculate standalone adjustment ratios specific to the agriculture and motor categories.

Lastly, the Evaluator observed that, as listed in the tracking sheet, adjustment ratios are currently embedded within the gross electrical energy and peak demand savings at the meter. To prevent misinterpretation and calculation errors, the Evaluator recommends applying these adjustment factors separately and recording the adjusted values in a dedicated field in the CIS.

3.2.2 Interactive Effects

Interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling; these are considered in the gross savings standard equation that E1 tracks in the CIS. For BER-AR, interactive effects only apply to indoor lighting projects.

The Evaluator updated the interactive effects factors as part of the 2025 DSM MA activities. For BER-AR, the interactive effects factors are assigned according to building type, space heating and cooling type, and whether the lighting is recessed or not, as detailed in the 2025 DSM MA.

Based on site visit observations, the Evaluator confirmed that E1 applied the correct interactive effects factors for the projects visited.

3.2.3 Effective Useful Life

In 2025, the Evaluator reviewed the EUL values used in the calculations of electrical energy savings that are expected to persist over time. For LED linear fixture, LED linear lamp, and LED outdoor fixture measures, the Evaluator recalculated the EUL values where baseline changes are expected over the measure lifetime. Detailed explanations of this calculation methodology are provided in the 2025 DSM MA.

The tracked and evaluated EUL values are presented in Table 8 below. The table includes only those values modified by the Evaluator during the 2025 evaluation.

Table 8: 2025 BER-AR EUL Values

Measure	Tracked EUL	Evaluated EUL
LED Linear Fixtures		
1 x 4 Luminaires	11.6	4.8
2 x 2 Luminaires and Retrofit Kits	11.6	4.8
2 x 4 Luminaires and Retrofit Kits	11.6	4.8
Linear Ambient and Low-bay Luminaires	11.9	4.8
High-bay Luminaires	23.8	4.8
Troffers	20.9	4.8
Stairwell and Passageway Luminaires	14.3	2.9
LED Linear Lamps		
2-foot Replacement Lamps	11.6	4.8
3-foot Replacement Lamps	11.6	4.8
4-foot Replacement Lamps	11.6	4.8
8-foot Replacement Lamps	11.6	4.8
U-bends	11.9	4.8
LED General-use and Decorative Lamps		
Four Pin-base Replacement Lamps for Compact Fluorescent Lamps (CFLs)	11.9	1.9
LED Outdoor Fixtures		
Outdoor Full-cut-off Wall-mounted Area Luminaires	17.4	4.5
Flood and Spot Luminaires	17.4	4.5
LED Replacements for High-intensity Discharge Lamps	11.6	4.5
Non-cut-off and Semi-cut-off Wall-mounted Area Luminaires	23.2	4.5
Pole/Arm-mounted Area Luminaires	13.9	3.5
Parking Garage Luminaires	23.2	4.6
Case Lighting for Sign Retrofit Applications	11.9	4.8
LED Directional and Architectural Fixtures		
Track or Mono-point Directional Luminaires, LED Wall Wash Luminaires	11.9	1.0
Other LED Lighting		
Refrigerated Case Luminaires	16.6	4.8
LED Roadway Lighting	13.7	2.7
Horticultural Lighting	8.3	3.3

The evaluated equivalent EUL values are applied to each measure gross and net first-year electrical energy savings to obtain gross and net lifetime electrical energy savings. As a result, the weighted average EUL value for gross and net savings is equal to 15.8 years and 16.0 years respectively (see Subsections 3.2.4 above and 3.3.4 below).



3.2.4 Evaluated Gross Savings

The savings achieved for each Application Rebates measure category are presented in Table 9 below. Both electrical energy and peak demand savings were revised by applying the adjustment ratios discussed in Subsection 3.2.1 above.

The savings at the generator were calculated using a line loss factor that accounts for electricity losses occurring between the generator and the meter. This value is a weighted average of the line loss factors provided by NS Power for each rate code and the corresponding gross electrical energy savings listed in the final 2025 tracking sheet.⁹ The line loss factors correspond to the values submitted to the NSEB as part of the 2014 Cost of Service Study Progress Update.¹⁰

⁹ For municipal utility participants, the line loss factor of the most similar NS Power rate code was assumed.

¹⁰ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.

Table 9: Evaluated 2025 Application Rebates Gross Electrical Energy and Peak Demand Savings

Measure Category	Agriculture	Commercial Kitchen	HVAC	Lighting	Motor	Pumping	Refrigeration	Renewable Energy	Total
Electrical Energy Savings									
Tracked Electrical Energy Savings (GWh)	0.140	0.010	1.675	3.077	1.278	0.004	0.052	2.462	8.703
Adjustment Ratio*	0.949	0.951	1.021	1.125	0.613	0.951	1.019	1.000	0.990
Gross Electrical Energy Savings – at the Meter (GWh)	0.133	0.010	1.711	3.462	0.783	0.004	0.053	2.462	8.618
Line Loss Factor	1.0796	1.0947	1.0745	1.0644	1.0614	1.0631	1.0669	1.0740	1.0692
Gross Electrical Energy Savings – at the Generator (GWh)	0.144	0.011	1.839	3.685	0.831	0.004	0.056	2.645	9.214
Effective Useful Life (years)	15.0	14.5	18.4	4.6	15.0	15.0	12.3	30.0	15.8
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	2.155	0.157	33.847	16.923	12.465	0.060	0.694	79.342	145.644
Peak Demand Savings									
Tracked Demand Savings (MW)	0.015	-	0.212	0.379	0.113	-	0.005	-	0.725
Adjustment Ratio*	0.495	-	1.027	1.226	0.514	0.514	0.514	-	1.036
Gross Peak Demand Savings – at the Meter (MW)	0.008	-	0.217	0.465	0.058	-	0.003	-	0.751
Line Loss Factor	1.1323	-	1.1185	1.0723	1.0625	1.0700	1.0770	-	1.0855
Gross Peak Demand Savings – at the Generator (MW)	0.009	-	0.243	0.499	0.062	-	0.003	-	0.815

* The adjustment ratios presented in this table differ from the calculated adjustment ratios in Table 7 because tracked electrical energy savings already included the previous evaluation's adjustment ratios. Therefore, to calculate gross electrical energy savings, the Evaluator first removed the previous year's adjustment ratios before applying the adjustment ratios presented in Table 7.

Figure 8 and Figure 9 compare tracked and evaluated gross energy and peak demand savings, respectively. The differences between tracked and evaluated savings outlined in the figures are the results from applying updated adjustment ratio values across all measure categories and revised interactive effects values for recessed fixture lighting measures.

Figure 8: Tracked and Evaluated 2025 Application Rebates Gross Electrical Energy Savings at the Generator

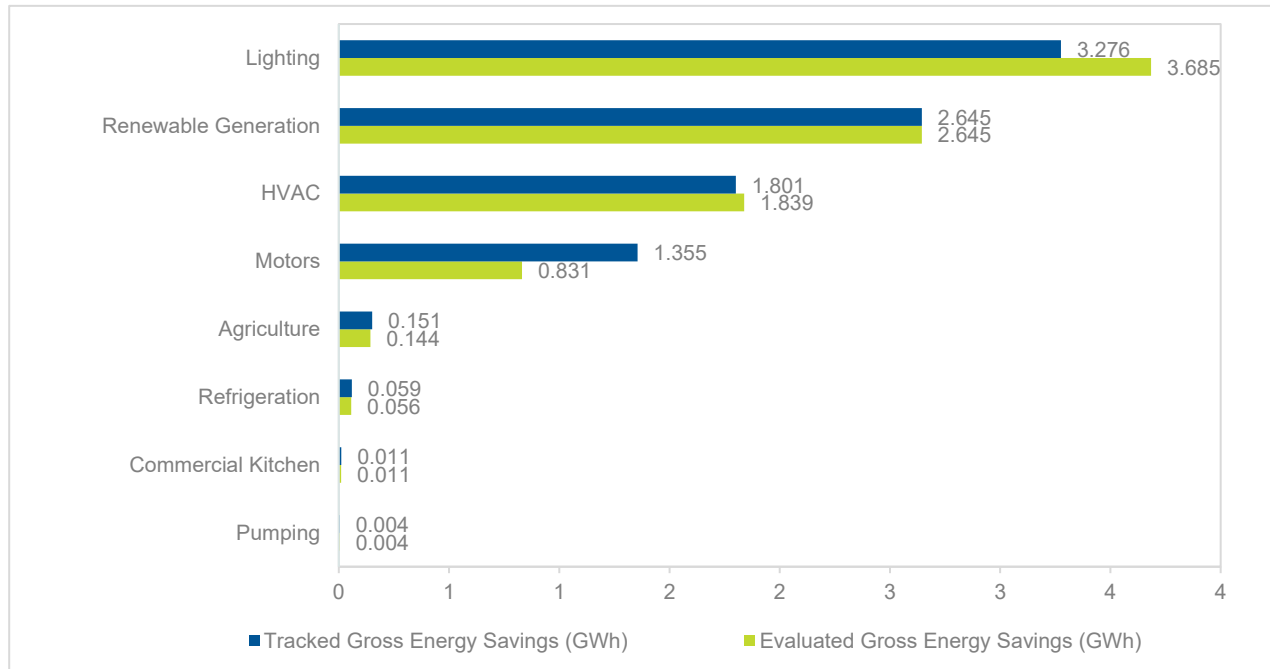
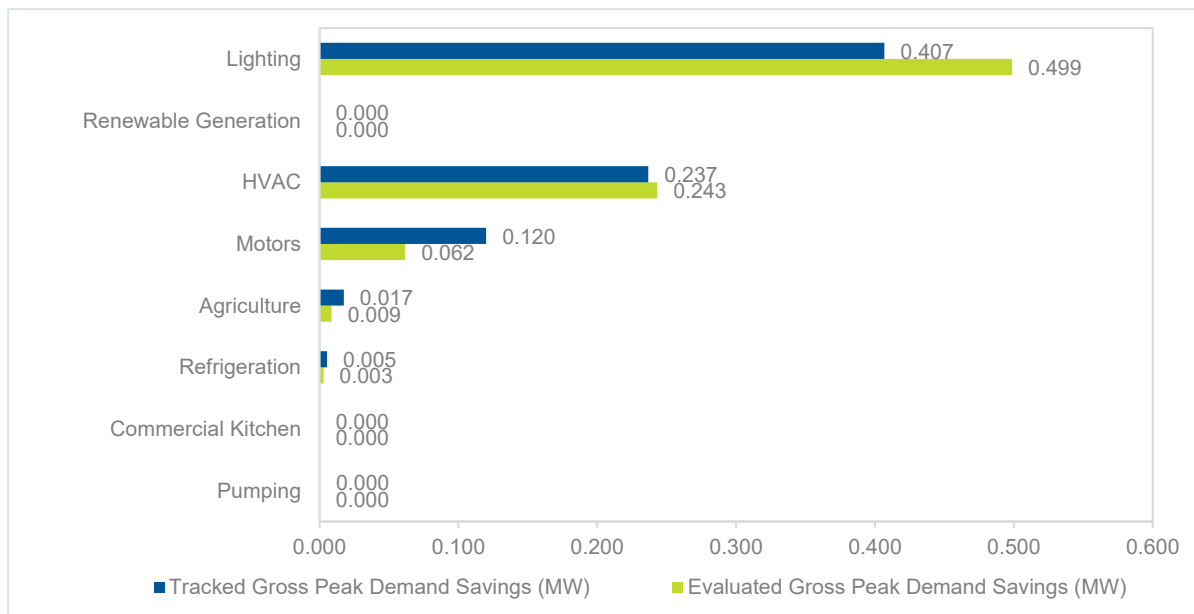


Figure 9: Tracked and Evaluated 2025 Application Rebates Gross Peak Demand Savings at the Generator



As presented Table 10 below. GHG emission reductions were calculated by applying the Nova Scotia-specific factor¹¹ for GHG emissions generated by electricity production to Application Rebates gross electrical energy savings.

Table 10: Evaluated 2025 Application Rebates Gross GHG Emission Reductions

	Total
Gross Electrical Energy Savings – at the Generator (GWh)	9,214
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO2 eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO2 eq)	4,324

3.3 Net Savings

The Evaluator determined the net electrical energy savings and peak demand savings, i.e. the electrical energy and peak demand savings that can be reliably attributed to a service, by estimating the NTGR. More precisely, the NTGR is established by considering the effects that positively or negatively affect energy savings, namely free-ridership and spillover.

3.3.1 Free-ridership

In the case of Application Rebates, free-ridership occurs when participants would have still implemented the energy efficiency measures in the absence of the service. The free-ridership level was assessed during the 2025 evaluation using a self-report approach that involved asking participants a set of questions during a telephone survey. To reach the desired survey sample size, the Evaluator included participants from both 2025 and 2024 in the sample. Since no major changes to the service were made between 2024 and 2025, the Evaluator deemed that including projects from both years was reasonable to establish 2025 free-ridership levels.

Table 11 outlines the 2025 evaluated free-ridership levels.

Table 11: 2025 Free-ridership Levels for Application Rebates

Measure Category	Average Free-ridership Level	Margin of Error
Lighting	6%	2.5%
HVAC	17%	8.7%
Total (including lighting, HVAC, agriculture, motor, and refrigeration measures)	9%	3.8%

As the free-ridership assessment approach was modified for the 2025 evaluation compared to the previous assessment conducted in 2021, caution should be exercised when making direct comparisons across years. For reference, the overall free-ridership level across all measure categories was 26% in 2021.

¹¹ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO2 eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed August 26, 2025) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).

3.3.2 Spillover

For Application Rebates, spillover refers to instances whereby participants implement eligible energy efficiency measures because of prior participation in the service or other efficiency programs without receiving any additional support.

The Evaluator found that the spillover level for 2025 was nil; a spillover level of 0% was therefore applied.

3.3.3 Net-to-gross Ratio Calculation

The NTGR is calculated using the following equation.

$$NTGR = (1 - \% \text{ Free-ridership} + \% \text{ Spillover})$$

Table 12 presents the NTGR values calculated by the Evaluator using the free-ridership and spillover levels assessed for Application Rebates. Due to the measure being discontinued in 2025, the NTGR was not reassessed for renewable generation (solar PV), and a value of 1.00 was retained in the net savings calculations.

Table 12: 2025 Application Rebates NTGR

Measure Category	Free-ridership	Spillover	NTGR
Lighting	6%	0%	0.94
HVAC	17%	0%	0.83
Total (including lighting, HVAC, agriculture, motor, kitchen, pumping, and refrigeration measures)	9%	0%	0.91

3.3.4 Evaluated Net Savings

Net savings are defined as the changes in energy use attributable specifically to Application Rebates. Net savings were estimated by applying the above NTGR values to the evaluated gross electrical energy savings, as illustrated in the following equation.

$$\text{Net Savings} = \text{Evaluated Gross Electrical Energy Savings} \times \text{NTGR}$$

Detailed results are presented in Table 13 below. The net electrical energy savings resulted in 4,029 tonnes of CO₂ eq in net annual GHG emission reductions.

Table 13: Evaluated 2025 Application Rebates Net Electrical Energy and Peak Demand Savings

Measure Category	Agriculture	Commercial Kitchen	HVAC	Lighting	Motor	Pumping	Refrigeration	Renewable Generation	Total
Electrical Energy Savings									
Gross Electrical Energy Savings – at the Meter (GWh)	0.133	0.010	1.711	3.462	0.783	0.004	0.053	2.462	8.618
NTGR	0.91	0.91	0.83	0.94	0.91	0.91	0.91	1.00	0.93
Net Electrical Energy Savings – at the Meter (GWh)	0.121	0.009	1.420	3.254	0.712	0.003	0.048	2.462	8.031
Line Loss Factor	1.0796	1.0947	1.0745	1.0644	1.0614	1.0631	1.0669	1.0740	1.0692
Net Electrical Energy Savings – at the Generator (GWh)	0.131	0.010	1.526	3.463	0.756	0.004	0.051	2.645	8.586
Effective Useful Life (years)	15.0	14.5	18.4	4.6	15.0	15.0	12.3	30.0	16.0
Net Lifetime Energy Savings – at the Generator (GWh)	1.961	0.143	28.093	15.908	11.343	0.054	0.632	79.342	137.476
Peak Demand Savings									
Gross Peak Demand Savings – at the Meter (MW)	0.008	0.000	0.217	0.465	0.058	-	0.003	-	0.751
NTGR	0.91	-	0.83	0.94	0.91	0.91	0.91	-	0.91
Net Peak Demand Savings – at the Meter (MW)	0.007	-	0.180	0.437	0.053	-	0.002	-	0.680
Line Loss Factor	1.1323	-	1.1185	1.0723	1.0625	1.0700	1.0770	-	1.0844
Net Peak Demand Savings – at the Generator (MW)	0.008	-	0.202	0.469	0.056	-	0.003	-	0.737

3.4 Realization Rate

Table 14 presents a comparison between the 2025 evaluated energy and peak demand savings and those tracked by E1. It also shows the realization rates, which indicate the ratio of evaluated net savings to tracked net savings, for both energy and peak demand.

Table 14: Comparison of Tracked and Evaluated 2025 Application Rebates Savings at the Generator

	Gross Savings		NTGR	Net Savings		Realization Rate
	Value	Unit		Value	Unit	
Electrical Energy Savings						
Tracked Savings by E1	9.302	GWh	0.740	6.884	GWh	125%
Evaluated Savings	9.214	GWh	0.932	8.586	GWh	
Peak Demand Savings						
Tracked Savings by E1	0.787	MW	0.740	0.582	MW	127%
Evaluated Savings	0.815	MW	0.904	0.737	MW	
* The average NTGR values presented in this table correspond to the ratio of net savings to gross savings for Application Rebates.						

The higher realization rates are mostly a result of the updated NTGR values applied by the Evaluator.



4 Impact Evaluation for Instant Rebates

The objectives of the 2025 Instant Savings impact evaluation were to determine gross and net electrical energy and peak demand savings, annually avoided GHG emissions, as well as EUL values and associated lifetime energy savings.

4.1 Tracking Sheet Audit

To ensure program service results were reliably compiled, the Evaluator first performed a tracking sheet audit to verify the completeness and consistency of the data submitted by E1. The results obtained from the tracking sheet audit are presented in Appendix II. The tracked savings results presented in this report, therefore, refer to the corrected tracked savings obtained by the Evaluator.

4.2 Gross Savings

For Instant Rebates, gross savings refer to changes in energy consumption resulting from actions taken by participants compared to the consumption level had those actions not occurred.¹² Since the identification of eligible measures for participants is performed at the point of sale (as opposed to on site), information on participants as well as project operating conditions and old equipment parameters are not fully detailed in the tracking sheet. Hence, E1 estimates savings based on a set of assumptions specific to each measure type. Electrical energy and peak demand savings are calculated for each data entry; the equations used for lighting measures include baseline wattages, the actual wattages of efficient measures, ballast factors where applicable, interactive effects factors, peak coincidence factors (PCFs), and in-service rates (ISRs), while unitary savings values are used for occupancy and motion sensors as well as circulator pump measures.

The equations, parameters, as well as EUL values used in the 2025 evaluation are presented in the 2025 DSM MA.

4.2.1 In-service Rates

Research indicates that a percentage of measures purchased through rebate programs can be stored by customers for later use. For the 2025 evaluation, the Evaluator maintained the ISR of 85% for LED linear lamps and the ISR of 100% for fixtures, occupancy/motion sensors, as well as circulator pumps, which were reviewed as part of the 2024 evaluation and originally established in the 2016 evaluation based on a literature review.

4.2.2 Energy Savings

As part of 2025 DSM MA activities, several parameters were updated and some measures eligible under Instant Rebates were impacted. In 2025, the unitary savings values for circulator pumps were updated. The tracked and evaluated unitary electrical energy savings values that were changed in 2025 are presented in Table 15 below.

¹² Definition adapted from National Renewable Energy Laboratory, "Chapter 21: Estimating Net Savings – Common Practices", The Uniform Methods Project, October 2017, p. 3, available at: <https://www.nrel.gov/docs/fy17osti/68578.pdf>.

Table 15: 2025 Instant Rebates Tracked and Evaluated Unitary Electrical Energy Savings for Circulator Pumps

Tracked Maximum Input Power Categories	Evaluated Maximum Input Power Categories	Tracked Unitary Electrical Energy Savings Value (kWh)	Evaluated Unitary Electrical Energy Savings Value (kWh)
Less Than 150 W (exclusively)	Less Than 144 W (exclusively)	412	420
150 W up to 500 W (exclusively)	144 W up to 575 W (exclusively)	800	816
500 W up to 2,500 W (exclusively)	575 W up to 2,500 W (exclusively)	1,974	2,014

4.2.3 Peak Demand Savings

Peak demand savings correspond to the demand savings that coincide in time with the peak demand period of the electricity system. The projected electricity demand peak period in Nova Scotia is between 5 p.m. and 7 p.m. in the months of December to February on non-holiday weekdays. For lighting measures, the difference between the baseline and efficient wattages are multiplied by a PCF determined based on operation times relative to the peak demand period. For occupancy/motion sensors and circulator pumps, unitary peak demand savings values are used.

In the 2025 evaluation, the Evaluator maintained the PCF of 60% for indoor lighting measures, which was reviewed as part of the 2024 evaluation and originally established using the weighted average PCF of all indoor lighting measures installed through Application Rebates and SBES in 2022, and a PCF of 100% was used for outdoor lighting measures since these are assumed to be in operation during the peak demand period. No change was made to occupancy/motion sensor and circulator pump unitary peak demand savings for 2025.

4.2.4 Interactive Effects

Interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling; these are taken into account in the gross unitary savings equation presented in the 2025 tracking sheet.

As part of the 2025 DSM MA activities, the Evaluator calculated interactive effects factors for each product eligible under Instant Rebates based on average values for indoor lighting products installed through Application Rebates and SBES and using the interactive effects factors established per facility type and per heating and cooling system determined in the 2024-2025 DSM MA update. For outdoor lighting measures and circulator pumps, interactive effects factors are considered to be nil.

The variation between tracked and evaluated average interactive effects factors is due to the Evaluator: 1) Applying the updated interactive effects factors per facility type established as part of the 2024-2025 DSM MA update; and 2) calculating the average interactive effect factors for BER-IR based on the mix of heating systems of buildings that participated in BER-AR and SBES in 2025. This is especially evident in the case of indoor occupancy/motion sensors since they had negative tracked interactive effects factors before the update and then had positive evaluated interactive effects factors after the update, because most participating buildings in 2025 were either non-electrically heated or had no heating. The tracked and evaluated interactive effects factors that were changed in 2025 are presented in Table 16 below.

Table 16: 2025 Instant Rebates Interactive Effects Factor Calculation Results

Measure		Tracked Interactive Effects Factor for Energy Savings	Tracked Interactive Effects Factor for Peak Demand Savings	Evaluated Interactive Effects Factor for Energy Savings	Evaluated Interactive Effects Factor for Peak Demand Savings
LED Linear Fixtures	Recessed	-4.9%	-9.2%	-7.8%	-25.0%
	Non-recessed	-8.7%	-16.1%	-3.6%	-15.1%
	Weighted Average	-8.0%	-14.9%	-	-
LED Linear Lamps	Recessed	-1.6%	-7.1%	-7.8%	-25.0%
	Non-recessed	-2.9%	-12.5%	-3.6%	-15.1%
	Weighted Average	-2.7%	-11.6%	-	-
LED Directional and Architectural Fixtures		4.0%	0.0%	9.1%	0.0%
Indoor Occupancy/Motion Sensors		-4.1%	-13.2%	3.6%	0.0%

4.2.5 Effective Useful Life

As part of the 2025 DSM MA activities, the Evaluator reviewed the EUL values used in the calculations of electrical energy savings that are expected to persist over time. In the 2025 evaluation for LED linear fixtures, LED linear lamps, LED outdoor fixtures, as well as LED directional and architectural fixtures, EUL values were adjusted as a result of regulatory changes that will cause the baseline to gradually shift to LED over the lifetime of the efficient lighting measures. For all other Instant Rebates measures, the EUL values established in the 2021 evaluation remained valid for the 2025 evaluation.

The tracked and evaluated EUL values that were changed in 2025 are presented in Table 17.

Table 17: 2025 Instant Rebates Tracked and Evaluated EUL Values

Measure	Tracked EUL (years)	Evaluated EUL (years)
LED Linear Fixtures		
1 x 4 Luminaires	11.9	4.8
2 x 2 Luminaires and Retrofit Kits	11.9	4.8
2 x 4 Luminaires and Retrofit Kits	11.9	4.8
Linear Ambient and Low-bay Luminaires	11.9	4.8
Troffers	21.4	4.8
LED Linear Lamps		
2-foot Replacement Lamps	11.9	4.8
3-foot Replacement Lamps	11.9	4.8
4-foot Replacement Lamps	11.9	4.8
8-foot Replacement Lamps	11.9	4.8
U-bend Lamps	11.9	4.8
LED Outdoor Fixtures		
Outdoor Full-cut-off Wall-mounted Area Luminaires	17.4	4.5
Flood and Spot Luminaires	17.4	4.5
Non-cut-off and Semi-cut-off Wall-mounted Area Luminaires	23.2	4.5
LED Directional and Architectural Fixtures		
Track or Mono-point Directional Luminaires, LED Wall Wash Luminaires	11.9	1.0

The evaluated equivalent EUL values are applied to the gross and net first-year electrical energy savings of each measure to obtain gross and net lifetime electrical energy savings. As a result, the weighted average EUL values for gross and net savings differ (see Subsections 4.2.6 and 4.3.3 below). The gross weighted average EUL value is equal to 4.9 years.

4.2.6 Evaluated Gross Savings

The electrical energy and peak demand savings associated with Instant Rebates were calculated using the unitary savings values (including baseline wattages, the actual wattages of efficient measures, ballast factors where applicable, interactive effects factors, PCFs, and ISRs for lighting measures) from the 2025 DSM MA. Gross savings at the generator were calculated using weighted average line loss factors determined based on the distribution of the rate code spending of other BNI programs in 2025. The line loss factors were updated in 2019 and correspond to the values submitted to the Nova Scotia Utility and Review Board (NSUARB), now named the Nova Scotia Energy Board (NSEB), as part of the 2014 Cost of Service Study Progress Update.¹³

The total savings established for each measure type are presented in Table 18 below.

¹³ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.

Table 18: 2025 Instant Rebates Evaluated Gross Electrical Energy and Peak Demand Savings

Measure Category	LED Linear Fixtures	LED Linear Lamps	LED Outdoor Fixtures	LED Directional and Architectural Fixtures	Outdoor Motion Sensors	Indoor Occupancy/ Motion Sensors	Circulator Pumps	Total for All Measures
Number of Units	61,836	242,049	6,433	315	66	5,788	825	317,312
Electrical Energy Savings								
Gross Electrical Energy Savings Without Interactive Effects and In-service Rates – at the Meter (GWh)	14.178	15.813	6.075	0.046	0.008	0.555	0.364	37.039
In-service Rate	1.00	0.85	1.00	1.00	1.00	1.00	1.00	-
Interactive Effects Factor*	0.952	0.964	1.000	1.091	1.000	1.036	1.000	-
Gross Electrical Energy Savings – at the Meter (GWh)	13.497	12.958	6.075	0.050	0.008	0.575	0.364	33.527
Line Loss Factor	1.0698	1.0698	1.0698	1.0698	1.0698	1.0698	1.0698	-
Gross Electrical Energy Savings – at the Generator (GWh)	14.439	13.863	6.499	0.054	0.009	0.615	0.389	35.867
Effective Useful Life (years)	4.8	4.8	4.5	1.0	10	10	15	4.9
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	69.307	66.542	29.244	0.054	0.091	6.149	5.835	177.221
Peak Demand Savings								
Gross Non-peak Demand Savings Without Interactive Effects, In-service Rates, and Peak Coincidence Factors – at the Meter (MW)	3.369	3.757	1.407	0.011	0.002	0.132	0.056	8.734
In-service Rate	1.00	0.85	1.00	1.00	1.00	1.00	1.00	-
Peak Coincidence Factor	0.60	0.60	1.00	0.60	1.00	0.60	1.00	-
Interactive Effects Factor	0.820	0.849	1.000	1.000	1.000	1.000	1.000	-
Gross Peak Demand Savings – at the Meter (MW)	1.658	1.626	1.407	0.007	0.002	0.079	0.056	4.835
Line Loss Factor	1.0817	1.0817	1.0817	1.0817	1.0817	1.0817	1.0817	-
Gross Peak Demand Savings – at the Generator (MW)	1.793	1.759	1.522	0.007	0.002	0.086	0.061	5.231
*The interactive effects factors for LED linear fixtures and LED linear lamps were drawn from the 2025 DSM MA, adjusted by the proportions of LED recessed lamps and fixtures in Instant Rebates 2025 tracking sheet.								

Figure 10 below compares the tracked and evaluated gross electrical energy savings, while Figure 11 further below compares the tracked and evaluated gross peak demand savings.

The slight differences between tracked and evaluated gross electrical energy savings as well as between tracked and evaluated gross peak demand savings were due to updated energy and demand line loss factors for all measures, updated interactive effects factors for lighting measures and occupancy sensors, and updated unitary energy savings values for circulator pumps.

Figure 10: 2025 Instant Rebates Tracked and Evaluated Gross Electrical Energy Savings at the Generator

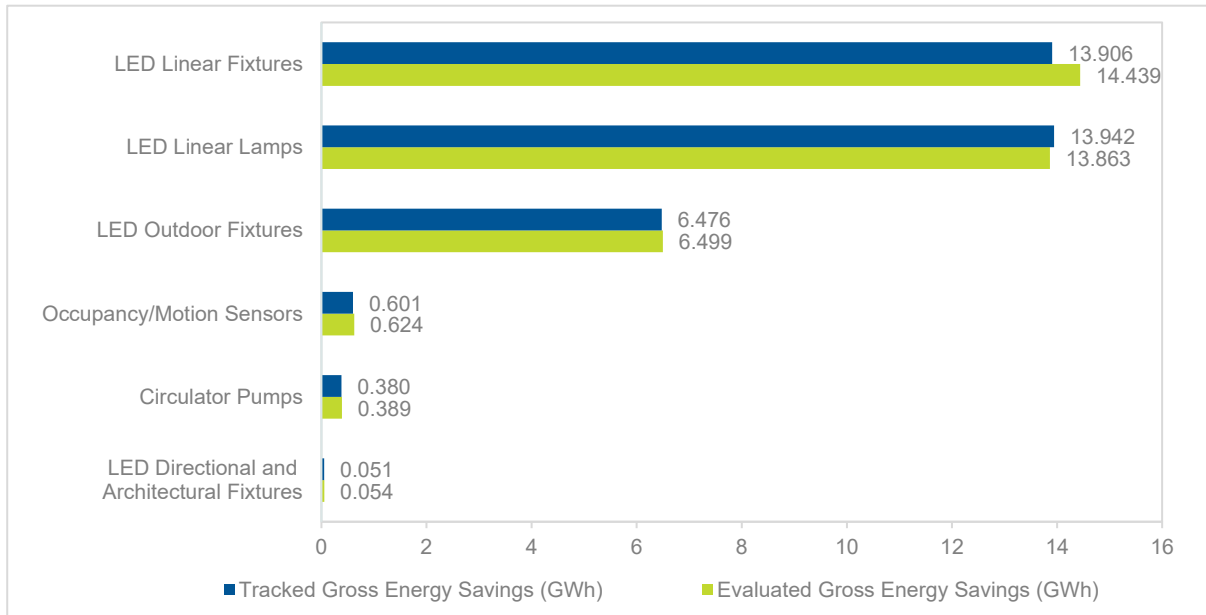
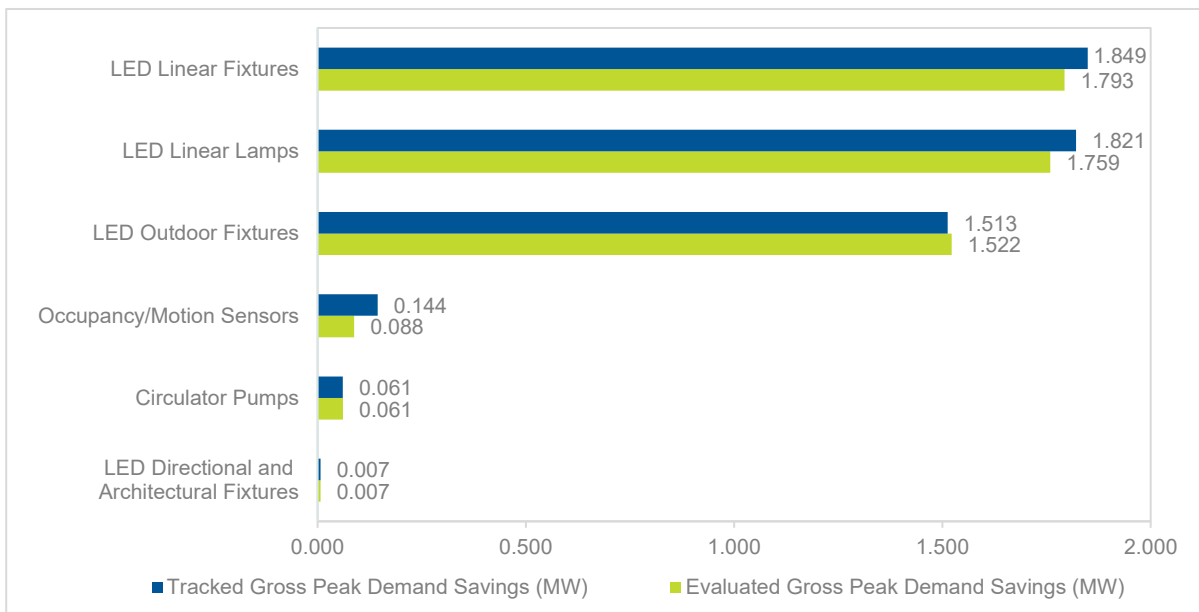


Figure 11: 2025 Instant Rebates Tracked and Evaluated Gross Peak Demand Savings at the Generator



As presented in Table 19, GHG emission reductions were calculated by applying the Nova Scotia-specific factor¹⁴ for GHG emissions generated by electricity production to Instant Rebates gross savings.

Table 19: 2025 Instant Rebates Evaluated Gross GHG Emission Reductions

	Total
Gross Energy Savings – at the Generator (GWh)	35.867
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO2 eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO2 eq)	16,832

4.3 Net Savings

The Evaluator determined the net energy savings, i.e. the electrical energy savings that can be reliably attributed to a service, by estimating the NTGR. In the case of Instant Rebates, the NTGR is established by considering free-ridership.

4.3.1 Free-ridership

For Instant Rebates, free-ridership corresponds to the proportion of savings attributed to natural market trends. Thus, the free-ridership assessment is aimed at estimating the level of sales of energy efficient products that would have occurred in a market that evolved naturally, i.e. without service influence. To do so, a self-report approach that involved asking both participants and distributors sets of questions during telephone interviews was used. Participants were asked if they would have paid for the full cost of the products they bought and if they had the same efficiency level and the same number of products. In addition, the Evaluator considered distributor influence to capture midstream service influences on aspects like product promotion and stocking.

Since no data collection aimed at updating the free-ridership level was conducted in 2025, the Evaluator used the 2024 free-ridership levels.

4.3.2 Net-to-gross Ratio

The NTGR is calculated using the following equation.

$$NTGR = (1 - \% \text{ Free-ridership})$$

As presented in Table 20 below, the NTGRs for the main measure categories were established using the 2024 free-ridership levels. For the other measures sold through Instant Rebates, a NTGR of 1.00 was used.

¹⁴ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO2 eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed August 26, 2025) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).

Table 20: 2025 Instant Rebates Evaluated NTGRs

Measure	Free-ridership	NTGR
LED Linear Fixtures	8%	0.92
LED Linear Lamps	15%	0.85
LED Outdoor Fixtures	15%	0.85
Other Measures	0%	1.00

4.3.3 Evaluated Net Savings

Net savings are defined as the changes in energy use that are specifically attributable to Instant Rebates. Net savings were estimated by applying the NTGR presented above to evaluated gross savings as exemplified in the following equation.

$$\text{Net Savings} = \text{Evaluated Gross Savings} \times \text{NTGR}$$

Net electrical energy savings were first calculated separately for each measure category because NTGRs differed from one measure category to another.

Table 21 below presents the calculation details. The net electrical energy savings resulted in 14,857 tonnes of CO₂ eq in net annual GHG emission reductions.

Table 21: 2025 Instant Rebates Evaluated Net Electrical Energy and Peak Demand Savings

Measure Category	LED Linear Fixtures	LED Linear Lamps	LED Outdoor Fixtures	LED Directional and Architectural Fixtures	Outdoor Motion Sensors	Indoor Occupancy/ Motion Sensors	Circulator Pumps	Total for All Measures
Electrical Energy Savings								
Gross Electrical Energy Savings – at the Meter (GWh)	13.497	12.958	6.075	0.050	0.008	0.575	0.364	33.527
NTGR	0.92	0.85	0.85	1.00	1.00	1.00	1.00	-
Net Electrical Energy Savings – at the Meter (GWh)	12.417	11.015	5.163	0.050	0.008	0.575	0.364	29.592
Line Loss Factor	1.0698	1.0698	1.0698	1.0698	1.0698	1.0698	1.0698	-
Net Electrical Energy Savings – at the Generator (GWh)	13.284	11.783	5.524	0.054	0.009	0.615	0.389	31.658
Effective Useful Life (years)	4.8	4.8	4.5	1.0	10	10	15	5.0
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	63.762	56.561	24.857	0.054	0.091	6.149	5.835	157.309
Peak Demand Savings								
Gross Peak Demand Savings – at the Meter (MW)	1.658	1.626	1.407	0.007	0.002	0.079	0.056	4.835
NTGR	0.92	0.85	0.85	1.00	1.00	1.00	1.00	-
Net Peak Demand Savings – at the Meter (MW)	1.525	1.382	1.196	0.007	0.002	0.079	0.056	4.248
Line Loss Factor	1.0817	1.0817	1.0817	1.0817	1.0817	1.0817	1.0817	-
Net Peak Demand Savings – at the Generator (MW)	1.650	1.495	1.294	0.007	0.002	0.086	0.061	4.595

4.4 Realization Rate

Table 22 compares total tracked and evaluated savings for Instant Rebates. It also includes the realization rates, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings.

Table 22: Comparison of 2025 Instant Rebates Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR*	Net Savings		Realization Rate
	Value	Unit		Value	Unit	
Electrical Energy Savings						
Tracked Savings by E1	35.357	GWh	0.88	31.181	GWh	102%
Evaluation Results	35.867	GWh	0.88	31.658	GWh	
Peak Demand Savings						
Tracked Savings by E1	5.394	MW	0.88	4.746	MW	97%
Evaluation Results	5.231	MW	0.88	4.595	MW	
* The average NTGR values presented in this table correspond to the ratios of net savings to gross savings for Instant Rebates.						

The evaluated net electrical energy and peak demand savings were respectively 2% higher and 3% lower than the values tracked by E1. Similarly to gross savings, these differences are explained by the updated line loss factors, interactive effects factors, and unitary energy savings values for circulator pumps.

5 Overall BER Results

As outlined in Figure 12, BER exceeded the planned net electrical energy savings by 5% and fell short of the planned peak demand savings target by 26%.

Figure 12 : 2025 BER Targeted and Evaluated Net Electrical Savings

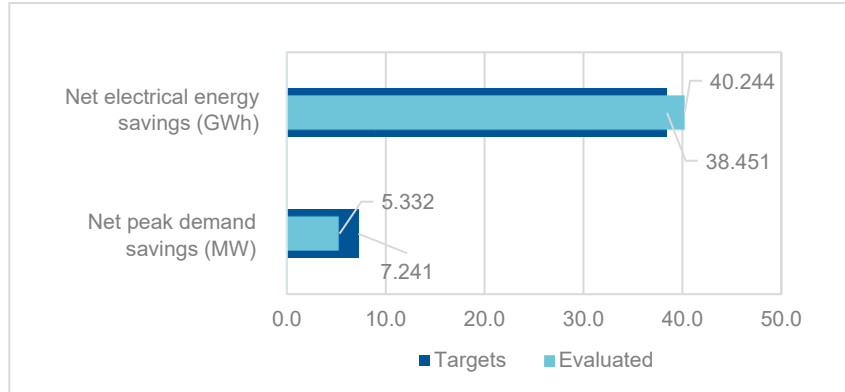


Table 23 compares the savings tracked by E1 to the 2025 evaluated savings for BER along with the corresponding realization rates.

Table 23: Comparison of 2025 BER Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR*	Net Savings		Realization Rate
	Value	Unit		Value	Unit	
Electrical Energy Savings						
Tracked Savings by E1	44.659	GWh	0.85	38.065	GWh	106%
Evaluation Results	45.081	GWh	0.89	40.244	GWh	
Peak Demand Savings						
Tracked Savings by E1	6.181	MW	0.86	5.328	MW	100%
Evaluation Results	6.046	MW	0.88	5.332	MW	
*Different NTGRs were established for Application Rebates and Instant Rebates. The average NTGR values presented in this table correspond to the ratios of net savings to gross savings for both services.						

While the evaluated net electrical energy savings established through this evaluation were 6% higher than the value tracked by E1, the evaluated net electrical peak demand savings were almost identical to the value tracked by E1. The differences are due to updated NTGR values and adjustment ratios for Application Rebates as well as updated line loss factors, interactive effects factors, and unitary energy savings values for Instant Rebates.



6 BER Market Evolution

E1 has been active in the light-emitting diode (LED) market of the business, non-profit, and institutional (BNI) sector through Business Energy Rebates (BER) since 2010. Market evolution assessments of the BNI lighting market were completed as part of the 2017, 2018, 2019, 2021, and 2024 evaluations.

The 2024 BER evaluation included a recommendation that E1 undertake additional research to further validate the 2024 market evaluation results to establish, no later than Q3 when the LED baseline for BER Instant Rebates (BER-IR) LED fixtures should take effect. This will be accomplished by looking at the potential risk of the fixture market rebounding from reducing or removing the IR incentives from the Nova Scotia market by examining the New Brunswick market as a comparator.

The main purpose of the study conducted under this assignment was to confirm the findings of the 2024 market evolution assessment. The study was focused on three groups of LED lighting products incentivized by BER-IR:

- › LED linear lamps (as of June 15, 2025, rebates are no longer offered for linear T8 LEDs in both BER-IR and BER-AR programs)
- › LED fixtures
- › LED outdoor fixtures

6.1 BER-IR Lighting Market Study Results

The results of interviews conducted with New Brunswick distributors and one non-participating Atlantic Canada distributor to gauge the market evolution of LED fixtures and lamps is explored first in this section. followed by the results of a jurisdictional scan of eight North American jurisdictions that currently offer business lighting rebates or did so in the past. The findings from one interview with program administrators at Mass Save is included in Section 6.3.

6.2 Sales of LED Lighting Technologies

The Evaluator asked interviewed distributors about recent changes in the commercial lighting market, current and anticipated LED stocks. and DLC certified fixtures. Results are discussed below, first for participating distributors and then for the non-participating distributor.

6.2.1 Trends in the New Brunswick Commercial Lighting Market

General LED Market Changes

The Evaluator asked distributors about changes they observed in the New Brunswick lighting market in the last three years. Therefore, the views expressed reflect the market prior to the introduction of the MBRP.

The commercial **lighting market is both more efficient and more diverse than three years prior** according to participating distributors. Most distributors (4 of 6) said that LED products currently have higher lumen outputs and lower wattages than in 2022, reflecting efficiency gains. Distributors (3 of 6) also noted increased integration of controls and sensors in LED products and a shift in technological innovation toward fixtures rather than lamps. For example, one distributor said, “*New technologies are more developed on the fixtures side...there are some improvements in lamps but not as much.*” Another distributor remarked on the growing number of colour options.



LED Lighting Demand

Most distributors (4 of 6) said there was no significant change in demand, noting demand was already high, while others (2 of 6) noted that nearly all lighting demand is for LED products. **Fixture sales are generally on the rise, while lamp sales are declining.** One distributor reported that customers no longer ask for non-LED fixtures and that the types of non-LED lamps stocked has decreased from 20 to five in the last three years.

LED Product Mix

Most distributors (4 of 6) said a growing selection of LED product offerings are kept in stock especially for retrofit lighting and in specific fixture categories such as flat panels and bathroom lights. **Moreover, one distributor said that there is now an LED equivalent for nearly all traditional lighting options,** and one highlighted that growth in new product offerings has been more robust in the residential sector versus products offered in the commercial sector.

LED Availability

Most distributors (4 of 6) also said that **LED products are more readily accessible than in the past because of the increasing number of LED manufacturers.** However, one distributor has experienced delivery delays of up to 18 weeks due to US tariffs. Another noted challenges in replacing or servicing lighting when LED manufacturers exit the market. Another **key factor driving up LED inventory is the discontinuation of non-LED manufacturing;** one distributor said this is due to government climate policy.

LED Pricing Trends

Finally, most distributors (4 of 6) reported that **the price of LED fixtures has fallen, citing improved manufacturing and more competition.** Others (2 of 6) said prices recently increased due to US tariffs, while one described stable prices, and one mentioned small annual price increases linked to inflation.

Changes in LED Stocking Practices: 2022-2025

All distributors who sell lamps (5 of 6) report a decline in sales of linear and outdoor replacement lamps as more customers opt to replace entire fixtures with LED technology. A different trend is observed for high bay replacement lamps with two distributors reporting little to no replacement lamp sales, while the other three noted selling very few high-bay replacement lamps.

Lighting Special Ordering Practices

Six of the seven distributors interviewed for this study indicated that their LED versus non-LED special ordering practices match their general stocking practices. One distributor noted that they order only slightly more non-LEDs via special order (20% non-LEDs via special order versus 15% non-LEDs in stock). When asked what types of non-LEDs are typically special ordered, distributors indicated that mainly specialty decorative lighting is ordered along with some high-density discharge lighting and fluorescent T5s and T8s.



Laggard Market Customer Types

Through this research, the Evaluator determined that there are mainly **three customer types that continue to use non-LED lighting**. The first group includes **organizations with limited capital**, such as churches, non-profit organizations, retirement homes, small businesses, and businesses that rent their space. The second group consists of **institutional customers**, such as schools and hospitals, that are more likely to operate under maintenance contracts that extend the use of existing lighting systems. The third group is comprised of **large industrial customers whose facilities often require more complex and involved decision-making processes**, slowing the transition to LED lighting. All four distributors still stocking non-LED options said they do so specifically for the needs of these customer types.

6.2.2 Evolution of LED Versus Non-LED Lighting Products Stocked

To understand the availability of LED versus non-LED products in New Brunswick prior to the launch of MBRP, the Evaluator asked New Brunswick (N.B.) distributors what proportion of their 2025 lighting stock was LED versus non-LED for each product category. Distributors were then asked how they expected their forecasted lighting sales to evolve in the next two years.

The shares of lighting stocked by distributors that is LED versus non-LED and anticipated shares in the coming years are presented below. **Overall, distributors reported carrying a large majority of LED lighting products; two distributors reported carrying only LED lighting in 2025 (prior to the MBRP), three indicated that between 95% and 98% of their lighting inventory are LED, and one said 85% are LED.**¹⁵ No distributor reported any change in the proportion of LED lighting they carry since joining the MBRP, citing the recent program launch. Results by measure are presented in Figure 13 below.

¹⁵ This distributor said, "We can no longer source non-LED fixtures." This indicates their remaining non-LED stock is comprised of only lamps as the question on the survey was posed to include the % of both fixtures and lamps.

Figure 13: 2025 LED Lighting Stock and Expected Evolution



Distributors generally expect the proportion of LED fixtures in their inventory to remain stable or increase slightly in the near future, reaching 100% of their fixture stock by 2026-2027 as they sell through discontinued non-LED products. **Nearly all stocked linear fixtures are reported by all six distributors as LED (99%). All six participating distributors exclusively carry LED outdoor fixtures and LED high bay fixtures.**

Two distributors said they no longer carry any non-LED products. Overall, **the proportion of LED lighting has increased across lighting categories over the past three years**, driven primarily by the improved price competitiveness of LED products compared to traditional lighting; one distributor stated that, for all lighting categories, non-LED prices are higher than LED prices.

There is variability in the proportion of LED lamps carried across distributors. LED accounts for 95% to 100% of linear lamps for three distributors, while two others reported much lower LED shares (35% and 53%) (5 of 6 distributors interviewed). Most distributors reported LED shares for outdoor (5 of 6) and high bay replacement lamps (6 of 6) of between 95% and 100%.

The proportion of LED lamps in inventories is expected to increase over the next two years. For linear lamps, one distributor anticipates their LED lamp inventory will increase from the current 35% to 50% by 2027 and that the amount of the increase will be tied to rebate levels. Another distributor who anticipated their linear lamp inventory would increase from the current 53% to 95% in 2027 said the increase would be due to manufacturers producing fewer non-LED units. In contrast, all other distributors (4 of 6) expect their LED inventory for linear lamps to reach between 95% and 100% within the next two years, with two anticipating a complete transition to 100% LED by 2030.

One distributor does not plan to carry LED outdoor and high bay replacement lamps due to a lack of program rebates for these products and because program fixture rebates make it more attractive for customers to simply replace fixtures rather than lamps. The other three that still stock non-LED lamps in these categories expect to transition to 100% LED by 2027. Two other distributors also expect to transition to 100% LED for these products due to the improved cost-competitiveness of LED products and fewer manufacturers making non-LEDs.

Similarly, the non-participating distributor shared that they **have seen steady improvements in fixture and lamp efficiencies, and demand has trended toward fixtures rather than lamps** largely due to more competitive pricing. LED product availability has remained stable as lighting was not significantly affected by the COVID-19 pandemic. LED product prices increased during the pandemic but have since regressed and are close to pre-pandemic levels. **This distributor stated that there are no meaningful differences between LED prices in Nova Scotia and New Brunswick.**

These results indicate that New Brunswick LED stocking practices are very similar to those in Nova Scotia. In both markets, LEDs represent all or nearly all stocked fixtures (99-100%). Lamp shares are slightly lower in New Brunswick, but they still represent a large majority of the stock (80% in N.B. compared to almost 90% in Nova Scotia).

Table 24: Non-Participating Distributor, 2025 Proportion of LED Lighting Supplied

	LED (%)	Non-LED (%)
Overall	85	15
Nova Scotia	90	10
New Brunswick	80	20

The non-participating distributor supplies only LED fixtures in both Nova Scotia and New Brunswick. In contrast, just over half of lamps supplied in Nova Scotia are LED, while this proportion is much lower in New Brunswick, as indicated in Table 25 below. Supplies of LED lamps have increased in both provinces since 2022 due to the phasing out of non-LED lamps and better LED prices.

Table 25: Proportion of LED Lighting Supplied in 2025 by Category and Province

Lighting Category	LED in NS (%)	LED in NB (%)
Linear fixtures	100	100
Linear lamps	55	30
Outdoor fixtures	100	100
Outdoor replacement lamps	60	20

The non-participating distributor reported an **increase in demand for LED linear lamps and outdoor replacement lamps as non-LED options are phased out of the market.**

6.2.3 DesignLights Consortium (DLC) Certified Fixtures

Nearly all fixtures (98-99%) offered by all six participating distributors interviewed are DLC-certified, with no differences in shares of distributor stocks before and after joining the MBRP.

Moreover, three distributors said they were unable to differentiate between DLC Standard and Premium products. with one remarking that, “No one has been able to tell me what DLC Premium means, but all we carry is DLC. for sure.” The average shares of DLC-certified lighting stocked by these three distributors before joining the program were 99% for linear, 98% for outdoor, and 100% for high bay fixtures.

The other three distributors said they carried almost entirely DLC-certified products before joining the program, with some differences between shares of DLC Standard and Premium across lighting categories.

Table 26: Participating Distributors - Average DLC Shares Stocked

Lighting Category	% DLC Standard	% DLC Premium	% NOT DLC Certified
Linear fixtures (n=3)	55	43	2
Outdoor fixtures (n=3)	48	50	2
High bay fixtures (n=3)	32	67	2

Lighting distributors (4 of 6) reported that, after program rebates, DLC Standard-certified LED fixtures typically cost less than non-DLC-certified products. Some distributors (3 of 6) indicated that their inventory is almost exclusively DLC-certified, making direct price comparisons with non-DLC products difficult. Some said that nearly all their sales consist of DLC Standard fixtures (3 of 6), with only a small proportion attributed to DLC Premium models; they also said they lack information on the price differences between these categories.

Opinions among distributors were mixed on the topic of DLC Premium and DLC Standard pricing patterns and the impact of rebates on pricing differences between the two categories. For DLC Premium fixtures, some distributors observed that their prices remain higher than those of DLC Standard products even after rebates¹⁶, although prices are still lower than those of non-DLC options in some cases. Other New Brunswick distributors expressed unfamiliarity with the distinction between DLC Standard and Premium certifications or noted limited communication from the program about these categories, resulting in uncertainty about actual price impacts.

¹⁶ The only lighting category where the incentive level differs in the MBRP is for high bay fixtures.

Similarly, **all fixtures supplied by the non-participating distributor are DLC-certified, with most being DLC Standard.** The proportion is higher for outdoor fixtures compared to linear fixtures. The situation is the same in both provinces, as indicated in Table 27.

Table 27: Non-participating Distributor – Average DLC Shares Stocked

Lighting Category	Nova Scotia			New Brunswick		
	DLC Standard (%)	DLC Premium (%)	Non-DLC (%)	DLC Standard (%)	DLC Premium (%)	Non-DLC (%)
Linear Fixtures	60	40	0	60	40	0
Outdoor Fixtures	75	25	0	75	25	0

6.2.4 Distributor Reasons for Continuing to Stock Non-LED Lighting

Participating distributors that still carry non-LED lighting were asked to explain why they do so. While all distributors now stock only LED options for outdoor and high-bay fixtures, two distributors continue to carry non-LED fixtures, and four continue to carry non-LED versions of linear, outdoor replacement, and high-bay replacement lamps. According to **these distributors, they continue stocking some non-LED inventory to serve customers who are either unwilling or unable (for financial or other reasons) to undertake a full LED retrofit** and instead seek replacement lamps or fixtures.

According to the non-participant distributor, the reasons for still carrying non-LED linear lamps and outdoor replacement lamps are similar and consistent across provinces. New fixtures remain more expensive than replacement linear lamps, which explains why some businesses continue to seek non-LED lamp options. In certain applications such as lamps installed in explosion-proof fixtures, non-LED lamps are still better suited. Additionally, some businesses are not yet ready to fully retrofit their fixtures for cost reasons. while smaller operations may simply be unaware of the availability of LED lighting. **In New Brunswick, one distributor noted that the previous lack of incentives for LED lamps also may have hindered the adoption of this technology among the laggard market segments.**

In both provinces, participating distributors reported that customers are most likely to purchase non-LED lighting include large industrial businesses that are less likely to undertake large retrofit projects unless necessary for their operations as well as smaller businesses, non-profits, and institutions that may be unaware of availability of LED lighting or may not have the financial means to undertake a retrofit. The non-participating distributor supplies non-LED lighting specifically to meet the needs of these customer segments.

Participating distributor quote:

“Large industrial customers [...] everything is LED. but they are not fast on doing capital work for renovation. If you have to change a fixture. it has to go through an engineering review and with manpower constraints they are more [focused on] production than changing all of the fixtures to LED. The slower moving industrials are still using old technology.”

6.3 Jurisdictional Scan

This subsection outlines the results of a jurisdictional scan of eight North American jurisdictions that served to examine current commercial and industrial lighting program offerings, baseline assumptions, and recent changes to program offers. The jurisdictions reviewed are Mass Save (MA), Efficiency Maine, the Independent Electricity System Operator (IESO, Ontario), Hydro-Québec, Central Hudson (NY), Efficiency Vermont, Puget Sound Energy (WA), and ComEd/Illinois. Table 28 below provides an overview of the types of programs reviewed and any recent or upcoming notable program changes. The highlighted cells in the table below indicate which types of business lighting programs are currently offered in each jurisdiction (in blue) along with program types previously offered in jurisdictions where incentives have been discontinued (in teal).

Table 28: Summary of Jurisdictional Scan Findings by Region

Program Administrator	Region	Instant Rebate Program	Application Rebate Program	Custom Program	Direct Install	LED Incentives Continuing in the Near Term?
1. National Grid (Mass Save)	Massachusetts, USA	Lighting controls	Lamp and fixture (linear, high-bay, and exterior) lighting controls ¹⁷	Lighting controls		✗
2. Efficiency Maine	Maine, USA	Lamp and fixture (linear, high-bay, and exterior) lighting controls	Lamp and fixture (linear, high-bay, and exterior) lighting controls	Lamps and fixtures (linear, high-bay, and exterior) lighting controls		✓ ¹⁸
3. IESO	Ontario, Canada	Lamp and fixture (linear, high-bay, and exterior) lighting controls	Lamp and fixture (linear, high-bay, and exterior) lighting controls	Lamps and fixtures (linear, high-bay, and exterior) lighting controls		✓ ¹⁹
4. Hydro-Québec	Quebec, Canada		Fixtures (linear, high-bay, and exterior) lighting controls	Fixtures (linear, high-bay, and exterior) lighting controls		? ²⁰
5. Central Hudson	New York, USA		Lamp and fixture (linear, high-bay, and exterior) lighting controls		Linear lamps	✗
6. Efficiency Vermont	Vermont, USA		Lamp and fixture (outdoor) lighting controls			✗
7. Puget Sound Energy	Washington State, USA	Lamps and fixtures (linear, high-bay, and exterior)	Lamp and fixture (linear, high-bay, and exterior) lighting controls			✓ ²¹
8. ComEd	Illinois, USA	Fixture (linear, high bay, and exterior) lighting controls		Lamp and fixture (linear, high-bay, and exterior) lighting controls ²²		✓
Total Programs Reviewed		5	7	5	2	

¹⁷ Only available for certain market segments.

¹⁸ LED assumptions are based on a 2009 study and have not been updated in the most recent DSM plan in this jurisdiction.

¹⁹ The IESO informally indicated, at a roundtable session held at the 2025 Retrofit Canada Conference in June 2025, that LED incentives are likely to be phased out in Ontario in the next few years.

²⁰ Hydro-Québec has also recently announced upcoming changes to their lighting incentives with more details to be provided at a later date.

²¹ Programs are being maintained; however, Puget Sound has moved to a dual baseline approach with a declining EUL.

²² ComEd also offers a lighting design support program.

Several jurisdictions (5 of 8) have already reduced or announced phase-outs of traditional lighting measures. Effective in January 2025, Mass Save removed lighting rebates for fixtures and lamps from its midstream program, with only controlled lighting measures eligible for rebate. Industry-specific laggards (municipal and small business) are still eligible for general lighting rebates through a targeted application-based program. Even considering this recent change, incentives for networked and luminaire-level lighting controls were further reduced in September 2025. As per a New York State Public Service Commission mandate, Central Hudson (NY) will stop accepting new applications for commercial lighting rebates by the end of 2025 and will end payments for existing claims by the end of 2026. Central Hudson is also actively reviewing baselines for some fixtures to reflect new federal efficiency standards. In 2024, Efficiency Vermont increased rebates to target late adopters, but the utility announced in May 2025 that it would be eliminating all lighting rebates in the coming months. Illinois still offers rebates; however, due to minimum efficiency guidelines published in the Illinois TRM, savings cannot be claimed for screw-in lamps and many fixtures unless documentation demonstrating that the rebate is being claimed in an early replacement scenario is provided. Hydro-Québec still offers rebates for many types of lighting; however, the maximum rebate is \$5.00 for most lighting types, potentially indicating that the savings to be claimed from these products have diminished.²³ The IESO in Ontario still offers lighting incentives under their current DSM plan but has shared that changes to their lighting incentive strategy are being contemplated for the coming years.

An interview was conducted with Mass Save program staff to discuss their decision to shift their new portfolio and DSM plan toward lighting controls-only programming as of 2025. Mass Save indicated that their new DSM plan is focused on achieving 2030 greenhouse gas (GHG) emission savings targets. However, with the decreasing EUL of LED fixtures and lamps, Mass Save determined that there would be minimal contribution toward their GHG target as this target only includes measure lifetime savings. To prepare for the program change, lighting incentives were reduced prior to the market notice period regarding an upcoming change in LED rebates. Distributors received notice in early 2023 that changes to the midstream lighting program would be coming in late 2024/early 2025 with many engagement touchpoints throughout 2024. While there was discontent among distributors, many large distributors have remained in the program and only those who do not carry lighting control products²⁴ have exited the program. Follow-up research studies or outreach on current market conditions following the discontinuation of lighting rebates has not been conducted due to the policy shift toward GHG emission reductions. Mass Save continues to offer lighting incentives to difficult-to-reach markets through an application-only program (non-profits, municipalities, and small businesses). Mass Save has refocused their portfolio of business programs toward electrification and retro-commissioning in the new DSM plan.

²³ Hydro-Québec offers a flat rate \$5 rebate for DLC standard fixtures and \$40 for DLC premium fixtures.

²⁴ Mass Save has received anecdotal feedback that many distributors, contractors, and building operators are still not familiar enough with lighting control products and have a certain level of discomfort recommending them to their customers.



6.3.1 Baseline Approach and Effective Useful Life (EUL) Assumptions for Application Programs

The Evaluator also investigated the baseline approach and EUL assumptions utilized for LED lighting in midstream and application rebate programs for the eight jurisdictions included in a jurisdictional scan.

Three primary baseline types are currently in use across jurisdictions. as follows.

Existing Lighting Baseline: Savings are calculated against the savings attributable to the installed equipment (often fluorescent or earlier generation LEDs). This is the baseline used by Efficiency Maine, Efficiency Vermont, Mass Save, Central Hudson, and Illinois (early replacement only). It should be noted that Efficiency Maine has not updated sections related to lighting measures in their TRM since 2009 so some assumptions likely do not take into account recent LED market changes. Illinois uses an existing lighting baseline. However, for screw-in bulbs and ENERGY STAR fixtures, Illinois requires documentation attesting that lighting was still operational (i.e. early replacement) for savings to be claimed; otherwise, they assume an LED baseline for these lighting measures.

Efficiency Maine, the IESO, and ComEd use an EUL assumption equal to the lifetime of the new measure. Central Hudson and Efficiency Vermont also use an EUL assumption equal to the lifetime of the new measure; however, they are sunsetting their programs in 2026, implying they expect low savings from these programs due to LED market transformation post-2026.

- › An existing lighting baseline with an EUL equal to the lifetime of the measure is currently used to determine savings for BER-AR lighting measures, as documented in the 2024 Measure Assessment. This approach does not take into account LED fixture market transformation that has occurred in Nova Scotia.

Market Blend Baseline: A baseline is developed based on a weighted average of what is currently installed and what is being sold in the market. The baseline estimates a proportion of projects at end of life versus early replacement and assumes a different baseline for each case. This is the approach used by the IESO, with baseline efficiencies calculated as a blend of fluorescent and LED sales in the calculation.²⁵ Puget Sound Energy (PSE) applies a dual baseline approach and assumes that existing equipment would have continued to be operable for a further one-third of its lifetime. For this period, savings are calculated using the existing equipment as the baseline. Using a one-third assumption for the remaining life in early replacement is consistent with Chapter 2 of the Uniform Methods Project (UMP) regarding developing an early replacement baseline.²⁶ For the remainder of the efficient equipment lifetime, PSE assumes a market blend baseline. The blend of technologies assumed in the market blend baseline varies by measure and is forecast to be 100% LED for most lighting measures by 2029.

- › A market blend baseline can account for LED fixture market transformation. It is somewhat more complicated to implement as data or assumptions are required to establish the market blend and also requires an assumption on when LED fixtures would be the baseline for all project types.

Dual Baseline: Savings are calculated based on the actual installed equipment for a given period and then assumes an LED baseline (i.e. zero savings) for the remainder of the lifetime of the measures. Mass Save's program uses this approach; they assume a LED baseline for their application rebates program measures until 2029, so the EUL is four years for lighting measures in 2025 and will decrease by one year until 2029. PSE also applies a dual baseline approach, although with a market blend baseline as described above.

²⁵ The IESO uses a blend of non-LED measures for their fixture baseline and LED is one of the technologies included in the mix of measures included in the baseline assumptions for linear lamps.

²⁶ Chapter 2 of the Uniform Methods Project (UMP). Gowans, D.; Telarico, C. (2017). Chapter 2: Commercial and Industrial Lighting Evaluation Protocol, The Uniform Methods Project: Methods for Determining Energy-Efficiency Savings for Specific Measures. Golden, CO; National Renewable Energy Laboratory. NREL/SR-7A40- 68558. <http://www.nrel.gov/docs/fy17osti/68558.pdf>.

- › The dual baseline approach accounts for LED fixture market transformation and is simple to implement. EUL assumptions may be based on projects targeted by a given program (e.g. early replacement) and/or an agreed upon date when it is assumed that LED fixtures is the baseline for all project types (even early replacement).

The Table 29 below details the baseline approach and EUL assumptions utilized by each jurisdiction for their application rebate programs. Across the jurisdictions included in this study, the Evaluator did not find any references indicating that a different baseline approach for LED fixtures or lamps is utilized by program type (application. instant. etc.) within one jurisdiction.

Table 29: Jurisdictional Scan. Baseline. and EUL Assumptions

Program Administrator	Region	Program Type	Existing Lighting Baseline	Market Blend Baseline	Dual Baseline
Efficiency One	Nova Scotia. Canada	Instant. application	✓ EUL = full lifetime of installed measure		
1. National Grid (Mass Save)	Massachusetts. USA	Application. custom			✓ ²⁷ Existing lighting to 2029. LED after that. EUL at 4 years. decreasing each year.
2. Efficiency Maine	Maine. USA	Instant. application. custom	✓ ²⁸ EUL = full lifetime of installed measure		
3. IESO	Ontario. Canada	Instant. application. custom		✓ EUL = full lifetime of installed measure	
4. Hydro-Québec	Quebec. Canada	Application. custom	<i>Not published</i>		
5. Central Hudson	New York. USA	Application. direct install	✓ EUL = full lifetime of lighting measure. program sunset by 2026		
6. Efficiency Vermont	Vermont. USA	Application	✓ EUL = full lifetime of lighting measure. program sunset by 2026		
7. Puget Sound Energy	Washington State. USA	Instant. application			✓ One-third of measure lifetime using the full lifetime of the installed measure. remainder market blend.
8. ComEd	Illinois. USA	Instant. custom. direct install	✓ EUL = full lifetime of installed measure ²⁹		

²⁷ Specific only to laggard market on the adoption curve.

²⁸ Measure assumptions have not been updated since 2009.

²⁹ ENERGY STAR fixtures and screw-in bulbs are only eligible for programs where it can be demonstrated that the measures are early replacement.



As illustrated by Table 29 above, the majority of jurisdictions (5 of 7³⁰) reviewed accounts for LED market transformation in their baselines (or their program plans in the case of Central Hudson and Efficiency Vermont). In addition, in response to LED market transformation, several jurisdictions are shifting their programs to ensure that they target early replacement (vs. end-of-life replacement) and laggard markets to ensure their efforts result in tangible savings.

Dual Baseline Approach for BER-AR and SBES

For SBES, since the target population is small businesses, Econoler assumes that the majority of projects is early replacement. Therefore, Econoler recommends using the UMP approach to develop a dual baseline, notably using the existing baseline for one-third of the lifetime of the existing measure and then using an LED baseline for the remainder of the efficient measure lifetime.

For BER-AR, the current program does not specifically target early replacement or market laggards. For this program, the Evaluator proposes two options to be selected based on considerations accounting for program design and operational feasibility:

Option 1: Focus BER-AR on market laggards and adopt eligibility criteria to ensure projects are early replacement (as seen in ComEd). In the case of ComEd, they require proof of early replacement in documentation provided by a contractor. If this is feasible, the Evaluator recommends using the UMP approach to develop a dual baseline, notably using the existing baseline for one-third of the lifetime of the existing measure and then using an LED baseline for the remainder of the efficient measure lifetime.

Option 2: If developing and enforcing eligibility criteria to ensure targeted projects are early replacement, a market blend baseline should be used that accounts for the proportion of projects aimed at early replacement versus end of life. The blended baseline would combine an LED baseline for the proportion of projects assumed to be at end of life and a baseline closer to the existing baseline for the proportion assumed for early replacement. For clarity, should an end-of-life LED lighting project receive a rebate under this option, there will be no savings attributable to that project.

The market should be monitored, and SBES and BER-AR should plan for full market transformation in the next three to four years (i.e. 2028-2029), meaning that there will be no further savings opportunity for both lamps and fixtures, including early replacement projects for SBES and BER-AR.

³⁰ One jurisdiction does not publish baseline information.



7 BER Key Findings and Recommendations

The main objectives of the 2025 BER evaluation were as follows:

- › Calculate BER gross and net results, namely first-year and lifetime electrical energy savings, peak demand savings, as well as avoided GHG emissions
- › Identify the implications of a baseline change for BER-AR and SBES
- › Validate 2024 market evaluation results and determine timing for when a LED baseline for BER-IR LED fixtures should take effect

This section provides the Evaluator's key findings and recommendations in relation to the above objectives. The recommendations are also outlined in Appendix IX.

2025 BER-Finding: BER exceeded the net electrical energy savings target by almost 5% and fell short of the net peak demand savings target by 26%.

BER achieved 40.244 GWh in net electrical energy savings and 5.332 MW in net peak demand savings at the generator in 2025, thus exceeding by 5% the planned net electrical energy savings of 38.451 GWh and falling short by 26% of the planned net peak demand savings of 7.241 MW.

2025 BER-Finding: Application Rebates participation as well as total gross electrical energy and peak demand savings decreased in 2025 compared to 2024 levels, while Instant Rebates achieved its highest participation rate since 2019, resulting in increased electrical energy and peak demand savings compared to 2024 levels.

Application Rebates participation decreased in 2025 with 36% fewer businesses participating, leading to an 8% reduction in gross electrical energy savings per participant. In 2025, 317,312 products were rebated through Instant Rebates, representing a 79% increase compared to 2024 levels. This increase is due to the promotion of T8 LED linear lamps in the first quarter of 2025, which increased LED linear lamp sales by 196% compared to 2024 levels in terms of number of products sold. Overall, BER gross electrical energy savings and peak demand savings decreased by 4% and 11% respectively between 2024 and 2025. This was mainly due to the decrease in Application Rebates participation.

2025 BER Finding: Following Application Rebates site visits, the Evaluator established updated adjustment ratios to track electrical energy and peak demand savings.

For lighting and HVAC measures, the adjustments resulted in positive adjustment ratios of 1.117 and 1.006 for electrical energy savings and 1.031 and 1.027 for peak demand savings, respectively. For agriculture, motor, pumping, refrigeration, and commercial kitchen measures, the Evaluator applied a combined adjustment ratio of 0.951 for electrical energy savings and 0.514 for peak demand savings. The higher-than-expected margin of error for the combined adjustment ratio for the peak demand savings, indicates that this value may not be reliable for future years.

Recommendation #1: Use the calculated adjustment ratios to track gross electrical energy and peak demand savings moving forward, with the exception of the 0.514 adjustment ratio for peak demand savings for non-lighting and non-HVAC measures. Reassess the electrical energy and demand adjustment ratios for agriculture, motor, pumping, refrigeration, and commercial kitchen measures in the 2026 evaluation after sampling additional projects in this group of measures. Recalculate adjustment ratio for electrical energy and demand savings specifically for agriculture and motor measures to determine whether standalone ratios are warranted.

2025-BER Finding: Application Rebates average free-ridership levels decreased in 2025 resulting in higher NTGR while spillover remained nil.

The Evaluator estimated the average NTGRs at 0.83 for HVAC, 0.94 for lighting and 0.91 for all other measure categories compared to an overall 0.74 for all measure categories in 2021 when it was last evaluated.

Recommendation #2: Moving forward, use the updated measure-level NTGR values to convert gross electrical energy and peak demand savings into net savings for reporting and evaluation purposes.

2025 BER-Finding: Application Rebates evaluated net electrical energy and peak demand savings were respectively 25% and 27% higher than the values tracked by E1. For Instant Rebates, evaluated net electrical energy savings were 4% higher than tracked results, while evaluated net peak demand were 6% lower than tracked results.

The differences between tracked and evaluated savings in Application Rebates are mainly attributed to the decrease in free-ridership levels. The evaluated savings were also impacted by updated adjustment ratios applied by the Evaluator pursuant to on-site visits. The differences between tracked and evaluated savings in Instant Rebates are explained by the updated line loss factors, interactive effects factors, and unitary energy savings values for circulator pumps.

2025-BER Finding: Application Rebates tracking sheet adjustments resulted in increases of 0.06% in gross tracked electrical energy savings and 0.02% in gross tracked peak demand savings.

The Evaluator verified wattages for multi-wattage fixtures. Very few corrections were required, indicating that DLC wattages generally reflect high-setting values and are reliable for evaluation purposes. Moreover, adjustments to interactive effects factors were made to account for recessed fixtures. Tracking sheet data indicate that only troffers were identified as recessed fixtures, suggesting that the program's recessed-fixture installations consist exclusively of troffers and that other recessed fixture types are not currently being installed.

Recommendation #3: Continue to use DLC wattages as the efficient wattage values for multi-wattage products. Rather than track whether each fixture is multi-wattage, conduct periodic spot checks, particularly on large applications, to confirm the accuracy of DLC wattage listings and identify any cases that may require correction.

Recommendation #4: Rather than track whether a fixture is recessed in Application Rebates, adopt an assumption that recessed fixtures are limited to troffers, which is consistent with practices in BER-IR, and apply the recessed interactive effect factors to troffers only.

2025-BER Finding: Application Rebates adjustment ratios were found to be embedded directly in the tracking sheet gross electrical energy and demand savings fields, thereby increasing the risk of misinterpretation or calculation errors.

Recommendation #5: Apply adjustment factors separately rather than embedding them in gross values and record the adjusted results in dedicated fields in the tracking sheet to improve transparency and reduce error risks.



2025 BER-IR Finding: Average interactive effects factors calculated for Instant Rebates were similar to those used in the 2024 evaluation.

In the 2025 evaluation, average interactive effects factors were updated for LED linear lamps, LED linear fixtures, LED directional and architectural fixtures, as well as indoor occupancy/motion sensors following the application of the 2024 interactive effects methodology and using the updated interactive effects factors per facility type. The updated average interactive effects factors were similar to tracked factors for all measures, except for indoor occupancy/motion sensors that had had negative tracked factors and then had positive evaluated factors after the update. This was because most buildings participating in Application Rebates and SBES in 2025 had non-electrical or no heating.

2025 BER-Finding: According to participant distributors, the New Brunswick commercial lighting market has become more energy efficient and diverse over the past three years.

These results indicate is increased integration of controls and sensors in LED products and a shift in technological innovation toward fixtures rather than lamps. Furthermore, prices have generally declined mainly due to increased competitiveness.

2025 BER-Finding: New Brunswick distributors and one non-participant distributor in Nova Scotia reported that the fixture market has been transformed to LED. Distributors indicate that non-LED options for fixtures are now rare, reporting that their entire stocks of outdoor and high-bay fixtures and 99% of linear fixtures are LED.

Distributors reported that manufacturers no longer supply non-LED alternatives and expect the proportion of LED fixtures in their inventory to remain stable or increase slightly by 2026-2027.

2025 BER-Finding: The market findings in New Brunswick indicate that a rebound effect is unlikely from discontinuing incentives in BER-IR for LED fixtures in Nova Scotia.

Recommendation #6: Update the baseline for LED fixtures in 2026 to reflect that the market stocking practice has become LED only. This baseline would apply to all LED fixtures rebated through BER-IR.

2025 BER-Finding: Nearly all fixtures offered by participating distributors are DLC-certified, with no differences in inventory stocking practices before and after joining the MBRP. Some distributors said they were unable to differentiate between DLC Standard products and DLC Premium products.

Given this finding, the Evaluator hereby updates its 2024 recommendation on the LED baseline.

Recommendation #7: When the new LED baseline is applied, it should be at the efficiency level of DLC-certified standard LED fixtures. Explore the possibility of continuing to offer rebates for DLC Premium products and lighting controls in midstream programs with updated savings assumptions based on a LED baseline.

2025 BER-Finding: According to New Brunswick distributors, the lamp market lags the fixture market, with LEDs representing 76-78% of the stock depending on the lamp type. Moreover, distributors anticipate that LED lamps will represent 80-89% of the stock by 2027.

Recommendation #8: The 2024 recommendation that the current non-LED baseline for lamps be maintained for BER-IR remains valid and should be reassessed in 2026. Given trends, E1 should plan for a baseline change for BER-IR lamps starting in 2028.



2025 BER-Finding: Some New Brunswick distributors continue stocking non-LED inventory (mainly lamps) to serve customers who have not yet undertaken a full LED retrofit and are instead seeking replacement lamps or fixtures.

These customers tend to be small organizations with limited capital such as churches and non-profits, institutional customers such as schools, hospitals with long-term maintenance contracts, and large industries.

2025 BER-Finding: DSM program administrators are shifting their programs in the face of LED market transformation, with some exiting the BNI sector completely and others adapting their offers.

Of the eight jurisdictions reviewed and as of 2025, two have discontinued offering LED incentives to the broader business market and two have indicated an upcoming change in their LED offer in the next few years. After removing LED lamp and fixture incentives from their midstream program, another jurisdiction continues to offer LED incentives via an application-based program for their difficult-to-reach customer segments.

Recommendation #9: Focus LED fixture rebates on application-based and direct install programs in the near-to-medium term to target early replacements in the laggard market segments (small businesses, institutions, non-profits, etc.).

2025 BER-Finding: For application-based and direct install programs, jurisdictions have updated their baselines to reflect LED market transformation, similarly to what is seen in Nova Scotia for LED fixtures, using either a market blend baseline or dual baseline. The approach varies depending on the project type (e.g. early replacement or end of life). The timing of baseline adjustments for application-based and direct install programs should be aligned across the program portfolio.

Recommendation #10: For SBES, given the target population of small businesses, the Evaluator assumes that many projects are early replacement. Therefore, implement a dual baseline approach for LED fixtures, notably by using the existing baseline for one-third of the lifetime of the existing measure and a LED baseline for the remainder of the efficient measure lifetime.

Recommendation #11: For BER-AR, consider two options:

Option 1: Focus BER-AR on market laggards and adopt eligibility criteria to ensure projects are early replacement (as seen in ComEd). If this is feasible, the Evaluator recommends using the Uniform Methods Project (UMP) approach of developing a dual baseline by using the existing baseline for one-third of the lifetime of the existing measure and a LED baseline for the remainder of the efficient measure lifetime.

Option 2: If developing and enforcing eligibility criteria to ensure all projects are early replacement, a market blend baseline should be used and that accounts for the proportion of projects aimed at early replacement versus end of life. The blended baseline should assume a LED baseline for the proportion of projects assumed to be at end of life.

Recommendation #12: Monitor the market and plan for full market transformation in the next three to four years. Assume that there will be no further opportunities, including early replacement projects for both lamps and fixtures, under SBES and BER-AR after 2028.

2025 BER-Finding: Based on the findings of this market study, the following dates for the implementation of lighting baseline changes were identified in collaboration with E1 to provide sufficient market notice periods.

Program	Measure	Date an Early Replacement Baseline Calculation Approach Comes into Effect	Date of LED Baseline Expected to Come into Effect for All Projects
BER-IR	Fixtures	N/A – midstream program	June 30, 2026
	Lamps	N/A – midstream program	January 1, 2028*
SBES	Fixtures	June 30, 2026	January 1, 2029
	Lamps	January 1, 2028*	January 1, 2029
BER-AR	Fixtures	June 30, 2026	January 1, 2029
	Lamps	January 1, 2028*	January 1, 2029
	New Construction**		June 15, 2025
*To be confirmed through 2026 market study.			
**All lighting			

CONCLUSION

Table 30 below presents the participation levels, net-to-gross ratios (NTGRs), evaluated gross and net savings at the generator, annual GHG emission reductions, as well as effective useful life (EUL) values for each service and Efficient Product Rebates as a whole.

Table 30: Overall 2025 Efficient Product Rebates Participation and Evaluated Savings

	Participation Level		Gross Savings		NTGR	Net Savings	
	Value	Unit	Value	Unit	Value*	Value	Unit
Application Rebates							
Electrical Energy Savings	143	Projects	9.214	GWh	0.93	8.586	GWh
Lifetime Electrical Energy Savings			145.644	GWh	0.94	137.476	GWh
Peak Demand Savings			0.815	MW	0.90	0.737	MW
Annual GHG Emission Reductions			4,324	Tonnes of CO2 eq	0.93	4,029	Tonnes of CO2 eq
EUL			15.8	Years		16.0	Years
Instant Rebates							
Electrical Energy Savings	317,312	Products sold	35.867	GWh	0.88	31.658	GWh
Lifetime Electrical Energy Savings			177.221	GWh	0.89	157.309	GWh
Peak Demand Savings			5.231	MW	0.88	4.595	MW
Annual GHG Emission Reductions			16,832	Tonnes of CO2 eq	0.88	14,857	Tonnes of CO2 eq
EUL			4.9	Years		5.0	Years
Total							
Electrical Energy Savings			45.081	GWh	0.89	40.244	GWh
Lifetime Electrical Energy Savings			322.865	GWh	0.91	294.786	GWh
Peak Demand Savings			6.046	MW	0.88	5.332	MW
Annual GHG Emission Reductions			21,156	Tonnes of CO2 eq	0.89	18,886	Tonnes of CO2 eq
EUL			7.2	Years		7.3	Years
* The average NTGR values presented in this total correspond to the ratios of net savings to gross savings for both Application Rebates and Instant Rebates.							

Figure 14 and Figure 15 below illustrate the net electrical energy and peak demand savings targets for the overall Efficient Product Rebates program and indicate whether targets were achieved in 2025. Efficient Product Rebates was aimed at achieving 38.451 GWh in net electrical energy savings and 7.241 MW in net peak demand savings at the generator for 2025. The program exceeded the net electrical energy savings by 5% while falling short of the planned net peak demand savings by 26%. Instant Rebates was the largest contributor to total program net electrical energy and peak demand savings.

Figure 14: 2025 Efficient Product Rebates Targeted and Evaluated Net Electrical Energy Savings

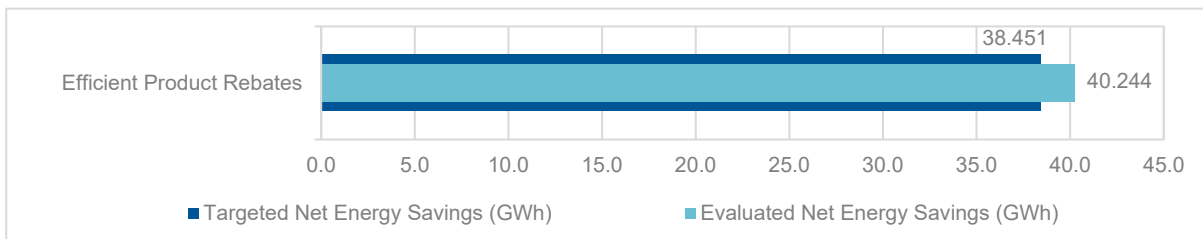
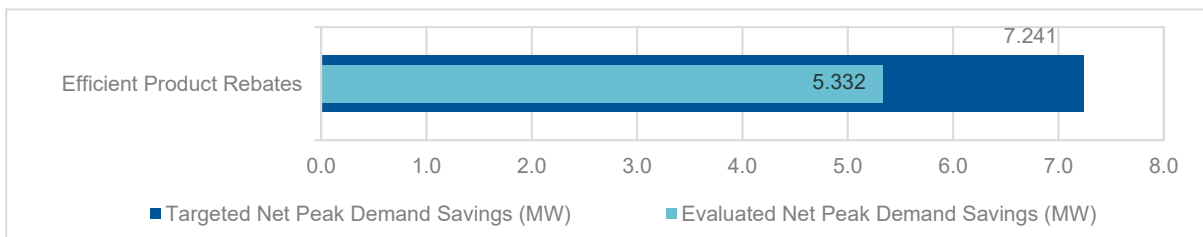


Figure 15: 2025 Efficient Product Rebates Targeted and Evaluated Net Peak Demand Savings





LIST OF APPENDICES

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Appendix VII BER: Participating Distributor Interview Guide

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EFFICIENT PRODUCT REBATES PROGRAM

Final Appendix Report

2025 DSM EVALUATION

March 18, 2026

In collaboration with:





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APPENDIX I

BER Application Rebates Tracking Sheet Audit

This appendix summarizes the results of the tracking sheet audit conducted by the Evaluator. The audit was aimed at:

- › Confirming that all data fields required for the evaluation were included and filled out in the tracking sheet submitted by E1
- › Ensuring the accuracy of tracked results by:
 - › Verifying that the parameters used to calculate program results (gross and net electrical energy savings and peak demand savings at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were performed consistently

Table 1 presents the corrected tracked savings after incorporating all changes made by the Evaluator.

Table 1: 2025 Application Rebates Corrected Tracked Savings

Result	Value Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	Value
Gross Electrical Energy Savings at the Generator	9.297	GWh	9.302	GWh	0.06%
Gross Peak Demand Savings at the Generator	0.786	MW	0.787	MW	0.02%
Net Electrical Energy Savings at the Generator	6.880	GWh	6.884	GWh	0.06%
Net Peak Demand Savings at the Generator	0.582	MW	0.582	MW	0.02%

The differences between the tracked and corrected savings are due to:

- › An adjustment to differentiate between recessed and non-recessed lighting to consider the limited interaction with heating and cooling systems for recessed fixtures, resulting in updated interactive effects factors for most lighting projects.
- › An adjustment to the efficient wattages for multi-wattage products.

APPENDIX II

BER Instant Rebates Tracking Sheet Audit

This appendix presents the main results of the tracking sheet audit performed by the Evaluator, which was aimed at:

- › Verifying that all data fields required for the evaluation were included and filled out in the tracking sheet submitted by E1
- › Ensuring that tracked results were accurate by:
 - › Verifying that the parameters used to calculate service results (gross and net electrical energy and peak demand savings at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were performed consistently

Table 1 presents the corrected tracked savings resulting from all changes made by the Evaluator for lighting and pumping measures as well as for Instant Rebates overall.

Table 1: 2025 Instant Rebates Corrected Tracked Savings

Service Results	Value Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	Value
Instant Rebates - Lighting					
Gross Electrical Energy Savings at the Generator	34.996	GWh	34.976	GWh	-0.1%
Gross Peak Demand Savings at the Generator	6.818	MW	5.334	MW	-21.8%
Net Electrical Energy Savings at the Generator	30.818	GWh	30.801	GWh	-0.1%
Net Peak Demand Savings at the Generator	5.947	MW	4.686	MW	-21.2%
Instant Rebates - Pumping					
Gross Electrical Energy Savings at the Generator	0.380	GWh	0.380	GWh	0.01%
Gross Peak Demand Savings at the Generator	0.061	MW	0.061	MW	0.09%
Net Electrical Energy Savings at the Generator	0.380	GWh	0.380	GWh	0.01%
Net Peak Demand Savings at the Generator	0.061	MW	0.061	MW	0.09%
Instant Rebates - Total					
Gross Electrical Energy Savings at the Generator	35.377	GWh	35.357	GWh	-0.1%
Gross Peak Demand Savings at the Generator	6.878	MW	5.394	MW	-21.6%
Net Electrical Energy Savings at the Generator	31.198	GWh	31.181	GWh	-0.1%
Net Peak Demand Savings at the Generator	6.008	MW	4.746	MW	-21.0%

For lighting measures, the difference between tracked and corrected electrical energy savings was due to the adjustment of hours of use and rated wattage values for architectural flood and spot luminaires and the adjustment of the baseline wattage values for four-foot high-output lamps to match the values listed in the 2024-2025 DSM MA, while the difference in tracked and corrected peak demand savings was due to a correction to the savings calculation for LED Linear Lamps, which initially did not consider the efficient wattage value.

For pumping measures, the differences between tracked and corrected values at the generator were due to inconsistent line loss factors for both electrical energy and demand savings, which were corrected to those used in the 2024 evaluation.

APPENDIX III

BER Application Rebates Participant Survey Questionnaire

BUSINESS ENERGY REBATES - APPLICATION REBATES PROGRAM EVALUATION PARTICIPANT SURVEY

Table 1: Overview of Data Collection Activity

Descriptor	This Instrument
Instrument Type	Telephone survey
Estimated Time to Complete	15 minutes
Target Audience	2025 program participants
Expected Number of Completions	40
Contact List Source	2025 tracking sheet
Fielding Firm	Narrative Research
Estimated Timeline for Fielding	October 24 th to November 14 th , 2025

Table 2: Research Objectives and Associated Sections

Research Objectives	Section
Free-ridership – Heat Pumps	C
Free-ridership – Lighting	D
Free-ridership – Others	E
Cross-influence	F

To be adapted by Econoler **[Blue text]**

Import variables from database < **LIKE THIS** >

Skip pattern or programming instructions **[LIKE THIS]**

Black text: instructions for interviewer **[NOTE: xxxx] / [PROBE: xxxx]**



INTRODUCTION

A. INTRODUCTION A – Business with a contact name

Could I speak with <INSERT NAME>?

1. Yes [GO TO INTRODUCTION]
2. No [SAY “PERHAPS YOU CAN HELP ME ANYWAY.” GO TO INTRODUCTION]

Hello, I am with Narrative Research, and we are performing an evaluation of energy efficiency programs and services provided by Efficiency Nova Scotia. We have a few questions about your recent experience with the Business Energy Rebates Program, and we wish to offer you a \$50 VISA e-gift card to answer some questions about your experience with the program. As a reminder, through the program you or your business recently installed <IF LIGHTING=YES; LIGHTING, IF HEAT PUMP=YES; HEAT PUMP, IF OTHER=YES; OTHER TYPE>. You may have been asked questions about your project during a site visit, but please know that today’s survey touches on different aspects, and thus your participation is very important.

A1. Are you the person in your business who is most knowledgeable about the decision to purchase [: IF ONLY ONE PIECE OF IF LIGHTING=YES; LIGHTING, IF HEAT PUMP=YES; HEAT PUMP, IF OTHER=YES; OTHER TYPE SAY “this”. IF MULTIPLE, SAY “these”] <IF LIGHTING=YES; LIGHTING, IF HEAT PUMP=YES; HEAT PUMP, IF OTHER=YES; OTHER TYPE> in <INSTALLATION YEAR AND MONTH>?

1. Yes [GO TO A3]
2. No [GO TO A2]

A2. Is there someone else in your business who would know about the decision to purchase [PN: IF ONLY ONE PIECE OF IF LIGHTING=YES; LIGHTING, IF HEAT PUMP=YES; HEAT PUMP, IF OTHER=YES; OTHER TYPE SAY “this”. IF MULTIPLE, SAY “these”] <IF LIGHTING=YES; LIGHTING, IF HEAT PUMP=YES; HEAT PUMP, IF OTHER=YES; OTHER TYPE>? [PROBE IF RESPONDENT IS UNSURE WHO BEST TO FORWARD THE CALL TO, SAY. This individual may be an engineer, equipment contractor, or utility account manager].

1. Yes (Ask for name: _____ and telephone #: _____) [ASK TO SPEAK TO THAT PERSON AND RESTART AT INTRODUCTION. IF OTHER PERSON IS UNAVAILABLE, THANK, TERMINATE, RECORD DATA AND SCHEDULE INTERVIEW WITH BEST CONTACT]
2. No [GO TO A2A]

A2a. [IF NO IN A2] Could you give me the name of the person we should be speaking to about your business’ participation in the Efficiency Nova Scotia’s Business Energy Rebates Program?

1. Yes (Ask for name: _____ and telephone #: _____) [ASK TO SPEAK TO THAT PERSON AND RESTART AT INTRODUCTION. IF OTHER PERSON IS UNAVAILABLE, THANK, TERMINATE, RECORD DATA AND SCHEDULE INTERVIEW WITH BEST CONTACT]
2. No [THANK, TERMINATE, RECORD AND KEEP DATA]

A3. We would appreciate your help in answering questions about the **<IF LIGHTING=YES; LIGHTING, IF HEAT PUMP=YES; HEAT PUMP, IF OTHER=YES; OTHER TYPE>** you recently installed and your participation in the program. The information you provide will help Efficiency Nova Scotia improve its program. The survey will take about 15 minutes to complete. Is now a good time to conduct this survey?

1. Yes **[CONTINUE]**
2. No **[ASK “CAN WE SCHEDULE A MORE CONVENIENT TIME FOR YOU TO CONDUCT THIS SURVEY?”] [SCHEDULED, IF NECESSARY, FOR:**
_____]

B. INTRODUCTION B – Business with no contact name

Hello, I am with Narrative Research, and we are performing an evaluation of energy efficiency programs and services provided by Efficiency Nova Scotia. We have a few questions about your recent experience with Efficiency Nova Scotia Business Energy Rebates Program through which you or your business installed **<IF LIGHTING=YES; LIGHTING, IF HEAT PUMP=YES; HEAT PUMP, IF OTHER=YES; OTHER TYPE>**.

B1. Could you help us identify the person who is most knowledgeable about the decision to purchase and install the **<IF LIGHTING=YES; LIGHTING, IF HEAT PUMP=YES; HEAT PUMP, IF OTHER=YES; OTHER TYPE>**? **[PROBE IF RESPONDENT IS UNSURE WHO BEST TO FORWARD THE CALL TO, SAY This individual may be an engineer, equipment contractor, or utility account manager]**.

1. Yes, the person is available (Ask for name: _____ and telephone #: _____)
(And ask to speak to this person – Go back to Intro A)
2. Yes, but the person is unavailable (Ask for name: _____ and telephone #: _____) **[THANK AND TERMINATE; SCHEDULE CALL BACK TO SPEAK TO THAT PERSON]**
3. No **[THANK AND TERMINATE]**

C. Free-Ridership (Heat Pumps)

[ASK SERIES IF HEAT PUMP=YES]

I will now ask you a few questions about your participation in the Business Energy Rebates Program for the **<>** heat pump you installed in **<INSTALLATION YEAR AND MONTH>**.

C1. Had you already decided to purchase and install a heat pump before you heard about Efficiency Nova Scotia's Business Energy Rebates Program? **[ONLY ONE ANSWER POSSIBLE]**

1. Yes
2. No
98. Don't know/Refused

- C2. **[IF C1=YES]** Just to confirm: Have I understood correctly that you had already made the decision to purchase and install a heat pump before you learned about the Business Energy Rebates Program?
1. Yes, correct (already made the decision)
 2. No, incorrect (not already made the decision)
 98. Don't know/Refused
- C3. The Efficiency Nova Scotia Business Energy Rebates Program offered you a rebate of **< HEAT PUMP REBATE>** for the purchase of your heat pump. If you had not received the rebate from Efficiency Nova Scotia, what is the likelihood you would have paid the full cost of the heat pump?
1. Definitely would have
 2. Probably would have
 3. Probably would not have
 4. Definitely would not have
 98. Don't know/Refused
- C4. Without the Business Energy Rebates Program and the rebate you received, would you have: **[ONLY ONE POSSIBLE ANSWER. RANDOMIZE 1-3]**
1. Kept your old heating system as is
 2. Kept your old heating system as is and bought an air conditioner
 3. Bought a heat pump anyway
 98. Don't know/Refused
- C5. **[ASK IF C2=1 OR IF C3=1, 2 OR 3]** Without the Business Energy Rebates Program, what is the likelihood you would have postponed the purchase of your heat pump by at least one year?
1. Definitely would have
 2. Probably would have
 3. Probably would not have
 4. Definitely would not have
 98. Don't know/Refused

- C6. **[ASK IF (C2=1 OR C3=1, 2 OR 3) AND IF HEAT PUMP QTY>1]** Without Efficiency Nova Scotia's Business Energy Rebate program and the rebate you received, which of the following scenarios would have most likely occurred? **[ONLY ONE POSSIBLE ANSWER. RANDOMIZE]**
- You would have purchased and installed
1. ... exactly the same number of heat pumps
 2. ... fewer heat pumps
 3. You would not have purchased nor installed any heat pumps
 98. Don't know/Refused
- C7. **[ASK IF C2=1 OR C3=1, 2 OR 3 – RANDOMIZE 1 AND 2]** You indicated earlier that you would have purchased a heat pump without the Business Energy Rebates Program and the rebate you received. What type of heat pump would you have purchased?
1. A standard heat pump
 2. A high-efficiency heat pump (one that's efficient in temperatures below -10 degrees Celsius)
 3. I wouldn't have concerned myself with the type of heat pump
 98. Don't know/Refused
- C8. Did your organization use the services of an Onsite Energy Manager or Business Development Manager while the project was being considered for implementation?
1. Yes, an Onsite Energy Manager
 2. Yes, a Business Development Manager
 3. No
 98. Don't know/Refused
- C9. How influential were the following factors in your decision to purchase an energy-efficient heat pump? **[RANDOMIZE]**
- a) The Efficiency Nova Scotia program rebate
 - b) The information from Efficiency Nova Scotia's website
 - c) **[IF C8=1]** The recommendations and technical assistance provided by the Onsite Energy Manager
 - d) **[IF C8=2]** The recommendations and technical assistance provided by the Business Development Manager
 - e) The information and recommendations provided by a contractor or distributor
1. Very influential
 2. Somewhat influential
 3. Not very influential
 4. Not at all influential
 98. Don't know/Refused



D. Free-Ridership (Lighting)

[ASK SERIES IF LIGHTING=YES]

I will now ask you a few questions about your participation in the Business Energy Rebates Program for the lighting products you installed in **<INSTALLATION YEAR AND MONTH>**.

- D1. Before learning about the Business Energy Rebates Program, had your business already decided to install energy-efficient LED lighting products?
1. Yes
 2. No
 98. Don't know/Refused
- D2. **[ASK IF D1=1]** Just to confirm, your business had already made the decision to install energy-efficient LED lighting products before you learned about the Business Energy Rebates Program?
1. Yes, the business had already made the decision
 2. No, the business had not already made the decision
 98. Don't know/Refused
- D3. **[ASK IF (D1=2 OR D2=2) AND NEW CONSTRUCTION=YES]** Before learning about the Business Energy Rebates Program, what other lighting options did you consider for your project? **[PROBE FOR: fluorescent, metal halide, different LED product, incandescent, halogen, high-pressure sodium]**
1. Enter response
 2. Only considered LED lighting
 98. Don't know/Refused
- D4. The Efficiency Nova Scotia Business Energy Rebates Program offered you a rebate of **< LIGHTING REBATE>** for the purchase of your energy-efficient LED lighting products. If your business had not received the rebate from Efficiency Nova Scotia, what is the likelihood you would have paid the full cost of the energy-efficient LED lighting products?
1. Definitely would have
 2. Probably would have
 3. Probably would not have
 4. Definitely would not have
 98. Don't know/Refused

- D5. **[ASK ONLY IF DLC Premium=YES]** Without the Business Energy Rebates Program, what is the likelihood that you would have purchased DLC Premium LED lighting products?
1. Definitely would have
 2. Probably would have
 3. Probably would not have
 4. Definitely would not have
 98. Don't know/Refused
- D6. **[ASK IF LIGHTING QTY>1 AND (D2=1 OR D4=1, 2 OR 3)]** Without the rebate, which of the following scenarios would have most likely occurred? You would have purchased... **[SINGLE RESPONSE – RANDOMIZE 2 AND 3 (?)]**
1. Exactly the same number of energy-efficient lighting products
 2. Some, but not all of the energy-efficient lighting products
 3. You would not have purchased any of the energy-efficient lighting products
 98. Don't know/Refused
- D7. **[ASK IF D2=1 OR D4=1, 2 OR 3]** Without the Business Energy Rebates Program rebate, what is the likelihood that you would have postponed the purchase of the energy-efficient lighting products by at least one year?
1. Definitely would have
 2. Probably would have
 3. Probably would not have
 4. Definitely would not have
 98. Don't know/Refused
- D8. **[ASK IF NEW CONSTRUCTION=NO]** As your project was to replace existing lamps or fixtures, what proportion of the lamps or fixtures were:
- Working but at the end of their useful life: ____%
- Working and not close to the end of their useful life: ____%
- Broken: ____%
- D9. Did your organization use the services of an Onsite Energy Manager or Business Development Manager while the project was being considered for implementation?
1. Yes, an Onsite Energy Manager
 2. Yes, a Business Development Manager
 3. No
 98. Don't know/Refused

- 
- D10. How influential were the following factors in your decision to purchase (an) energy-efficient lighting product(s)? **[RANDOMIZE]**
- a) The program rebate
 - b) The information received from Efficiency Nova Scotia's website
 - c) **[IF D9=1]** The recommendations and technical assistance provided by the Onsite Energy Manager
 - d) **[IF D9=2]** The recommendations and technical assistance provided by the Business Development Manager
 - e) The information and recommendations provided by a contractor or distributor
- 1. Very influential
 - 2. Somewhat influential
 - 3. Not very influential
 - 4. Not at all influential
 - 98. Don't know/Refused

E. Free-Ridership (Others)

[ASK SERIES IF OTHER=YES]

I will now ask you a few questions about your participation in the Business Energy Rebates Program for the **<OTHER TYPE>** you installed in **<INSTALLATION YEAR AND MONTH>**.

- E1. Before learning about the Business Energy Rebates Program, had your business already decided to install **<OTHER TYPE>**?
- 1. Yes
 - 2. No
 - 98. Don't know/Refused
- E2. **[ASK IF E1=1]** Just to confirm, your business had already made the decision to install **< OTHER TYPE>** before you learned about the Business Energy Rebates Program?
- 1. Yes, the business had already made the decision
 - 2. No, the business had not already made the decision
 - 98. Don't know/Refused

- E3. The Efficiency Nova Scotia Business Energy Rebates Program offered you a rebate of **<OTHER REBATE>** for the purchase of your **<OTHER TYPE>**. If your business had not received the rebate from Efficiency Nova Scotia, what is the likelihood you would have paid the full cost of the **<OTHER TYPE>**?
1. Definitely would have
 2. Probably would have
 3. Probably would not have
 4. Definitely would not have
 98. Don't know/Refused
- E4. **[ASK IF E2=1 OR E3=1, 2 OR 3]** Without the Business Energy Rebates Program, what is the likelihood that you would have purchased the exact same model(s) of **<OTHER TYPE>**?
1. Definitely would have
 2. Probably would have
 3. Probably would not have
 4. Definitely would not have
 98. Don't know/Refused
- E5. **[ASK IF OTHER QTY>1 AND (E2=1 OR E3=1, 2 OR 3)]** Without the rebate, which of the following scenarios would have most likely occurred? You would have purchased...? **[SINGLE RESPONSE – RANDOMIZE 1 AND 2?]**
1. exactly the same number of **<OTHER TYPE>**
 2. some, but not all of the **<OTHER TYPE>**
 3. You would not have purchased any **<OTHER TYPE>**
 98. Don't know/Refused
- E6. **[ASK IF E2=1 OR E3=1, 2 OR 3]** Without the Business Energy Rebates Program, what is the likelihood that you would have postponed the purchase of the **<OTHER TYPE>** by at least one year?
1. Definitely would have
 2. Probably would have
 3. Probably would not have
 4. Definitely would not have
 98. Don't know/Refused

- 
- E7. Did your organization use the services of an Onsite Energy Manager or Business Development Manager while the project was being considered for implementation?
1. Yes, an Onsite Energy Manager
 2. Yes, a Business Development Manager
 3. No
 98. Don't know/Refused
- E8. How influential were the following factors in your decision to purchase a **<OTHER TYPE>?**
[RANDOMIZE]
- a) The program rebate
 - b) The information received from Efficiency Nova Scotia's website
 - c) **[IF E7=1]** The recommendations and technical assistance provided by the Onsite Energy Manager
 - d) **[IF E7=2]** The recommendations and technical assistance provided by the Business Development Manager
 - e) The information and recommendations provided by a contractor or distributor
1. Very influential
 2. Somewhat influential
 3. Not very influential
 4. Not at all influential
 98. Don't know/Refused

F. Cross-Influence

[ASK FOR ALL MEASURE CATEGORIES]

- F1. Before participating in the Business Energy Rebates (BER) Program in **<MONTH AND YEAR OF PARTICIPATION>**, had your company/organization at any time in the past already participated in the Business Energy Rebates program or another Efficiency Nova Scotia program?
1. Yes, in BER
 2. Yes, in another program(s)
 3. Yes, in both BER and another program(s)
 4. No
 98. Don't know/Refused

- F2. Before participating in the Business Energy Rebates Program, had you at any time in the past seen Efficiency Nova Scotia promotional materials advertising the benefits of energy efficiency?
1. Yes
 2. No
 98. Don't know/Refused
- F3. **[IF F1=1, 2 OR 3]** Do you agree or disagree that your company/organization's previous participation in an Efficiency Nova Scotia program was a major factor in the decision to purchase **<IF LIGHTING=YES; LIGHTING, IF HEAT PUMP=YES; HEAT PUMP, IF OTHER=YES; OTHER TYPE>?**
1. Agree
 2. Disagree
 98. Don't know/Refused
- F4. **[IF F1=1, 2 OR 3]** Do you agree or disagree that because of your company/ organization's previous participation in an Efficiency Nova Scotia program and what was learned by participating in that program, a company representative asked a contractor or a technical staff member to examine the energy efficiency options for your facility?
1. Agree
 2. Disagree
 98. Don't know/Refused
- F5. **[IF F1=1, 2 OR 3]** Do you agree or disagree that because of your company's previous participation in an Efficiency Nova Scotia program and what was learned by participating in that program, a company representative took into account the cost-effectiveness of energy-efficient **<IF LIGHTING=YES; LIGHTING, IF HEAT PUMP=YES; HEAT PUMP, IF OTHER=YES; OTHER TYPE>** measures when evaluating different options for your facility?
1. Agree
 2. Disagree
 98. Don't know/Refused
- F6. **[IF F2=1]** Do you agree or disagree that Efficiency Nova Scotia promotional materials or communications were a major factor in your company/organization's decision to purchase **<IF LIGHTING=YES; LIGHTING, IF HEAT PUMP=YES; HEAT PUMP, IF OTHER=YES; OTHER TYPE>?**
1. Agree
 2. Disagree
 98. Don't know/Refused

- 
- F7. **[IF F2=1]** Do you agree or disagree that Efficiency Nova Scotia promotional materials or communications prompted a company representative to ask a contractor or a distributor about **<IF LIGHTING=YES; LIGHTING, IF HEAT PUMP=YES; HEAT PUMP, IF OTHER=YES; OTHER TYPE>** options for your organization?
1. Agree
 2. Disagree
 98. Don't know/Refused
- F8. **[IF F2=1]** Do you agree or disagree that Efficiency Nova Scotia promotional materials or communications prompted a company representative to take into account the cost-effectiveness of **<IF LIGHTING=YES; LIGHTING, IF HEAT PUMP=YES; HEAT PUMP, IF OTHER=YES; OTHER TYPE>** when evaluating different options for the facility?
1. Agree
 2. Disagree
 98. Don't know/Refused

G. Incentive

- G1. Finally, in closing, do you wish to receive a \$50 VISA e-gift card in recognition of your time committed to today's survey?
1. Yes, am interested [RECORD NAME: ____ EMAIL ADDRESS: ____ TEL #: ____]
 2. No, am not interested

END: Those are all the questions I have for you. I thank you very much for your time and cooperation. Have a nice day!

APPENDIX IV

BER Application Rebates Algorithm for Free-Ridership Calculation

Table 1: BER-AR Participant Survey Free-ridership Algorithm (Heat Pumps)

INTENTION 1 – Heat Pump		
Question	Answer	Score
Planning		
C1. Had you already decided to purchase and install a heat pump before you heard about Efficiency Nova Scotia’s Business Energy Rebates Program? [ONLY ONE ANSWER POSSIBLE]	1. Yes 2. No 98. Don’t know/Refused	IF 1: C2 IF 2 OR 98: 0%
C2. [IF C1=YES] Just to confirm: Have I understood correctly that you had already made the decision to purchase and install a heat pump before you learned about the Business Energy Rebates Program?	1. Yes, correct (already made the decision) 2. No, incorrect (not already made the decision) 98. Don’t know/Refused	IF 1: 100% IF 2 OR 98: 0%
Planning Score (PS)	C1 adjusted with C2	
Cost		
C3. The Efficiency Nova Scotia Business Energy Rebates Program offered you a rebate of <HEAT PUMP REBATE AMOUNT> for the purchase of your heat pump. If you had not received the rebate from Efficiency Nova Scotia, what is the likelihood you would have paid the full cost of the heat pump?	1. Definitely would have 2. Probably would have 3. Probably would not have 4. Definitely would not have 98. Don’t know/Refused	IF 1: 100% IF 2: 75% IF 3: 25% IF 4: 0% IF 98: EMPTY
Cost Score (CS)	C3	
Context Question		
C4. Without the Business Energy Rebates Program and the rebate you received, would you have: [ONLY ONE POSSIBLE ANSWER. RANDOMIZE]	1. Kept your old heating system as is 2. Kept your old heating system as is and bought an air conditioner 3. Bought a heat pump anyway 98. Don’t know/Refused	FOR CONTEXT ONLY; NO SCORE
Timing		
C5. [ASK IF C2=1 OR IF C3=1, 2 OR 3] Without the Business Energy Rebates Program, what is the likelihood you would have postponed the purchase of your heat pump by at least one year?	1. Definitely would have 2. Probably would have 3. Probably would not have 4. Definitely would not have 98. Don’t know/Refused	IF 1: 100% IF 2: 75% IF 3: 25% IF 4: 0% IF 98: EMPTY
Timing Score (TS)	C5	

Quantity		
C6. [ASK IF (C2=1 OR C3=1, 2 OR 3) AND IF HEAT PUMP QTY>1] Without Efficiency Nova Scotia's Business Energy Rebate program and the rebate you received, which of the following scenarios would have most likely occurred? [ONLY ONE POSSIBLE ANSWER. RANDOMIZE]	You would have purchased and installed ... 1. ... exactly the same number of heat pumps 2. ... fewer heat pumps 3. You would not have purchased nor installed any heat pumps 98. Don't know/Refused	IF 1: 100% IF 2: 50% IF 3: 0% IF 98: EMPTY
Quantity Score (QS)	C6	
Efficiency		
C7. [ASK IF D2=1 OR D3=1, 2 OR 3] You indicated earlier that you would have purchased a heat pump without the Business Energy Rebates Program and the rebate you received. What type of heat pump would you have purchased?	1. A standard heat pump 2. A high-efficiency heat pump (one that's efficient in temperatures below - 10 degrees Celsius) 3. I wouldn't have concerned myself with the type of heat pump 98. Don't know/Refused	IF 1: 25% IF 2: 100% IF 3: 50% IF 98: EMPTY
Efficiency Score (ηS)	C5	
Intention Score	MIN [MEAN (PS; CS); MEAN (PS; CS; ηS); MEAN (PS; CS; TS); MEAN (PS; CS; QS); MEAN (PS; CS; ηS; TS); MEAN (PS; CS; ηS; QS); MEAN (PS; CS; TS; QS); MEAN (PS; CS; ηS; TS; QS)]	
Inconsistency Test – Planning	IF C1= 100% AND C3 < 75%: C1= EMPTY	
Inconsistency Test – Cost	IF ABS (C3-C9a) ≥ 75%: C7 = MIN (C3; C9a)	
INFLUENCE		
C8. Did your organization use the services of an Onsite Energy Manager or Business Development Manager while the project was being considered for implementation?	1. Yes, an Onsite Energy Manager 2. Yes, a Business Development Manager 3. No 98. Don't know/Refused	NO SCORE
C9. How influential were the following factors in your decision to purchase an energy-efficient heat pump? [RANDOMIZE] a) The Efficiency Nova Scotia program rebate b) The information from Efficiency Nova Scotia's website c) [IF C8=1] The recommendations and technical assistance provided by the Onsite Energy Manager d) [IF C8=2] The recommendations and technical assistance provided by the Business Development Manager e) The information and recommendations provided by a contractor or distributor	1. Very influential 2. Somewhat influential 3. Not very influential 4. Not at all influential 98. Don't know/Refused	IF 1: 0% IF 2: 25% IF 3: 75% IF 4: 100% IF 98: EMPTY
Influence Score (IS)	MIN (C8a; C8b; C8c; C8d; C8e)	
Participant Free-Ridership (FR)	(INTENTION + INFLUENCE) / 2	

Cross-influence		
F1. Before participating in the Business Energy Rebates (BER) Program in <MONTH AND YEAR OF PARTICIPATION> , had your company/organization at any time in the past already participated in the Business Energy Rebates program or another Efficiency Nova Scotia program?	1. Yes, in BER 2. Yes, in another program(s) 3. Yes, in both BER and another program(s) 4. No 98. Don't know/Refused	USE FOR F2
F2. Before participating in the Business Energy Rebates Program, had you at any time in the past seen Efficiency Nova Scotia promotional materials advertising the benefits of energy efficiency?	1. Yes 2. No 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F3. [IF F1=1, 2 OR 3] Do you agree or disagree that your company/organization's previous participation in an Efficiency Nova Scotia program was a major factor in the decision to purchase heat pump(s)?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F4. [IF F1=1, 2 OR 3] Do you agree or disagree that because of your company/ organization's previous participation in an Efficiency Nova Scotia program and what was learned by participating in that program, a company representative asked a contractor or a technical staff member to examine the energy efficiency options for your facility?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F5. [IF F1=1, 2 OR 3] Do you agree or disagree that because of your company's previous participation in an Efficiency Nova Scotia program and what was learned by participating in that program, a company representative took into account the cost-effectiveness of energy-efficient heat pumps when evaluating different options for your facility?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F6. [IF F2=1] Do you agree or disagree that Efficiency Nova Scotia promotional materials or communications were a major factor in your company/organization's decision to purchase heat pump(s)?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F7. [IF F2=1] Do you agree or disagree that Efficiency Nova Scotia promotional materials or communications prompted a company representative to ask a contractor or a distributor about heat pump options for your organization?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F8. [IF F2=1] Do you agree or disagree that Efficiency Nova Scotia promotional materials or communications prompted a company representative to take into account the cost-effectiveness of heat pumps when evaluating different options for the facility?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
Cross-influence (CI)	IF (F3 OR F6 =Agree; 1) + IF (F4 OR F7 = Agree; 1) + IF (F5 OR F8) = Agree; 1)	
Revised Free-Ridership (Revised FR)	IF CI = 0 OR 1: Revised FR = FR IF CI = 2: Revised FR = FR*0.75 IF CI = 3: Revised FR = FR*0.50	

Table 2: BER-AR Participant Survey Free-ridership Algorithm (Lighting)

INTENTION		
Planning		
Question	Answer	Score
D1. Before learning about the Business Energy Rebates Program, had your business already decided to install energy-efficient LED lighting products?	1. Yes 2. No 98. Don't know/Refused	NO SCORE
D2. [ASK IF D1=1] Just to confirm, your business had already made the decision to install energy-efficient LED lighting products before you learned about the Business Energy Rebates Program?	1. Yes, the business had already made the decision 2. No, the business had not already made the decision 98. Don't know/Refused	IF 1: 100% IF 2 OR 98: 0%
D3. [ASK IF (D1=2 OR D2=2) AND NEW CONSTRUCTION=YES] Before learning about the Business Energy Rebates Program, what other lighting options did you consider for your project? [PROBE FOR: fluorescent, metal halide, different LED product, incandescent, halogen, high-pressure sodium]	1. Enter response 2. Only considered LED lighting 98. Don't know/Refused	INCONSISTENCY TEST (D3 vs D1/D2)
Planning Score (PS)	D1 (adjusted with D2)	
Cost		
D4. The Efficiency Nova Scotia Business Energy Rebates Program offered you a rebate of <LIGHTING REBATE > for the purchase of your energy-efficient LED lighting products. If your business had not received the rebate from Efficiency Nova Scotia, what is the likelihood you would have paid the full cost of the energy-efficient LED lighting products?	1. Definitely would have 2. Probably would have 3. Probably would not have 4. Definitely would not have 98. Don't know/Refused	IF 1: 100% IF 2: 75% IF 3: 25% IF 4: 0% IF 98: EMPTY
Cost Score (CS)	D4	
Efficiency		
D5. [ASK ONLY IF DLC Premium=YES] Without the Business Energy Rebates Program, what is the likelihood that you would have purchased DLC Premium LED lighting products?	1. Definitely would have 2. Probably would have 3. Probably would not have 4. Definitely would not have 98. Don't know/Refused	IF 1: 100% IF 2: 75% IF 3: 25% IF 4: 0% IF 98: EMPTY
Efficiency Score (ηS)	D6	
Quantity		
D6. [ASK IF LIGHTING QTY>1 AND (D2=1 OR D4=1, 2 OR 3)] Without the rebate, which of the following scenarios would have most likely occurred? You would have purchased... [SINGLE RESPONSE]	1. Exactly the same number of energy-efficient lighting products 2. Some, but not all of the energy-efficient lighting products 3. You would not have purchased any of the energy-efficient lighting products 98. Don't know/Refused	IF 1: 100% IF 2: 50% IF 3: 0% IF 98: EMPTY
Quantity Score (QS)	D6	

Timing		
D7. [ASK IF D2=1 OR D4=1, 2 OR 3] Without the Business Energy Rebates Program, what is the likelihood that you would have postponed the purchase of the energy-efficient lighting products by at least one year?	1. Definitely would have 2. Probably would have 3. Probably would not have 4. Definitely would not have 98. Don't know/Refused	IF 1: 0% IF 2: 25% IF 3: 75% IF 4: 100% IF 98: EMPTY
D8. [ASK IF NOT NEW CONSTRUCTION = NO] As your project was to replace existing lamps or fixtures, what proportion of the lamps or fixtures were:	Working but at the end of their useful life: __90__% Working and not close to the end of their useful life: __10__% Broken: ____%	NO SCORE
Timing Score (TS)	D7	
Inconsistency Test – PS	IF D1= 100% AND D4 < 75% OR D5 < 75%: PS= EMPTY	
Inconsistency Test – CS	IF ABS (D4-D10a) ≥ 75%: CS = MIN (D4; D10a)	
INTENTION SCORE	MIN [MEAN (PS; CS); MEAN (PS; CS; ηS); MEAN (PS; CS; TS); MEAN (PS; CS; QS); MEAN (PS; CS; ηS; TS); MEAN (PS; CS; ηS; QS); MEAN (PS; CS; TS; QS); MEAN (PS; CS; ηS; TS; QS)]	
INFLUENCE		
D9. Did your organization use the services of an Onsite Energy Manager or Business Development Manager while the project was being considered for implementation?	1. Yes, an Onsite Energy Manager 2. Yes, a Business Development Manager 3. No 98. Don't know/Refused	NO SCORE
D10. How influential were the following factors in your decision to purchase an energy-efficient lighting products? [RANDOMIZE] a) The program rebate b) The information from Efficiency Nova Scotia's website c) [IF D9=1] The recommendations and technical assistance provided by the Onsite Energy Manager d) [IF D9=2] The recommendations and technical assistance provided by the Business Development Manager e) The information and recommendations provided by a contractor or distributor	1. Very influential 2. Somewhat influential 3. Not very influential 4. Not at all influential 98. Don't know/Refused	IF 1: 0% IF 2: 25% IF 3: 75% IF 4: 100% IF 98: EMPTY
Influence Score (IS)	MIN (D9a; D9b; D9c; D9d; D9e)	
Participant Free-Ridership (FR)	(INTENTION + INFLUENCE) / 2	

Cross-influence		
F1. Before participating in the Business Energy Rebates (BER) Program in <MONTH AND YEAR OF PARTICIPATION> , had your company/organization at any time in the past already participated in the Business Energy Rebates program or another Efficiency Nova Scotia program?	1. Yes, in BER 2. Yes, in another program(s) 3. Yes, in both BER and another program(s) 4. No 98. Don't know/Refused	USE FOR F2
F2. Before participating in the Business Energy Rebates Program, had you at any time in the past seen Efficiency Nova Scotia promotional materials advertising the benefits of energy efficiency?	1. Yes 2. No 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F3. [IF F1=1, 2 OR 3] Do you agree or disagree that your company/organization's previous participation in an Efficiency Nova Scotia program was a major factor in the decision to purchase energy-efficient lighting products?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F4. [IF AND F1=1, 2 OR 3] Do you agree or disagree that because of your company/organization's previous participation in an Efficiency Nova Scotia program and what was learned by participating in that program, a company representative asked a contractor or a technical staff member to examine the energy efficiency options for your facility?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F5. [IF F1=1, 2 OR 3] Do you agree or disagree that because of your company's previous participation in an Efficiency Nova Scotia program and what was learned by participating in that program, a company representative took into account the cost-effectiveness of energy-efficient lighting products when evaluating different options for your facility?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F6. [IF F2=1] Do you agree or disagree that Efficiency Nova Scotia promotional materials or communications were a major factor in your company/organization's decision to purchase energy-efficient lighting products?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F7. [IF AND IF F2=1] Do you agree or disagree that Efficiency Nova Scotia promotional materials or communications prompted a company representative to ask a contractor or a distributor about energy-efficient lighting products options for your organization?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F8. [IF F2=1] Do you agree or disagree that Efficiency Nova Scotia promotional materials or communications prompted a company representative to take into account the cost-effectiveness of energy-efficient lighting products when evaluating different options for the facility?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
Cross-influence (CI)	IF (F3 OR F6 =Agree; 1) + IF (F4 OR F7 = Agree; 1) + IF (F5 OR F8) = Agree; 1)	
Revised Free-Ridership (Revised FR)	IF CI = 0 OR 1: Revised FR = FR IF CI = 2: Revised FR = FR*0.75 IF CI = 3: Revised FR = FR*0.50	

Table 3: BER-AR Participant Survey Free-ridership Algorithm
(Other measures categories, including refrigeration, motors and agriculture)

INTENTION		
Planning		
Question	Answer	Score
E1. Before learning about the Business Energy Rebates Program, had your business already decided to install <OTHER TYPE>?	1. Yes 2. No 98. Don't know/Refused	IF 1: E2 IF 2 OR 98: 0%
E2. [ASK IF E1=1] Just to confirm, your business had already made the decision to install <OTHER TYPE > before you learned about the Business Energy Rebates Program?	1. Yes, the business had already made the decision 2. No, the business had not already made the decision 98. Don't know/Refused	IF 1: 100% IF 2 OR 98: 0%
Planning Score (PS)	E1 (adjusted with E2)	
Cost		
E3. The Efficiency Nova Scotia Business Energy Rebates Program offered you a rebate of <OTHER REBATE > for the purchase of your <OTHER TYPE>. If your business had not received the rebate from Efficiency Nova Scotia, what is the likelihood you would have paid the full cost of the <OTHER TYPE>?	1. Definitely would have 2. Probably would have 3. Probably would not have 4. Definitely would not have 98. Don't know/Refused	IF 1: 100% IF 2: 75% IF 3: 25% IF 4: 0% IF 98: EMPTY
Cost Score (CS)	E3	
Efficiency		
E4. [ASK IF E2=1 OR E3=1, 2 OR 3] Without the Business Energy Rebates Program, what is the likelihood that you would have purchased the exact same model(s) of <OTHER TYPE >?	1. Definitely would have 2. Probably would have 3. Probably would not have 4. Definitely would not have 98. Don't know/Refused	IF 1: 100% IF 2: 75% IF 3: 25% IF 4: 0% IF 98: EMPTY
Efficiency Score (ηS)	E4	
Quantity		
E5. [ASK IF OTHER QTY>1 AND (E2=1 OR E3=1, 2 OR 3)] Without the rebate, which of the following scenarios would have most likely occurred? You would have purchased...? [SINGLE RESPONSE]	1. exactly the same number of <OTHER TYPE> 2. some, but not all of the <OTHER TYPE> 3. You would not have purchased any <OTHER TYPE> 98. Don't know/Refused	IF 1: 100% IF 2: 50% IF 3: 0% IF 98: EMPTY
Quantity Score (QS)	E5	
Timing		
E6. [ASK IF E2=1 OR E3=1, 2 OR 3] Without the Business Energy Rebates Program, what is the likelihood that you would have postponed the purchase of the <OTHER TYPE> by at least one year?	1. Definitely would have 2. Probably would have 3. Probably would not have 4. Definitely would not have 98. Don't know/Refused	IF 1: 0% IF 2: 25% IF 3: 75% IF 4: 100% IF 98: EMPTY
Timing Score (TS)	E6	

Inconsistency Test – PS	IF E1= 100% AND E3 < 75%: PS= EMPTY	
Inconsistency Test – CS	IF ABS (E3-E8a) ≥ 75%: CS = MIN (E3; E8a)	
INTENTION SCORE	MIN [MEAN (PS; CS); MEAN (PS; CS; ηS); MEAN (PS; CS; TS); MEAN (PS; CS; QS); MEAN (PS; CS; ηS; TS); MEAN (PS; CS; ηS; QS); MEAN (PS; CS; TS; QS); MEAN (PS; CS; ηS; TS; QS)]	
INFLUENCE		
E7. Did your organization use the services of an Onsite Energy Manager or Business Development Manager while the project was being considered for implementation?	1. Yes, an Onsite Energy Manager 2. Yes, a Business Development Manager 3. No 98. Don't know/Refused	NO SCORE
E8. How influential were the following factors in your decision to purchase a <OTHER TYPE >? [RANDOMIZE] a) The program rebate b) The information from Efficiency Nova Scotia's website c) [IF E7=1] The recommendations and technical assistance provided by the Onsite Energy Manager d) [IF E7=2] The recommendations and technical assistance provided by the Business Development Manager e) The information and recommendations provided by a contractor or distributor	1. Very influential 2. Somewhat influential 3. Not very influential 4. Not at all influential 98. Don't know/Refused	IF 1: 0% IF 2: 25% IF 3: 75% IF 4: 100% IF 98: EMPTY
Influence Score (IS)	MIN (E7a; E7b; E7c; E7d; E7e)	
Participant Free-Ridership (FR)	(INTENTION + INFLUENCE) / 2	
Cross-influence		
F1. Before participating in the Business Energy Rebates (BER) Program in <MONTH AND YEAR OF PARTICIPATION>, had your company/organization at any time in the past already participated in the Business Energy Rebates program or another Efficiency Nova Scotia program?	1. Yes, in BER 2. Yes, in another program(s) 3. Yes, in both BER and another program(s) 4. No 98. Don't know/Refused	USE FOR F2
F2. Before participating in the Business Energy Rebates Program, had you at any time in the past seen Efficiency Nova Scotia promotional materials advertising the benefits of energy efficiency?	1. Yes 2. No 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F3. [IF F1=1, 2 OR 3] Do you agree or disagree that your company/organization's previous participation in an Efficiency Nova Scotia program was a major factor in the decision to purchase <OTHER TYPE>?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F4. [IF AND F1=1, 2 OR 3] Do you agree or disagree that because of your company/organization's previous participation in an Efficiency Nova Scotia program and what was learned by participating in that program, a company representative asked a contractor or a technical staff member to examine the energy efficiency options for your facility?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0

F5. [IF F1=1, 2 OR 3] Do you agree or disagree that because of your company's previous participation in an Efficiency Nova Scotia program and what was learned by participating in that program, a company representative took into account the cost-effectiveness of <OTHER TYPE> when evaluating different options for your facility?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F6. [IF F2=1] Do you agree or disagree that Efficiency Nova Scotia promotional materials or communications were a major factor in your company/organization's decision to purchase <OTHER TYPE>?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F7. [IF AND IF F2=1] Do you agree or disagree that Efficiency Nova Scotia promotional materials or communications prompted a company representative to ask a contractor or a distributor about <OTHER TYPE> options for your organization?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
F8. [IF F2=1] Do you agree or disagree that Efficiency Nova Scotia promotional materials or communications prompted a company representative to take into account the cost-effectiveness of <OTHER TYPE> when evaluating different options for the facility?	1. Agree 2. Disagree 98. Don't know/Refused	IF 1: 1 IF 2 OR 98: 0
Cross-influence (CI)	IF (F2= Agree; 1) + IF (F4= Agree; 1)	
Revised Free-Ridership (Revised FR)	IF CI = 0: Revised FR = FR IF CI = 1: Revised FR = FR*0.75 IF CI = 2: Revised FR = FR*0.50	

APPENDIX V

BER Application Rebates On-site Visit Sampling Methodology and Protocol

Sampling Methodology

The 2025 Business Energy Rebates (BER) sample included 40 sites for a total of 47 projects. Table 1 below presents the number of projects and measures in the sample, organized by measure category. The sampling plan was developed based on the October 2025 tracking sheet that included all completed projects to date. The tracking sheet contained 135 projects implemented by a total of 127 participants.

Table 1: Sampling Plan by Measure Category

	Tracking Sheet	Sample	
Category	Projects	Projects	Measures
Lighting	42	18	265
Heating, Ventilation, and Air Conditioning (HVAC)	38	12	19
Agriculture	6	4	8
Commercial Kitchen	1	1	2
Motors	12	8	13
Refrigeration	4	4	7
Pumping	1	-	-
Renewable Generation	31	-	-
Total	135	47	314

The Evaluator followed industry best practices for sampling as described in the Uniform Methods Project¹ and selected the stratified sample such that all key project types were proportionally represented to improve the precision of estimates and reduce sampling bias. Projects that received an incentive lower than \$1,000 were excluded from the sample. Renewable generation projects were also excluded from the sample as rebates for solar projects were discontinued as of April 30, 2025.

On-site Visit Protocol

The 2025 BER Application Rebates on-site visit protocol was prepared based on the 2021 protocol. Only the sections for measure categories included in the sample were kept. The protocol contains a general section for project information as well as a section on measure-specific variables. The General Information section documents the facility type and contact information. The measure-specific data sections provide the parameters required for savings calculations based on the data documented in the CIRx Screening Tool and are completed with the information gathered on site. Most fields in the protocol were filled out prior to the on-site visits with the information in the project documentation provided by E1. This saved time and enabled the Evaluator to record additional details only if on-site conditions did not match the tracked information.

¹ 1 NREL, The Uniform Methods Project: Methods for Determining Energy-Efficiency Savings for Specific Measures, Chapter 11: Sample Design Cross-Cutting Protocol, September 2017, pp. 60-61.

APPENDIX VI

BER Application Rebates Adjustment Ratio Calculation Example

This appendix displays a sample calculation to demonstrate the process of revising the energy and peak demand savings. Lighting measures accounted for the majority of tracked energy and peak demand savings in the BER program this year. Therefore, one of the lighting measures has been chosen to show the calculation details for the following:

- › Algorithms for calculating energy and peak demand savings;
- › Comparison of the calculation of tracked energy and peak demand savings and the calculation of revised energy and peak demand savings; and
- › Algorithm for establishing the adjustment ratio.

Energy and Peak Demand Savings Algorithms

The following algorithms include the parameters required to determine the annual energy savings and the annual peak demand savings associated with a low-bay LED luminaire replacement measure.

$$[1] \text{ Energy Savings } \left[\frac{kWh}{yr} \right] = \frac{(W_B - W_E * (DF * PTD + 1 - PTD)) * IE * Qty * CF}{1,000 \frac{W}{kW}}$$
$$[2] \text{ Peak Demand Savings } \left[\frac{kW}{yr} \right] = \frac{(W_B - W_E * (DF * PTD + 1 - PTD)) * IE_{pd} * Qty * CF}{1,000 \frac{W}{kW}}$$

Where:

- › W_B : the existing nominal (bare) lamp wattage.
- › W_E : the system wattage of the efficient lamp.
- › DF : the dimming factor as a percent of the efficient lamp's full light output.
- › PTD : the percentage of time the efficient lights are dimmed.
- › Qty : the quantity of lamps.
- › IE/IE_{pd} : the interactive effects factor based on the location of the lighting measure.
- › CF : the coincidence factor.
- › $1,000 \frac{W}{kW}$: conversion from watts to kilowatts

Tracked Savings Calculation

The example project for these savings calculations is a New Construction project. To accurately represent a theoretical baseline fixture, ENS refers to the New Construction Baseline table created with the Evaluator in previous program years. This table defines an agreed upon baseline lamp wattage according to the fixture type, function and the efficient lighting measure's lumen output to ensure baseline fixture wattages are selected based on consistent criteria. In the example project, the same linear LED fixture was installed in both the stairwell and parkade areas of the building, resulting in two different baseline assumptions. The proposed measure wattage was obtained from the product specification sheet submitted with the application.

Table 1 presents the values used for the lighting measures as noted by ENS in the final Tracking Sheet. The first measure evaluates the savings for the installation of a linear LED fixture in the parkade area, with an average assumed baseline wattage for a linear ambient luminaire with an output between 5,000 and 10,000 lm. The second measure evaluates the savings for the installation of the same linear LED fixture in the stairwells, with an average assumed baseline wattage for a stairwell and passageway luminaire with an output greater than 750 lm.

Table 1: Tracked Variables for Example Calculation

Baseline Measure - New Construction			
Parameter	Value – Measure 1	Value – Measure 2	Source
Existing Lamp Quantity	180	20	Tracking Report
Baseline Lamp Wattage (W)	112	59	Tracking Report
Existing Hours per Week	168	168	Tracking Report
Hours of Operation (hrs/year)	8,760	8,760	Calculation based on 52 weeks per year
Dimming Factor	1	1	No Dimming in Tracking Report
Percent Time Dimmed	1	1	No Dimming in Tracking Report
Interactive Effects Factor (energy)	1	1	Tracking Report
Interactive Effects Factor (demand)	1	1	Tracking Report
Coincidence Factor	1	1	Tracking Report
Annual Energy Consumption (kWh)	176,601.6	10,336.8	Calculation
Annual Peak Demand (kW)	20.16	1.18	Calculation
New Measure – Low-Bay LED Luminaire			
Proposed Lamp Quantity	180	20	Tracking Report
Proposed Lamp Wattage	44	44	Tracking Report
Proposed Hours per Week	168	168	Tracking Report
Hours of Operation (hrs/year)	8,760	8,760	Calculation based on 52 weeks per year
Dimming Factor	1	1	No Dimming in Tracking Report
Percent Time Dimmed	1	1	No Dimming in Tracking Report
Interactive Effects Factor (energy)	1	1	Tracking Report
Interactive Effects Factor (demand)	1	1	Tracking Report
Coincidence Factor	1	1	Tracking Report
Annual Energy Consumption (kWh)	69,379.2	7,708.8	Calculation
Annual Peak Demand (kW)	7.92	0.88	Calculation

Baseline Measure - New Construction			
Calculated Savings			
Calculated Energy Savings (kWh)	107,222.4	2,628	Calculation
Calculated Demand Savings (kW)	12.24	0.3	Calculation
Tracked Savings			
Tracked Energy Savings (kWh)	106,466.01	2,609.46	Tracking Report
Tracked Demand Savings (kW)	10.29	0.25	Tracking Report

Revised Savings Calculation

The revised savings calculations are based on four adjustments. The first adjustment revised the IE and IEpd values from 1, assuming no heating or cooling in the spaces, to 0.81 and 0.69, respectively, based on electric heating and no cooling found in the garage and stairwells during on-site visits.

The second adjustment was to the hours of use for 40 of the lights, which were originally tracked under the first measure. These 40 lights were installed in low-occupancy areas (e.g., storage rooms, generator room, bike room, etc.); the site contact stated the lights were seldom used, estimating they may only be used a few hours per week. The annual hours of use were revised from 8760 to 182.5 to account for an average 0.5 hours of use per day based on the participant estimation. As a result of this adjustment, the Evaluator defined these fixtures in a third measure, which is represented in the revised calculations below. These fixtures are switch-operated, but have integral sensors for dimming, which supports the site contact's estimate of low runtime.

The third adjustment was to the dimming factor of the first measure. The tracking sheet did not specify dimming for the garage lighting. Based on the invoice statement and on-site verification, the dimming factor and percent time dimmed were revised to 30% and 80%, respectively.

The fourth adjustment was to revise the coincidence factor for the stairwell and low-occupancy area lights (Measures 2 & 3) from 1 to 0.3. This was based on the low occupancy of these areas, resulting in the lights being most likely dimmed during peak hours.

Table 2 outlines the revisions made to variables for the baseline measures, efficient measures and the resulting revised savings.

Table 2: Revised Variables for Example Calculation

Baseline Measure - New Construction				
Parameter	Value – Measure 1	Value – Measure 2	Value – Measure 3	Source
Existing Lamp Quantity	140	20	40	Validated on site
Baseline Lamp Wattage (W)	112	59	112	Validated with New Construction Baseline
Existing Hours per Week	168	168	3.5	Validated on site
Hours of Operation (hrs/year)	8,760	8,760	182.5	Calculation based on weekly hours
Dimming Factor	1	1	1	No Dimming in New Construction Baseline
Percent Time Dimmed	1	1	1	No Dimming in New Construction Baseline
Interactive Effects Factor (energy)	0.81	0.81	0.81	Residential Building with Electric Heat, no Cooling
Interactive Effects Factor (demand)	0.69	0.69	0.69	Residential Building with Electric Heat, no Cooling
Coincidence Factor	1	0.3	0.3	Validated on site
Annual Energy Consumption (kWh)	111,259.008	8,372.808	662.256	Calculation
Annual Peak Demand (kW)	10.819	0.244	0.927	Calculation
New Measure – Low-Bay LED Luminaire				
Proposed Lamp Quantity	140	20	40	Validated on site
Proposed Lamp Wattage	44	44	44	Validated on site
Proposed Hours per Week	168	168	3.5	Validated on site
Hours of Operation (hrs/year)	8,760	8,760	182.5	Calculation based on weekly hours
Dimming Factor	0.3	1	1	Validated on site
Percent Time Dimmed	0.8	1	1	Validated on site
Interactive Effects Factor (energy)	0.81	0.81	0.81	Residential Building with Electric Heat, no Cooling
Interactive Effects Factor (demand)	0.69	0.69	0.69	Residential Building with Electric Heat, no Cooling
Coincidence Factor	1	0.3	0	Validated on site
Annual Energy Consumption (kWh)	19,231.914	6,244.128	260.172	Calculation
Annual Peak Demand (kW)	1.870	0.182	0.364	Calculation
Revised Savings				
Calculated Energy Savings (kWh)	92,027.094	2128.680	402.084	Calculation
Calculated Demand Savings (kW)	8.949	0.062	0.563	Calculation



Adjustment Ratio Algorithm

The adjustment ratio is determined by comparing the revised savings values with the tracked savings values. For this measure, due to the revisions made to the IE/IEpd, hours of use, dimming, and coincidence factors, the calculated ratios were 0.867 for energy savings and 0.908 for the peak demand savings.

$$\frac{\text{Revised ES}}{\text{Tracked ES}} = \frac{(92027.094 + 2128.680 + 402.084) \text{ kWh}}{(106466.01 + 2609.46) \text{ kWh}} = 0.867$$

$$\frac{\text{Revised Peak DS}}{\text{Tracked Peak DS}} = \frac{(8.949 + 0.062 + 0.563) \text{ kW}}{(10.29 + 0.25) \text{ kW}} = 0.908$$

APPENDIX VII

Participating Distributor Interview Guide

LIGHTING MARKET STUDY - Midstream BUSINESS Rebate Program

NB Power & Efficiency One

Interview guide with participating NB distributors

Table 1: Overview of Data Collection Activity

Descriptor	This Instrument
Instrument Type	Interview guide
Estimated Time to Complete	30-40 min
Target Audience	New Brunswick Participating Lighting Distributors
Expected Number of Completes	8
Contact List Source	NB Power/Efficiency Nova Scotia
Fielding Firm	Narrative Research
Estimated Timeline for Fielding	3 weeks

Table 2: Research Objectives and Associated Questions

Research Objectives	Section
Introduction & Screener	A
Lighting Market Assessment	B
Experience with NB Power Midstream Business Rebate Program	C

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Import variables from database < **LIKE THIS** >

Skip pattern or programming instructions **[LIKE THIS]**

Black text: instructions for interviewer **[NOTE: xxxx] / [PROBE: xxxx]**



Introduction

Thank you for taking the time to speak with me today. I am interested in your perspective on the state of the lighting market in New Brunswick, as well as your initial feedback on the lighting incentives offered through NB Power's Midstream Business Rebate Program (MBRP). Econoler, in partnership with Narrative Research, is conducting this market research on behalf of NB Power and Efficiency Nova Scotia.

We would appreciate your collaboration in answering questions about your involvement in this program. The information you provide will help NB Power and Efficiency Nova Scotia evaluate and improve the program. Our discussion should last around 30 minutes, Is this a good time for you?

Please note that your responses will be kept strictly confidential and that we will not share the information you provide with any other party in a way that could identify your individual or corporate responses. **[IF REQUIRED: With your permission, I would like to audio record our discussion to assist with the analysis of findings. The recordings will not be shared with other organizations, including NB Power and Efficiency One. [OBTAIN VERBAL PERMISSION BEFORE RECORDING]**

A. Identification and Screening of Respondent

- A1. To begin, what is your title, and could you briefly describe your role within the company?
- A2. Can you provide a brief description of your company? Is your company a provincial, national or international distributor? Do you serve all of New Brunswick or only specific regions?
- A3. To confirm, are you the person within the company/store who is most knowledgeable about the inventory and sales of lighting products, including: **1) linear LED fixtures, 2) LED linear lamps, 3) outdoor LED fixtures, 4) outdoor LED lamps, 5) high bay LED fixtures, 6) high bay LED lamps?**
1. Person responsible available **[CONTINUE]**
 2. Person responsible currently unavailable **[ARRANGE CALL BACK WITH THE RIGHT PERSON]**
 3. No person responsible for stocking or management of products **[CONTINUE INTERVIEW WITH STORE MANAGER/HEAD OFFICE CONTACT - CONTINUE]**
 98. Don't know **[CONTINUE INTERVIEW WITH STORE MANAGER/HEAD OFFICE CONTACT CONTINUE]**
 99. Refused **[THANK AND TERMINATE]**
- A4. To confirm, are you currently in market and offering incentives to your customers through the NB Power Midstream Business Rebate Program?
4. Yes **[CONTINUE]**
 5. No **[CONTINUE]**
 98. Don't know **[ASK IF THERE IS A CONTACT FAMILIAR WITH STOCKING PRACTICES AND THE PROGRAM, RECORD INFO & TERMINATE]**



B. Lighting Market Assessment

B1. Based on your observations, what's happened in the **commercial LED** lighting market in the **past three years** in terms of...? **[ASK FOR EACH]**

- b. New technologies [Any differences between LED lamps and LED fixtures?]
- c. Changes in demand [Any differences between LED lamps and LED fixtures?]
- d. Changes in product offerings [Any differences between LED lamps and LED fixtures?]
- e. Changes in availability [Any differences between LED lamps and LED fixtures?]
- f. Changes in pricing [Any differences between LED lamps and LED fixtures?]

B2. What proportion of all your lighting stock, **in 2025** is LED vs. non-LED?

LED ____% Non-LED ____% **[TOTAL MUST EQUAL 100%]**

A. **[ASK ONLY IF A4 = 1]** Did this percentage change after you began participating in the Midstream Business Rebate Program? If yes, please record the difference.

LED ____% Non-LED ____% **[TOTAL MUST EQUAL 100%]**

B3. Which of the following lighting categories do you carry? **[SELECT ALL THAT APPLY]**

- 6. Linear fixtures
- 7. Linear lamps
- 8. Outdoor fixtures
- 9. Outdoor replacement lamps
- 10. High bay fixtures
- 11. High bay replacement lamps

B4. **[ASK IF LESS THAN 100% FOR LED AT B2; ASK FOR EACH CATEGORY MENTIONED AT B3]** A) **[READ THIS IF A4=1:** For the following question, please focus on your 2025 sales prior to participating in the Midstream Business Lighting Program.] Thinking of 2025 to date, what percentage of your **[READ CATEGORY NAME]** New Brunswick sales are LED versus non-LED products? **[TOTAL LED AND NON-LED MUST EQUAL 100%]**

B) Has the percentage of LED sales increased or decreased since 2022? Why?

2025 YTD Lighting Sales (%)			
Lighting Category	% LED Lighting	% Non-LED Lighting	Increase/Decrease in LED vs. 2022? Why?
a) Linear fixtures	___%	___%	_____
b) Linear lamps	___%	___%	_____
c) Outdoor fixtures	___%	___%	_____
d) Outdoor replacement lamps	___%	___%	_____
e) High bay fixtures	___%	___%	_____
f) High bay replacement lamps	___%	___%	_____

B5. **[ASK IF B3=2 (LINEAR LAMPS)]** Customers can replace the lamps in their linear fixtures or replace the fixtures altogether. How would you describe your sales of **replacement lamps for linear fixtures** in **2025** so far? Is it that **[READ IN ORDER]**? **CODE ONE ONLY**

1. You are selling very few, most customers are replacing whole fixtures with LED fixtures
2. Compared to 2022 your sales are decreasing, as more customers are replacing whole fixtures with LED fixtures.
3. Compared to 2022, there is no change, many customers are still purchasing replacement lamps
96. Other: SPECIFY

B6. **[ASK IF B3=4 (OUTDOOR REPLACEMENT LAMPS)]** Similarly, how would you describe your sales of **replacement lamps for outdoor fixtures** in **2025**?

1. You are selling very few, most customers are replacing whole fixtures with LED fixtures
2. Compared to 2022 your sales are decreasing, as more customers are replacing whole fixtures with LED fixtures.
3. Compared to 2022, there is no change, many customers are still purchasing replacement lamps
97. Other: SPECIFY

B7. **[ASK IF B3=6 (HIGH BAY REPLACEMENT LAMPS)]** Similarly, how would you describe your sales of replacement lamps for high bay fixtures in 2025?

1. You are selling very few, most customers are replacing whole fixtures with LED fixtures
2. Compared to 2022, your sales are decreasing, as more customers are replacing whole fixtures with LED fixtures.
3. Compared to 2022, there is no change, many customers are still purchasing replacement lamps
96. Other: SPECIFY

B8. **[ASK IF LIGHTING CATEGORY LESS THAN 100% LED AT B4A]** You mentioned that in 2025, about **[INSERT % NON-LED LIGHTING FOR EACH CATEGORY FROM B4A]** % of your sales in this category were non-LED **[READ CATEGORY NAME]**. Why do you still carry non-LED **[READ CATEGORY NAME]**? **[PROBE: for specific markets or customers?]**

Lighting Category	Reasons for still carrying non-LED
a) Linear fixtures	Record: _____
b) Linear lamps	Record: _____
c) Outdoor fixtures	Record: _____
d) Outdoor replacement lamps	Record: _____
e) High bay fixtures	Record: _____
f) High bay replacement lamps	Record: _____

B9. **[IF NOT MENTIONED AT B8]** Broadly speaking, are there specific types of customers or market segments that actively look for or purchase non-LED lighting? If yes, which ones?

B10. **[IF B9 = YES OR MENTIONED AT B8]** Do you stock non-LED lighting specifically to meet the needs of these customers or market segments?

1. Yes
2. No
98. Don't know

B11. A) **Two years from now, in 2027**, what percentage of your **[READ CATEGORY NAME IDENTIFIED IN B3]** sales in New Brunswick do you expect will be LED lighting compared to non-LED lighting?

B) Why do you expect the percentage of your LED lighting sales to increase or decrease vs. 2025?

C) **[IF LESS THAN 100% FOR LED AT B11A)]** When do you expect LED products to make up 100% of your **[READ CATEGORY NAME]** sales?

Lighting Estimated Sales (%) in 2027				
Lighting Category	% LED Lighting	% Non-LED Lighting	[Why increase/decrease vs. B3 ANSWERS]	Year anticipated for sales to be 100% LED
a) Linear fixtures	___%	___%	_____	_____
b) Linear lamps	___%	___%	_____	_____
c) Outdoor fixtures	___%	___%	_____	_____
d) Outdoor replacement lamps	___%	___%	_____	_____
e) High bay fixtures	___%	___%	_____	_____
f) High bay replacement lamps	___%	___%	_____	_____

B13. **[IF A4=1, READ THIS PHRASE:** Before your company participated in the Midstream Business Rebate Program,] Approximately what percentage of the LED **[INSERT “LINEAR”/”OUTDOOR”/”HIGH BAY”]** fixtures you carry fell into each of the following categories?
[IF UNFAMILIAR WITH DLC STANDARD VS. PREMIUM, RECORD & SKIP]

DLC Standard/Premium Sales (%) in 2025 (without program)			
Lighting Category	% DLC Standard	% DLC Premium	% <u>NOT</u> DLC Certified
a) Linear fixtures	___%	___%	___%
b) Outdoor fixtures	___%	___%	___%
c) High bay fixtures	___%	___%	___%

- B14. **[ASK ONLY IF A4=1]** Since your company participated in the Midstream Business Rebate Program, about what percentage of the LED **[INSERT “linear”/”outdoor”/”high bay”]** fixtures you carry fall into each of the following categories? **[SKIP QUESTION IF UNKNOWN]**

DLC Standard/Premium Sales (%) in 2025 (with program)			
Lighting Category	% DLC Standard	% DLC Premium	% <u>NOT</u> DLC Certified
a) Linear fixtures	____%	____%	____%
b) Outdoor fixtures	____%	____%	____%
c) High bay fixtures	____%	____%	____%

- B15. **[ASK ONLY IF A4=1]** After applying the rebate from the Midstream Business Rebate Program, how does the price of DLC standard certified LED fixtures (all types) generally compare to that of non-DLC certified fixtures? **[SELECT ONE]**

- 3. Lower than non-DLC certified products
- 4. Comparable to non-DLC certified products
- 5. Higher than non-DLC certified products
- 96. Other (please indicate):
- 98. Don't know

- B16. **[ASK ONLY IF A4=1]** Similarly, after applying the rebate, how does the price of DLC premium certified LED fixtures (all types) generally compare to that of DLC standard certified LED fixtures? **[SELECT ONE]**

- 1. Lower than DLC standard certified products
- 2. Comparable to DLC standard certified products
- 3. Higher than DLC standard certified products
- 96. Other (please indicate):
- 98. Don't know

- B17. **[ASK ONLY IF A4=1]** Similarly, after applying the rebate, how does the price of DLC premium certified LED fixtures (all types) generally compare to that of non-DLC certified LED fixtures? **[SELECT ONE]**

- 1. Lower than non-DLC certified products
- 2. Comparable to non-DLC certified products
- 3. Higher than non-DLC certified products
- 96. Other (please indicate):
- 98. Don't know

C. Early Experience with NB Power Midstream Business Rebate Program

[ASK QUESTIONS IN SECTION C IF A4 =1]

C1. On a scale from 1 to 10 (where 1 = not at all satisfied and 10 = very satisfied) ...

- a. ...how would you rate your satisfaction with each of the following aspects?
- b. ...[ASK IF D1 IS LESS THAN 8], Please explain the reason(s) for your score.

Aspects of the program	Score	Reason
1. The overall NB Power Midstream Business Rebate Program		
2. The program support and communications provided by the program		
3. The rebate processing, tracking and reporting		

C2. Has your company experienced any challenges with the program since joining the program?

4. Yes
5. No
98. Don't know
99. Refused

C3. [IF D2=1] Please describe the challenges you encountered [OPEN RESPONSE]

C4. Do you have any suggestions to improve the program? [OPEN RESPONSE]

Record: _____

☐ No suggestion at this time

C5. [ASK ALL RESPONDENTS] Finally, would you be open to being contacted again at a later date, if needed, to validate some of the survey results? [YES/NO]

Those are all the questions I have for you today. Thank you for your time and the valuable feedback you have provided.

APPENDIX VIII

Non-participating Distributor Interview Guide

LIGHTING MARKET STUDY - INSTANT BUSINESS Rebate Programs – EFFICIENCY ONE

Interview guide with non-participating distributors

Table 1: Overview of Data Collection Activity

Descriptor	This Instrument
Instrument Type	Interview guide
Estimated Time to Complete	30 min
Target Audience	Nova Scotia – Non-participating Lighting Distributors
Expected Number of Completes	2
Contact List Source	Efficiency Nova Scotia
Fielding Firm	Narrative Research
Estimated Timeline for Fielding	3 weeks

Table 2: Research Objectives and Associated Questions

Research Objectives	Section
Screener	A
Lighting Market Assessment	B
Awareness & Participation: BER-IR Program	C

To be adapted by Econoler **[Blue text]**

Import variables from database < **LIKE THIS** >

Skip pattern or programming instructions **[LIKE THIS]**

Black text: instructions for interviewer **[NOTE: xxxx] / [PROBE: xxxx]**

PRE-SCREENING NOTE TO NARRATIVE: When reaching out to schedule interviews, please confirm with respondents that they are lighting distributors with the following question:

1. We are conducting market research on the state of the commercial lighting market in Nova Scotia, and we are hoping to speak with lighting distributors. Does your company operate as a lighting distributor, selling primarily lighting to contractors or other customers, or more as a lighting design firm offering turnkey lighting solutions and purchasing lighting products from a distributor?
 - › Company operates as a lighting distributor **[BOOK INTERVIEW]**
 - › Company operates as a lighting design firm primarily **[THANK & TERMINATE]**



Introduction

Thank you for taking the time to speak with me today. I am interested in your perspective on the state of the lighting market in Nova Scotia and New Brunswick. Econoler, in partnership with Narrative Research, is conducting this market research on behalf of Efficiency Nova Scotia.

We would appreciate your collaboration in answering questions about your involvement in this program. The information you provide will help Efficiency Nova Scotia improve their rebate programs. Our discussion should last around 30 minutes, Is this a good time for you?

Please note that your responses will be kept strictly confidential and that we will not share the information you provide with any other party in a way that could identify your individual or corporate responses. **[IF REQUIRED: With your permission, I would like to audio record our discussion to assist with the analysis of findings. The recordings will not be shared with other organizations, including Efficiency Nova Scotia. [OBTAIN VERBAL PERMISSION BEFORE RECORDING]**

A. Identification and Screening of Respondent

- A1. To begin, what is your title, and could you briefly describe your role within the company?
- A2. Can you provide a brief description of your company. Is your company a provincial, national or international distributor?
- A3. To confirm, are you the person within the company/store who is most knowledgeable about the inventory and sales of lighting products in Nova Scotia and New Brunswick, including: **1) linear LED fixtures, 2) LED linear lamps, 3) outdoor LED fixtures, 4) outdoor LED lamps,**
 - 1. Person responsible available **[CONTINUE]**
 - 2. Person responsible currently unavailable **[ARRANGE CALL BACK WITH THE RIGHT PERSON]**
 - 3. No person responsible for stocking or management of products **[CONTINUE INTERVIEW WITH STORE MANAGER/HEAD OFFICE CONTACT - CONTINUE]**
 - 98. Don't know **[CONTINUE INTERVIEW WITH STORE MANAGER/HEAD OFFICE CONTACT CONTINUE]**
 - 99. Refused **[THANK AND TERMINATE]**

B. Lighting Market Assessment

B1. Based on your observations, what's happened in the **commercial LED** lighting market in the **past three years** in terms of...in Nova Scotia? Any differences to note in New Brunswick? **[ASK FOR EACH]**

- a. New technologies [Any differences between LED lamps and LED fixtures?]
- b. Changes in demand [Any differences between LED lamps and LED fixtures?]
- c. Changes in product offerings [Any differences between LED lamps and LED fixtures?]
- d. Changes in availability [Any differences between LED lamps and LED fixtures?]
- e. Changes in pricing [Any differences between LED lamps and LED fixtures?]

B2. What proportion of all the lighting you supply, **in 2025** is LED vs. non-LED overall? What about in Nova Scotia? And, New Brunswick?

LED ____% Non-LED ____% **[TOTAL MUST EQUAL 100%]**

B3. Which of the following lighting categories do you supply? **[SELECT ALL THAT APPLY]**

1. Linear fixtures
2. Linear lamps
3. Outdoor fixtures
4. Outdoor replacement lamps

B4. **[ASK IF LESS THAN 100% FOR LED AT B2; ASK FOR EACH CATEGORY MENTIONED AT B3]**
 A) Thinking of 2025 to date, what percentage of the lighting your supply in **[READ CATEGORY NAME]** Nova Scotia are LED versus non-LED products? What about in New Brunswick? **[TOTAL LED AND NON-LED MUST EQUAL 100%]**

B) Has the percentage of LED sales increased or decreased since 2022 in Nova Scotia? What about in New Brunswick? Why? [NOTE: Please ask that they answer this question without including any COVID supply chain impacts.]

2025 YTD Lighting Sales (%)			
Lighting Category	% LED Lighting	% Non-LED Lighting	Increase/Decrease in LED vs. 2022? Why?
1. Linear fixtures	____%	____%	_____
2. Linear lamps	____%	____%	_____
3. Outdoor fixtures	____%	____%	_____
4. Outdoor replacement lamps	____%	____%	_____

B5. **[ASK IF B3=2 (LINEAR LAMPS)]** Customers can replace the lamps in their linear fixtures or replace the fixtures altogether. How would you describe your sales of replacement lamps for **linear fixtures** in 2025 so far in Nova Scotia? Is it that **[READ IN ORDER]**? **CODE ONE ONLY**

1. You are selling very few, most customers are replacing whole fixtures with LED fixtures
2. Compared to 2022 your sales are decreasing, as more customers are replacing whole fixtures with LED fixtures.
3. Compared to 2022, there is no change, many customers are still purchasing replacement lamps
96. Other: SPECIFY

PROBE: Any differences in New Brunswick?

B6. **[ASK IF B3=4 (OUTDOOR REPLACEMENT LAMPS)]** Similarly, how would you describe your sales of replacement lamps for **outdoor fixtures** in Nova Scotia?

1. You are selling very few, most customers are replacing whole fixtures with LED fixtures
2. Compared to 2022 your sales are decreasing, as more customers are replacing whole fixtures with LED fixtures.
3. Compared to 2022, there is no change, many customers are still purchasing replacement lamps
96. Other: SPECIFY

PROBE: Any differences in New Brunswick?

B7. **[ASK IF LIGHTING CATEGORY LESS THAN 100% LED AT B3 for NS only]** You mentioned that in 2025, about **[INSERT % NON-LED LIGHTING FOR EACH CATEGORY FROM B4A]**% of your sales in this category were non-LED **[READ CATEGORY NAME]** in Nova Scotia. Why do you still sell non-LED products **[READ CATEGORY NAME]**? **[PROBE: for specific markets or customers?]**

Lighting Category	Reasons for still carrying non-LED
1. Linear fixtures	Record: _____
2. Linear lamps	Record: _____
3. Outdoor fixtures	Record: _____
4. Outdoor replacement lamps	Record: _____

B8. **[IF NOT MENTIONED AT B8//IF KNOWN]** Broadly speaking, are there specific types of customers or market segments that actively look for or purchase non-LED lighting? If so, which ones? Does this vary in Nova Scotia and New Brunswick? Other parts of Canada?

VERBATIM RESPONSE:

B9. **[IF B9 = YES OR MENTIONED AT B8//IF KNOWN]** Do you sell non-LED lighting specifically to meet the needs of these customers or market segments?

1. Yes
2. No
98. Don't know

B10. A) **Two years from now, in 2027**, what percentage of your **[READ CATEGORY NAME IDENTIFIED IN B3]** sales in Nova Scotia do you expect will be LED lighting compared to non-LED lighting? What about in New Brunswick?

B) Why do you expect the percentage of your LED lighting sales to increase or decrease vs. 2025? **[PROBE for differences in NS and NB]**

C) **[IF LESS THAN 100% FOR LED AT B11A]** When do you expect LED products to make up 100% of your **[READ CATEGORY NAME]** sales in Nova Scotia? What about New Brunswick? What about Canada-wide?

Lighting Estimated Sales (%) in 2026				
Lighting Category	% LED Lighting	% Non-LED Lighting	[Why increase/decrease vs. B3 ANSWERS]	Year anticipated for sales to be 100% LED
1. Linear fixtures	___%	___%	_____	_____
2. Linear lamps	___%	___%	_____	_____
3. Outdoor fixtures	___%	___%	_____	_____
4. Outdoor replacement lamps	___%	___%	_____	_____

B12. About what percentage of the LED **[INSERT "linear"/"outdoor"]** fixtures you sell fall into each of the following categories in Nova Scotia? What about in New Brunswick?

DLC Standard/Premium Sales (%) in 2025 (without program)			
Lighting Category	% DLC Standard	% DLC Premium	% <u>NOT</u> DLC Certified
1. Linear fixtures	___%	___%	___%
2. Outdoor fixtures	___%	___%	___%



C. Awareness & Participation: BER-IR Program

C1. Have you heard of the Efficiency Nova Scotia Business Energy Rebates Program that offers instant lighting rebates?

1. Yes
2. No

C2. **[IF C1 = 2 (NOT PARTICIPATING)] A)** The Business Energy Rebates Program is an energy efficiency program in Nova Scotia that works with distributors to offer an instant discount on select lighting products to their customers. Participating distributors are later reimbursed by Efficiency Nova Scotia for the incentives they have passed along to their customers. Based on this description, is this a program your company would be interested in promoting?

1. Yes
2. No
98. Don't know

B) [If yes, why? If no, why not?]

[IF RESPONDANT ASKS FOR MORE INFORMATION, PLEASE SHARE WEBLINK ADDRESS]
[<https://www.efficiencyns.ca/programs-rebates/business-energy-rebates>]

C3. To conclude, is there anything we haven't yet discussed that you can share about the lighting market in Nova Scotia or New Brunswick? Any general Canadian trends in lighting sales you could share at a high-level?

C4. Finally, would you be open to being contacted again at a later date, if needed, to validate some of the survey results? **[YES/NO]**

Those are all the questions I have for you today. Thank you for your time and the valuable feedback you have provided.

APPENDIX IX

BER 2025 Recommendations

This appendix summarizes all the recommendations made by the Evaluator as part of the 2025 BER evaluation.

Section	Recommendations
Executive Summary	Recommendation #1: Use the calculated adjustment ratios to track gross electrical energy and peak demand savings moving forward, with the exception of the 0.514 adjustment ratio for peak demand savings for non-lighting and non-HVAC measures. Reassess the electrical energy and demand adjustment ratios for agriculture, motor, pumping, refrigeration, and commercial kitchen measures in the 2026 evaluation after sampling additional projects in this group of measures. Recalculate adjustment ratio for electrical energy and demand savings specifically for agriculture and motor measures to determine whether standalone ratios are warranted.
Executive Summary	Recommendation #2: Moving forward, use the updated measure-level NTGR values to convert gross electrical energy and peak demand savings into net savings for reporting and evaluation purposes.
Executive Summary	Recommendation #3: Continue to use DLC wattages as the efficient wattage values for multi wattage products. Rather than track whether each fixture is multi-wattage, conduct periodic spot checks, particularly on large applications, to confirm the accuracy of DLC wattage listings and identify any cases that may require correction.
Executive Summary	Recommendation #4: Rather than track whether a fixture is recessed in Application Rebates, adopt an assumption that recessed fixtures are limited to troffers, which is consistent with practices in BER-IR, and apply the recessed interactive effect factors to troffers only.
Executive Summary	Recommendation #5: Apply adjustment factors separately rather than embedding them in gross values and record the adjusted results in dedicated fields in the tracking sheet to improve transparency and reduce error risks.
Executive Summary	Recommendation #6: Update the baseline for LED fixtures in 2026 to reflect that the market stocking practice has become LED only. This baseline would apply to all LED fixtures rebated through BER-IR.
Executive Summary	Recommendation #7: When the new LED baseline is applied, it should be at the efficiency level of DLC-certified standard LED fixtures. Explore the possibility of continuing to offer rebates for DLC Premium products and lighting controls in midstream programs with updated savings assumptions based on a LED baseline.
Executive Summary	Recommendation #8: The 2024 recommendation that the current non-LED baseline for lamps be maintained for BER-IR remains valid and should be reassessed in 2026. Given trends, E1 should plan for a baseline change for BER-IR lamps starting in 2028.
Executive Summary	Recommendation #9: Focus LED fixture rebates on application-based and direct install programs in the near-to-medium term to target early replacements in the laggard market segments (small businesses, institutions, non-profits, etc.).
Executive Summary	Recommendation #10: For SBES, given the target population of small businesses, the Evaluator assumes that many projects are early replacement. Therefore, implement a dual baseline approach for LED fixtures, notably by using the existing baseline for one-third of the lifetime of the existing measure and a LED baseline for the remainder of the efficient measure lifetime.

Executive Summary	Recommendation #11: For BER-AR, consider two options: Option 1: Focus BER-AR on market laggards and adopt eligibility criteria to ensure projects are early replacement (as seen in ComEd). If this is feasible, the Evaluator recommends using the Uniform Methods Project (UMP) approach of developing a dual baseline by using the existing baseline for one-third of the lifetime of the existing measure and a LED baseline for the remainder of the efficient measure lifetime. Option 2: If developing and enforcing eligibility criteria to ensure all projects are early replacement, a market blend baseline should be used and that accounts for the proportion of projects aimed at early replacement versus end of life. The blended baseline should assume a LED baseline for the proportion of projects assumed to be at end of life.
Executive Summary	Recommendation #12: Monitor the market and plan for full market transformation in the next three to four years. Assume that there will be no further opportunities, including early replacement projects for both lamps and fixtures, under SBES and BER-AR after 2028.



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ECONOLÉR



EfficiencyOne

CUSTOM INCENTIVES PROGRAM

Final Report

2025 DSM EVALUATION

March 20, 2026

In collaboration with:





ABBREVIATIONS

BDM	Business Development Manager
BER	Business Energy Rebates
BNI	Business, non-profit, and institutional
BOpt	Building Optimization
CPA	Customer Project Agreement
DR	Demand response
DSM	Demand-side management
DSM MA	Demand-side Management Measure Assessment
E1	EfficiencyOne
EMIS	Energy Management Information Systems
EMIS	Energy Management Information Systems
ENS	Efficiency Nova Scotia
EPP	Efficiency Preferred Partner
EUL	Effective useful life
GHG	Greenhouse gas
HVAC	Heating, ventilation, and air-conditioning
IEM	Industrial energy manager
IPMVP	International Performance Measurement and Verification Protocol
KPI	Key performance indicator
LED	Light-emitting diode
M&V	Measurement and verification
MOU	Memorandum of Understanding
NECB	National Energy Code of Canada for Buildings
NS Power	Nova Scotia Power
NSEB	Nova Scotia Energy Board
NSUARB	Nova Scotia Utility and Review Board
NTGR	Net-to-gross ratio
OEM	On-site energy manager
P4P	Pay-for-Performance
PV	Photovoltaic
SEM	Strategic Energy Management
TRM	Technical Reference Manual
UMP	Uniform Methods Project

DEFINITIONS

Accuracy	Reflects the proximity of measurements to the true value.
Adjustment ratio	The ratio of evaluated results to tracked results. This ratio expresses the adjustment made to tracked savings or other tracked values such as effective useful life values.
Available Demand Response Capacity	The capacity that is available to Nova Scotia Power (NS Power) to reduce system peak demand. This capacity is calculated based on the first two hours of all events called between December and February, excluding weekends and holidays. If an event is shorter than two hours, only the first hour is used to measure available demand response (DR) capacity. Available DR capacity is evaluated on a per-participant basis based on the average demand reduction observed for each event in which the participant was scheduled to participate. E1's total available DR capacity is the sum of each participant's available DR capacity.
Baseline	To determine gross savings, a baseline (or base case) is established, providing detailed information about the reference (e.g. pre-existing or standard) measure or equipment chosen to be compared with the efficient measure or equipment. For the reference measure or equipment, the baseline may include such information as the hours of operation, wattage, and base consumption.
Bias	Systematic deviations of measurements from the true value.
Billing calibration	An activity that consists of adjusting the expected energy savings based on the relative difference between the results of energy simulations and the actual energy consumption of a building or system.
Confidence interval	The estimated range of values that is likely to include unknown population parameters.
Demand response	Demand response measures generate savings in the form of available capacity or a load reduction in response to events called by the electric utility (NS Power) to reduce the load at strategic moments. These events can be called at any time and for any duration, although they are usually called for one to four hours during peak periods.
Displaced wattage	The displaced wattage is defined as the difference between the wattage values of the baseline equipment or product and that of the efficient equipment or product.
EnerGuide rating	An EnerGuide (official brand of Natural Resources Canada) rating is a standard measure of home energy performance. It is a measure of the efficiency of the building only and does not take into account occupant behaviour. It shows how energy efficient a home is through modelled home heat losses based on several factors including building envelope characteristics, heated volume, heating systems, and air leakage.
Effective useful life	The period a measure is expected to be in service and provide both electrical energy and peak demand savings. This value combines equipment life and measure persistence, which includes factors such as business turnover or early retirement.
Equipment life	The number of years installed equipment will operate before it fails.

Equivalent CO2	A unit of measurement indicating the amount of carbon dioxide to which various kinds of emitted greenhouse gases are equivalent in terms of warming effects. In this report, gas global warming potential is estimated over a timescale of 100 years.
Equivalent effective useful life	The number of years by which the first-year savings estimate is multiplied to obtain lifetime energy savings. This value takes into account variations in annual electrical energy savings throughout the effective useful life due to increased baselines.
Evaluated savings	Gross and net electrical energy or peak demand savings calculated by the Evaluator using the parameters (unitary savings values, installation rates, interactive effects, net-to-gross ratios, etc.) validated or measured during the evaluation process. Unless otherwise specified, evaluated savings are first-year savings.
Evaluation plan	The evaluation plan summarizes the program description, objectives, base cases, documentation, evaluation methodology, budget, and schedule.
First-year savings	The first full year of electrical energy or peak demand savings generated by an energy efficiency measure.
Free-ridership	Percentage of gross savings attributable to participants who would have implemented the same or similar energy efficiency measures, with no change in timing, in the absence of the program.
Gross savings	Change in energy consumption and/or demand that results directly from program-related actions taken by participants in an energy efficiency program regardless of why they participated.
Induced consumption	Energy consumption of appliances that would have been unplugged and not replaced by participants in the absence of the program.
Interactive effects	Effects on the energy consumption of other systems (such as heating and cooling) in a building due to the installation of an energy efficiency measure.
In-service rate	The proportion of incentivized products installed and operating. This rate is usually applied to programs through which rebates are offered in-store and products are likely to be stored for a certain period before being installed, such as light-emitting diode (LED) lamps.
Installation rate	The proportion of incentivized products reported as installed and that remain installed and operating at the time of evaluation. This rate is usually applied to direct install or mail-in rebate programs through which measures are expected to be installed immediately at the time of participation.
Lifetime energy savings	The energy savings that occur over the lifetime of an energy efficiency measure. Lifetime energy savings account for a measure's effective useful life and any increase in the baseline efficiency level (which reduces attributable annual savings) over its lifetime.
Line loss factor	The multiplier to convert savings at the customer meter to savings at the utility generator. It accounts for the electrical losses of the transmission and distribution system.
Margin of error	The amount of random sampling error.
Market effects	The impact of a program on the market (in terms of product availability, practices, and prices) and that extends beyond changing program participant behaviours. Market effects include spillover among non-participants.

Net savings	Electrical energy or peak demand savings that can be reliably attributed to a program. These include effects such as free-ridership and spillover that negatively or positively affect the savings attributable to a program.
Net-to-gross ratio	The ratio of net electrical energy savings to gross electrical energy savings.
Non-sampling error	Errors arising during the course of all survey activities other than sampling. Non-sampling errors tend to lead to bias in measurements and are very difficult to quantify.
Peak coincidence factor	The percentage of measure demand savings that coincide in time with the annual peak demand of the entire electricity system.
Peak demand savings	The demand savings that coincide in time with the expected annual peak demand period of the entire electricity system. For industrial participants on an interruptible rate, peak demand savings may include savings on non-firm loads, i.e. loads that may be interrupted when NS Power's 10-minute reserve is low.
Precision	The extent to which repeated measurements agree with one another.
Random sampling error	An error in measurement due to the fact that measurements are taken from a subset of the population and not the entire population.
Realization rate	The ratio of evaluated savings to tracked savings.
Sample size	The number of observations or replicates included in a statistical sample.
Secondary market impacts	Energy consumption of appliances that would have been transferred to the secondary market if said appliances had not been retired.
Spillover	Savings attributable to participants who implement additional energy efficiency measure(s) introduced by a program after participating in it once and without participating in the program a second time.
Tracked savings	Gross and net savings calculated based on various parameters such as number of participants or units installed or sold, unitary savings values, installation rates, interactive effects, and net-to-gross ratios. Those parameters, with the exception of the number of participants or units installed or sold, are obtained from the previous evaluation.
Unitary savings	Electrical energy or peak demand savings established on a unitary basis. A unit can either be a product (e.g. an 8 W LED lamp), a capacity (e.g. one tonne capacity of an air-source heat pump), or a participant (e.g. one participant taking part in a behaviour-based program).

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EXECUTIVE SUMMARY

This report presents the 2025 demand-side management (DSM) results of the Custom Incentives program administered by EfficiencyOne (E1). This program is comprised of two program components: (1) Custom and (2) Strategic Energy Management (SEM). Custom is further comprised of the Retrofit, Pay-for-Performance (P4P), New Construction, and Building Optimization (BOpt) services. Combined, the two program components help commercial, industrial, and institutional participants identify, prioritize, and implement energy efficiency projects, processes, or policies in their organizations by providing support, training, and financial incentives.

Evaluation Approach

The 2025 evaluation was aimed at calculating program component gross and net results, namely first-year and lifetime electrical energy savings, peak demand savings, as well as avoided greenhouse gas (GHG) emissions. Table 1 summarizes the types of evaluation conducted for each program component and the corresponding methodology.

Table 1: Summary of 2025 Custom Incentives Program Evaluation

Program Component	Evaluation Type			Methodology
	Impact	Process	Market	
Custom	Comprehensive			› Participant phone interviews › Project file reviews and participant follow-up interviews or site visits (regular Retrofit) › Project file reviews and participant follow-up interviews (BOpt, P4P) › Savings verification (solar photovoltaic [PV], compressed air leak audit) › Project reviews and energy model reviews (New Construction) › Tracking sheet audit and analysis › Calculations using evaluation results › Avoided GHG emission reduction calculations
SEM	Comprehensive			› Tracking sheet audit › Project file reviews supported by participant and/or Service Provider follow-up interviews › Site visits for participants claiming savings for the first time › Calculations using evaluation results › Avoided GHG emission reduction calculations

Program Performance

Table 2 below presents the participation levels, average net-to-gross ratios (NTGRs), evaluated gross and net savings at the generator, annual GHG emission reductions, as well as average effective useful life (EUL) values for each program component and for Custom Incentives as a whole.

Table 2: Overall 2025 Custom Incentives Participation and Savings

	Participation Level		Gross Savings		NTGR*	Net Savings	
	Value	Unit	Value	Unit	Value	Unit	Value
Custom							
Electrical Energy Savings	80	Projects completed	36.207	GWh	0.84	30.487	GWh
Lifetime Electrical Energy Savings			531.666	GWh	0.82	437.723	GWh
Peak Demand Savings			7.523	MW	0.85	6.372	MW
Annual GHG Emission Reductions			16,992	Tonnes of CO2 eq	0.84	14,308	Tonnes of CO2 eq
EUL			14.7	Years		14.4	Years
SEM							
Electrical Energy Savings	11	Projects completed ¹	4.031	GWh	1.00	4.031	GWh
Lifetime Electrical Energy Savings			20.515	GWh	1.00	20.515	GWh
Peak Demand Savings			0.372	MW	1.00	0.372	MW
Annual GHG Emission Reductions			1,892	Tonnes of CO2 eq	1.00	1,892	Tonnes of CO2 eq
EUL			5.1	Years		5.1	Years
Total							
Electrical Energy Savings	91	Projects completed	40.239	GWh	0.86	34.519	GWh
Lifetime Electrical Energy Savings			552.182	GWh	0.83	458.238	GWh
Peak Demand Savings			7.895	MW	0.85	6.744	MW
Annual GHG Emission Reductions			18,884	Tonnes of CO2 eq	0.86	16,200	Tonnes of CO2 eq
EUL			13.7	Years		13.3	Years
*The NTGRs listed in this table match the rounded averages obtained by dividing net savings by gross savings.							

Custom Incentives was aimed at achieving 26.817 GWh in net electrical energy savings and 5.112 MW in net peak demand savings at the generator for 2025. The program surpassed both the net electrical energy and demand savings targets. Custom was the largest contributor to total program net electrical energy and peak demand savings.

The following subsections present evaluation results at the program component level.

Custom Findings and Recommendations

This subsection provides the key findings and recommendations from the Custom evaluation. The Evaluator has no specific recommendation for Custom.

¹ Completed SEM projects reference participants that generated savings in a given year.



Custom General Key Findings and Recommendations

2025 Custom-Finding: Custom achieved 30.487 GWh in net electrical energy savings and 6.372 MW in net peak demand savings at the generator in 2025, thereby surpassing by 26% the planned electrical energy savings of 24.160 GWh and by 32% the planned peak demand savings of 4.824 MW.

2025 Custom-Finding: Participation decreased for Retrofit and increased for BOpt and New Construction in 2025 compared to 2024 levels. One P4P project was completed in 2025. Overall, total participation decreased in the Custom program component compared to 2024.

2025 Custom-Finding: Following the project reviews, the Evaluator adjusted the electrical energy and peak demand savings for three Custom services. For Retrofit, these adjustments resulted in adjustment ratios of 0.993 and 1.011 for electrical energy and peak demand savings respectively. Similarly, resulting adjustment ratios for P4P were 1.000 and 0.528 for electrical energy and peak demand savings respectively, while New Construction had resulting adjustment ratios of 0.949 and 0.937 for electrical energy and peak demand savings respectively.

2025 Custom-Finding: The free-ridership level decreased from 15% to 8% for regular Retrofit projects. Free-ridership levels were established at 8% for compressed air leak audits and were maintained at 38% for solar PV. New Construction free-ridership was established at 18%, a decrease from 28% in 2024. The free-ridership level for P4P was established at 8%, while it was not measured for BOpt and was, therefore, maintained at 9%. Spillover was nil for regular Retrofit projects and compressed air leak audit projects. Spillover levels were not measured for solar PV and BOpt and were, therefore, maintained at 1% and nil respectively.

2025 Custom-Finding: The evaluated net electrical energy and peak demand savings determined by the Evaluator were both 8% higher than the savings tracked by E1.

SEM Findings and Recommendations

This subsection provides the key findings from the SEM evaluation. The Evaluator has no specific recommendation for SEM.

2025 SEM-Finding: SEM net electrical energy savings exceeded the 2.657 GWh target by 52% and the planned 0.289 MW in net peak demand savings by 29%.

2025 SEM-Finding: In 2025, the SEM participation level increased to the highest level since 2018. Conversely, electrical energy savings per participant were lower than in the last three years.

2025 SEM-Finding: The measurement and verification (M&V) methodologies applied to quantify savings were generally appropriate and accurate.

Program Tracked and Evaluated Savings

Table 3 below compares E1 tracked electrical energy and peak demand savings to evaluated savings at the generator. It also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings. Furthermore, the NTGRs are also presented and correspond to the rounded averages obtained by dividing net savings by gross savings, which explains why the NTGR values in Table 3 differ from those presented herein in other sections.

Table 3: Comparison of 2025 Tracked and Evaluated Savings at the Generator

		Gross Savings		NTGR*	Net Savings		Realization Rate
		Value	Unit		Value	Unit	
Custom	Electrical Energy Savings						
	Tracked Savings by E1	36.627	GWh	0.77	28.244	GWh	108%
	Evaluation Results	36.207	GWh	0.84	30.487	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	7.883	MW	0.75	5.887	MW	108%
	Evaluation Results	7.523	MW	0.85	6.372	MW	
SEM	Electrical Energy Savings						
	Tracked Savings by E1	4.228	GWh	1.00	4.228	GWh	95%
	Evaluation Results	4.031	GWh	1.00	4.031	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	0.421	MW	1.00	0.421	MW	88%
	Evaluation Results	0.372	MW	1.00	0.372	MW	
*The NTGRs listed in this table match the rounded averages obtained by dividing net savings by gross savings.							

INTRODUCTION

EfficiencyOne (E1), an independent and non-profit organization, is responsible for helping Nova Scotians improve the energy efficiency of their homes and workplaces by designing, marketing, and delivering demand-side management (DSM) for Nova Scotians. E1 provides energy efficiency, demand response, and carbon mitigation services through the Efficiency Nova Scotia (ENS) franchise. Regulatory oversight of its DSM activities is provided by the Nova Scotia Energy Board (NSEB). E1 receives funding for its electricity DSM activities from Nova Scotia Power (NS Power) ratepayers.

E1 has a DSM portfolio of three residential programs, three business, non-profit, and institutional (BNI) programs, and one demand response (DR) program that are marketed to Nova Scotians through the ENS franchise. Each program has one or more program components. Econoler was commissioned by E1 to evaluate E1's 2025 DSM program portfolio.

This report presents the evaluation results of the Custom Incentives program comprised of two components: (1) Custom and (2) Strategic Energy Management (SEM). Table 4 below lists the Custom Incentives program components and the types of evaluations conducted for 2025. A comprehensive impact evaluation involves reviewing the following four key elements: (1) The baseline definition; (2) the savings calculation methodology; (3) the values of the parameters used to calculate savings; and (4) net-to-gross ratios (NTGRs).

Table 4: Types of Evaluations Conducted for Each Program Component, 2025

Program	Program Component	2025		
		Process	Market	Impact
Custom Incentives	Custom			Comprehensive
	SEM			Comprehensive

For each program, the Evaluator prepared a DSM evaluation report presenting key findings, first-year and lifetime electrical energy savings, peak demand savings, and avoided greenhouse gas (GHG) emissions.²

² Unless specified otherwise, energy savings refer to first-year energy savings rather than lifetime energy savings throughout this report.

1 Custom Overview

This section describes the Custom component of the Custom Incentives program, follows up on past evaluation recommendations, and provides an overview of participation history.

1.1 Custom Description

Custom provides large business, non-profit, and institutional (BNI) participants with technical assistance, financial incentives, and project financing to help reduce their electricity consumption and peak demand. Business Development Managers (BDM) also work with participants to assist them in moving their projects forward and identifying consultants. As outlined in Figure 1, Custom includes four different services.

Figure 1: Custom Services

Retrofit	• Technical and financial support to help organizations conduct scoping and feasibility studies. • Technical and financial support for the implementation of energy efficiency projects using a customized and flexible approach.* • Organizations with annual consumption of 350,000 kWh or higher are eligible provided projects have not yet started.
New Construction	• Technical and financial support to achieve electrical energy savings in new buildings and for major renovations in existing buildings, excluding savings from lighting systems. • Participation begins at the preliminary design stage to ensure the effective implementation of energy efficiency measures and achievement of maximum savings. • Eligible facilities must be 15,000 square feet or larger. • Projects must achieve reductions in total building energy consumption of at least 25% and must save at least 100,000 kWh in electricity.
Building Optimization (BOpt)	• Technical and financial support to help organizations conduct an investigation study with the objective of improving building operational efficiency. • Technical and financial support for the implementation of no-cost or low-cost energy efficiency measures (e.g. operating schedule changes) identified through a recommissioning process. • Eligible facilities must not have been commissioned in the previous two years, must have a building automation system, and annually consume 350,000 kWh or more.
Pay-for-Performance (P4P)	• Financial support for reductions in electricity consumption achieved through a variety of capital and behavioural energy efficiency upgrades. • Incentives are based on verified facility energy performance. • Organizations with annual consumption of 1,000,000 kWh or higher are eligible if projects generate reductions in electricity consumption of at least 10%.

* The Retrofit service also includes compressed air leak audits and solar photovoltaic (PV) projects for which a semi-prescriptive approach is used to establish evaluated savings.

EfficiencyOne (E1) claims savings for certain Custom projects over multiple years since certain phases or measures can be fully operational before an entire project is completed. There are three types of projects for which savings were tracked in 2025:

- › **Projects not completed in 2025**, which include projects that either submitted their first savings claim in 2025 or submitted savings claims in prior years and were not yet completed. In these cases, the savings claims submitted in 2025 were claimed as *partial savings*.
- › **Single-year projects completed in 2025** for which all project savings were claimed in that year. In these cases, the full project savings were claimed as *final savings*.
- › **Multiyear projects completed in 2025**, which are projects that submitted *partial savings* claims in previous years and that were fully completed in 2025. In these cases, the portion of savings submitted in 2025 was claimed as *final savings*. Since these projects were completed in 2025, the 2025 adjustment ratios and NTGRs were applied to the full savings associated with these projects, including previously submitted partial claims, via *true-up adjustments* (described in further detail in Subsection 3.2.6 below).

Retrofit, P4P, New Construction, and Building Optimization combined were aimed at generating net electrical energy savings of 24.2 GWh and net peak demand savings of 4.8 MW at the generator in 2025.

1.2 Follow-up on Past Evaluation Report Recommendations

The Evaluator evaluated Custom in previous years and issued improvement recommendations. Table 5 below provides a summary of the implementation status of each recommendation still being implemented as presented in the Executive Summary section of the 2024 Custom Incentives evaluation report as well as based on the recommendations issued in the 2022 Custom Incentives evaluation report.

Table 5: Implementation Status of Past Recommendations for Custom

#	Recommendations	Status	Comments
2022-Retrofit-R2	Require measurement and verification (M&V) efforts based on the International Performance Measurement and Verification Protocol (IPMVP) Option C approach for any Retrofit indoor horticultural lighting projects.	In progress	Program staff are currently exploring effective methods for accurately representing the interactive effects associated with indoor horticultural lighting projects, including the IPMVP Option C approach. E1 staff are trialling a project with one customer using interactive effects calculations informed by the Efficiency Maine 2024 Technical Reference Manual (TRM). E1 staff estimated savings using this approach in 2024 and have been attempting to conduct M&V throughout 2025 to assess the calculations used. However, project delays have pushed this assessment into 2026.
2024-New Construction-R1	Review the peak demand savings script used for projects modelled in eQuest to ensure accurate results and favour an approach that can be applied consistently across a variety of modelling software.	In progress	E1 staff have reviewed the demand savings script and methodologies used for projects modelled in eQuest and other software. Hourly demand savings calculations have been added to a new template. E1 staff anticipate implementing the updated script in the first quarter of 2026.
2024-New Construction-R2	Amend Subsection 7.10 of the New Construction program guide to require M&V for large industrial New Construction projects.	Deferred	Given the infrequent occurrence of large industrial New Construction projects, E1 staff plan to defer this amendment to a future year, to be revisited when program priorities and resources allow for implementation.

#	Recommendations	Status	Comments
2024-New Construction-R3	Investigate the impact of increasing modelling incentives (the share of modelling costs covered as well as the incentive cap) on the service.	In progress	The New Construction service underwent a jurisdictional scan in 2024, comparing it to five similar programs across North America. E1's maximum modelling incentive is aligned with several reviewed jurisdictions. In Q2 2026, E1 anticipates investigating the potential impact of increasing modelling incentives and consider any findings for future program updates.
2024-New Construction-R4	Endeavour to recruit new energy modellers through targeted outreach; modellers put a premium on networking opportunities with builders.	Complete	E1 has added two new energy modellers to their approved list in 2025 and are actively working with three others. E1 staff will continue to recruit new modellers as the demand arises.
2024-New Construction-R5	Consider collaborating with educational institutions and professional associations on energy modelling to build a stronger pipeline of qualified and engaged energy modellers across Nova Scotia.	Complete	This responsibility falls under E1's Efficiency Preferred Partner (EPP) and Capacity Building teams. The teams have already initiated efforts, including working with CIET to host energy modeling training and exploring micro-credential courses through the Nova Scotia Community College. Program staff plan to defer further action on this recommendation to a future year as the EPP and Capacity Building teams continue to lead these initiatives.
2024-New Construction-R6	For builders and energy modellers, the service should increase targeted outreach and educational activities related to the code shift and its impacts, particularly about the impacts involving technologies (including electrification), costs, and energy efficiency improvements. By providing practical guidance on meeting new requirements and exceeding them with service support, the service can be positioned as a valuable resource while increasing awareness about the service and encouraging more participation.	Not recommended for action	E1 appreciates this recommendation. While targeted outreach and educational activities are important, other organizations have already taken the lead in this area. The Department of Growth and Development, in partnership with the Construction Association of Nova Scotia and the Canadian Home Builders' Association of Nova Scotia, sponsored sessions on upcoming changes to the Nova Scotia Building Code. Sessions were held virtually and in person across the province in March 2025.
2024-New Construction-R7	Review the program guidelines and update to align with the National Energy Code of Canada for Buildings (NECB) 2020 that will be adopted in April 2025.	In progress	NECB 2020 Tier 1 was adopted in Nova Scotia on April 1, 2025, which will impact the baseline definition for all New Construction projects moving forward. E1 staff are currently interpreting the changes to the energy code and will update the program guidelines accordingly. E1 staff anticipate to have updated the New Construction Program Guide in alignment with NECB 2020 by the end of March 2026.
2024-New Construction-R8	Investigate aligning implementation incentives with NECB 2020 tiers. Such alignment would need to consider the phased-in adoption of NECB 2020 Tiers 1-3 over the 2025-29 period.	In progress	New Construction incentives are currently tiered based on improvements in whole-building efficiency beyond minimum code requirements. E1 staff are working on aligning these incentives with NECB 2020 Tiers 1-3. Any changes to the incentive structure will be reflected in the updated program guide. E1 staff anticipate updating the New Construction Program Guide by the end of March 2026.
2024-New Construction-R9	E1 should update the Custom New Construction logic model to document and address current barriers and update the theory of change to include all activities being carried out to address the barriers.	In progress	E1 agrees with this recommendation. The Evaluator will update the Custom New Construction logic model by the end of March 2026. E1 staff will revise the theory of change to include all activities aimed at overcoming program barriers.

1.3 Participation History

This subsection provides a participation overview for the four Custom services.

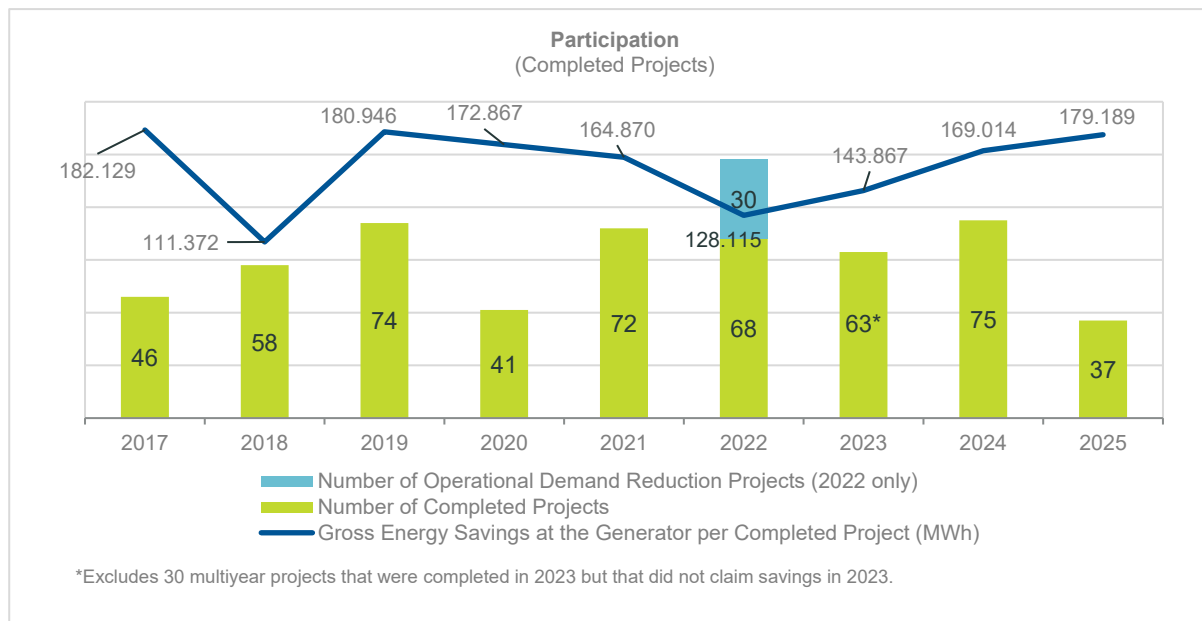
Retrofit

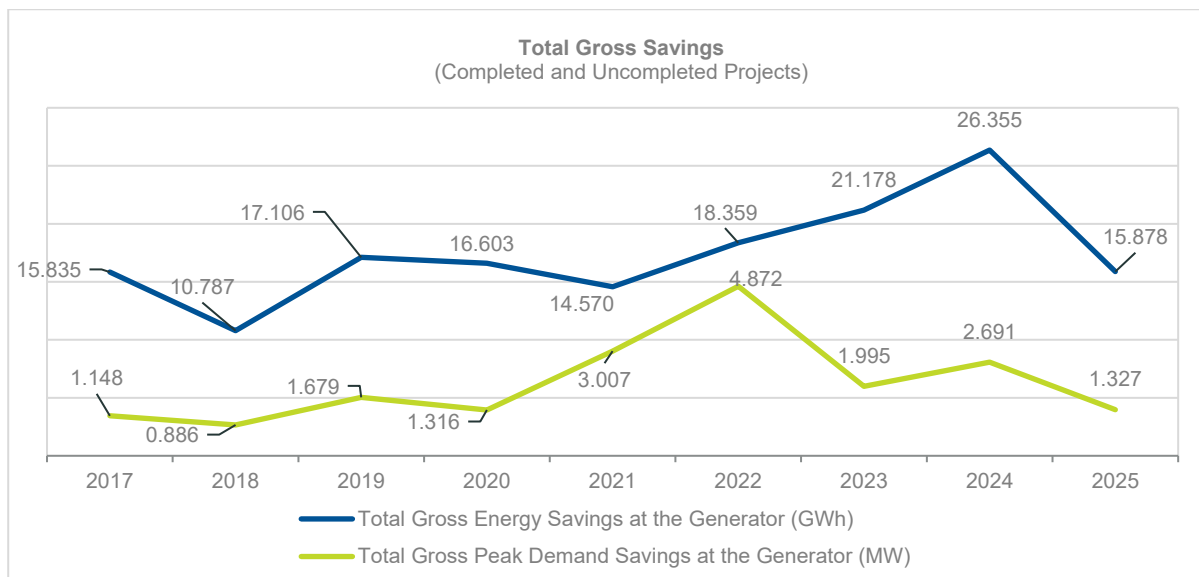
In 2025, electrical energy savings and/or peak demand savings were generated by a total of 46 Retrofit projects, including:

- › 37 projects that were completed and claimed final savings in 2025:
 - › 31 single-year projects
 - › Six multiyear projects
- › Nine projects that claimed partial savings in 2025 but were not completed:
 - › Two projects were started in 2025 but have not yet been completed; these projects had partial savings claimed in 2025.
 - › Seven multiyear projects were started before 2025 but have not yet been completed; these projects had partial savings claimed in 2025.

As presented in Figure 2 below, 37 completed projects generated electrical energy savings in 2025, which is 51% lower than the 75 projects completed in 2024. However, average electrical energy savings per completed project increased by 6% in 2025 compared to 2024 levels. Overall, Retrofit projects achieved 40% fewer gross electrical energy savings and 51% fewer gross peak demand savings in 2025 compared to 2024 levels.

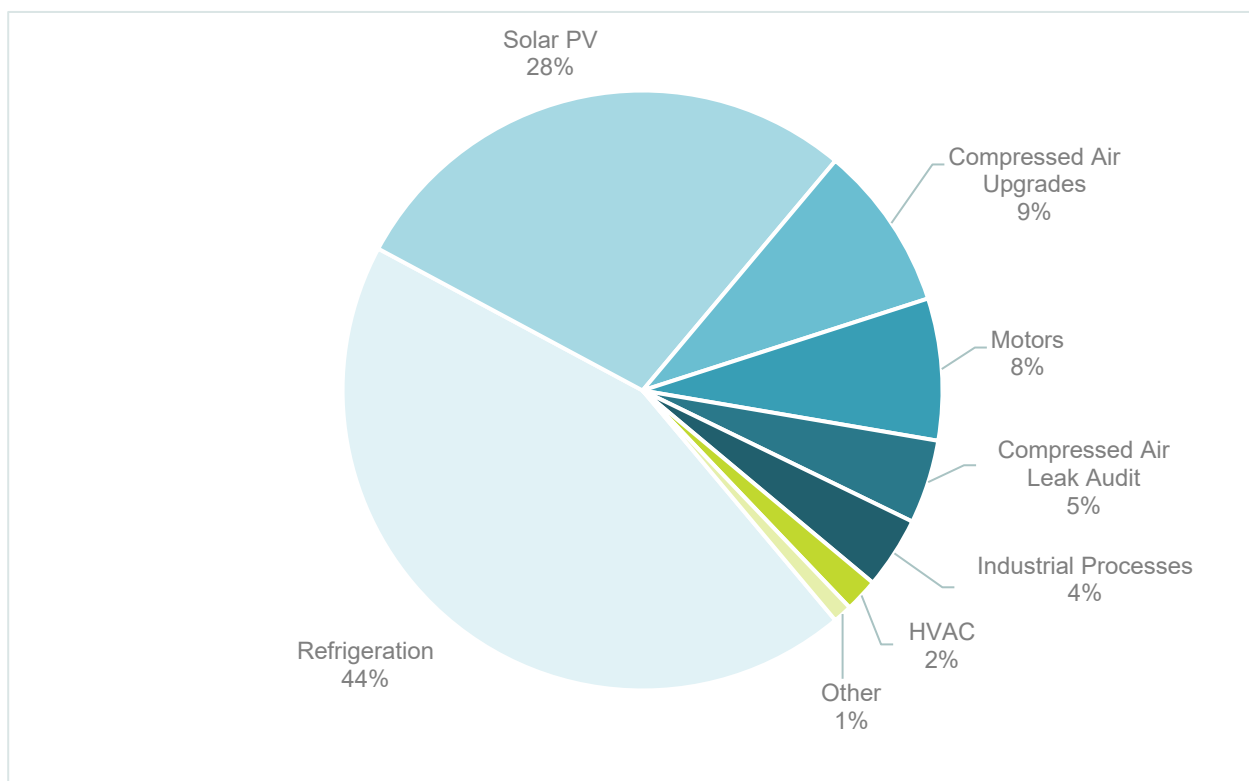
Figure 2: Overview of Retrofit Participation, 2017–2025





As illustrated in Figure 3 below, the three measure types that contributed the most to Retrofit tracked electrical energy savings at the meter were refrigeration, solar PV, and compressed air upgrade measures.

Figure 3: Retrofit Electrical Energy Savings by Measure Type - Projects Completed in 2025



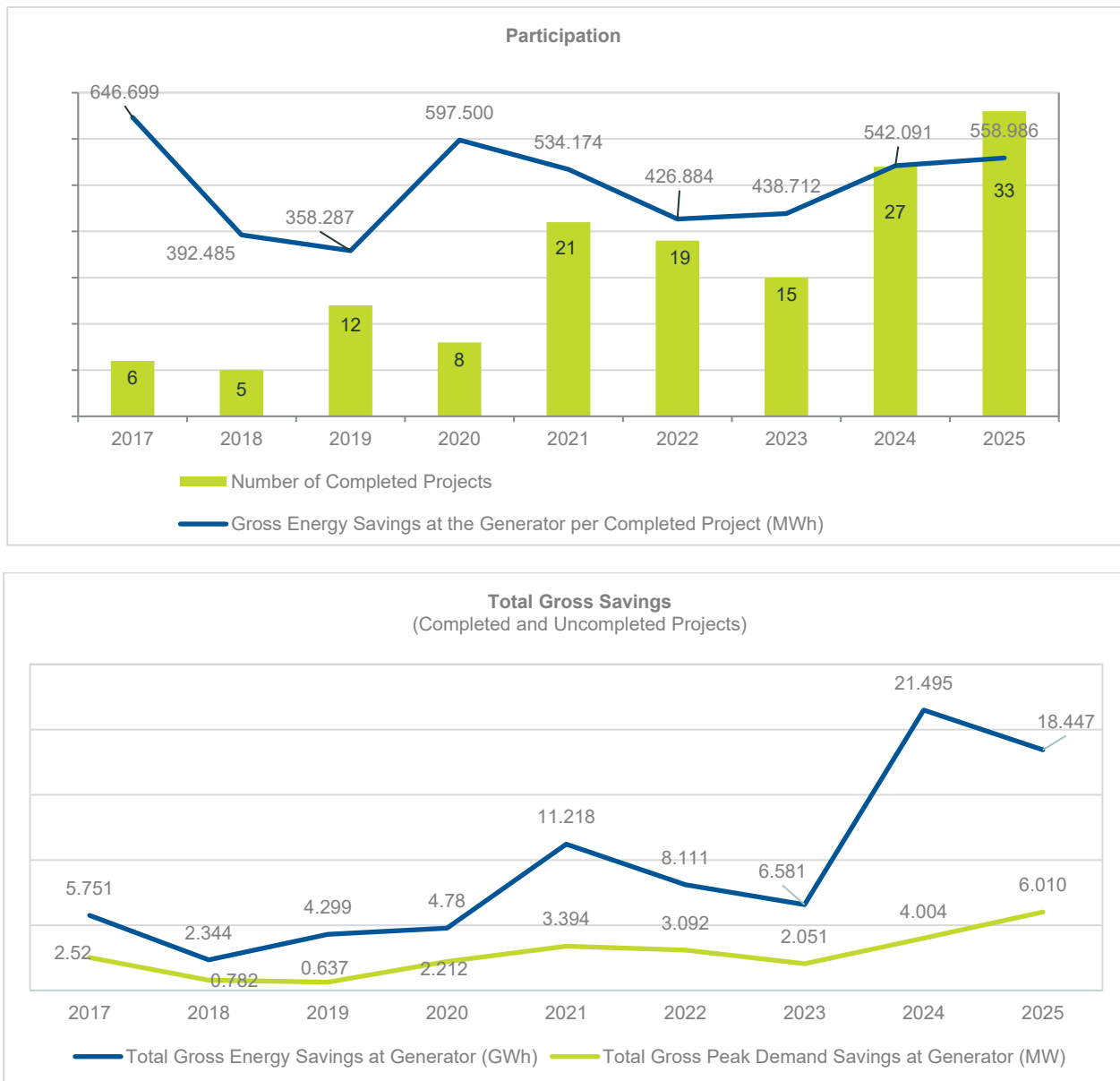
Pay-for-Performance

In 2025, six projects claimed savings under the Pay-for-Performance (P4P) service: one single-year project and five projects that claimed partial savings in 2025 but that have not yet completed. These are the first projects to claim savings under P4P since 2022. The single-year project generated 0.770 GWh and 0.167 MW in gross energy and peak demand savings respectively. Including partial claims, P4P generated a total of 1.274 GWh and 0.167 MW in gross energy and peak demand savings.

New Construction

In 2025, 33 projects claimed savings under New Construction. As shown in Figure 4 below, the number of completed projects again reached a new high in 2025. Average gross savings per project (558.986 MWh) and total program savings also reached new highs in 2025. New Construction projects generated 18.447 GWh and 6.010 MW in gross energy and peak demand savings respectively.

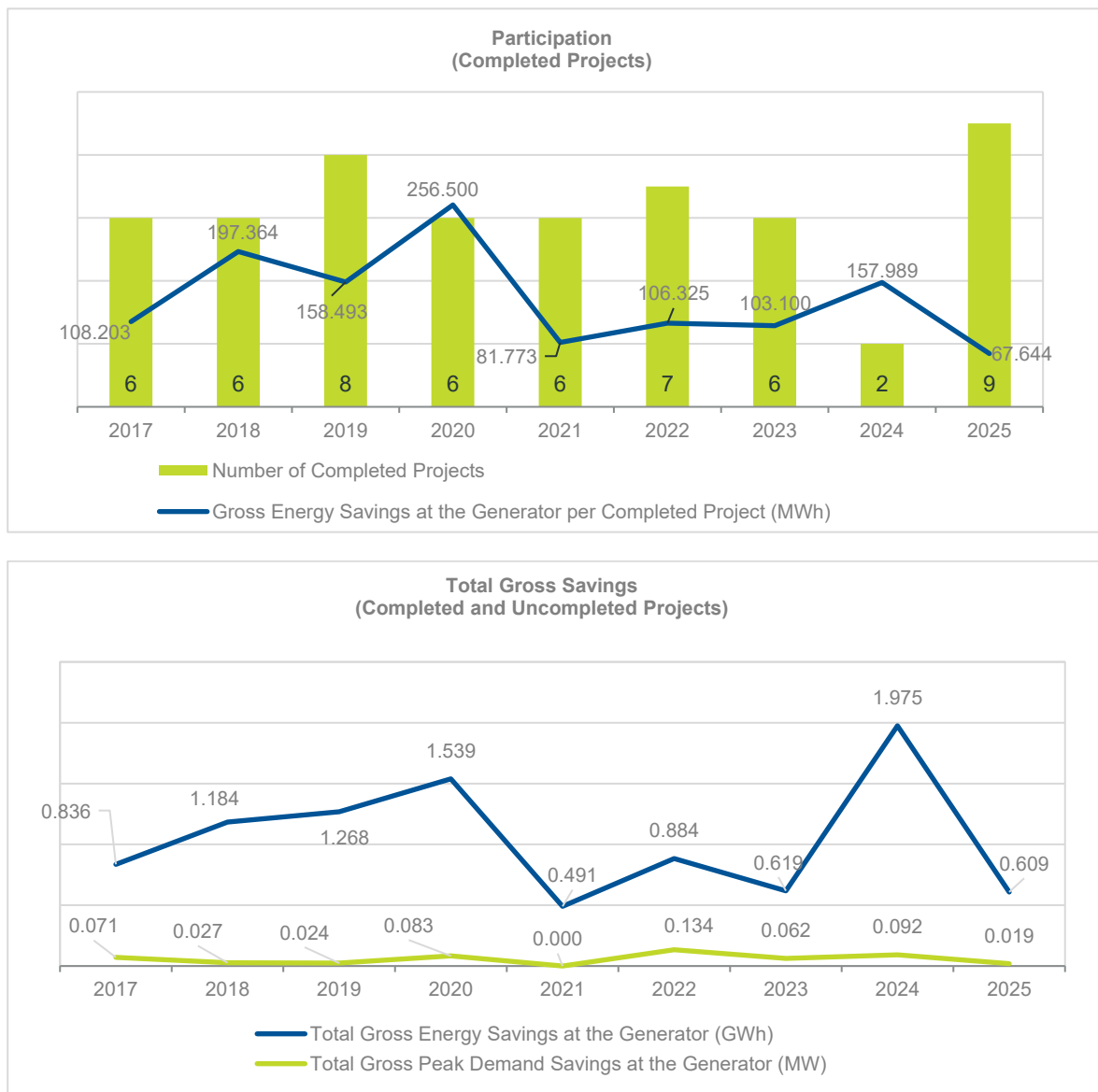
Figure 4: Overview of New Construction Participation, 2017-2025



Building Optimization

A total of nine Building Optimization projects reported savings in 2025, all of which were single-year projects. As illustrated in Figure 5 below, while the number of projects completed in 2025 increased compared to 2024 levels, gross electrical energy savings per project decreased by 57%. The main reason for this reduction is that one of the projects completed in 2024 included measures implemented at multiple sites, thereby inflating the gross electrical energy savings per project. Total gross electrical energy and peak demand savings decreased by 69% and 79% respectively compared to 2024 levels. These decreases are largely attributable to a multiyear project that had a partial savings claim of 1.6 GWh in 2024. This project is still on-going and did not claim partial savings in 2025.

Figure 5: Overview of Participation in Building Optimization, 2017–2025



2 Custom Evaluation Approach

The 2025 Custom evaluation comprised a comprehensive impact evaluation for Retrofit, P4P, and New Construction. For Building Optimization, given its smaller contribution to Custom savings, NTGR results from 2021 were applied. The main objectives of the 2025 Custom evaluation were as follows:

- › Calculate gross and net results, namely first-year and lifetime electrical energy savings, peak demand savings, as well as avoided GHG emissions

The Evaluator identified key research questions aimed at achieving the above objectives. Table 6 below outlines the evaluation objectives and maps them to the research questions, methods, and sample sizes (n) established by the Evaluator. Each method is described further below.

Table 6: 2025 Custom Evaluation Approach

Evaluation Objectives	Research Questions	Methodology
Calculate gross results	› Are the data in the tracking sheet complete, accurate, and consistent? › Are the gross savings calculated for a sample of projects consistent with both E1 savings calculation methods and the measures implemented? › Have the correct EUL values been correctly applied to sampled project measures? › What are the evaluated first-year and lifetime gross electrical energy and peak demand savings?	› Tracking sheet audits › Regular Retrofit projects: Desk reviews of 18 sampled projects with 7 of those selected for site visits; those not selected for site visits had participant follow-up interviews › Savings verification: For all Retrofit compressed air leak audit and solar PV projects › Building Optimization: Project reviews of all completed projects, with follow-up interviews (n=9) › New Construction: Project reviews of 12 projects, with follow-up interviews if needed › P4P: Project reviews of all completed projects, with follow-up interviews (n=1) › Calculations using evaluation results
Calculate net results	› What are the free-ridership and spillover levels for regular Retrofit, compressed air leak Retrofit, New Construction, and P4P projects? › What are the evaluated first-year and lifetime net electrical energy and peak demand savings? › What are the net avoided GHG emissions in CO2 eq?	› Participant phone interviews › Regular Retrofit (n= 13) › Compressed air leak Retrofit projects (n=2) › New Construction (n=12) › P4P (n=1) › The 2023 NTGR will be used for solar PV Retrofit projects › The 2021 NTGR will be used for BOpt › Calculations using evaluation results › Avoided GHG emission reduction calculations



Participant Phone Interviews

To collect information on participant free-ridership and perspectives, the Evaluator conducted phone interviews with 13 regular Retrofit participants, two compressed air leak audit Retrofit participants, one P4P participant, and 10 New Construction participants between November 2025 and January 2026. The interview guides are presented in Appendices I and II for Retrofit and Compressed Air Leak participants and Appendix VIII and IX for New Construction participants.

Tracking Sheet Audit

Prior to performing any savings calculations, the Evaluator conducted an audit of the final 2025 tracking sheets to ensure they were complete and data entry was consistent. The detailed protocols used for the tracking sheet audits and the results obtained are presented in Appendices V and XII.

Project File Reviews and Participant Site Visits or Follow-up Phone Interviews

In the fall of 2025 and January 2026, Econoler and its subcontractor CDM Energy Solutions carried out a full technical review of project documentation for 18 regular Retrofit projects, one P4P project, and nine Building Optimization projects. Pursuant to the desk reviews, site visits or follow-up phone interviews with participants were conducted to finalize the project reviews.

In that same time period, Econoler and its subcontractor Akonovia conducted technical reviews of project documentation and the building models for 12 New Construction projects. The information provided in the project files was sufficient to conduct the reviews; thus, neither follow-up phone calls, nor site visits were necessary for New Construction project reviews. Non-technical phone interviews were conducted for the reviewed New Construction projects to collect free-ridership information.

The protocol presented in Appendix VI was used to review Retrofit, P4P, and Building Optimization projects. The Retrofit participant interview guide is presented in Appendix I. The New Construction project review protocol is presented in Appendix X, while the participant interview guide is presented in Appendix IX.

Calculations Using Evaluation Results

Building on all the above methods and collected data, the Evaluator calculated the first-year and lifetime electrical energy and peak demand savings per the calculation methodology presented in Sections 3, 4, 5 and 6 below.

GHG Emission Reduction Calculations

To obtain Custom net avoided GHG emissions in CO₂ eq, the Evaluator multiplied the net electrical energy savings by the latest Nova Scotia-specific factor for GHG emissions generated by electricity production. This factor was established using Nova Scotia Power (NS Power) data.

Note on Margins of Error

For evaluation activities that yield quantitative results based on a sample, the Evaluator aimed to achieve a maximum margin of error of 10% at a confidence level of 90%. This means that, if measurements were conducted many times with different samples, the data would be within 10 percentage points above or below the percentage reported 90% of the time. Thus, the margin of error indicates the relative level of precision³ of the measurement, while its associated confidence level indicates the probability of a measurement falling within the margin of error.⁴

As part of the 2025 Custom evaluation, the Evaluator calculated the margins of error of savings adjustment ratios for Retrofit and New Construction. No margins of error were calculated for Building Optimization and P4P since all projects completed in 2025 were reviewed by the Evaluator. The margins of error are listed alongside results in the applicable sections herein. Examples of calculations used to establish margins of error are provided in Appendix II of the 2025 DSM Programs Evaluation Executive Summary.

³ Precision refers to how reproducible a set of measurements is. It does not take into account, however, how close the measured values are to the true values since this would refer to accuracy.

⁴ As part of this evaluation, confidence levels and margins of error only take random sampling errors into account; they do not reflect non-sampling errors or biases such as data entry errors, inaccurate responses from respondents, or the inability to contact certain people.

3 Retrofit Impact Evaluation

The objectives of the 2025 Retrofit impact evaluation were to determine gross and net electrical energy savings and peak demand savings, annually avoided GHG emissions, as well as EUL values and associated lifetime energy savings.

As described in Subsection 1.1 above, Retrofit includes three types of savings: (1) Partial savings (projects started in 2025 or prior but not completed in 2025); (2) final savings for single-year projects completed in 2025 projects; and (3) final savings for multiyear projects completed in 2025. As presented in Table 7 nine projects claimed partial savings in 2025, while 31 single-year projects and six multiyear projects claimed final savings in 2025.

Table 7: Evaluated 2025 Retrofit Projects

Type of Savings Claimed	Number of Projects
Single-year Projects with Final Savings in 2025	31
Multiyear Projects with Final Savings in 2025	6
Total Projects with Final Savings in 2025	37
Partial Savings in 2025	9
Total Projects Claiming Savings in 2025	46

Given the range of different project types completed in Retrofit, three distinct project categories were analyzed individually, namely (1) regular Retrofit projects; (2) solar PV projects; and (3) compressed air leak projects. For each project category, a distinct evaluation approach was used to determine gross and net savings. A 2025 NTGR was established for regular Retrofit and compressed air leak projects, whereas the NTGR value from the 2023 evaluation was applied to solar PV projects.

Table 8 below summarizes the impact evaluation approach for each project category under Retrofit. Results for the three project categories are presented below; these are then combined as the aggregated results for Retrofit in Subsections 3.2.6 and 3.3.4 further below.

Table 8: Impact Evaluation Approach per Retrofit Project Category

Retrofit Project Category	Number of Projects Completed in 2025 (Final Savings Claims)	Gross Savings Methodology	Net Savings Methodology
Regular Retrofit*	27	Adjustment ratio determined from a full review of a sample of projects (n=18)	NTGR evaluated in 2025 (n=18)
Solar PV	7	Savings verification, applying adjustment ratios established in 2023**	NTGR from 2023 applied
Compressed Air Leak Audit	3	Savings verification, applying the adjustment ratio established for compressed air leak projects in 2021	NTGR evaluated in 2025 (n=2)

*The regular Retrofit category includes all projects that are not included in one of the other two categories.

**Two different adjustment ratios are applied to solar PV projects, one for projects modelled with PV Watts and one for those modelled with RETScreen Expert. These ratios were established as part of the 2023 evaluation based on modelled and measured energy production data for a sample of solar PV projects.

3.1 Tracking Sheet Audit

To ensure service results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1. The verification and corrective actions taken by the Evaluator, where applicable, are described in detail in Appendix V. The tracked savings results presented in this report, therefore, refer to the corrected tracked savings obtained by the Evaluator.

3.2 Gross Savings

Gross savings correspond to the changes in energy consumption resulting from measures installed or actions taken by Retrofit participants compared to the consumption level had those measures or actions not occurred.⁵ E1 tracks the annual gross savings of each project. This subsection describes the methodology used by the Evaluator to review the gross savings of Retrofit projects.

E1 calculates gross savings for each individual file in accordance with best M&V practices for commercial and industrial energy efficiency projects. To establish the gross savings, the Evaluator used the information and data made available by participants and E1 and supplemented these with engineering assumptions and professional judgments where necessary.

3.2.1 Savings Verification

For compressed air leak and solar PV projects, the Evaluator verified savings by validating that the correct input parameters were used by E1 to estimate savings following a semi-prescriptive approach.

For compressed air leak audit projects, the Evaluator applied the 2021 evaluated Retrofit adjustment ratios to tracked energy and peak demand savings to determine gross savings. For solar PV projects, the Evaluator validated that the adjustment ratios developed in 2023⁶ were correctly applied to the energy savings tracked by E1.

Note on the M&V Approach Used for Compressed Air Leak Projects

For most compressed air leak projects completed through Retrofit, permanent or temporary submetering was not available. In these cases, the Evaluator accepted the use of ultrasonic leak detectors as a valid methodology for both identifying leaks and quantifying the estimated savings. The Evaluator also noted that, if no compressor efficiency value specific to a given facility was available, the savings were estimated with a conservative compressor efficiency assumption, which is an appropriate approach. While the Unified Methods Project (UMP)⁷ recommends that participants conduct leak-down tests before and after completing leak repairs to measure energy savings, the Evaluator considers the ultrasonic detector approach to be acceptable for the following reasons:

- 1) Relying on ultrasonic detectors to detect compressed air leaks and estimate associated leak rates (CFM) and energy losses (kWh) is widely used as an acceptable method in industry, including for utility programs.
- 2) Leak-down tests require interruptions to production lines, generating considerable revenue losses and rendering them costly. Given these production interruptions and that leak repairs are usually completed over extended time periods, leak-down tests are highly impractical. Requiring Retrofit participants to conduct leak-down tests would, therefore, not be aligned with the IPMVP Core Concepts (2022), which states that, “The cost of the M&V effort must be aligned with the value of the project [...] and the expected savings.”

⁵ Definition adapted from National Renewable Energy Laboratory, “Chapter 21: Estimating Net Savings – Common Practices”, The Uniform Methods Project, October 2017, p. 3, available at: <https://www.nrel.gov/docs/fy17osti/68578.pdf>.

⁶ In 2023, two distinct adjustment ratios were developed, one for projects using RETScreen to estimate annual solar PV energy generation, and another for projects using PV Watts.

⁷ Benton, Nathanael; Patrick Burns, and Joel Zahlan. (2021). Chapter 22: Compressed Air Evaluation Protocol. The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures. Golden, CO; National Renewable Energy Laboratory. NREL/SR-7A40-77820. <http://www.nrel.gov/docs/fy21osti/77820.pdf>.



3.2.2 Project Review Sampling Methodology

For the regular Retrofit project category, the Evaluator used a stratified sampling approach to select 18 projects for review from a total of 27 projects completed in 2025. More specifically, the Evaluator ranked projects based on their respective level of electrical energy savings and divided them into strata. The first stratum contained the smallest projects while the last stratum contained the largest projects. All projects within the last stratum were included in the sample (sample rate of 100% for that stratum), to ensure that all largest projects are reviewed, while projects were sampled at a lower rate in the other strata. Within each stratum, projects were selected randomly. The selected sample of 18 projects represented 88% of total tracked electrical energy savings for projects completed in 2025. Only completed projects were considered for sampling, and projects with partial savings claims in 2025 were excluded from the project reviews. Those projects will be eligible for review in a future evaluation when they are considered complete (in 2026 or later). The Evaluator obtained gross savings by extrapolating the results of the sampled project reviews to all regular Retrofit projects through a weighted average adjustment ratio.

3.2.3 Project Review Findings

The Evaluator reviewed a sample of projects completed in 2025 to ensure the best M&V practices were applied to commercial and industrial energy efficiency projects and adjusted the tracked savings accordingly. The nine on-going projects that had partial savings claims in 2025 were not reviewed and will be considered for review in the evaluation year in which they are completed.

Regular Retrofit Project Reviews

As a result of the review process, the Evaluator adjusted the savings of three of the 18 sampled regular Retrofit projects, resulting in one project only having electrical energy savings adjustments and two projects only having peak demand savings adjustments. Below is a summary of the adjustments made by the Evaluator:

- › For the project whose electrical energy savings only were adjusted, the annual hours of use were corrected to reflect post-M&V values, which resulted in an upward adjustment.
- › For the two projects whose peak demand savings only were adjusted, the tracked values were adjusted upward to more accurately estimate demand savings occurring during the peak periods.

In light of the two projects with peak demand savings adjustments, the Evaluator suggests that E1 ensure the peak demand savings calculation best practices are applied to future regular Retrofit projects to ensure they properly represent demand savings occurring during the peak period.

The Evaluator used the above adjustments to calculate average adjustment ratios for electrical energy and peak demand savings for the project sample (the results of which are provided in Subsection 3.2.6 below).

3.2.4 Interactive Effects

Since interactive effects vary significantly from one Retrofit project to another, they are taken into account in the project engineering calculations used to obtain initial gross savings. Any required adjustments to interactive effects factors were made as part of the project review.

3.2.5 Effective Useful Life

The Evaluator reviewed the EUL values of all sampled projects by selecting an appropriate EUL for each measure implemented. The revised measure level EUL values were selected based on the values outlined in the 2025 Demand-side Management Measure Assessment (DSM MA).⁸

Following the review of the 18 sampled regular Retrofit projects, the Evaluator found that the EUL value of one project required an adjustment to reflect the value outlined in the 2025 DSM MA.

Following the savings verification performed on compressed air leak audit projects, the Evaluator adjusted the EUL of all those projects from four years to two years, as presented in the 2025 DSM MA.

For solar PV projects, the Evaluator adjusted the tracked 25-year EUL to 30 years, as presented in the 2025 DSM MA.

3.2.6 Evaluated Gross Savings

Savings for Retrofit are claimed under three defined categories:⁹ (1) Partial savings; (2) final savings for single-year projects completed in 2025; and (3) final savings for multiyear projects completed in 2025. The Evaluator applied a distinct current-year adjustment ratio to the savings of each project category under Retrofit based on the approaches described in Subsections 3.2.1 and 3.2.2 above. These adjustment ratios are presented in Table 9 below. The Evaluator aggregated results from all project categories to determine overall evaluated gross savings for Retrofit.

Table 9: 2025 Retrofit Adjustment Ratios per Project Category

Retrofit Project Category	Adjustment Ratio on Electrical Energy Savings (Margin of Error)	Adjustment Ratio on Peak Demand Savings (Margin of Error)
Regular Retrofit	1.003 ($\pm 0.4\%$)	1.018 ($\pm 1.4\%$)
Solar PV - PV Watts	1.101 ($\pm 2.3\%$)*	N/A **
Solar PV - RETScreen	0.942 ($\pm 4.2\%$)*	N/A **
Compressed Air Leak Audit	0.981 ($\pm 1.2\%$)**	1.007 ($\pm 4.8\%$)**
* A savings verification was completed for solar PV projects. For these projects, the adjustment ratios established in 2023 are used.		
** The energy generated by solar PV systems and coinciding with the Nova Scotia peak periods is considered nil, and none of the solar PV projects completed in 2025 had tracked peak demand savings.		
*** A savings verification was completed for compressed air leak audit projects; therefore, adjustment ratios were not calculated for those projects in 2025 and the 2021 Retrofit adjustment ratios were used.		

For multiyear projects that claimed partial savings in previous years and were completed in 2025, the Evaluator applied the 2025 adjustment ratios to the full savings associated with those projects. To compensate for adjustments to partial savings made in prior years (e.g. the 2024 adjustment ratio was applied to partial savings claimed in 2024), the Evaluator calculates a true-up adjustment for each multiyear project completed in 2025. This true-up adjustment is then added to the 2025 gross savings claimed for these projects. The true-up adjustment process applied to a given multiyear project is therefore equivalent to applying the 2025 adjustment ratio to the full savings associated with the given project.

⁸ The 2025 DSM MA is a reference document that provides an in-depth review of all parameters necessary to calculate the annual and lifetime gross electrical energy and peak demand savings of all prescriptive measures and most semi-prescriptive measures offered through E1's DSM program portfolio. In addition, the DSM MA includes effective useful life values for all measures offered in E1's program portfolio. For the evaluation conducted during the last year of the 2023-2025 DSM cycle, the Evaluator refers to the values presented in the 2025 DSM MA.

⁹ See Subsection 1.1 for more details on these three categories.

Table 10 presents an illustrative example of how the true-up adjustment process was applied to the gross electrical energy savings of a hypothetical multiyear project completed in 2025.

Table 10: Example of a 2025 True-up Adjustment

	2024	2025	Total
Tracked Savings (kWh)	105,187	63,884	169,071
Year-specific Adjustment Ratio	1.021	1.003	
Revised Savings Prior to True-up (kWh)	107,396	64,076	171,472
Total Project Revised Savings with 2025 Adjustment Ratio (kWh)			169,578
True-up Adjustment (kWh)			-1,893

Table 11 below presents the overall evaluated gross savings for Retrofit, which were obtained by applying the appropriate adjustment ratios from Table 10 above to the electrical energy savings and peak demand savings of each project and by applying true-up adjustments to the final savings of multiyear projects completed in 2025. The adjustment ratios presented in Table 10 are the resulting adjustment ratios for each type of savings claimed in Retrofit and are obtained by dividing gross savings without true-up adjustments by tracked savings. Savings at the generator were calculated using line loss factors that account for electricity losses occurring between the meter and the generator. For each project, the Evaluator applied electrical energy and peak demand line loss factors corresponding to the relevant rate code based on the values drawn from the 2014 Cost of Service Study Progress Update¹⁰ provided by NS Power.¹¹

¹⁰ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.

¹¹ For municipal utility participants, the line loss factor of the most similar NS Power rate code was assumed.

Table 11: Evaluated 2025 Retrofit Gross Electrical Energy and Peak Demand Savings

	Partial Savings Claimed	Final Savings Claimed for Single-year Projects	Final Savings Claimed for Multiyear Projects	Total
Number of Projects	9	31	6	46
Electrical Energy Savings				
Tracked Gross Electrical Energy Savings – at the Meter (GWh)	8.911	6.307	0.000	15.217
Adjustment Ratio for Electrical Energy Savings*	0.988	1.001	-	0.993
Gross Electrical Energy Savings Without True-up Adjustment (GWh)	8.801	6.313	0.000	15.114
True-up Adjustment for Gross Electrical Energy Savings (GWh)	0.000	0.000	-0.043	-0.043
Gross Electrical Energy Savings – at the Meter (GWh)	8.801	6.313	-0.043	15.071
Line Loss Factor**	1.0508	1.0575	1.0594	1.0536
Gross Electrical Energy Savings – at the Generator (GWh)	9.248	6.676	-0.046	15.878
Effective Useful Life (years)***	5.8	18.3	15.0	11.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	53.477	122.459	-0.690	175.245
Peak Demand Savings				
Tracked Gross Peak Demand Savings – at the Meter (MW)	0.852	0.394	0.000	1.246
Adjustment Ratio for Peak Demand Savings*	1.009	1.017	-	1.011
Gross Peak Demand Savings Without True-up Adjustment (MW)	0.859	0.401	0.000	1.260
True-up Adjustment for Gross Peak Demand Savings (MW)	0.000	0.000	0.002	0.002
Gross Peak Demand Savings – at the Meter (MW)	0.859	0.401	0.002	1.262
Line Loss Factor**	1.0467	1.0622	1.0667	1.0516
Gross Peak Demand Savings – at the Generator (MW)	0.899	0.425	0.002	1.327
* The adjustment ratios listed in this table are the averages obtained by dividing gross savings without true-up adjustments by tracked savings. They differ from the values presented in Table 10 above because of the different adjustment ratios applied to each project category. ** The line loss factors are average values obtained by dividing gross savings at the generator by gross savings at the meter. Each retrofit project received its own specific line loss factor based on participant rate codes. *** These EULs are average EUL values obtained by dividing gross lifetime electrical energy savings by gross electrical energy savings. Each Retrofit project received its own specific EUL to obtain lifetime savings.				

As presented in Table 12 below, GHG emission reductions were calculated by applying the Nova Scotia-specific factor¹² for GHG emissions generated by electricity production to Retrofit gross savings.

¹² At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO₂ eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed August 26, 2025) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).

Table 12: Evaluated 2025 Retrofit Gross GHG Emission Reductions

	Total
Gross Electrical Energy Savings – at the Generator (GWh)	15.878
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO2 eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO2 eq)	7,452

3.3 Net Savings

The Evaluator determined net electrical energy and peak demand savings, that is, the electrical energy and peak demand savings that can be reliably attributed to a service, by estimating a NTGR. Specifically, the NTGR includes effects such as free-ridership and spillover that positively or negatively affect the energy savings generated by a service. For Retrofit, free-ridership and participant spillover are both considered in the NTGR.

For each of the three Retrofit project categories, the Evaluator determined a distinct NTGR. Table 13 describes the approach used to determine the NTGR for each project category.

Table 13: 2025 NTGR Approach per Retrofit Project Category

Retrofit Project Category	Number of Projects Completed in 2025	NTGR Methodology	Sample Size (Unique Participant Interviews)*
Regular Retrofit	27	Free-ridership and spillover were measured by conducting phone interviews with sampled participants	13**
Solar PV	7	2023 evaluation NTGR applied	N/A
Compressed Air Leak Audit	3	Free-ridership and spillover were measured by conducting phone interviews with sampled participants	2***

*If a participant completed more than one project sampled for review, only one interview was conducted. The associated NTGR was applied to all projects completed by that participant unless they indicated that their decision-making process differed across projects, in which case a distinct NTGR was calculated for each project.

**For regular Retrofit projects, the evaluation methodology included a sample size of n=18, but participant interviews were conducted for only 15 projects (completed by 13 unique participants). Participants who completed the remaining three sampled projects could not be reached or declined to be interviewed.

***For compressed air leak audit projects, the evaluation methodology involved a census approach (i.e. contacting all participants with completed projects in 2025 [n=3]). One participant declined to be interviewed.

3.3.1 Free-ridership

In the case of Retrofit, free-ridership occurs when participants would have still implemented energy efficiency upgrades and measures in the absence of the service.

For solar PV projects, the NTGR measured as part of the 2023 evaluation, which relied on a self-report approach, was applied to 2025 results, meaning the 2023 solar PV free-ridership level was used in the 2025 evaluation.

For the regular Retrofit and compressed air leak project categories, the corresponding 2025 free-ridership level was assessed using a self-report approach that involved asking participants a set of questions during phone interviews. The questionnaire included questions for all applicable variables in the decision-making process, including planning, efficiency, timing, cost, and E1 influence through financial incentives or participant support from program staff or on-site energy managers (OEMs). Certain questions were also used to determine the extent to which participant decisions about whether to implement measures or not had been influenced by previous participation in an E1 program component or E1 efforts to raise awareness about energy efficiency. When participant answers indicated that they had been significantly influenced by one of these two factors, the free-ridership level was adjusted downward to better reflect the overall influence of E1 activities on participant decisions. The feedback collected from participant interviews was converted into an overall free-ridership level using the algorithm presented in Appendix III.

The free-ridership level calculated for each project category is presented in Table 14, along with the corresponding margin of error.

Table 14: 2025 Retrofit Free-ridership Level per Project Category

Retrofit Project Category	Free-ridership Level	Margin of Error
Regular Retrofit	8%	1.7%
Solar PV	38%*	9.5%*
Compressed Air Leak Audit	8%**	19.2%**
*Free-ridership for solar PV projects was not measured in 2025; the free-ridership level from the 2023 evaluation is presented here for reference only.		
**For compressed air leak projects, the free-ridership level presented here is the weighted average of the individual free-ridership scores obtained from two participant interviews. This very small sample size explains the relatively high margin of error. A third participant completed a compressed air leak audit project in 2025 declined to be interviewed.		

For regular Retrofit projects, the 2025 free-ridership level was established at 8%, down from 15% in 2024. E1 influence on participant decision-making was the most significant factor contributing to the decrease in the free-ridership level, with all 13 unique regular Retrofit respondents indicating that E1 influence, either through financial incentives or E1 staff support, was “very important” in their decision to implement their project.

For compressed air leak projects, the 2025 free-ridership level was established at 8%.

For regular Retrofit projects, the project sampling methodology is based on energy savings because incentives for these projects have historically been paid based on energy savings. Therefore, consistently with past evaluations, free-ridership was calculated based on the energy savings for these project categories, and the resulting NTGR was applied to both electrical energy and demand savings to establish net savings.

As in previous evaluations, for each project category, the Evaluator considered the free-ridership level to be representative of the balance of projects in the tracking sheet when the margin of error was below the 10% target. While this condition is met for the regular Retrofit and solar PV project categories, the margin of error for the compressed air leak audit project category is higher than the target 10%, which is mainly explained by the very small sample size (n=2). However, given that only one other compressed air leak audit project was completed in 2025, the Evaluator considered it appropriate to apply the average free-ridership level of 8% obtained from the two participant interviews to that project as well.

3.3.2 Spillover

For Retrofit, participant spillover occurs when participants implement eligible energy efficiency measures due to the influence of previous participation in the service without receiving any kind of additional support.¹³ The Evaluator used phone interviews to question participants directly about any potential spillover effects. The algorithm used to determine the level of participant spillover is presented in Appendix IV.

Among the 13 unique respondents from regular Retrofit participants, two mentioned having implemented energy efficiency measures on their own without seeking financial support from E1, and both indicated that their participation in Custom Retrofit was “very influential” on their decision to implement the measures. One participant mentioned that the measure involved installing an automated water valve and, based on the information provided, the Evaluator estimated the associated electrical energy at 9,700 kWh. The other participant mentioned having implemented several measures, but that none of them were eligible for incentives through E1 programs. Using these findings, the Evaluator calculated the overall spillover level to be nil for regular Retrofit.

3.3.3 Net-to-gross Ratio Calculation

The NTGR was calculated using the following equation.

$$NTGR = (1 - \% \text{ Free-ridership} + \% \text{ Participant Spillover})$$

Table 15 outlines the free-ridership and spillover levels established for Retrofit, along with the NTGR values calculated for each project category.

Table 15: Evaluated 2025 Retrofit NTGRs

Project Category	Free-ridership Level	Spillover Level	NTGR
Regular Retrofit	8%	0%	0.92
Solar PV*	38%	1%	0.63
Compressed Air Leak Audit	8%	0%	0.92
*Free-ridership and spillover levels for solar PV projects were not measured in 2025; the values from the 2023 evaluation are presented here for reference.			

3.3.4 Evaluated Net Savings

Net savings are defined as changes in energy use that are specifically attributable to Retrofit. Net Retrofit impacts are calculated by applying the NTGR value to gross savings as illustrated in the following equation.

$$\text{Net Savings} = \text{Gross Savings} \times \text{NTGR}$$

The Evaluator applied the corresponding NTGR to the gross savings generated in each Retrofit project category. The evaluated NTGRs are presented in Table 15 above. The Evaluator aggregated results from all project categories to determine overall evaluated net savings for Retrofit.

¹³ Participant spillover may also include measures implemented by past Retrofit participants. No projects from past participants were brought forward by E1 for consideration in the 2025 evaluation.

The Evaluator applied a true-up adjustment to the net electrical energy savings of multiyear projects completed in 2025 so that the total revised net savings over the complete duration of each project are equivalent to the total revised gross project savings multiplied by the appropriate NTGR for 2025. This approach is similar to the one described in Subsection 3.2.6 to obtain adjusted gross savings for multiyear projects.

The results are listed in Table 16 below. The average EUL was established at 10.6 years, and the net electrical energy savings resulted in 6,413 tonnes of CO2 eq in net annual GHG emission reductions.

Table 16: Evaluated 2025 Retrofit Net Electrical Energy and Peak Demand Savings

	Partial Savings Claimed	Final Savings Claimed for Single-year Projects	Final Savings Claimed for Multiyear Projects	Total
Number of Projects	9	31	6	46
Electrical Energy Savings				
Gross Electrical Energy Savings – at the Meter (GWh)	8.801	6.313	-0.043	15.071
NTGR*	0.86	0.84	0.92	0.85
Net Electrical Energy Savings Without True-up Adjustment (GWh)	7.586	5.291	-0.040	12.837
True-up Adjustment for Net Electrical Energy Savings (GWh)	-	-	0.133	0.133
Net Electrical Energy Savings – at the Meter (GWh)	7.586	5.291	0.093	12.970
Line Loss Factor**	1.0511	1.0570	1.0594	1.0536
Net Electrical Energy Savings – at the Generator (GWh)	7.974	5.593	0.098	13.665
Effective Useful Life***	5.9	17.2	15.0	10.6
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	47.354	96.186	1.471	145.011
Peak Demand Savings				
Gross Peak Demand Savings – at the Meter (MW)	0.859	0.401	0.002	1.262
NTGR*	0.96	0.98	0.98	0.97
Net Peak Demand Savings Without True-up Adjustment (MW)	0.827	0.391	0.002	1.221
True-up Adjustment for Net Peak Demand Savings (MW)	-	-	0.010	0.010
Net Peak Demand Savings – at the Meter (MW)	0.827	0.391	0.012	1.231
Line Loss Factor**	1.0467	1.0625	1.0667	1.0520
Net Peak Demand Savings – at the Generator (MW)	0.866	0.416	0.013	1.295
*The NTGRs listed in this table match the rounded averages obtained by dividing net savings by gross savings. They differ from the values presented in Subsection 3.3.3 above because of the true-up adjustments and different NTGRs applied to each project category. **The line loss factors are average values obtained by dividing gross savings at the generator by gross savings at the meter. Each Retrofit project received its own specific line loss factor depending on participant rate codes. ***These are average EUL values obtained by dividing gross lifetime electrical energy savings by gross electrical energy savings. Each Retrofit project received its own specific EUL to obtain lifetime savings.				

3.4 Realization Rate

Table 17 below compares total 2025 Retrofit tracked and evaluated savings. It also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings.

Table 17: Comparison of 2025 Retrofit Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR*	Net Savings		Realization Rate
	Value	Unit	Value	Value	Unit	Value
Electrical Energy Savings						
Tracked Savings by E1	16.032	GWh	0.82	13.121	GWh	104%
Evaluation Results	15.878	GWh	0.86	13.665	GWh	
Peak Demand Savings						
Tracked Savings by E1	1.310	MW	0.84	1.106	MW	117%
Evaluation Results	1.327	MW	0.98	1.295	MW	
* The NTGRs listed in this table match the rounded averages obtained by dividing net savings by gross savings. They differ from the values presented in Subsection 3.3.3 above because of the true-up adjustments and different NTGRs applied to each project category.						

Evaluated gross electrical energy savings were lower than the tracked savings, while the evaluated peak demand savings were higher than the tracked savings. These discrepancies are mainly explained by the differences between 2025 adjustments ratios for regular Retrofit projects and the values tracked by E1, which are based on 2024 adjustments ratios. The 2025 electrical energy savings adjustment ratio is lower than the 2024 value, while the 2025 peak demand savings adjustment ratio is higher than the 2024 value. Evaluated net electrical energy savings and peak demand savings were both higher than tracked savings because the 2025 evaluated NTGR was higher than the NTGR tracked by E1, which was based on the 2024 NTGR.



4 Pay-for-Performance Impact Evaluation

The objectives of the 2025 Pay-for-Performance (P4P) impact evaluation were to determine gross and net electrical energy savings and peak demand savings, annually avoided GHG emissions, as well as EUL values and associated lifetime energy savings. Similarly to Retrofit, P4P includes three types of savings: (1) Partial savings (projects to be completed in future years); (2) final savings for single-year projects completed in 2025; and (3) final savings for multiyear projects completed in 2025. In 2025, one single-year project claimed final savings, while five projects claimed partial savings as they began in 2025 but were not yet completed.

4.1 Tracking Sheet Audit

To ensure service results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1. The verification and corrective actions taken by the Evaluator, where applicable, are described in detail in Appendix V. The tracked savings results presented in this report, therefore, refer to the corrected tracked savings obtained by the Evaluator.

4.2 Gross Savings

Gross savings correspond to changes in energy consumption resulting from actions taken by participants compared to the consumption level had those actions not occurred. This subsection describes the review methodology used for all P4P projects and the adjustments made to specific projects.

The Evaluator calculated the gross savings for each individual P4P project file in accordance with best M&V practices for commercial and industrial energy efficiency projects. This was achieved by using the information and data made available by participants and E1 as well as by supplementing the data with engineering assumptions and judgments where necessary.

4.2.1 Project Review Findings

The Evaluator reviewed the single completed P4P project in 2025, which involved the implementation of an advanced building automation system to optimize set point control and scheduling of a building heating, ventilation, and air-conditioning (HVAC) system. The five on-going projects that had partial claims in 2025 were not reviewed and will be considered for review in the evaluation year in which they are completed.

Following the review of the single completed project, the Evaluator made no adjustment to electrical energy savings and made a downward adjustment to peak demand savings. The peak demand savings calculated by E1 for this project represented the average billed demand reduction for the participant, which did not reflect the demand savings coinciding with the peak demand period in Nova Scotia. The Evaluator recalculated peak demand savings following this rationale, which resulted in a downward adjustment.

4.2.2 Interactive Effects

Since interactive effects vary significantly from one P4P project to another, they are either accounted for in the project engineering calculations used to establish gross savings or included when using whole building consumption data. Any adjustments required to interactive effects factors are made as part of the project reviews.

4.2.3 Effective Useful Life

The Evaluator validated the EUL values based on the 2025 DSM MA.

No adjustment was made to the EUL value of the reviewed project.

4.2.4 Evaluated Gross Savings

Table 18 below presents the overall evaluated gross savings for P4P. For the one single-year project completed in 2025, evaluated gross electrical energy and peak demand savings were determined following the project review process described in Subsection 4.2.1 above. For the five projects with partial claims, the Evaluator did not apply any adjustment, and gross evaluated savings are equal to the gross savings tracked by E1. These five projects will be subject to review in the evaluation year in which they are completed, and any adjustments to gross savings will be applied then. Savings at the generator were calculated using line loss factors that account for electricity losses occurring between the meter and the generator. For each project, the Evaluator applied electrical energy and peak demand line loss factors corresponding to the relevant rate code based on the values drawn from the 2014 Cost of Service Study Progress Update¹⁴ provided by NS Power.¹⁵

Table 18: Evaluated 2025 P4P Gross Electrical Energy and Peak Demand Savings

	Partial Savings Claims	Final Savings Claimed for Single-year Projects	Total
Number of Projects	5	1	6
Electrical Energy Savings			
Tracked Gross Electrical Energy Savings – at the Meter (GWh)	0.474	0.724	1.198
Adjustment Ratio for Energy Savings*	1.000	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.474	0.724	1.198
Line Loss Factor**	1.063	1.063	1.063
Gross Electrical Energy Savings – at the Generator (GWh)	0.504	0.770	1.274
Effective Useful Life (years)***	14.9	3.0	7.7
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	7.495	2.309	9.804
Peak Demand Savings			
Tracked Gross Peak Demand Savings – at the Meter (MW)	0.000	0.297	0.297
Adjustment Ratio for Peak Demand Savings*	-	0.528	0.528
Gross Peak Demand Savings – at the Meter (MW)	0.000	0.157	0.157
Line Loss Factor**	-	1.063	1.063
Gross Peak Demand Savings – at the Generator (MW)	0.000	0.167	0.167
*The adjustment ratios listed in this table are the averages obtained by dividing gross electrical energy savings by tracked gross electrical energy savings. ** The line loss factors are average values obtained by dividing gross savings at the generator by gross savings at the meter. Each P4P project received its own specific line loss factor depending on participant rate codes. ***These are average EUL values obtained by dividing gross lifetime electrical energy savings by gross electrical energy savings. Each P4P project received its own specific EUL to obtain lifetime savings.			

¹⁴ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.

¹⁵ For municipal utility participants, the line loss factor of the most similar NS Power rate code was assumed.

As presented in Table 19 below, GHG emission reductions were calculated by applying the Nova Scotia-specific factor¹⁶ for GHG emissions generated by electricity production to P4P gross savings.

Table 19: Evaluated 2025 P4P Gross GHG Emission Reductions

	Total
Gross Electrical Energy Savings – at the Generator (GWh)	1.274
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO2 eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO2 eq)	598

4.3 Net Savings

The Evaluator determined the net electrical energy and peak demand savings, that is, the electrical energy and peak demand savings that can be reliably attributed to a service, by estimating the NTGR. Specifically, the NTGR includes effects such as free-ridership and spillover that positively or negatively affect the electrical energy savings generated by a service. For P4P, free-ridership and participant spillover are both considered in the NTGR.

4.3.1 Free-ridership

In the case of P4P, free-ridership occurs when participants would have still implemented energy efficiency upgrades and measures in the absence of the service.

The 2025 free-ridership level was assessed using a self-report approach that involved asking the participant a set of questions during a phone interview. The questionnaire included questions for all applicable variables in the decision-making process, including planning, efficiency, timing, cost, and E1 influence through financial incentives or participant support from program staff or OEMs. Certain questions were also used to determine the extent to which participant decisions about whether to implement measures or not had been influenced by previous participation in an E1 program component or E1 efforts to raise awareness about energy efficiency. When participant answers indicated that they had been significantly influenced by one of these two factors, the free-ridership level was adjusted downward to better reflect the overall influence of E1 activities on participant decisions. The feedback collected from the participant interview was converted into an overall free-ridership level using the algorithm presented in Appendix III.

The free-ridership level for the single project completed in 2025 was established at 8%. Given that only one participant was interviewed, this free-ridership level was not applied to partial savings claims. Individual free-ridership levels will be determined for each project in the evaluation year in which they are completed, and the Evaluator will retroactively adjust 2025 savings claims via true-up adjustments, if needed. In the interim, the Evaluator assumed the free-ridership level to be nil for these participants.

¹⁶ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO2 eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed August 26, 2025) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).

4.3.2 Spillover

For P4P, participant spillover occurs when participants implement eligible energy efficiency measures due to the influence of previous participation in the service without receiving any kind of additional support. The Evaluator used phone interviews to question participants directly about any potential spillover effects. The algorithm used to determine the level of participant spillover is presented in Appendix IV.

The spillover level for the single project completed in 2025 was determined to be nil. Similarly to the approach used for free-ridership, the Evaluator assumed the spillover level to be nil for projects with partial savings claims, and individual spillover levels will be determined for each project in the evaluation year in which they are completed. The Evaluator will retroactively adjust 2025 savings claims via true-up adjustments if needed.

4.3.3 Net-to-gross Ratio Calculation

The NTGR was calculated using the following equation.

$$NTGR = (1 - \% \text{ Free-ridership} + \% \text{ Participant Spillover})$$

Table 20 below outlines the free-ridership and spillover levels established for the single project completed under P4P, along with the NTGR value. For projects with partial savings claims, the Evaluator applied a NTGR of 1.0, as explained in Subsections 4.3.1 and 4.3.2 above.

Table 20: Evaluated 2025 P4P NTGR

Value for Savings Claimed in 2025 *	
Free-ridership Level	8%
Participant Spillover Level	0%
NTGR	0.92

4.3.4 Evaluated Net Savings

Net savings represent the savings that can be reliably attributed to a service. For P4P, net savings are calculated by applying the NTGR using the following equation.

$$\text{Net Savings} = \text{Gross Savings} \times \text{NTGR}$$

The detailed net savings results are presented in Table 21 below. The average EUL was established at 7.9 years, and the net electrical energy savings resulted in 569 tonnes of CO₂ eq in net annual GHG emission reductions.

Table 21: Evaluated 2025 P4P Net Electrical Energy and Peak Demand Savings

	Partial Savings Claims	Final Savings Claimed for Single-Year Projects	Total
Number of Projects	5	1	6
Electrical Energy Savings			
Gross Electrical Energy Savings – at the Meter (GWh)	0.474	0.724	1.198
NTGR	1.000	0.920	0.952
Net Electrical Energy Savings – at the Meter (GWh)	0.474	0.666	1.141
Line Loss Factor*	1.063	1.063	1.063
Net Electrical Energy Savings – at the Generator (GWh)	0.504	0.708	1.212
Effective Useful Life (years)**	14.9	3.0	7.9
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	7.495	2.125	9.620
Peak Demand Savings			
Gross Peak Demand Savings – at the Meter (MW)	0.000	0.157	0.157
NTGR	-	0.920	0.920
Net Peak Demand Savings – at the Meter (MW)	0.000	0.144	0.144
Line Loss Factor*	-	1.063	1.063
Net Peak Demand Savings – at the Generator (MW)	0.000	0.153	0.153
*The line loss factors are average values obtained by dividing gross savings at the generator by gross savings at the meter. Each P4P project received its own specific line loss factor depending on participant rate codes. **These EULs are average EUL values obtained by dividing gross lifetime electrical energy savings by gross electrical energy savings. Each P4P project received its own specific EUL to obtain lifetime savings.			

4.4 Realization Rate

A comparison of the electrical energy and peak demand savings values established through this evaluation and those tracked by E1 is presented in Table 22 below. The table also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings.

Table 22: Comparison of 2025 P4P Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR	Net Savings		Realization Rate
	Value	Unit	Value	Value	Unit	Value
Electrical Energy Savings						
Tracked Savings by E1	1.274	GWh	0.86	1.095	GWh	111%
Evaluation Results	1.274	GWh	0.95	1.212	GWh	
Peak Demand Savings						
Tracked Savings by E1	0.316	MW	0.86	0.272	MW	56%
Evaluation Results	0.167	MW	0.92	0.153	MW	

Evaluated electrical energy savings were higher than those tracked by E1 because the Evaluator applied higher NTGR values than those tracked by E1. Evaluated peak demand savings were lower than those tracked by E1 due to a downward adjustment made by the Evaluator following the project review process.



5 New Construction Impact Evaluation

The objective of the 2025 New Construction impact evaluation was to determine gross and net electrical energy and peak demand savings.

5.1 Tracking Sheet Audit

To ensure service results were reliably compiled, the Evaluator first performed a tracking sheet audit intended to verify the completeness and consistency of the data submitted by E1. The verification and corrective actions taken by the Evaluator, where applicable, are described in detail in Appendix XII. Therefore, the tracked savings results presented in this report refer to the corrected tracked savings obtained by the Evaluator.

5.2 Gross Savings

This subsection describes the methodology used by the Evaluator to review the gross savings of New Construction projects.

For New Construction, the gross savings for each participating building are calculated using energy models developed with building energy simulation software. Savings are calculated as the difference between the modelled electricity consumption of the baseline and proposed cases. The baseline case corresponds to the reference building as defined in the National Energy Code of Canada for Buildings (NECB) Part 8 and the guidelines developed by E1. The proposed case refers to final building design that includes the energy efficiency measures that reduce electricity consumption.

The 2025 gross savings evaluation for New Construction consisted of energy model reviews.

5.2.1 Sampling Methodology

For the energy model reviews, the Evaluator used a stratified sampling approach to select 12 projects for review from a total of 33 projects completed in 2025. More specifically, the Evaluator ranked projects based on their electrical energy savings and divided them into strata. In the last stratum that contained the largest projects, seven of eight projects were sampled while the strata of smaller projects were sampled at a lower rate. Within each stratum, projects were selected randomly. The selected sample of 12 projects represented 53% of total tracked electrical energy savings for projects completed in 2025. The Evaluator calculated gross savings by extrapolating the results of the sampled project reviews to all New Construction projects through a weighted average adjustment ratio.

5.2.2 Project Review Findings

The 12 project reviews were intended to validate the energy models developed for the baseline and proposed cases of each project and the resulting savings. The Evaluator based the review mainly on the project files provided by E1. Pictures, mechanical plans, specification sheets, and other documents available in the project files included enough detail to confirm energy efficiency measure installations and validate the input data of the energy models. The most common simulation software remains eQuest; of the 12 reviewed projects, 10 were modelled in eQuest and two were modelled in IESVE.

The quality of the information available in the project files continues to be good for most projects. Overall, the project files provided to the Evaluator were well documented with photos, E1 site visit results, explanatory notes, etc. As a result, no telephone calls to participants were required to complete the 2025 energy model reviews.



One modelling firm, new to the program, submitted two projects that were not accurate and, thus, required substantial remodelling as part of the project reviews. E1 indicated that they were supporting the modeller as they gain experience with program requirements. In future, the Evaluator recommends that E1 plan for additional review time and back and forth with new modellers to ensure the models submitted to the program fully meet program requirements.

The project reviews served to identify a need for clarification regarding which parameter (notably adjusted sensible recovery efficiency or sensible recovery efficiency) should be used in modelling heat recovery ventilators. The Evaluator will work with E1 to further examine this issue to clarify, in the program guidelines, the appropriate parameter to be used.

Electrical Energy Savings

Positive or negative adjustments were made to the tracked gross electrical energy savings of all 12 projects reviewed by the Evaluator for 2025.

The energy model reviews resulted in an average adjustment ratio of 0.949 for gross electrical energy savings with a margin of error of 5.6%. The adjustments made were as follows:

- › The most frequent adjustments were made to HVAC and building envelope characteristics. Some corrections were also made to match the modelled specifications of building systems with the specifications of installed building systems. There were no notable recurring corrections.
- › In two files completed by a new modeller to the program, significant changes and remodelling were completed to align the model with program requirements.
- › Several adjustments were made due to clerical errors in the models, which resulted in savings reductions upon adjustment by the Evaluator.

Peak Demand Savings

The differences between tracked peak demand savings and evaluation results were mainly due to the same adjustments made to the energy models described in the Electrical Energy Savings section above. The average adjustment ratio for gross peak demand savings was 0.937 with a margin of error of 7.5%.

5.2.3 Interactive Effects

Since New Construction savings are based on the results of simulation models which calculate the total electricity consumption of both proposed and reference buildings, interactive effects are already accounted for in the simulations. No further interactive effects factor was, therefore, applied to savings.

5.2.4 Effective Useful Life

The New Construction tracking sheet records savings on a measure-by-measure basis for each project. The Evaluator reviewed the EUL values of all measures in the tracking sheet as part of the tracking sheet audit and selected the correct EUL for each measure based on the values outlined in the 2025 DSM MA.

5.2.5 Evaluated Gross Savings

The 2025 New Construction gross electrical energy and peak demand savings are presented in Table 23 below. They were obtained by applying the average adjustment ratios of 0.949 to electrical energy savings and 0.937 to peak demand savings for all projects that claimed savings in 2025. To obtain savings at the generator, the line loss factor was applied specifically to each project based on the rate code and corresponding line loss factor based on data provided by NS Power.¹⁷

Table 23: Evaluated 2025 New Construction Gross Electrical Energy and Peak Demand Savings

	Total
Number of Projects	33
Electrical Energy Savings	
Tracked Gross Electrical Energy Savings – at the Meter (GWh)	18.235
Adjustment Ratio for Electrical Energy Savings	0.949
Gross Electrical Energy Savings – at the Meter (GWh)	17.307
Line Loss Factor	1.0658
Gross Electrical Energy Savings – at the Generator (GWh)	18.447
Effective Useful Life (years)	18.7
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	344.790
Peak Demand Savings	
Tracked Gross Peak Demand Savings – at the Meter (MW)	5.976
Adjustment Ratio for Peak Demand Savings	0.937
Gross Peak Demand Savings – at the Meter (MW)	5.600
Line Loss Factor	1.0733
Gross Peak Demand Savings – at the Generator (MW)	6.010

As presented in Table 24 below, GHG emission reductions were calculated by applying the Nova Scotia-specific factor¹⁸ for GHG emissions generated by electricity production to New Construction gross savings.

Table 24: Evaluated 2025 New Construction Gross GHG Emission Reductions

	Total
Gross Electrical Energy Savings – at the Generator (GWh)	18.447
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO2 eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO2 eq)	8,657

¹⁷ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1. For municipal utility participants, the line loss factor of the most similar NS Power rate code was assumed.

¹⁸ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO2 eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed August 26, 2025) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).



5.3 Net Savings

The NTGR is applied to calculate net savings, that is, the savings that can be reliably attributed to a service. For New Construction, the NTGR was established by considering free-ridership. Spillover was assumed to be zero because a building developer who participates in this program is unlikely to implement energy efficiency measures in other projects without being a repeat participant in the program due to familiarity with the program and the financial incentive to participate, and 2022 evaluation results demonstrated that the potential for non-participant spillover is low. Thus, spillover was not measured as part of the 2025 evaluation.

5.3.1 Free-ridership

In the case of New Construction, free-ridership occurs when participants would have still implemented energy efficiency measures in their new building in the absence of the service. The free-ridership level was assessed using a self-report approach that involved asking decision-makers a set of questions during phone interviews. The questionnaire used included questions for all applicable variables in the decision-making process, including planning, efficiency, and cost.

To determine free-ridership, the Evaluator used a free-ridership questionnaire developed as part of the 2024 evaluation and designed to accurately capture all influence factors that can have an impact on building design decisions, such as the energy model, modelling and implementation incentives, as well as technical assistance provided by the energy modeller, Business Development Managers (BDMs), and New Construction staff. Other factors such as participating organizations' internal energy efficiency policies and market demand for energy efficient buildings were also factored into the calculation.

Certain questions served to determine the extent to which participant decisions to have efficient products installed were influenced by previous participation in an E1 program component or service or E1 efforts to raise awareness about energy efficiency. When participant answers indicated that they had been significantly influenced by one of these two factors, the free-ridership level was adjusted downward to better capture the overall influence of E1 activities on participant decisions.

The algorithm used to calculate the overall free-ridership level is presented in Appendix XI. The Evaluator attempted to measure free-ridership for the 12 sampled projects in the project review. The Evaluator was able to contact decision-makers for 10 of the 12 sampled projects.

To collect free-ridership information as timely as possible, some participants were interviewed in earlier years at the time they completed their Customer Project Agreement (CPA). Four participant results were collected at the CPA stage. The remaining participants were interviewed in the fall 2025 after their project was completed. Given the CPA interviews were completed in previous years, there were minor differences in wording in some questions. To ensure consistency across participants, small adjustments were made to the free-ridership algorithm for these four participants to account for these wording differences and align results across interview phases.

The weighted average free-ridership level was measured at 18%, thus representing a decrease compared to the free-ridership level of 28% in 2024. The 18% free-ridership level was applied to both total gross electrical energy savings and peak demand savings, with a 9.4% and an 8.1% margin of error, respectively.

5.3.2 Net-to-gross Ratio Calculation

The NTGR is calculated using the following equation.

$$NTGR = (1 - \% \text{ Free-ridership})$$

Table 25 outlines the free-ridership level established for New Construction, along with the calculated NTGR value. Participant spillover is not included as it was assumed to be nil.

Table 25: Evaluated 2025 New Construction NTGR

Projects Fully Claimed in 2025	
Free-ridership Level	18%
NTGR	0.82

5.3.3 Evaluated Net Savings

Net savings represent the savings that can be reliably attributed to a service. For New Construction, net savings are calculated by applying the NTGR value in the following equation.

$$\text{Net Savings} = \text{Gross Savings} \times NTGR$$

The results are listed in Table 26 below. The average EUL was established at 18.7 years, and the net electrical energy savings resulted in 7,006 tonnes of CO2 eq in net annual GHG emission reductions.

Table 26: Evaluated 2025 New Construction Net Electrical Energy and Peak Demand Savings

Total	
Electrical Energy Savings	
Gross Electrical Energy Savings – at the Meter (GWh)	17.307
NTGR	0.82
Net Electrical Energy Savings – at the Meter (GWh)	14.127
Line Loss Factor	1.0658
Net Electrical Energy Savings – at the Generator (GWh)	15.057
Effective Useful Life (years)	18.7
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	281.430
Peak Demand Savings	
Gross Peak Demand Savings – at the Meter (MW)	5.600
NTGR	0.82
Net Peak Demand Savings – at the Meter (MW)	4.571
Line Loss Factor	1.0733
Net Peak Demand Savings – at the Generator (MW)	4.906

5.4 Realization Rate

Table 27 below compares total 2025 tracked and evaluated savings for New Construction. It also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings.

Table 27: Comparison of 2025 New Construction Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR	Net Savings		Realization Rate
	Value	Unit	Value	Value	Unit	Value
Electrical Energy Savings						
Tracked Savings by E1	18.713	GWh	0.72	13.473	GWh	112%
Evaluation Results	18.447	GWh	0.82	15.057	GWh	
Peak Demand Savings						
Tracked Savings by E1	6.239	MW	0.72	4.492	MW	109%
Evaluation Results	6.010	MW	0.82	4.906	MW	

Evaluated gross electrical energy savings and peak demand savings were lower than those tracked by E1 because of adjustments made to the energy models, which resulted in an overall downward adjustment to gross savings. Evaluated net electrical energy and peak demand savings were higher than those tracked by E1 because of a lower free-ridership in 2025 compared to the tracked value, resulting in an overall positive realization rate.



6 Building Optimization Impact Evaluation

The objectives of the 2025 Building Optimization impact evaluation were to determine gross and net electrical energy and peak demand savings, annually avoided GHG emissions, as well as EUL values and associated lifetime energy savings. Similarly to Retrofit and P4P, Building Optimization includes three types of savings: (1) Partial savings (projects to be completed in future years); (2) final savings for single-year projects completed in 2025; and (3) final savings for multiyear projects completed in 2025. In 2025, nine single-year projects claimed final savings; no multiyear projects were completed, and no partial savings claims were made.

6.1 Tracking Sheet Audit

To ensure service results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1. The verification and corrective actions taken by the Evaluator, where applicable, are described in detail in Appendix V. The tracked savings results presented in this report, therefore, refer to the corrected tracked savings obtained by the Evaluator.

6.2 Gross Savings

Gross savings correspond to changes in energy consumption resulting from actions taken by Building Optimization participants compared to the consumption level had those actions not occurred. The following subsections describe the review methodology used for all Building Optimization projects and the adjustments made to specific projects.

The Evaluator calculated the gross savings for each individual Building Optimization project file in accordance with best measurement and verification practices for commercial and industrial energy efficiency projects. This was achieved by using the information and data made available by participants and E1 as well as by supplementing the data with engineering assumptions and judgments where necessary.

6.2.1 Project Review Findings

The Evaluator reviewed all nine completed Building Optimization projects and made no adjustment to electrical energy or peak demand savings following these reviews. Therefore, the gross evaluated savings for each project are equal to the gross savings tracked by E1. The Evaluator then obtained the total Building Optimization gross electrical energy and peak demand savings by summing the evaluated savings for each project.

6.2.2 Interactive Effects

Since interactive effects vary significantly from one Building Optimization project to another, they are either accounted for in the project engineering calculations used to establish gross savings or included when using whole building consumption data. Any adjustments required to interactive effects factors are made as part of the project reviews.

6.2.3 Effective Useful Life

The Evaluator validated the EUL values based on the 2025 DSM MA. There were no adjustments made to the EUL values of reviewed 2025 projects.

6.2.4 Evaluated Gross Savings

Table 28 below presents the overall 2025 evaluated gross savings for Building Optimization. In 2025, no multiyear projects were completed, and no partial savings claims were made; consequently, total savings are equal to final savings claims for single-year projects,

Given that no adjustments were made to the electrical energy and peak demand savings as a result of project reviews, evaluated gross savings at the meter are equal to gross savings tracked by E1. Savings at the generator were calculated using line loss factors that account for electricity losses occurring between the meter and the generator. For each project, the Evaluator applied electrical energy and peak demand line loss factors corresponding to the relevant rate code based on the values drawn from the 2014 Cost of Service Study Progress Update¹⁹ provided by NS Power.²⁰

Table 28: Evaluated 2025 Building Optimization Gross Electrical Energy and Peak Demand Savings

	Final Savings Claimed for Single-Year Projects	Total
Number of Projects	9	9
Electrical Energy Savings		
Tracked Gross Electrical Energy Savings – at the Meter (GWh)	0.573	0.573
Adjustment Ratio for Electrical Energy Savings*	1.000	1.000
Gross Electrical Energy Savings – at the Meter (GWh)	0.573	0.573
Line Loss Factor**	1.063	1.063
Gross Electrical Energy Savings – at the Generator (GWh)	0.609	0.609
Effective Useful Life (years)***	3.0	3.0
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	1.826	1.826
Peak Demand Savings		
Tracked Gross Peak Demand Savings – at the Meter (MW)	0.018	0.018
Adjustment Ratio for Peak Demand Savings*	1.000	1.000
Gross Peak Demand Savings – at the Meter (MW)	0.018	0.018
Line Loss Factor**	1.070	1.070
Gross Peak Demand Savings – at the Generator (MW)	0.019	0.019
*The adjustment ratios listed in this table are the averages obtained by dividing gross electrical energy savings by tracked gross electrical energy savings. ** The line loss factors are average values obtained by dividing gross savings at the generator by gross savings at the meter. Each Building Optimization project received its own specific line loss factor depending on participant rate codes. ***These are average EUL values obtained by dividing gross lifetime electrical energy savings by gross electrical energy savings. Each Building Optimization project received its own specific EUL to obtain lifetime savings.		

As presented in Table 29 below, GHG emission reductions were calculated by applying the Nova Scotia-specific factor²¹ for GHG emissions generated by electricity production to Building Optimization gross savings.

¹⁹ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.

²⁰ For municipal utility participants, the line loss factor of the most similar NS Power rate code was assumed.

²¹ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO₂ eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed August 26, 2025)

Table 29: Evaluated 2025 Building Optimization Gross GHG Emission Reductions

	Total
Gross Electrical Energy Savings – at the Generator (GWh)	0.609
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO2 eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO2 eq)	286

6.3 Net Savings

The Evaluator determined the net electrical energy and peak demand savings, that is, the electrical energy and peak demand savings that can be reliably attributed to a service, by estimating the NTGR. For Building Optimization, free-ridership and spillover are accounted for in the NTGR calculation.

Given the minor contribution of Building Optimization to Custom savings, free-ridership and spillover levels were not measured in 2025. To obtain net electrical energy and peak demand savings, the Evaluator applied the NTGR results from the 2021 Custom Building Optimization evaluation²² to gross savings.

6.3.1 Net-to-gross Ratio Calculation

The NTGR was calculated using the following equation.

$$NTGR = (1 - \% \text{ Free-ridership} + \% \text{ Participant Spillover})$$

Table 30 outlines the free-ridership and spillover levels established for Building Optimization, along with the NTGR value.

Table 30: Evaluated 2025 Building Optimization NTGR

	Value for Savings Claimed in 2025 *
Free-ridership Level	9% (±7.2%)
Participant Spillover Level	0%
NTGR	0.91
*Free-ridership and spillover levels were not measured in 2025; hence, results from the 2021 Custom evaluation were applied.	

6.3.2 Evaluated Net Savings

Net savings represent the savings that can be reliably attributed to a service. For Building Optimization, net savings are calculated by applying the NTGR value using the following equation.

$$\text{Net Savings} = \text{Gross Savings} \times \text{NTGR}$$

The detailed net savings results are presented in Table 31 below. The average EUL was established at 3.0 years, and the net electrical energy savings resulted in 260 tonnes of CO2 eq in net annual GHG emission reductions.

²² Free-ridership and spillover levels for Building Optimization projects were last measured as part of the 2021 Custom evaluation.

Table 31: Evaluated 2025 Building Optimization Net Electrical Energy and Peak Demand Savings

	Final Savings Claimed for Single-year Projects	Total
Number of Projects	9	9
Electrical Energy Savings		
Gross Electrical Energy Savings – at the Meter (GWh)	0.573	0.573
NTGR	0.910	0.910
Net Electrical Energy Savings – at the Meter (GWh)	0.521	0.521
Line Loss Factor*	1.063	1.063
Net Electrical Energy Savings – at the Generator (GWh)	0.554	0.554
Effective Useful Life (years)**	3.0	3.0
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	1.662	1.662
Peak Demand Savings		
Gross Peak Demand Savings – at the Meter (MW)	0.018	0.018
NTGR	0.910	0.910
Net Peak Demand Savings – at the Meter (MW)	0.016	0.016
Line Loss Factor*	1.070	1.070
Net Peak Demand Savings – at the Generator (MW)	0.018	0.018
*The line loss factors are average values obtained by dividing gross savings at the generator by gross savings at the meter. Each Building Optimization project received its own specific line loss factor depending on participant rate codes. **These EULs are average EUL values obtained by dividing gross lifetime electrical energy savings by gross electrical energy savings. Each Building Optimization project received its own specific EUL to obtain lifetime savings.		

6.4 Realization Rate

A comparison of the electrical energy and peak demand savings values established through this evaluation and those tracked by E1 is presented in Table 32 below. The table also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings.

Table 32: Comparison of 2025 Building Optimization Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR	Net Savings		Realization Rate
	Value	Unit	Value	Value	Unit	Value
Electrical Energy Savings						
Tracked Savings by E1	0.609	GWh	0.91	0.554	GWh	100%
Evaluation Results	0.609	GWh	0.91	0.554	GWh	
Peak Demand Savings						
Tracked Savings by E1	0.019	MW	0.91	0.018	MW	100%
Evaluation Results	0.019	MW	0.91	0.018	MW	

Evaluated electrical energy and peak demand savings were equal to those tracked by E1 given that no adjustments were made following project reviews and that the NTGR remained unchanged compared to the value tracked by E1 (value from the 2021 Custom evaluation).

7 Overall Savings for Custom

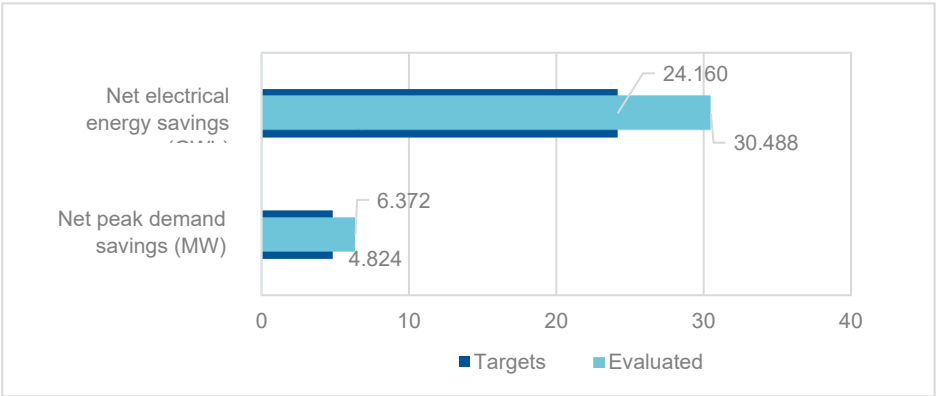
A comparison of the electrical energy and peak demand savings values established through this evaluation and those tracked by E1 is presented in Table 33. The realization rate, representing the ratio of evaluated net savings to tracked net savings, was established at 108% for energy savings and at 108% for peak demand savings.

Table 33: Comparison of 2025 Custom Tracked and Evaluated Savings at the Generator

		Gross Savings		NTGR*	Net Savings		Realization Rate
		Unit	Value	Value	Value	Unit	Value
Retrofit	Electrical Energy Savings						
	Tracked Savings by E1	16.032	GWh	0.82	13.121	GWh	104%
	Evaluation Results	15.878	GWh	0.86	13.665	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	1.310	MW	0.84	1.106	MW	117%
	Evaluation Results	1.327	MW	0.98	1.295	MW	
Pay-for-Performance	Electrical Energy Savings						
	Tracked Savings by E1	1.274	GWh	0.86	1.095	GWh	111%
	Evaluation Results	1.274	GWh	0.95	1.212	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	0.316	MW	0.86	0.272	MW	56%
	Evaluation Results	0.167	MW	0.92	0.153	MW	
New Construction	Electrical Energy Savings						
	Tracked Savings by E1	18.713	GWh	0.72	13.473	GWh	112%
	Evaluation Results	18.447	GWh	0.82	15.057	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	6.239	MW	0.72	4.492	MW	109%
	Evaluation Results	6.010	MW	0.82	4.906	MW	
Building Optimization	Electrical Energy Savings						
	Tracked Savings by E1	0.609	GWh	0.91	0.554	GWh	100%
	Evaluation Results	0.609	GWh	0.91	0.554	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	0.019	MW	0.91	0.018	MW	100%
	Evaluation Results	0.019	MW	0.91	0.018	MW	
Total Custom	Electrical Energy Savings						
	Tracked Savings by E1	36.627	GWh	0.77	28.244	GWh	108%
	Evaluation Results	36.208	GWh	0.84	30.488	GWh	
	Peak Demand Savings						
	Tracked Savings by E1	7.884	MW	0.75	5.887	MW	108%
	Evaluation Results	7.523	MW	0.85	6.372	MW	
* NTGRs differ for each service. The NTGRs listed in this table match the rounded averages obtained from dividing net savings by gross savings.							

As outlined in Figure 6 below, Custom surpassed its electrical energy savings target by 26% and its peak demand savings target by 32%. Custom achieved 531.666 GWh and 437.723 GWh in gross and net lifetime electrical energy savings respectively, resulting in a weighted average EUL of 14.7 years for gross electrical energy savings and 14.4 for net electrical energy savings.

Figure 6: 2025 Custom Targets and Evaluated Results





8 Custom Key Findings and Recommendations

The main objectives of the 2025 Custom evaluation were as follows:

- › Calculate gross and net results, namely first-year and lifetime electrical energy savings, peak demand savings, as well as avoided GHG emissions
- › Collect information on participant and non-participant perspectives for New Construction
- › Collect information on participation motivations and barriers, and the decision-making process for New Construction

This section provides the Evaluator's key findings in relation to these objectives. Pursuant to the 2025 evaluation, the Evaluator has no recommendations for Custom.

General Custom Key Findings and Recommendations

2025 Custom-Finding: Custom surpassed the net electrical energy and peak demand savings targets in 2025.

Custom achieved 30.487 GWh in net electrical energy savings and 6.372 MW in net peak demand savings at the generator in 2025, thereby surpassing by 26% the planned electrical energy savings of 24.160 GWh and by 32% the planned peak demand savings of 4.824 MW.

2025 Custom-Finding: Compared to 2024 levels, Custom participation decreased in 2025.

With 80 projects completed across the four Custom services,²³ the 2025 participation level for Custom was lower than 2024, with 104 completed projects. The number of completed projects decreased from 75 in 2024 to 37 in 2025 for Retrofit, and it increased from two in 2024 to nine in 2025 for Building Optimization. Participation in New Construction increased from 27 projects completed in 2024 to 33 in 2025, and a single project was completed under P4P, the first since 2022.

2025 Custom-Finding: Following the project reviews, the Evaluator adjusted the gross electrical energy and peak demand savings for Retrofit, P4P, and New Construction.

For Retrofit, the Evaluator adjusted gross electrical energy or peak demand savings, which varied for each project category (regular Retrofit, solar PV, and compressed air leak audit projects). These adjustments resulted in an adjustment ratio of 0.993 for gross electrical energy savings and 1.011 for gross peak demand savings.

For P4P, the Evaluator did not make adjustments to electrical energy savings and adjusted peak demand savings, resulting in adjustment ratios for gross electrical energy and peak demand savings of 1.000 and 0.528 respectively.

For New Construction, the resulting adjustment ratios for gross electrical energy and peak demand savings were 0.949 and 0.937 respectively.

For Building Optimization, the Evaluator did not make any adjustment to electrical energy savings or peak demand savings.

²³ Custom includes four services: Retrofit (37 projects completed); Pay-for-Performance (one project completed); New Construction (33 projects completed); and Building Optimization (nine projects completed).

2025 Custom-Finding: The free-ridership level decreased for regular Retrofit projects, and the New Construction free-ridership level decreased compared to the 2024 levels.

The overall 2025 free-ridership level for regular Retrofit projects was established at 8% (down from 15% in 2024) and at 8% for compressed air leak audit projects. The free-ridership level was not measured for solar PV projects and was, therefore, maintained at 38% (value from the 2023 evaluation).

The 2025 free-ridership level established at 8% for P4P and at 18% for New Construction (down from 28% in 2024).

Free-ridership was not measured for Building Optimization and was maintained at 9% (value from the 2021 evaluation).

Retrofit spillover was established at nil for regular Retrofit and compressed air leak audit projects. Spillover was neither measured for solar PV projects and was, therefore, maintained at 1% (value from 2023), nor for Building Optimization and was, therefore, maintained as nil (value from 2021).

2025 Custom-Finding: Both the evaluated net electrical energy savings and peak demand savings determined by the Evaluator were higher than the savings tracked by E1.

Evaluated net electrical energy savings and peak demand savings were both 8% higher than the values tracked by E1.



9 SEM Overview

This section describes the Strategic Energy Management (SEM) program component, follows up on past evaluation recommendations, and provides an overview of participation history.

9.1 SEM Description

SEM provides industrial and institutional participants with funding and support to implement energy management practices within their organizations. It also provides participants with energy management information system (EMIS) implementation support.

SEM helps participants achieve continuous energy savings by offering a structured approach to identifying, prioritizing, and completing energy-saving actions through the implementation of energy management policies and processes. To be eligible, participants must possess the necessary resources to implement energy efficient improvements, demonstrate commitment to energy management, and identify committed personnel to work in collaboration with E1 throughout the duration of projects.²⁴ Activities are conducted through a third-party Service Provider that delivers the program component. Participants commit to participating for 12 months, although E1 offers additional years to participants who want to continue operating the energy management system. SEM participants can also obtain funding for an EMIS, which is an additional tool that assists participants in using energy consumption data from metered systems to inform decisions about their processes. This funding may be used to conduct an EMIS audit, develop and implement an EMIS plan that involves the configuration of metering and monitoring equipment, as well as procure training and organizational support.

SEM provides participants with energy Kaizens²⁵ and mapping, treasure hunts,²⁶ energy management assessments, as well as performance monitoring and reporting tools. SEM also provides employee training and organizational support for the implementation of energy management engagement activities that consist of using energy performance information to prompt actions aimed at achieving behavioural change as well as operation and maintenance related energy-saving measures. Ultimately, SEM helps develop an energy management plan focused on changing business practices to enhance long-term energy performance.

Figure 7 below illustrates the SEM participation process along with details about the program component.

²⁴ An SEM project is defined as the implementation of a strategic energy management system in a facility.

²⁵ Energy Kaizens are activities aimed at continuously improving energy consumption by identifying waste and focusing on eliminating it.

²⁶ These consist of plant walkthroughs aimed at identifying energy-saving opportunities.

Figure 7: 2025 SEM Participation Process Summary



Starting in 2021, SEM participants have been offered performance-based incentives for the savings achieved through the program component. The objectives of this incentive are to facilitate recruitment and encourage the completion of energy efficiency projects. SEM participants may enroll in the Large Industrial initiative aimed at filling energy management capacity gaps for large industrial customers; if they choose to do so, they receive additional support in the form of a dedicated industrial energy manager (IEM), and the savings they achieve through SEM are incentivized at \$0.06/kWh. SEM participants who are not part of the Large Industrial initiative also receive a performance-based incentive although at a lower rate of \$0.04/kWh.

SEM was aimed at generating net electrical energy savings of 2.657 GWh and net peak demand savings of 0.289 MW at the generator in 2025.

9.2 Follow-up on Past Evaluation Report Recommendations

The Evaluator evaluated SEM in previous years and issued improvement recommendations. Table 34 provides a summary of the implementation status of the recommendations presented in the Executive Summary section of the 2024 SEM evaluation report.

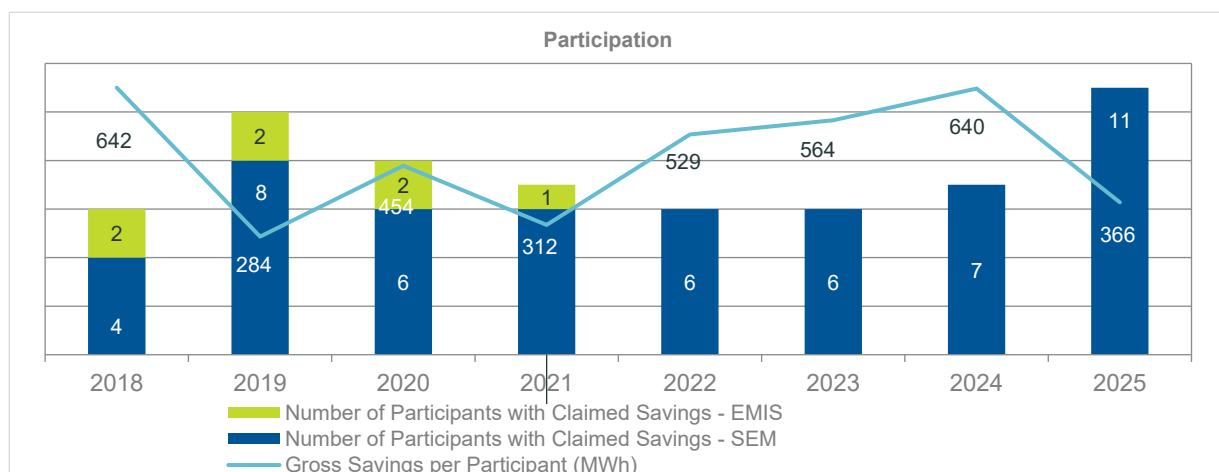
Table 34: Implementation Status of Past Recommendations for SEM

#	Recommendations	Status	Comments
2023-SEM-R1	Consider including plant-level key performance indicators (KPIs) and tracking their progression since program component inception in participant reporting.	In progress	In 2024, E1 program staff worked with the SEM Service Provider to determine which plant-level KPIs to include in participant reporting. In 2025, E1 staff continued to work with the SEM Service Provider to determine and implement plant-level KPIs in participant reporting. Implementation is ongoing.
2023-SEM-R3	Better communicate the value of energy management to both participants and non-participants, including its decarbonization potential.	Complete	In 2024 and 2025, E1 program staff worked with other departments to ensure messaging on decarbonization was clear and that participants fully understood all the benefits associated with SEM. In addition, program staff discussed this recommendation with the SEM Service Provider that subsequently added this topic to the agenda of regular customer meetings.

9.3 Participation History

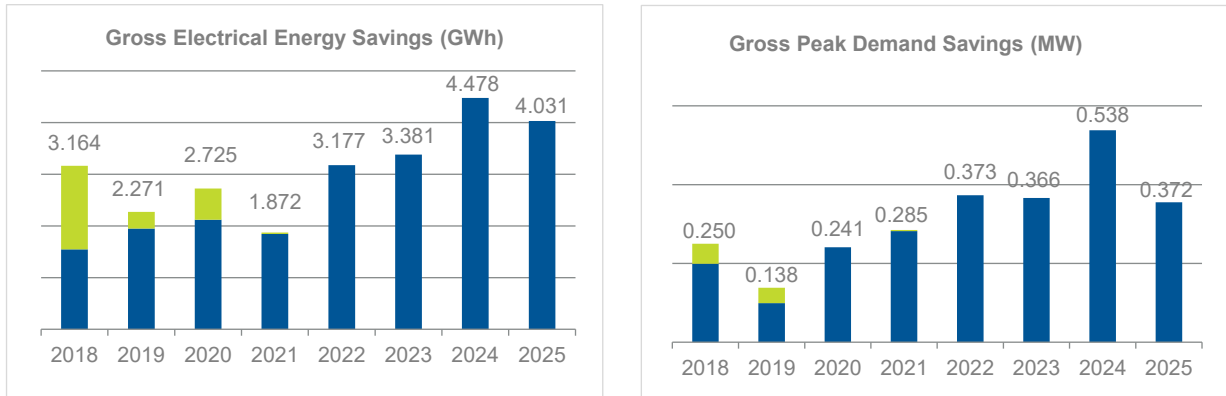
There were 12 active participants in SEM in 2025. Of these, nine were continuing participants and three were new participants. Moreover, 11 of the 12 active participants achieved savings in 2025. The electrical energy savings achieved in 2025 were the second highest since program inception in 2015 and slightly below 2024 results that were the highest achieved by the program component to date. The savings in 2025 were supported by the higher-than-normal number of active participants achieving savings, three of which contributed 55% of total electrical energy savings. Figure 8 and Figure 9 below illustrate the participation and savings trends since 2018 respectively.

Figure 8: Overview of SEM Participation, 2018-2025²⁷



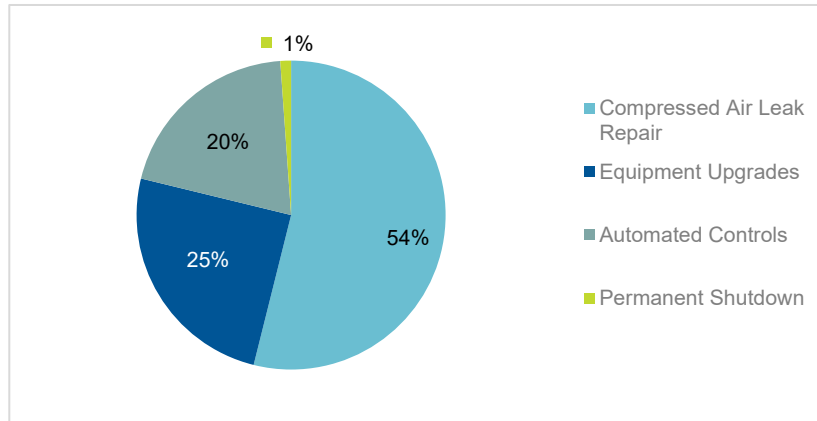
²⁷ The 2019 savings values per participant are based only on the savings that occurred in 2019. In this graph and the following, EMIS savings were included in historical data – they are presented in green.

Figure 9: Evolution of SEM Gross Savings, 2018-2025



Similarly to 2024, most SEM electrical energy savings are the result of compressed air leak repair measures, as illustrated in Figure 10 below. Of the 18 measures implemented by participants in 2025, six were compressed air leak repairs that represented 54% of 2025 electrical energy savings.

Figure 10: Distribution of 2025 SEM Electrical Energy Savings per Measure Category



10 SEM Evaluation Approach

The 2025 SEM evaluation comprised a comprehensive impact evaluation. The main objectives of the SEM evaluation were as follows:

- › Calculate SEM gross and net results, namely electrical first-year and lifetime energy savings, peak demand savings, and avoided GHG emissions

The Evaluator identified key research questions aimed at achieving these objectives. Table 35 outlines the evaluation objectives and maps them to the Evaluator's research questions, methods, and sample sizes (n). Each method is described further below.

Table 35: 2025 SEM Evaluation Approach

Evaluation Objectives	Research Questions	Methodology
Calculate gross results	› Are the data in the tracking sheet complete, accurate, and consistent? › Are the gross savings for each project accurately calculated? › Have the correct EUL values been applied to each measure? › What are the evaluated first-year and lifetime gross electrical energy and peak demand savings?	› Tracking sheet audit › Project file reviews supported by participant and/or Service Provider follow-up interviews (census, n=11) › Site visits for participants claiming savings for the first time (n=3) › Calculations using evaluation results
Calculate net results	› What are the evaluated first-year and lifetime net electrical energy and peak demand savings? › What are the net avoided GHG emissions in CO2 eq?	› Calculations using evaluation results › Avoided GHG emission reduction calculations

Tracking Sheet Audit

Prior to performing the savings review, the Evaluator audited the final 2025 tracking sheet to ensure it was complete and data entry was consistent. The detailed protocol used for the tracking sheet audit and the results obtained are presented in Appendix XIV.

Project File Reviews

In January 2025, a total of 18 measure reviews were conducted. Of these, one included an email request for additional measure information, while another two consisted of a participant interview. The remaining measures did not require clarifications from participants; therefore, no additional interviews were needed. Site visits were requested for three new participants that generated savings in 2025. The Evaluator conducted two site visits during which participants were asked questions and equipment was inspected based on the project review results provided ahead of the visits. A third site visit was requested for a new participant. Due to participant availability, the Evaluator was unable to schedule a site visit and instead conducted an interview with the participant to support two measure desk reviews. The Evaluator also contacted the Service Provider for clarifications where necessary.

The protocol used to conduct the interviews and project reviews is presented in Appendix XV, while detailed project review adjustments are provided in Appendix XVI.

Calculations Using Evaluation Results

Building on all the above methods and collected data, the Evaluator calculated the first-year and lifetime gross electrical energy savings and peak demand savings as per the calculation methodology presented in Section 11 below.

GHG Emission Reduction Calculations

To obtain net avoided GHG emissions in CO₂ eq for SEM, the Evaluator multiplied the net electrical energy savings by the latest Nova Scotia-specific factor for GHG emissions generated by electricity production. This factor was established using Nova Scotia Power (NS Power) data.



11 SEM Impact Evaluation

The objectives of the 2025 SEM comprehensive impact evaluation were to determine project gross and net electrical energy and peak demand savings as well as annually avoided GHG emissions, EUL values, and associated lifetime electrical energy savings.

11.1 Tracking Sheet Audit

To ensure program component results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1. The results obtained from the tracking sheet audit are presented in Appendix XIV. The tracked savings results presented in this report, therefore, refer to the corrected tracked savings obtained by the Evaluator.

11.2 Gross Savings

For SEM, gross savings correspond to the change in energy consumption resulting from actions taken by participants regardless of their reasons for participating.²⁸ The subsections below provide a description of the methodology used to review the 18 SEM measures that generated savings in 2025 and a summary of the review findings. Interactive effects, EUL values, and revised gross electrical savings were also assessed, the results of which are also presented below.

11.2.1 Project Review Findings

The Evaluator reviewed the calculation methodologies for the 18 SEM measures based on project documentation and information from interviews with participants (where required) and the Service Provider. All except one participant used a bottom-up approach to quantify savings by applying a distinct measurement and verification (M&V) methodology for each measure, which is consistent with how Custom Retrofit savings are typically calculated. While the bottom-up approach to quantify savings has been the preferred approach since 2022, a top-down approach is appropriate either in cases where a measure impacts the entire facility since such cases render interactive effects difficult to quantify or when monitoring individual components is not feasible. In these cases, savings are determined by continuously measuring energy consumption and demand at the whole facility level during the baseline and reporting periods. The Service Provider selected a bottom-up or top-down approach in a manner that is consistent with the M&V procedure developed by the Service Provider and approved by the Evaluator.

²⁸ Definition adapted from National Renewable Energy Laboratory, The Uniform Methods Project Chapter 23: Estimating Net Savings: Common Practices, September 2014, p. 3.



The M&V reports were complete and provided a clear understanding of the measures and the savings quantification approach. In nearly all cases, the Evaluator found the overall M&V methodology to be thorough and in alignment with best practices, including the usage of pre and post-measurements at the measure level (in the case of bottom-up approaches) or at the facility level (in the case of top-down approaches). In cases where measured data were unavailable, the Evaluator found the savings were mostly quantified taking a conservative approach using nameplate data and conservative engineering assumptions. For compressed air measures specifically, one M&V approach applied by participants involved measuring the airflow of each leak using permanent submetering flow meters and validating that the leak was no longer detectable after the repair. In cases where permanent or temporary submetering was not available, the Evaluator accepted the use of ultrasonic leak detectors as a valid methodology for both identifying leaks and quantifying the estimated savings. As part of the review, the Evaluator ensured that no leaks were reported twice and that the conversion from cubic feet per minute of compressed air to kW was performed using a conservative compressor efficiency if no compressor efficiency measurement specific to the given facility was available. While under an ideal scenario, participants would conduct leak-down tests pre and post-repair as the methodology for quantifying leaks, the Evaluator found the methodologies employed in each project as reasonable given that leak-down tests require interruptions to production lines and that leak repairs for many of the projects were completed over extended periods, making the use of these tests impractical.

Overall, the Evaluator adjusted the savings of seven measures, with six measures receiving electrical energy savings adjustments (four receiving downward adjustments and two receiving upward adjustments) and four measures receiving peak demand savings adjustments (including three downward adjustments and one upward adjustment).

Compressed Air Leak Repair Measures

The Evaluator reviewed six compressed air leak measures with one measure receiving a downward adjustment to both the electrical energy and peak demand savings. In this case, the compressor efficiency was calculated using a mix of measured data and nameplate data. The Evaluator reviewed the methodology and found that a bin analysis using metered data was possible and produced a more conservative estimate of those savings.

Equipment Upgrade Measures

Six of the measures reviewed by the Evaluator involved equipment upgrades. Of these measures, the Evaluator made downward adjustments to the electrical energy savings claimed for three measures and downward adjustments to the peak demand savings for two measures. While the Evaluator agrees with the methodology used to calculate the savings for those projects, minor adjustments were made, such as updating efficiency, operating hours, or production data based on confirmations obtained during the site visits and interviews.

Automated Controls Measures

There were five measures with claimed electrical energy savings that fell under the automated controls measure category. Of these measures, three received adjustments to electrical energy savings (two upward adjustments and one downward adjustment) and one received an upward adjustment to peak demand savings. While the Evaluator mostly agrees with the methodology used to calculate the savings for those projects, minor adjustments were made, such as corrections to power calculation formulas or updating operating hours and efficiency based on confirmations obtained during the site visits/interviews. For one project measure, the Evaluator calculated the peak demand savings for a measure that operates during peak demand hours and for which the initial peak demand savings were reported as nil.



Permanent Shutdown

There was one measure with claimed savings that fell under the permanent shutdown measure category. The Evaluator agrees with the methodology used to calculate the savings and, as such, made no adjustments to the electrical energy and peak demand savings.

Overall, the adjustment ratios for both gross and net electrical energy and peak demand savings were 0.953 and 0.884 respectively.

11.2.2 Interactive Effects

For each project reviewed, the Evaluator validated if interactive effects should have been considered and concluded that no interactive effects impacted the concerned measures. Hence, no additional interactive effects were applied to measured savings.

11.2.3 Effective Useful Life

As part of the 2025 Demand-side Management Measure Assessment (DSM MA)²⁹ activities, the Evaluator reviewed the EUL values for all measure categories to ensure they were still valid and revised them where appropriate. For all projects, the Evaluator estimated the proportion of savings achieved by measure and assigned a measure-specific EUL in accordance with the EUL values found in the 2025 DSM MA. This resulted in a weighted average EUL of 5.1 years.

11.2.4 Evaluated Gross Savings

The evaluated 2025 SEM gross electrical energy and peak demand savings at the generator are listed in Table 36 below.

The gross electrical energy and peak demand savings at the generator were estimated by using different line loss factors between the meter and the generator based on each facility rate code and line loss factor values drawn from the 2014 Cost of Service Study Progress Update.³⁰

²⁹ The 2025 DSM MA is a reference document that provides an in-depth review of all parameters necessary to calculate the annual and lifetime gross electrical energy and peak demand savings of all prescriptive measures and most semi-prescriptive measures offered through E1's DSM program portfolio. In addition, the MA includes effective useful life values for all measures offered in E1's program portfolio. For the evaluation conducted during the last year of the 2023-2025 DSM cycle, the Evaluator refers to the values presented in the 2025 DSM MA.

³⁰ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1. For municipal utility participants, the line loss factor of the most similar NS Power rate code was assumed.

Table 36: Evaluated 2025 SEM Gross Electrical Energy and Peak Demand Savings

	New Projects	Continuing Projects	Total
Number of Projects	3	8	11
Electrical Energy Savings			
Tracked Gross Electrical Energy Savings (GWh)	0.772	3.255	4.027
Adjustment Ratio for Electrical Energy Savings	1.028	0.936	0.953
Gross Electrical Energy Savings – at the Meter (GWh)	0.793	3.046	3.839
Line Loss Factor	1.0527	1.0494	1.0501
Gross Electrical Energy Savings – at the Generator (GWh)	0.835	3.197	4.031
Equivalent Effective Useful Life (years)	3.4	5.5	5.1
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	2.849	17.666	20.515
Peak Demand Savings			
Tracked Gross Peak Demand Savings (MW)	0.093	0.309	0.401
Adjustment Ratio for Peak Demand Savings	0.819	0.904	0.884
Gross Peak Demand Savings – at the Meter (MW)	0.076	0.279	0.355
Line Loss Factor	1.0550	1.0461	1.0480
Gross Peak Demand Savings – at the Generator (MW)	0.080	0.292	0.372

As presented in Table 37 below, GHG emission reductions were calculated by applying the Nova Scotia-specific factor³¹ for GHG emissions generated by electricity production to SEM gross savings.

Table 37: Evaluated 2025 SEM Gross GHG Emission Reductions

	Total
Gross Electrical Energy Savings – at the Generator (GWh)	4.031
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO2 eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO2 eq)	1,892

11.3 Net Savings

The Evaluator determined the net electrical energy and peak demand savings, i.e. the savings that can be reliably attributed to the program component, by estimating the NTGR. More precisely, the NTGR represents the positive or negative impacts of spillover and free-ridership on gross savings.

As recommended in the 2023 evaluation, the Evaluator applied the assumption that the SEM NTGR was equal to 1.

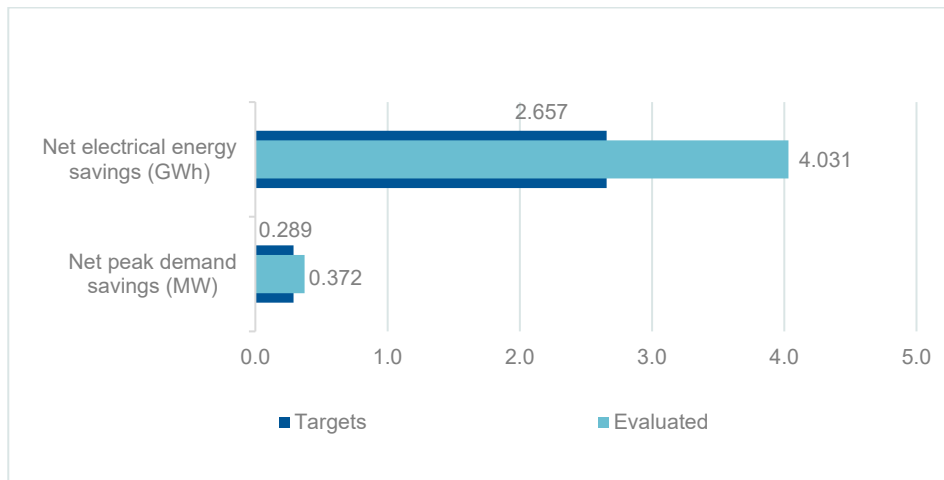
³¹ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO2 eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed August 26, 2025) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).

11.3.1 Evaluated Net Savings

Since spillover and free-ridership effects were considered nil, net SEM impacts are equal to gross savings. The 2025 SEM net electrical energy and peak demand savings were estimated at 4.031 GWh and 0.372 MW at the generator respectively. The net electrical energy savings resulted in 1,892 tonnes of CO₂ eq in net annual GHG emission reductions.

As outlined in Figure 11, SEM surpassed its electrical energy and peak demand savings targets by 52% and 29% respectively.

Figure 11: 2025 SEM Targets and Evaluated Results



11.4 Realization Rate

A comparison of the electrical energy and peak demand savings established through this evaluation and those tracked by E1 is presented in Table 38 below. The table also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings.

Table 38: Comparison of 2025 SEM Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR*	Net Savings		Realization Rate
	Value	Unit	Value	Value	Unit	Value
Electrical Energy Savings						
Tracked Savings by E1	4.228	GWh	1.00	4.228	GWh	95%
Evaluation Results	4.031	GWh	1.00	4.031	GWh	
Peak Demand Savings						
Tracked Savings by E1	0.421	MW	1.00	0.421	MW	88%
Evaluation Results	0.372	MW	1.00	0.372	MW	
* The average NTGR values presented in this table correspond to the ratios of net savings to gross savings for SEM.						

The evaluated net electrical energy savings were less than 5% below the tracked value due to four projects whose savings were slightly adjusted downward and two whose savings were adjusted upward.

The evaluated peak demand savings were less than 12% below the tracked value due to three projects whose peak demand savings were decreased and one project whose peak demand savings were increased.



12 SEM Key Findings and Recommendations

As mentioned previously, the main objectives of the 2025 SEM evaluation were as follows:

- › Calculate SEM gross and net results, namely electrical first-year and lifetime electrical energy savings, peak demand savings, and avoided GHG emissions

This section presents the Evaluator's key findings in relation to the above objectives. The Evaluator has no recommendations pursuant to the 2025 SEM evaluation.

2025 SEM-Finding: SEM exceeded its net electrical energy and peak demand savings targets.

In 2025, SEM achieved 4.031 GWh and 0.372 MW in net electrical energy and peak demand savings respectively. Electrical energy savings were 52% above the planned target of 2.657 GWh and peak demand savings were 29% above the planned target of 0.289 MW.

2025 SEM-Finding: In 2025, the SEM participation level increased to the highest level since 2018. Conversely, electrical energy savings per participant were lower than in the last three years.

There were 12 active SEM participants in 2025, nine continuing participants and three new participants. Moreover, 11 of the 12 participants completed projects with savings in 2025, which corresponds to the highest number of participants with savings since 2018. While the number of participants was above average, the electrical energy savings per participant were 366 MWh, representing a 43% decrease compared to 2024 levels.

2025 SEM-Finding: The M&V methodologies applied to quantify savings were generally appropriate and accurate.

While the Evaluator made adjustments to electrical energy savings and peak demand savings, the guideline written by E1 for calculating peak demand savings was generally followed by the Service Provider and, in most cases, projects and assumptions were well documented.

CONCLUSION

Table 39 below presents the participation levels, net-to-gross ratios (NTGRs), evaluated gross and net savings at the generator, annual greenhouse gas (GHG) emission reductions, as well effective useful life (EUL) values for each Custom Incentives program component and for the program as a whole.

Table 39: Overall 2025 Custom Incentives Participation and Evaluated Savings

	Participation Level		Gross Savings		NTGR*	Net Savings	
	Value	Unit	Value	Unit	Value	Unit	Value
Custom							
Electrical Energy Savings	80	Projects completed	36.207	GWh	0.84	30.487	GWh
Lifetime Electrical Energy Savings			531.666	GWh	0.82	437.723	GWh
Peak Demand Savings			7.523	MW	0.85	6.372	MW
Annual GHG Emission Reductions			16,992	Tonnes of CO2 eq	0.84	14,308	Tonnes of CO2 eq
EUL			14.7	Years		14.4	Years
SEM							
Electrical Energy Savings	11	Projects completed ³²	4.031	GWh	1.00	4.031	GWh
Lifetime Electrical Energy Savings			20.515	GWh	1.00	20.515	GWh
Peak Demand Savings			0.372	MW	1.00	0.372	MW
Annual GHG Emission Reductions			1,892	Tonnes of CO2 eq	1.00	1,892	Tonnes of CO2 eq
EUL			5.1	Years		5.1	Years
Total							
Electrical Energy Savings	91	Projects completed	40.239	GWh	0.86	34.519	GWh
Lifetime Electrical Energy Savings			552.182	GWh	0.83	458.238	GWh
Peak Demand Savings			7.895	MW	0.85	6.744	MW
Annual GHG Emission Reductions			18,884	Tonnes of CO2 eq	0.86	16,200	Tonnes of CO2 eq
EUL			13.7	Years		13.3	Years
* The NTGRs listed in this table match the rounded averages obtained from dividing net savings by gross savings.							

Figure 12 and Figure 13 below respectively illustrate the net electrical energy savings and peak demand savings targets for each program component and Custom Incentives as a whole as well as whether targets were achieved in 2025. Custom Incentives was aimed at achieving 26.817 GWh in net electrical energy savings and 5.112 MW in net peak demand savings at the generator for 2025. The program surpassed both the net electrical energy savings and peak demand savings targets. Custom was the largest contributor to total program net electrical energy and peak demand savings.

³² Completed SEM projects reference participants that generated savings in a given year.

Figure 12: 2025 Custom Incentives Targeted and Evaluated Net Electrical Energy Savings

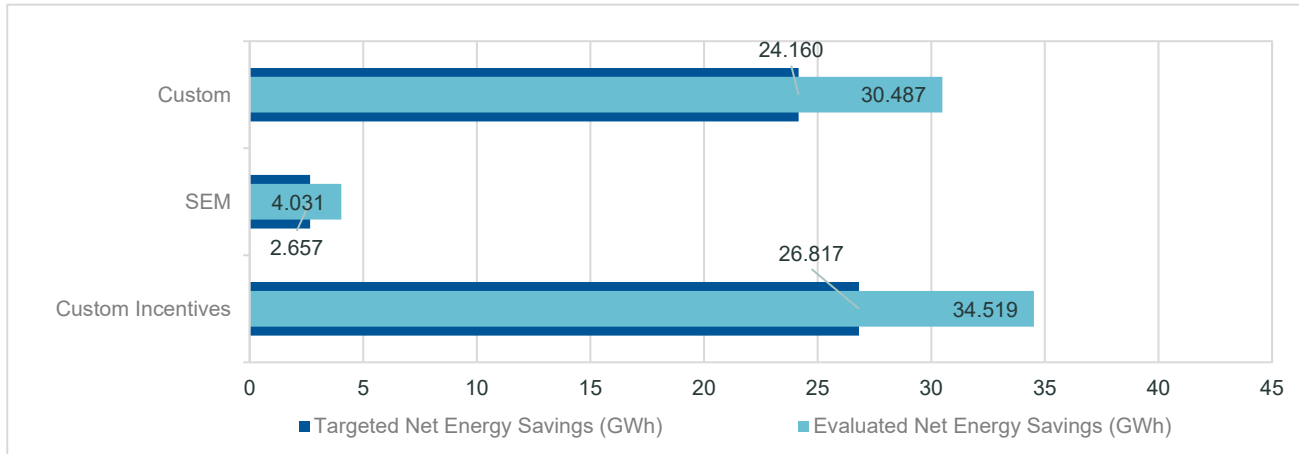
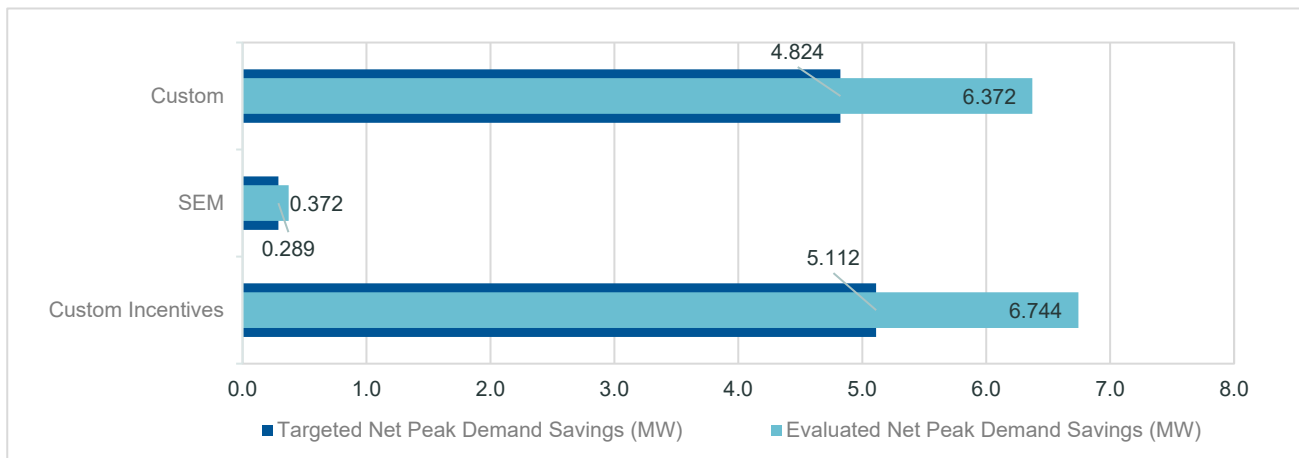


Figure 13: 2025 Custom Incentives Targeted and Evaluated Net Peak Demand Savings





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CUSTOM INCENTIVES PROGRAM

Final Appendix Report

2025 DSM EVALUATION

March 20, 2026

In collaboration with:





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APPENDIX I

Retrofit and Pay-for-Performance Participant Interview Guide

CUSTOM RETROFIT

PARTICIPANT INTERVIEW GUIDE

Table 1: Overview of Data Collection Activity

Descriptor	This Instrument
Instrument Type	Interview
Estimated Time to Complete	30 min.
Target Audience	Custom Retrofit participants
Expected Number of Completions	Retrofit up to 18
Contact List Source	EOne
Fielding Firm	Narrative
Estimated Timeline for Fielding	October - November

Table 2: Research Objectives and Associated Questions

Research Objectives	Section
Identifying Key Decision-makers	A
Awareness and Participation	B
Free-ridership	C
Cross-influence	D
Spillover	E
Measurement and Verification	F
Decarbonization and Electrification	G
Barriers	H
Satisfaction	I

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Black text: instructions for interviewer **[NOTE: xxxx] / [PROBE: xxxx]**

Introduction

I am with _____ and we are conducting an evaluation of the Custom Retrofit program offered by Efficiency Nova Scotia.

This interview could take up to 30 minutes. Is this still a good time for you?

We would like to better understand your organization's decision-making process regarding the energy efficiency project you completed as part of the Custom Retrofit program. Specifically, we are interested in how the decision was made to implement your energy efficiency Retrofit* project for the building located at **[SPECIFY LOCATION*]**. Throughout this interview, I will refer to this as your decision "to implement your energy efficiency project".

***[IF MORE THAN ONE COMPLETED PROJECT IS BEING REVIEWED]** This interview specifically refers to the following projects you have implemented **[SPECIFY PROJECT NAMES AND LOCATIONS]**. Please keep all of these projects in mind when answering the questions. Let me know during the interview when and how your responses differ by project.

Your responses will be kept confidential, and results from all interviews will be provided in aggregate format. Your responses will not affect the incentive amount you have or will receive for this project.

A. Identifying Key Decision-makers

A1. Did you play a key role in your organization's financial decision to implement the energy efficiency project?

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

A2. **[IF A1=YES OR DK/REFUSE]** Please describe your role in the decision-making process for this project.

96. Specify:

A3. **[IF A1=NO]** Could you provide the name, role, and contact information for someone who played a key role in your organization's decision to implement the energy efficiency project? **[RECORD INFORMATION; THANK & TERMINATE AND REACH OUT TO NEW CONTACT]**

96. Specify Name:
Specify role:
Specify contact info (email and/or phone):

B. Awareness and Participation

B1. Without commenting on your participation in the Custom Retrofit program for now, why did your organization decide to implement the energy efficiency upgrades we are discussing today? **[DO NOT READ] IF NEEDED TO REPLACE EQUIPMENT, ASK WHY THEY CHOSE HIGH EFFICIENCY FOR THE REPLACEMENT RATHER THAN STANDARD**

96. Specify:

Pre-coded answers **[DO NOT READ]**:

- 1. Lower operation costs
- 2. Energy policy in my organization
- 3. Environmental reasons/energy efficiency (non-cost related)
- 4. Competitors are doing it
- 98. Don't know
- 99. Refused

B2. How did you first hear about the Custom Retrofit program?

96. Specify:

B3. Why did your organization decide to participate in the Custom Retrofit program?

96. Specify:

C. Free-ridership

C1. Had your organization finalized the design and planning of the energy efficiency project BEFORE learning that you would receive an incentive from Efficiency Nova Scotia?

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

C2. **[IF C1=YES]** When you decided to move forward with the project, were you very, somewhat, not very, or not at all confident that you would receive an incentive from Efficiency Nova Scotia?

- 3. Very confident
- 4. Somewhat confident
- 5. Not very confident
- 6. Not at all confident
- 98. (Don't know)
- 99. (Refused)

- C3. Efficiency Nova Scotia gave your organization a rebate of \$<STUDY INCENTIVE> for the [INVESTIGATION OR FEASIBILITY] study and \$<IMPLEMENTATION INCENTIVE> for the project implementation, totalling <TOTAL> in incentives for your project.

I would like to understand how the incentive impacted the financial case for your project, specifically the extent to which it improved the project payback period. Would you say that the financial incentive [READ]?

1. Improved the payback period by a **very** significant margin; or
2. Improved the payback period by a **somewhat** significant margin; or
3. **DID NOT** improve the payback period by a significant margin
98. (Don't know)
99. (Refused)

- C4. If there had not been an implementation incentive, would you have definitely, probably, probably not, or definitely not paid the full cost of the energy efficiency project? [READ]

1. Definitely would have.
2. Probably would have.
3. Probably would not have.
4. Definitely would not have.
98. (Don't know)
99. (Refused)

- C5. [ASK IF \$<STUDY INCENTIVE> ≥ 0]

As part of its Custom Retrofit program, Efficiency Nova Scotia provided your organization a \$<STUDY INCENTIVE> incentive for the [Investigation or Feasibility] study. If this incentive had not been offered, would you have definitely, probably, probably not, or definitely not conducted this study? [READ]

1. Definitely would have.
2. Probably would have.
3. Probably would not have.
4. Definitely would not have.
98. (Don't know)
99. (Refused)

- C6. **[ASK IF C5 ≠ 98 OR 99]** Did you use the study during the planning stage to help compare and choose potential measures for the energy efficiency project?
- 1. Yes
 - 2. No
 - 98. Don't know
 - 99. Refused
- C7. You received a \$**<IMPLEMENTATION INCENTIVE>** implementation incentive from Efficiency Nova Scotia based on the energy savings achieved by your project once completed. Without this incentive, would you have **[READ]**? Implemented the exact same energy efficiency project; or
- 1. Implemented a project with fewer or less impactful energy efficiency measures; or
 - 2. Implemented the same project **but** delayed it by at least a year; or
 - 3. You would not have implemented the project at all.
 - 98. (Don't know)
 - 99. (Refused)
- C8. Did your organization work with an Onsite Energy Manager (OEM) before implementing the project?
- 1. Yes
 - 2. No
 - 98. Don't know
 - 99. Refused
- C9. **[IF C8 = YES]** What value does an On-site Energy Manager (OEM) bring to your organization?

C10. Please rate the importance of the following factors in your decision to implement energy efficiency measures through the Custom Retrofit program. Use the following scale: very important, somewhat important, not very important, not at all important. Let's begin with...

Factor [READ AND RANDOMIZE]	Responses		
a. The program financial incentive for the [Investigation or Feasibility Study] .	___ Response	___98 Don't Know	___Refused
b. The program financial incentive for the implementation of the energy efficiency measures.	___ Response	___98 Don't Know	___Refused
c. The information from the [Investigation or Feasibility Study] on the energy savings associated with each potential measure.	___ Response	___98 Don't Know	___Refused
d. The recommendations and technical assistance provided by the Business Development Manager, or other Efficiency Nova Scotia staff on the energy efficiency measures.	___ Response	___98 Don't Know	___Refused
e. The non-technical information offered by the Business Development Manager or other Efficiency Nova Scotia staff on energy efficiency such as but not limited to market trends, operating costs, and tradespeople availability.	___ Response ___Refused	___98 Don't Know/Not applicable	
f. [IF C8 = YES] The Onsite Energy Manager (OEM)'s technical support in identifying the measures to implement as part of the project.	___ Response	___98 Don't Know	___Refused
g. [IF C8 = YES] The OEM's contribution to the business case for your project or support for project management.	___ Response	___98 Don't Know	___Refused

D. Cross-Influence

[READ AND ROTATE (D1 + D2 TO D3) AND (D4 + D5 TO D7) SEQUENCES]

D1. Before participating in the Custom Retrofit program for this project, had your organization previously taken part in this program or in other programs offered by Efficiency Nova Scotia?

1. Yes, Custom Retrofit.
2. Yes, in another Efficiency Nova Scotia program
3. Yes, both
4. No (**GO TO D4**)
98. Don't know (**GO TO D4**)
99. Refused (**GO TO D4**)

For the following two statements, please respond with either "agree" or "disagree".

- D2. **[IF D1 =YES (1 OR 2 OR 3)]** As a result of your past participation in an Efficiency Nova Scotia program and what you learned from it, you asked a technical staff member from your organization (or a supplier/contractor) to examine the energy efficiency options for your project.
- 1. Agree
 - 2. Disagree
 - 98. Don't Know
 - 99. Refused
- D3. **[IF D1 = YES (1 OR 2 OR 3)]** As a result of your past participation in an Efficiency Nova Scotia program and what you learned from it, you considered the cost effectiveness of the energy efficiency for your project by evaluating the different options for your organization.
- 1. Agree
 - 2. Disagree
 - 98. Don't Know
 - 99. Refused
- D4. Before participating in the Custom Retrofit program, had you seen any energy efficiency promotional materials from Efficiency Nova Scotia, such as on its website, in brochures, newsletters or presentations?
- 1. Yes
 - 2. No **(GO TO SECTION E)**
 - 98. Don't know/Refuse **(Go to Section E)**

For the following three statements, please respond with either “agree” or “disagree”.

- D5. **[IF D4 = YES]** The Efficiency Nova Scotia energy efficiency promotional materials you saw were a major factor in your decision to implement the energy efficiency project.
- 1. Agree
 - 2. Disagree
 - 98. Don't Know
 - 99. Refused
- D6. **[IF D4 = YES]** The Efficiency Nova Scotia energy efficiency promotional materials you saw prompted you to ask a technical staff member from your organization (or a supplier/contractor) to examine the energy efficiency options for your project.
- 1. Agree
 - 2. Disagree
 - 98. Don't Know
 - 99. Refused

D7. **[IF D4 = YES]** The Efficiency Nova Scotia energy efficiency promotional materials you saw prompted you to consider the cost effectiveness of the energy efficiency measures by evaluating the different options for your organization.

- 1. Agree
- 2. Disagree
- 98. Don't Know
- 99. Refused

E. Spillover

E1. Since taking part in the Custom Retrofit program, have you implemented any additional energy efficiency measures outside of the program?

- 1. Yes
- 2. No **[GO TO SECTION F]**
- 98. Don't know **[GO TO SECTION F]**
- 99. Refused **[GO TO SECTION F]**

E2. **[IF E1 = 1]** Have you received or do you plan to request financing or rebates from Efficiency Nova Scotia for the energy efficiency upgrades implemented outside of the program?

- 1. Yes **[GO TO SECTION F]**
- 2. No
- 98. Don't know
- 99. Refused

E3. **[IF E2=NO OR DK/REFUSED]** Please describe these measures by providing the following information

- b. Name of measure
- c. Type of energy source saved - if all non-electric **(GO TO SECTION F)**
- d. Location of the facility - if not in Nova Scotia **(GO TO SECTION F)**
- e. Quantity of measures (or physical area covered by the measure in sq meters or sq feet)
- f. Technical information, such as HOU, capacity, efficiency, etc.
- g. Estimated savings (in kWh or \$)
- h. If no quantitative information is available, but the measure is the same as the one implemented through Custom Retrofit, probe participant on its relative size with respect to the Custom Retrofit project evaluated (% of size, area covered by measure, price, etc.).

E4. **[IF E2 = NO OR DK/REFUSED]** How influential was your experience with the energy efficiency project implemented through the Custom Retrofit program in your decision to pursue these additional measures outside of the program? **[READ]**

1. Very influential.
2. Somewhat influential.
3. Not very influential.
4. Not influential at all.
98. (Don't know)
99. (Refused)

E5. **[IF E2=NO OR DK/REFUSED]** Why did you implement this/these project(s) without the assistance of an Efficiency Nova Scotia program?

96. Specify
98. Don't know/ Refused

F. Program satisfaction

F1. On a scale from 1 to 10 (where 1 = not at all satisfied and 10 = very satisfied) ...

- a. how would you rate your satisfaction with each of the following aspects of the Custom Retrofit program?
- b. If less than 8, please explain the reason(s) for your score.

Aspects of the program [READ AND RANDOMIZE]	Score	Reason
1. The responsiveness of Efficiency Nova Scotia employees to your requests and enquiries in a timely manner	__ Response __98 DK __99 Ref __97 N/A	
2. The speed with which the application was approved	__ Response __98 DK __99 Ref __97 N/A	
3. The value of the program or service relative to the time and cost involved	__ Response __98 DK __99 Ref __97 N/A	
4. The ability to provide estimates of the savings or return on investment associated with the program	__ Response __98 DK __99 Ref __97 N/A	
5. The technical expertise of Efficiency Nova Scotia employees related to the program	__ Response __98 DK __99 Ref __97 N/A	

F2. Using the same 10-point scale, how satisfied are you with Efficiency Nova Scotia's overall performance in working with your organization?

Response: **[DO NOT ACCEPT A RANGE]**

97. Not applicable / Did not interact with Efficiency Nova Scotia

98. Don't Know

99. Refused

F3. **[ASK IF F2 < 5]** Why are you dissatisfied with Efficiency Nova Scotia's overall performance in working with your organization?

Response:

98. Don't Know

99. Refused

F4. Based on your personal experience, would you definitely, probably, probably not, or definitely not recommend the programs offered by Efficiency Nova Scotia to others? **[DO NOT READ, CODE ONE ONLY]**

1. Definitely

2. Probably

3. Probably not

4. Definitely not

96. Not Eligible for other programs

98. Don't know

99. Refused

F5. If your organization qualified, how likely would you be to participate in other programs offered by Efficiency Nova Scotia? Would you say definitely, probably, probably not, or definitely not participate in other programs? **[CODE ONE ONLY]**

1. Definitely

2. Probably

3. Probably not

4. Definitely not

98. Don't know

99. Refused

F6. Do you have any suggestions to improve the Custom Retrofit program? **[OPEN RESPONSE]**

Record: _____

☐ No suggestion at this time

END

Those are all the questions I have for you. I thank you very much for your time and cooperation and have a nice day!

APPENDIX II

Compressed Air Leak Participant Interview Guide

CUSTOM RETROFIT CA LEAK PARTICIPANT INTERVIEW GUIDE

Table 1: Overview of Data Collection Activity

Descriptor	This Instrument
Instrument Type	Interview
Estimated Time to Complete	30 min.
Target Audience	Custom Retrofit CA Leak participants
Expected Number of Completions	Census, up to 10
Contact List Source	EOne
Fielding Firm	Narrative
Estimated Timeline for Fielding	October - November

Table 2: Research Objectives and Associated Questions

Research Objectives	Section
Identifying Key Decision-makers	A
Awareness and Participation	B
Free-ridership	C
Cross-influence	D
Spillover	E
Measurement and Verification	F
Decarbonization and Electrification	G
Barriers	H
Satisfaction	I

To be adapted by Econoler **[Blue text]**

Import variables from database < **LIKE THIS** >

Skip pattern or programming instructions **[LIKE THIS]**

Black text: instructions for interviewer **[NOTE: xxxx] / [PROBE: xxxx]**

Introduction

I am with _____ and we are conducting an evaluation of the Custom Retrofit program offered by Efficiency Nova Scotia.

This interview could take up to 30 minutes. Is this still a good time for you?

We would like to better understand your organization's decision-making process regarding the compressed air leak audit and repair project you completed as part of the Custom Retrofit program. Specifically, we are interested in how the decision was made to conduct your compressed air leak audit and associated leak repairs* for the building located at **[SPECIFY LOCATION*]**. Throughout this interview, I will refer to this as your decision "to implement your compressed air leak project".

***[IF MORE THAN ONE COMPLETED PROJECT IS BEING REVIEWED]** This interview specifically refers to the following projects you have implemented **[SPECIFY PROJECT NAMES AND LOCATIONS]**. Please keep all of these projects in mind when answering the questions. Let me know during the interview when and how your responses differ by project.

Your responses will be kept confidential, and results from all interviews will be provided in aggregate format. Your responses will not affect the incentive amount you have or will receive for this project.

A. Identifying Key Decision-makers

A1. Did you play a key role in your organization's financial decision to implement the compressed air leak project?

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

A2. **[IF A1=YES OR DK/REFUSE]** Please describe your role in the decision-making process for this compressed air leak project.

96. Specify:

A3. **[IF A1=NO]** Could you provide the name, role, and contact information for someone who played a key role in your organization's decision to implement the compressed air leak audit? **[RECORD INFORMATION; THANK & TERMINATE AND REACH OUT TO NEW CONTACT]**

96. Specify Name:
Specify role:
Specify contact info (email and/or phone):

B. Awareness and Participation

- B1. Without commenting on your participation in the Custom Retrofit program for now, why did your organization decide to complete the compressed air leak audit and repairs we are discussing today?

Pre-coded answers **[DO NOT READ]**:

- 1. Lower operation costs
- 2. Energy policy in my organization
- 3. Environmental reasons/energy efficiency (non-cost related)
- 4. Competitors are doing it
- 98. Don't know
- 99. Refused

- B2. How did you first hear about the Custom Retrofit program?

- 96. Specify

- B3. Why did your organization decide to participate in the Custom Retrofit program?

- 96. Specify:

C. Free-ridership

- C1. Had your organization finalized the planning of the compressed air leak audit and repairs BEFORE learning that you would receive an incentive from Efficiency Nova Scotia?

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

- C2. **[IF C1=YES]** When you decided to move forward with the project, were you very, somewhat, not very, or not at all confident that you would receive an incentive from Efficiency Nova Scotia?

- 1. Very confident
- 2. Somewhat confident
- 3. Not very confident
- 4. Not at all confident
- 98. (Don't know)
- 99. (Refused)

C3. Efficiency Nova Scotia gave your organization a rebate of \$<IMPLEMENTATION INCENTIVE> for the completion of your compressed air audit and repairs.

I would like to understand how the incentive impacted the financial case for your compressed air leak project, specifically the extent to which it improved the project payback period. Would you say that the financial incentive [READ]?

1. Improved the payback period by a **very** significant margin; or
2. Improved the payback period by a **somewhat** significant margin; or
3. **DID NOT** improve the payback period by a significant margin
98. (Don't know)
99. (Refused)

C4. If there had not been an implementation incentive, would you have definitely, probably, probably not, or definitely not paid the full cost of the compressed air leak audit and repairs?

1. Definitely would have.
2. Probably would have.
3. Probably would not have.
4. Definitely would not have.
98. (Don't know)
99. (Refused)

C5. You received a \$<IMPLEMENTATION INCENTIVE> implementation incentive from Efficiency Nova Scotia based on the energy savings achieved by your compressed air leak repairs once completed. Without this incentive, would you have [READ]?

1. Conducted the compressed air leak audit and completed repairs in the exact same way; or
2. Conducted a less comprehensive compressed air leak audit and completed fewer leak repairs; or
3. Conducted the same compressed air leak audit and repairs, **but** delayed the project by at least a year; or
4. You would not have conducted the compressed air leak audit and repairs at all.
98. (Don't know)
99. (Refused)

C6. Did your organization work with an Onsite Energy Manager (OEM) before conducting the compressed air audit?

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

- C7. **[IF C6 = YES]** What value does an On-site Energy Manager (OEM) bring to your organization?
- C8. Please rate the importance of the following factors in your decision to complete a compressed air leak audit and repairs through the Custom Retrofit program. Use the following scale: very important, somewhat important, not very important, not at all important. Let's begin with...

Factor [READ AND RANDOMIZE]	Responses		
a. The program financial incentive for the compressed air leak audit and repairs.	___ Response	___98 Don't Know	___Refused
b. The recommendations and technical assistance provided by the Business Development Manager, or other Efficiency Nova Scotia staff on the compressed air leak audit and repairs.	___ Response	___98 Don't Know	___Refused
c. The non-technical information offered by the Business Development Manager or other Efficiency Nova Scotia staff on energy efficiency such as but not limited to market trends, operating costs, and trades people availability.	___ Response ___Refused	___98 Don't Know/Not applicable	
d. [IF C8 = YES] The Onsite Energy Manager (OEM)'s technical support in identifying the opportunity for completing the compressed air leak audit and repair.	___ Response	___98 Don't Know	___Refused
e. [IF C8 = YES] The OEM's contribution to the business case for your project or support for project management.	___ Response	___98 Don't Know	___Refused

D. Cross-Influence

[READ AND ROTATE (D1 + D2 TO D3) AND (D4 + D5 TO D7) SEQUENCES]

- D1. Before participating in the Custom Retrofit program for this compressed air leak project, had your organization previously taken part in this program or in other programs offered by Efficiency Nova Scotia?
1. Yes, Custom Retrofit.
 2. Yes, in another Efficiency Nova Scotia program
 3. Yes, both
 4. No (**GO TO D4**)
 98. Don't know (**GO TO D4**)
 99. Refused (**GO TO D4**)

For the following two statements, please respond with either "agree" or "disagree".

- D2. **[IF D1 =YES (1 OR 2 OR 3)]** As a result of your past participation in an Efficiency Nova Scotia program and what you learned from it, you asked a technical staff member from your organization (or a supplier/contractor) to examine the feasibility of the compressed air leak audit.
1. Agree
 2. Disagree
 98. Don't Know
 99. Refused
- D3. **[IF D1 = YES (1 OR 2 OR 3)]** As a result of your past participation in an Efficiency Nova Scotia program and what you learned from it, you considered the cost effectiveness of the energy efficiency for your compressed air project.
1. Agree
 2. Disagree
 98. Don't Know
 99. Refused
- D4. Before participating in the Custom Retrofit program had you seen any energy efficiency promotional materials from Efficiency Nova Scotia, such as on its website, in brochures, newsletters or presentations?
1. Yes
 2. No **(GO TO SECTION E)**
 98. Don't know/Refuse **(Go to Section E)**

For the following three statements, please respond with either “agree” or “disagree”.

- D5. **[IF D4 = YES]** The Efficiency Nova Scotia energy efficiency promotional materials you saw were a major factor in your decision to conduct the compressed air leak audit and repairs.
1. Agree
 2. Disagree
 98. Don't Know
 99. Refused
- D6. **[IF D4 = YES]** The Efficiency Nova Scotia energy efficiency promotional materials you saw prompted you to ask a technical staff member from your organization (or a supplier/contractor) to examine the feasibility of this compressed air leak project.
1. Agree
 2. Disagree
 98. Don't Know
 99. Refused

D7. **[IF D4 = YES]** The Efficiency Nova Scotia energy efficiency promotional materials you saw prompted you to consider the cost effectiveness of this project.

1. Agree
2. Disagree
98. Don't Know
99. Refused

E. Spillover

E1. Since taking part in the Custom Retrofit program, have you implemented any additional energy efficiency measures outside of the program?

1. Yes
2. No **[GO TO SECTION F]**
98. Don't know **[GO TO SECTION F]**
99. Refused **[GO TO SECTION F]**

E2. **[IF E1 = 1]** Have you received or do you plan to request financing or rebates from Efficiency Nova Scotia for the energy efficiency upgrades implemented outside of the program?

1. Yes **[GO TO SECTION F]**
2. No
98. Don't know
99. Refused

E3. **[IF E2=NO OR DK/REFUSED]** Please describe these measures by providing the following information

- a. Name of measure
- b. Type of energy source saved - if all non-electric **(GO TO SECTION F)**
- c. Location of the facility - if not in Nova Scotia **(GO TO SECTION F)**
- d. Quantity of measures (or physical area covered by the measure in sq meters or sq feet)
- e. Technical information, such as HOU, capacity, efficiency, etc.
- f. Estimated savings (in kWh or \$)
- g. If no quantitative information is available, but the measure is the same as the one implemented through Custom Retrofit, probe participant on its relative size with respect to the Custom Retrofit project evaluated (% of size, area covered by measure, price, etc.).

- E4. **[IF E2 = NO OR DK/REFUSED]** How influential was your experience with the compressed air leak project implemented through the Custom Retrofit program in your decision to pursue these additional measures outside of the program? **[READ]**
1. Very influential.
 2. Somewhat influential.
 3. Not very influential.
 4. Not influential at all.
 98. (Don't know)
 99. (Refused)
- E5. **[IF E2=NO OR DK/REFUSED]** Why did you implement this/these project(s) without the assistance of an Efficiency Nova Scotia program?
96. Specify
 98. Don't know/ Refused

F. Program satisfaction

- F1. On a scale from 1 to 10 (where 1 = not at all satisfied and 10 = very satisfied) ...
- a. how would you rate your satisfaction with each of the following aspects of the Custom Retrofit program?
 - b. If less than 8, please explain the reason(s) for your score.

Aspects of the program [READ AND RANDOMIZE]	Score	Reason
1. The responsiveness of Efficiency Nova Scotia employees to your requests and enquiries in a timely manner	__ Response __98 DK __99 Ref __97 N/A	
2. The speed with which the application was approved	__ Response __98 DK __99 Ref __97 N/A	
3. The value of the program or service relative to the time and cost involved	__ Response __98 DK __99 Ref __97 N/A	
4. The ability to provide estimates of the savings or return on investment associated with the program	__ Response __98 DK __99 Ref __97 N/A	
5. The technical expertise of Efficiency Nova Scotia employees related to the program	__ Response __98 DK __99 Ref __97 N/A	

F2. Using the same 10-point scale, how satisfied are you with Efficiency Nova Scotia's overall performance in working with your organization?

Response: **[DO NOT ACCEPT A RANGE]**

98. Don't Know

99. Refused

97. Not applicable / Did not interact with Efficiency Nova Scotia

F3. **[ASK IF F2 < 5]** Why are you dissatisfied with Efficiency Nova Scotia's overall performance in working with your organization?

Response:

98. Don't Know

99. Refused

F4. Based on your personal experience, would you definitely, probably, probably not, or definitely not recommend the programs offered by Efficiency Nova Scotia to others? **[DO NOT READ, CODE ONE ONLY]**

1. Definitely

2. Probably

3. Probably not

4. Definitely not

96. Not Eligible for other programs

98. Don't know

99. Refused

F5. If your organization qualified, how likely would you be to participate in other programs offered by Efficiency Nova Scotia? Would you say definitely, probably, probably not, or definitely not participate in other programs? **[CODE ONE ONLY]**

1. Definitely

2. Probably

3. Probably not

4. Definitely not

98. Don't know

99. Refused

F6. Do you have any suggestions to improve the Custom Retrofit program? **[OPEN RESPONSE]**

Record: _____

☐ No suggestion at this time

END

Those are all the questions I have for you. I thank you very much for your time and cooperation and have a nice day!

APPENDIX III

Retrofit and Pay-for-Performance Algorithm for Free-Ridership Calculation

Question		Answer	Score
Identifying Key Decision Makers			
A1a	We would like to speak with someone that played a key role in the financial decision to implement the energy efficiency project for your organization. Are you that person?	1) Yes	EMPTY
		2) No	
		98/99) Don't know/Refused	
A1b	[IF A1a=YES OR DK/Refused] Please describe your role in the decision-making process for this project.	Answer: _____	Contextual information to help identify if respondent is a key decision-maker.
A2	[IF A1a=NO] Who played a key role in the decision to implement the energy efficiency project? Can you provide their names, roles, contact information?	Answer: _____	Contextual information to help identify other key decision-makers to interview.
INTENTION			
Planning			
C1	Had your organization finalized the design and planning of the energy efficiency project BEFORE knowing that you would receive an incentive from Efficiency Nova Scotia?	1) Yes	Use C2
		2) No	0%
		98/99) Don't know/Refused	
C2	[IF C1=1] When you decided to move forward with the energy efficiency project, how confident were you that you would receive an incentive from Efficiency Nova Scotia? [READ]	1) Very confident	0%
		2) Somewhat confident	25%
		3) Not very confident	75%
		4) Not at all confident	100%
		98/99) Don't know/Refused	50%
		Planning Score	C1
Cost			
C3	Efficiency Nova Scotia gave your organization a rebate of \$<STUDY INCENTIVE> for the [Investigation or Feasibility] study and \$<IMPLEMENTATION INCENTIVE> for the project implementation, totalling \$<TOTAL> in incentives for your project. I would like to understand the impact of this incentive on the financial case for your project. To what extent did these financial incentives improve the payback period for this project? [READ]	1) The financial incentive improved the payback period by a very significant margin	NO SCORE (FOR CONTEXT ONLY)
		2) The financial incentive improved the payback period by a somewhat significant margin	
		3) The financial incentive DID NOT improve the payback period by a significant margin	
		98/99) Don't know/Refused	

Question		Answer	Score
C4	Without the implementation incentive, what is the likelihood that you would have paid the full amount for your energy efficiency project?	1) Definitely would have (100%) 2) Probably would have (75%) 3) Probably would not have (25%) 4) Definitely would not have (0%)	Answer (%)
		98/99) Don't know/Refused	EMPTY
C5	[ASK IF \$<STUDY INCENTIVE> ≥0] As part of its Custom Retrofit program, Efficiency Nova Scotia gave your organization a \$<STUDY INCENTIVE> incentive for the [Investigation or Feasibility] study. Without this incentive, what is the likelihood that you would have conducted this study?	1) Definitely would have (100%) 2) Probably would have (75%) 3) Probably would not have (25%) 4) Definitely would not have (0%)	USE C6
		98/99) Don't know/Refused	EMPTY
C6	[IF C5 ≠ 98 OR 99] Did you use the study as a decision-making tool during the planning stage, to compare and select the potential measures for the energy efficiency project?	1) Yes	C5 Answer (%)
		2) No	EMPTY
		98/99) Don't know/Refused	EMPTY
		Cost Score	(C4, C6)
Efficiency, Quantity, and Timing			
C7	You received a \$<IMPLEMENTATION INCENTIVE> implementation incentive based on the energy savings achieved by your energy efficiency project once completed. Without the implementation incentive from Efficiency Nova Scotia, which of the following scenarios would have been the most likely? [READ]	1) You would have implemented the exact same energy efficiency project	100%
		2) You would have implemented a project with fewer or less impactful energy efficiency measures	50%
		3) You would have implemented the exact same energy efficiency measures but delayed the project by at least a year	0%
		4) You would not have implemented the project at all	0%
		98/99) Don't know/Refused	EMPTY
		Efficiency, Quantity, Timing Score	C7

Question		Answer	Score
INFLUENCE			
C8	I would like you to rate the importance of the following five factors on your decision to implement energy efficiency measures through the Custom Retrofit program. a. The program financial incentive for the [Investigation or Feasibility Study]. b. The program financial incentive for the implementation of the energy efficiency measures. c. The information from the [Investigation or Feasibility Study] on the energy savings associated with each potential measure. d. The recommendations and technical assistance provided by the Business Development Manager, or other Efficiency Nova Scotia staff on the energy efficiency measures. e. The non-technical information offered by the Business Development Manager, or other Efficiency Nova Scotia staff on energy efficiency, such as, but not limited to, market trends, operating costs, and tradespeople availability.	For each sub-question: 1) Very important (0%) 2) Somewhat important (25%) 3) Not very important (75%) 4) Not at all important (100%)	For each sub-question: (Answer) (%)
	f. [IF C10 = YES] The Onsite Energy Manager (OEM)'s technical support in identifying the measures to implement as part of the project. g. [IF C10 = YES] The OEM's contribution to the business case for the project or support for project management.	98/99) Don't know/Refused	EMPTY
C9	Did your organization use the services of an Onsite Energy Manager while the project was being considered for implementation?	1) Yes	To provide context on whether or not proponent had services of an OEM
		2) No	EMPTY
		98) Don't know/Refused	EMPTY
C10	[IF C9=YES] How does having an On-site Energy Manager (OEM) add value to your organization?	Answer: _____	To provide context
INTENTION SCORE : AVERAGE (C1', C4', C6, C7) - C1: Adjusted with C2 and with Inconsistency Test #1 - C4: Adjusted with Inconsistency Test #2 - C6: No adjustment - C7: No adjustment			
INFLUENCE Score (IS): MINIMUM (C8a, C8b, C8c, C81d, C8e,C8f, C8g) Minimum score among influence factors in C8			
Inconsistency Test #1 (Planning/Cost)		IF C1 = 100% AND C4<70% AND C4 not EMPTY C1' = EMPTY	
Inconsistency Test #2 (Influence/Cost)		IF ABS(C4 – (1-C8b)) ≥ 50% AND C8b not EMPTY, C4'=(C4+(1-C8b)) ÷ 2))	
Free-Ridership (FR): (INTENTION + INFLUENCE)/2			

Cross-Influence			
Question	Answer	Score	
Cross-Influence			
D1	Before participating in the Custom Retrofit program for this project, had your organization already participated in this program or in another Efficiency Nova Scotia program?	1) Yes, Custom Retrofit	To determine if participants should respond to questions D2 and D3.
		2) Yes, in another Efficiency Nova Scotia program	
		3) Yes, both	
		4) No (SKIP TO D4)	
		98/99) Don't know/Refused (SKIP TO D4)	
For the following two statements, please respond with either "agree" or "disagree".			
D2	[IF D1 = 1 OR 2 OR 3] As a result of your previous participation in an Efficiency Nova Scotia program and what you learned from it, you asked a technical staff member from your organization (or a supplier/contractor) to examine the energy efficiency options for your project.	1) Agree	1
		2) Disagree	EMPTY
		98/99) Don't know/Refused	EMPTY
D3	[IF D1 = 1 OR 2 OR 3] As a result of your previous participation in an Efficiency Nova Scotia program and what you learned from it, you considered the cost effectiveness of the energy efficiency measures for your project by evaluating the different options for your organization.	1) Agree	1
		2) Disagree	EMPTY
		98/99) Don't know/Refused	EMPTY
D4	Before participating in the Custom Retrofit program had you seen energy efficiency promotional materials from Efficiency Nova Scotia on its website, or in brochures, newsletters or presentations?	1) Yes	To determine if participants should answer D5, D6, and D7.
		2) No (Thank and terminate)	
		98/99) Don't know/Refused	
For the following three statements, please respond with either "agree" or "disagree".			
D5	[IF D4 = 1] The Efficiency Nova Scotia energy efficiency promotional materials were a major factor in your decision to implement the energy efficiency project	1) Agree	1
		2) Disagree	EMPTY
		98/99) Don't know/Refused	EMPTY
D6	[IF D4 = 1] The Efficiency Nova Scotia energy efficiency promotional materials prompted you to ask a technical staff member from your organization (or a supplier/contractor) to examine the energy efficiency options for your project	1) Agree	1
		2) Disagree	EMPTY
		98/99) Don't know/Refused	EMPTY
D7	[IF D4 = 1] The Efficiency Nova Scotia energy efficiency promotional materials prompted you to consider the cost effectiveness of the energy efficiency measures by evaluating the different options for your organization	1) Agree	1
		2) Disagree	EMPTY
		98/99) Don't know/Refused	EMPTY
Cross-Influence (CI): IF(D5 =Agree; 1) + IF(D2 OR D6=Agree; 1) + IF(D3 OR D7)=Agree; 1)			
Revised Free-Ridership:	IF CI = 0 OR 1: Revised FR = FR IF CI = 2: Revised FR = FR*0.75 IF CI = 3: Revised FR = FR*0.50		

APPENDIX IV

Retrofit and Pay-for-Performance Algorithm for Participant Spillover Calculation

Current Algorithm			
Question		Answer	Score
E1	Since first taking part in the Custom Retrofit program, have you implemented any additional energy efficiency measures outside of the program?	1) Yes	CONTINUE
		2) No	Thank and terminate
		98/99) Don't know/Refused	
E2	[IF E1 = 1] For the energy efficiency upgrades that you implemented outside of the program, did you receive or plan on requesting financing or rebates from Efficiency Nova Scotia?	1) Yes	Thank and terminate
		2) No	CONTINUE
		98/99) Don't know/Refused	
E3	[IF E2 = 2 or 98] Can you please describe these measures by providing the following information?	1. Name of measure	
		2. Type of energy source saved If all non-electric, thank and terminate.	
		Location of the facility If not in Nova Scotia, thank and terminate.	
		4. Quantity of measures (or physical area covered by the measure in sq meters or sq feet)	
		5. Technical information, such as HOU, capacity, efficiency, etc.	
		6. Estimated savings (in kWh or \$)	
		7. If no quantitative information is available, but the measure is the same as the one implemented through Custom Retrofit, probe participant on its relative size with respect to the Custom Retrofit project evaluated (% of size, area covered by measure, price, etc).	
E4	[IF E2 = 2 or 98/99] How influential was your experience with the energy efficiency project implemented through the Custom Retrofit program on your decision to implement these additional energy efficiency measures outside of the program?	1) Very influential (100%) 2) Somewhat influential (75%) 3) Not very influential (25%) 4) Not at all influential (0%)	(Answer) (%)
		98/99) DK/Refuse	EMPTY
E5	[IF E2 = 2 or 98] Why did you implement this project without the assistance of an Efficiency Nova Scotia program?	Answer: _____	For contextual information on spillover
Spillover Level (SO) = SUM of (E3 x E4) for All Respondents SUM of Respondent Savings			

APPENDIX V

Retrofit, Pay-for-Performance and Building Optimization Tracking Sheet Audit

This appendix presents the main results of the tracking sheet audit performed by the Evaluator, which was aimed at:

- › Verifying that all data fields required for the evaluation were included and filled out in the tracking sheet submitted by EfficiencyOne (E1)
- › Ensuring that tracked results were accurate by:
 - › Verifying that parameters used to calculate program results (gross and net electrical energy and peak demand savings at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were performed consistently

Table 1, 2, 3 and 4 present the corrected tracked savings resulting from all changes made by the Evaluator for Retrofit, Building Optimization, Pay-for-Performance (P4P) and the three services combined.

Table 1. 2025 Retrofit Corrected Tracked Savings

Program Component Result	Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	
Gross Electrical Energy Savings – at the Generator	16.032	GWh	16.032	GWh	0.00%
Gross Peak Demand Savings – at the Generator	1.310	MW	1.310	MW	0.00%
Net Electrical Energy Savings – at the Generator	13.121	GWh	13.121	GWh	0.00%
Net Peak Demand Savings – at the Generator	1.106	MW	1.106	MW	0.00%

Table 2. 2025 Building Optimization Corrected Tracked Savings

Program Component Result	Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	
Gross Electrical Energy Savings – at the Generator	0.609	GWh	0.609	GWh	0.00%
Gross Peak Demand Savings – at the Generator	0.019	MW	0.019	MW	0.00%
Net Electrical Energy Savings – at the Generator	0.554	GWh	0.554	GWh	0.00%
Net Peak Demand Savings – at the Generator	0.018	MW	0.018	MW	0.00%

Table 3. 2025 Pay-for-Performance Corrected Tracked Savings

Program Component Result	Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	
Gross Electrical Energy Savings – at the Generator	1.274	GWh	1.274	GWh	0.00%
Gross Peak Demand Savings – at the Generator	0.316	MW	0.316	MW	0.00%
Net Electrical Energy Savings – at the Generator	1.095	GWh	1.095	GWh	0.00%
Net Peak Demand Savings – at the Generator	0.272	MW	0.272	MW	0.00%

**Table 4. Retrofit, Building Optimization and Pay-for-Performance
Combined Corrected Tracked Savings**

Program Component Result	Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	
Gross Electrical Energy Savings – at the Generator	17.914	GWh	17.914	GWh	0.00%
Gross Peak Demand Savings – at the Generator	1.645	MW	1.645	MW	0.00%
Net Electrical Energy Savings – at the Generator	14.771	GWh	14.771	GWh	0.00%
Net Peak Demand Savings – at the Generator	1.395	MW	1.395	MW	0.00%

There were no differences between the tracked and corrected tracked electrical energy and peak demand savings.

APPENDIX VI

Retrofit, Pay-for-Performance and Building Optimization Project Review Protocols

Project Review Protocol

The Evaluator used the same project review protocol in 2025 as the one used for the 2024 Custom Retrofit evaluation. The protocol includes questions and assessment fields for measurement and verification (M&V) plans and reports to ensure that the review is consistent with past evaluation recommendations. The protocol also includes dedicated worksheets containing measure-specific data fields for individual project measures.

Prior to conducting telephone project review interviews or on-site visits, the Evaluator reviewed all project documentation submitted by EfficiencyOne (E1). Those documents included, although were not limited to, the following: Scoping and/or feasibility studies; energy efficiency measure savings calculations; project development agreements; M&V reports; and email correspondence.

The Evaluator used the protocol form presented below to collect technical data and summarize information such as project details, key parameters to be reviewed during the telephone project review interviews, and previous M&V activities. Other collected technical information includes, although is not limited to, equipment operating schedules, equipment specifications and quantities, baseline conditions, typical equipment loads, and changes that occurred since M&V was conducted.

		Custom Retrofit Efficiency Nova Scotia On-Site Visit Protocol - 2025					
1. General Information							
Virtual Visit Date:	Team:	Contact Name:					
Project ID:		Contact Title:					
Project Type (Regular Retrofit (project type) / Compressed Air/Bopt) :		Role on the project:					
		Administer FR/SO?					
Company Name:		Alternate FR/SO contact:					
Facility Name:		Contact Phone:					
Address:		Email:					
Consultant:							
Other people met during the visit:							
Type of building:	<table border="1"><tr><td>Commercial/institutional</td><td>Industrial/manufacturing</td></tr><tr><td>Municipal</td><td>Other (specify)</td></tr></table>	Commercial/institutional	Industrial/manufacturing	Municipal	Other (specify)		Specify:
Commercial/institutional	Industrial/manufacturing						
Municipal	Other (specify)						
2. Facility and Project Description							
Facility Description: Outline a quick description of the facility and its primary operation/purpose. <i>NOTE: PC Users "Alt+Enter" for new line in cell. MAC Users: "CMD+Option+Enter".</i>							
Project Description: Indicate the key variables & observations from all available reports. These notes will serve to guide the virtual visit and identify the main information to collect and/or verify.							
Measure #1:							
Measure #2:							

3. M&V Plans and Documentation

1a. Is there any documentation that describes the plan for M&V dated from before the project takes place? (Y/N)

IF ANSWER TO QUESTION 1a. IS "NO", GO TO NEXT SECTION

1b. Does this document provide a description of:

i. Selection and substantiation of the project measurement boundary and justification of IPVMP Option? (Y/N)

ii. Selection and substantiation of the baseline measurement period? (Y/N)

iii. Selection and substantiation of the performance measurement period? (Y/N)

iv. Description of the savings calculation methodology? (Y/N)

v. Consideration of actual and potential independent variables? (Y/N)

vi. Consideration of actual and potential interactive effects? (Y/N)

vii. Description of the data collection approach for capturing relevant dependant and independent variables? (Y/N)

viii. Consideration of potential operational impacts and non-routine adjustments? (Y/N)

ix. Consideration of potential COVID impacts and non-routine adjustments? (Y/N)

2. Is the scope and detail of the documentation above commensurate with the energy and demand savings, budget, incentive level or technical complexity of the project in general alignment with the table from tab "M&V Table"?

i. For the M&V plan (Y/N)

ii. For the M&V results (Y/N)

Please see table to the right for definitions of Small to Large projects

3. If an M&V plan was prepared ahead of project completion, was it followed and reflected in the M&V Report? (Y/N)

Intermediate M&V score - Pre-evaluation

#DIV/0!

Notes before interview. Include specific questions to be asked (highlight them if needed to be sure not to forget to ask them)
Écrire questions en rouge (pour interview) et les notes en noir

Notes during/after interview

4. On-site or Virtual Review

Filled out on subsequent worksheets, one worksheet for each measure.

5. Other questionnaires

Market questionnaire filled-in		(Y/N)
Free-ridership questionnaire filled-in		(Y/N)
Spillover questionnaire filled-in		(Y/N)

Sections below to be filled after the visit

6. Estimated Useful Life "EUL" of the project

Type of replacement	EUL	
Measure #1		
Measure #2		
Tracked Project EUL (yrs)		Refer to project documentation for tracked baseline EUL
Evaluated Project EUL (yrs)		Refer to program document for standard EUL to be used
Explanation		

7. Energy and Demand Savings Adjustment: PAR MESURE

Measure #1		*Name of the Measure*						
			Tracking sheet	Evaluator	% of Tracked savings	Project status	Finish month	
Electricity Savings	kWh/yr							
Peak Demand Savings	kW							
Peak Coincidence Factor	-							

Measure #2	*Name of the Measure*							
			Tracking sheet	Evaluator	% of Tracked savings	Project status	Finish month	
Electricity Savings	kWh/yr							
Peak Demand Savings	kW							
Peak Coincidence Factor	-							

TOTAL		0						
				Tracking sheet	Evaluator	% of Tracked savings	Project status	Finish month
Electricity Savings		kWh/yr	0		0	#DIV/0!		
Peak Demand Savings		kW	0		0	#DIV/0!		
Peak Coincidence Factor		-						

Adjustments made to electricity savings?		(Y/N)
Adjustments made to demand savings?		(Y/N)
Adjustments made to PCF?		(Y/N)
Changes between PDA and completion?		(Y/N)
If Yes, was the tracking sheet adjusted accordingly?		(Y/N)

8. Summarize Project Adjustments and Final Savings Values - SUMMARY FOR EOne

If any adjustments were made to the energy savings, demand savings or PCF, describe the rationale and provide calculations.

See Templates sheet, the idea is to have uniform language across all project reviews, since these summaries will be used to produce the Summary of Adjustment spreadsheet for Eone.

4. On-site or Virtual Review (continued)

Section to be filled out with questions prior to virtual visits, and answers to be included during the call. Create new worksheet and repeat for each measure, as needed.

Measure #1	<i>*Name of the Measure*</i>

Validation of the measure

Validate the installation and quantities. Do we have pictures (nameplate) in the file? Can we see it during the call? Is there invoices confirming the quantities?

Notes before interview. Include specific questions to be asked (highlight them if needed to be sure not to forget to ask them)

Notes during/after interview

Baseline

4. Does the baseline measurement match what the project says is the baseline, and is it aligned with program rules?

9. Has anything changed between the baseline and reporting period? (Y/N)

a. If #9 is Y, has a non-routine adjustment been applied? (Y/N)

What is the baseline? Existing equipment, new construction? Was the equipment at the end of its useful life?

Notes before interview. Include specific questions to be asked (highlight them if needed to be sure not to forget to ask them)

Notes during/after interview

Operating Schedule

Include notes on schedule and seasonal variations. The operating schedule corresponds to the *typical* one (non-COVID).

6. Is the M&V period appropriate? (Y/N)

a. Do both the baseline and reporting periods cover all ranges of operation parameters?

b. Is M&V occurring in a reasonable period before and right after the EE project was implemented?

c. Does the period capture seasonal effects?

Savings calculation approach - Projects with M&V

5. Are the M&V boundaries capturing all the energy consumption that's impacted by the project? (Y/N)
7. Are M&V results measured in a short period extrapolated to annual results appropriately? (Y/N)
- a. Is the extrapolation consistent with what a "typical year" should be?
- b. Are operating conditions that were not covered in M&V taken into consideration when developing the extrapolation
8. If a regression is used (based on HDD, tons/day...) to build a performance equation as part of the M&V, is it valid?
- a. The Evaluator will want to be satisfied that the regression makes sense when looking at the physics of the situation.
- b. The Evaluator will want to be satisfied that statistical indicators were used to validate the fitness of the regression?

Report the virtual visit and indicate the key observations and findings made during the interview..

Seasonal Load Profile? (Y/N) Summer Load Variations? (Y/N)

Predicted Results (MWh)	M&V Results	Percent of Expected (%)	M&V Start Date	M&V Finish Date	Days in Period
					0

Intermediate M&V score - MEASURE #1

####

Notes before interview. Include specific questions to be asked (highlight them if needed to be sure not to forget to ask them)

Notes during/after interview

COVID Impact for Measure #1

Include notes on how calculated savings are impacted by COVID, if so.

Detail any adjustment, along with the rationale, needed to bring back the savings to a typical year.

10. Has this measure been impacted by COVID? (Y/N)
- a.i. Hours of occupancy, or production schedules? (Y/N)
- a.ii. Level of occupancy during occupied hours, or production intensity during production periods? (Y/N)
- b. If so, how has this impacted the selection of the baseline or reporting periods M&V methods? (Y/N)
- c. Is a non-routine adjustment warranted? (Y/N)
- d. Has a non-routine adjustment been appropriately applied? (Y/N)

Notes before interview. Include specific questions to be asked (highlight them if needed to be sure not to forget to ask them)

Notes during/after interview

Peak Demand Savings? YES ☐ NO ☐

Notes on peak demand savings (Nova Scotia Peak Period: weekdays between 5 and 7 p.m. between Dec and Feb)

Are demand savings based on measurements? ☐ (Y/N)

Notes before interview. Include specific questions to be asked (highlight them if needed to be sure not to forget to ask them)

Notes during/after interview

Interactive Effects? YES ☐ NO ☐

*Briefly describe interactive effects for the project and relevant information on **heating/cooling system** as required.*

Notes before interview. Include specific questions to be asked (highlight them if needed to be sure not to forget to ask them)

Notes during/after interview



APPENDIX VII

Custom Adjustment Ratio Calculation Example

This appendix provides an example of the project review process and calculations used to adjust the electrical energy savings results for a regular Retrofit project. The calculation described below presents the adjustments made to an air compressor retrofit project. The adjustments were based on information collected during a phone call as well as the results of a review of project documentation carried out by the Evaluator.

The project background is presented first, followed by the savings tracked by E1, revised savings, and the rationale behind the adjustments.

Project Background

The participant operates a steel fabrication facility, and the retrofit project consisted of replacing a 100 horsepower (hp) variable speed drive compressor and dryer with two 30 HP compressors and a heatless desiccant dryer that more efficiently dries compressed air before it gets distributed. The participant provided performance data sheets for the air compressors and dryer that were installed, along with detailed compressed air assessments providing estimated consumption for the base case and the efficient case. The participant relied on post-implementation M&V data to adjust claimed savings calculations, including compressor performance, annual hours of use (HOU), etc.

Revised Savings Calculation

The Evaluator found that the assumptions and the analysis performed by the participant were generally sound. However, after reviewing the savings calculations, the Evaluator found a mistake in some of the Excel formulas used to calculate savings following the collection of post-implementation data. These formulas did not use the annual HOU determined post implementation, although these values were documented in the same Excel document. The Evaluator corrected this mistake, which led to an upward adjustment to gross electrical energy savings. This correction did not affect the peak demand savings of the project since the correct HOU were used by the participant for those calculations.

Adjustment Ratio Calculation

Adjustment ratios are determined by comparing revised savings values with tracked savings values. Due to the revisions made to this project, the calculated adjustment ratio for electrical energy savings was 0.825.

$$\frac{\text{Revised Energy Savings}}{\text{Tracked Energy Savings}} = \frac{188,809 \text{ kWh}}{175,639 \text{ kWh}} = 1.075$$

APPENDIX VIII

New Construction Participant Interview Guide (CPA Stage)

CUSTOM – NEW CONSTRUCTION

PARTICIPANT PHONE INTERVIEW GUIDE / WEB SURVEY

Table 1: Overview of Data Collection Activity

Descriptor	This Instrument
Instrument Type	Interview Guide / Web survey (back-up)
Estimated Time to Complete	15 minutes
Target Audience	New Construction participants have completed an agreement at the project agreement stage (CPA stage))
Expected Number of Completions	Census
Contact List Source	New Construction tracking sheet
Fielding Firm	Econoler/Narrative
Estimated Timeline for Fielding	June 2022 – in continue: Quarterly basis

Table 2: Research Objectives and Associated Questions

Research Objectives	Section
What is the free-ridership level for New Construction?	I, I

To be adapted by Econoler [Blue text]

Import variables from database < LIKE THIS >

Skip pattern or programming instructions [LIKE THIS]

Black text: instructions for interviewer [NOTE: xxxx] / [PROBE: xxxx]



Introduction – Telephone IDI

I am with Narrative, and we are conducting an evaluation of the Efficiency Nova Scotia Custom New Construction program. This interview should take about 15-20 minutes. Is this still a good time for you?

The purpose of the interview is to better understand your organization's decision to build an energy efficient building, including your choice of energy efficient materials or equipment that exceed building code requirements. During this interview, I will refer to this as your decision "to build a better-than-code building".

Your responses will be kept confidential, and your comments will be combined with those of other program participants. Your responses will not affect the incentive amount you will received or you have received for this project.

Introduction – Online Survey

Narrative Research and Econoler are currently conducting a formal evaluation of the Efficiency Nova Scotia Custom New Construction program. Your organization recently entered into an agreement in **[CPA ACCEPTED DATE]** with Efficiency Nova Scotia to assist in the design of energy efficient measures for the **[INSERT PROJECT NAME]** project. As part of the evaluation process, we are interested in better understanding your organization's decision to build an energy efficient building (also referred to on the survey as a "better-than-code building"), including your choice of energy efficient materials or equipment that exceed building code requirements.

Please take a few minutes to complete the evaluation survey. This should only take you about 15 minutes of your time.

This survey is administered by Narrative Research and Econoler. Your responses will be kept confidential, and your comments will be combined with those of other program participants. Your responses will not affect the incentive amount you will receive or you have received for this project.

G. Identifying Key Decision-makers

G1. **[SINGLE RESPONSE]** Did you play a key role in your organization's decision to build an energy efficient, or better-than-code, building.

- 1. Yes
- 2. No
- 98. I am unsure

G2. **[IF G1=YES; CAPTURE VERBATIM]** Please briefly describe your role in the decision-making process.

G3. **[IF G1= YES; SINGLE RESPONSE]** Did others within your organization play a key role in the decision to build a better-than-code building?

- 1. Yes
- 2. No
- 98. I am unsure

G4. **[IF G1=YES]** Can you provide the name, role, and contact information (email and/or telephone) of one or two of the key decision-makers?

1. No, I cannot provide this information
2. Yes – Please provide the contact information below

Contact Person 1:

Name: **[RECORD]**

Role: **[CAPTURE VERBATIM]**

Email and/or phone number: **[RECORD IN FORMAT]**

Contact Person 2 [OPTIONAL]:

Name: **[RECORD]**

Role: **[CAPTURE VERBATIM]**

Email and/or phone number: **[RECORD IN FORMAT]**

[IF G1=YES OR A3=NO OR A4=NO: GO TO SECTION B]

G5. **[IF G1= NO OR DK; OPTIONAL RESPONSE FOR CONTACT INFO]** Can you provide the names, roles and contact information of one or two people who played a key role in your organization's decision to build a better-than-code building?

1. No
2. Yes – Please provide the contact information below

Contact Person 1:

Name: **[RECORD]**

Role: **[CAPTURE VERBATIM]**

Email: **[RECORD IN FORMAT]**

Phone number: **[RECORD NUMERALS ONLY]**

Contact Person 2 [OPTIONAL]:

Name: **[RECORD]**

Role: **[CAPTURE VERBATIM]**

Email: **[RECORD IN FORMAT]**

Phone number: **[RECORD NUMERALS ONLY]**

[IF G1= NO or DK: END] These are all the questions I have for you. Thank you very much for your time and cooperation! **[SCHEDULE INTERVIEW WITH KEY DECISION-MAKERS]**

H. Project Stage

H1. **[MULTIPLE RESPONSE KEEPING CODE 98 AND 99 EXCLUSIVE]** Now thinking of the **[INSERT PROJECT NAME]** project, at what stage is the project currently in? Please select all that apply.

- 1. Conceptual
- 2. Design
- 3. Construction
- 4. Building Occupancy
- 96. Other stage – Please specify: _____
- 98. I am unsure
- 99. I prefer not to say

I. Free-ridership

I1. **[CAPTURE VERBATIM; KEEP CODE 98 & 96 EXCLUSIVE]** Why did your organization decide to build a better-than-code building?

CAPTURE VERBATIM

- 98. I am unsure
- 99. I prefer not to say

I2. **[SINGLE RESPONSE]** Was the design of your better-than-code building finalized BEFORE knowing that your organization would receive an incentive from Efficiency Nova Scotia?

- 1. Yes
- 2. No
- 98. I am unsure
- 99. I prefer not to say

I3. **[IF I1=YES; SINGLE RESPONSE]** During the design stage, how confident were you that your organization would receive an incentive from Efficiency Nova Scotia?

- 1. Very confident
- 2. Somewhat confident
- 3. Not very confident
- 4. Not at all confident
- 98. I am unsure
- 99. I prefer not to say

14. **[SINGLE RESPONSE]** Which one of the following best represents the impact of the financial incentive offered by Efficiency Nova Scotia on the financing of the new building project?
1. The incentive from Efficiency Nova Scotia reduced the cost of the building's energy efficiency measures, allowing the project to be **within its approved budget**.
 2. The incentive from Efficiency Nova Scotia reduced the cost of the building's energy efficiency measures, significantly **strengthening the case for the overall project from a financial perspective**.
 3. The incentive from Efficiency Nova Scotia reduced the cost of the building's energy efficiency measures, **but even without the financial incentive, you would have included the same measures** for other reasons.
 4. The incentive from Efficiency Nova Scotia did not have a significant impact on the financing of the project.
98. I am unsure
99. I prefer not to say
15. **[SINGLE RESPONSE]** You received an incentive of **<INSERT MODELING INCENTIVE AMOUNT>** from Efficiency Nova Scotia for your building's energy model. Without this incentive, what is the likelihood that you would have hired an energy modeling consultant for your project?
- INSERT 0-10 SCALE WITH END POINTS: 0=VERY UNLIKELY AND 10=VERY LIKELY
98. Don't know
99. I prefer not to say
16. **[SINGLE RESPONSE]** Did the energy modeling consultant help you assess different options available for building envelope and HVAC equipment?
1. Yes
 2. No
98. I am unsure
99. I prefer not to say
17. **[SINGLE RESPONSE]** Your organization will receive an incentive from Efficiency Nova Scotia specifically for the implementation of the energy efficiency measures. Without this incentive, which of the following scenarios would have been the most likely?
1. Your organization would have designed the exact same better-than-code building.
 2. Your organization would have designed a less efficient building but still exceeded the minimum energy efficiency requirements prescribed in the building code.
 3. Your organization would have designed a less efficient building that met the minimum energy efficiency requirements prescribed in the building code.
98. I am unsure
99. I prefer not to say

18. **[IF I7=2; SINGLE RESPONSE PER STATEMENT; DO NOT RANDOMIZE]** Without the incentive provided by Efficiency Nova Scotia or the expertise provided by the energy modeler, what is the likelihood that your organization would have:

- a. designed a building with HVAC equipment as efficient as those you installed
- b. designed a building with **an envelope as efficient as the one you built, including insulation levels and glazing performance**
- c. designed a building with **as many efficiency measures as you included**

INSERT 0-10 SCALE WITH END POINTS: 0=VERY UNLIKELY AND 10=VERY LIKELY

98. I am unsure

99. I prefer not to say

19. **[IF I7=2 AND IF AVERAGE (I8a, C8b and C8c) $\geq$ 8; CAPTURE VERBATIM; KEEP CODE 98 AND 99 EXCLUSIVE]** You mentioned that, without an incentive from Efficiency Nova Scotia or the energy modeler, you would have designed a less efficient building than your current design. Please explain how your building would have been different than what it is right now.

CAPTURE VERBATIM

98. I am unsure

99. I prefer not to say

110. **[SINGLE RESPONSE PER STATEMENT; DO NOT RANDOMIZE]** Rate the influence of the following factors in your decision to build a better-than-code building.

- a. The program financial incentive for energy modeling.
- b. The program financial incentive for implementation of energy efficiency measures.
- c. The insights gained from the energy modeling regarding the energy savings associated with each potential measure.
- d. The recommendations and technical assistance provided by the energy modeler, Business Development Manager, onsite energy manager, or other Efficiency Nova Scotia staff.
- e. The non-technical information offered by the energy modeler, Business Development Manager, onsite energy manager, or other Efficiency Nova Scotia staff on building better-than-code buildings, for example, the market trends, building certifications, operating costs, and tradespeople availability, among other things.

INSERT 0-10 SCALE WITH END POINTS: 0=NOT AT ALL IMPORTANT AND 10=EXTREMELY IMPORTANT

98. I am unsure

99. I prefer not to say



J. Cross-Influence

J1. **[SINGLE RESPONSE]** Before participating in the Custom New Construction program for the **[INSERT PROJECT NAME]** project, had your organization already participated in Custom New Construction or in another Efficiency Nova Scotia program?

1. Yes, Custom New Construction
2. Yes, in another Efficiency Nova Scotia program
3. Yes, both
4. No
98. I am unsure
99. I prefer not to say

[IF D1=4, 98 OR 99: SKIP TO D4]

[ASK D2 AND D3 IF D1= YES (CODE 1-3); SHOW INTRO ON SAME PAGE AS D2 AND D3] To what extent do you agree or disagree with the following two statements:

J2. **[ASK IF D1= YES (CODE 1-3); SINGLE RESPONSE]** Because of your organization's previous participation in an Efficiency Nova Scotia program and what you learned from it, you/your organization asked a technical staff member or energy modeler to examine the energy efficiency options for your current building project.

INSERT 0-10 SCALE WITH END POINTS: 0=COMPLETELY DISAGREE AND 10=COMPLETELY AGREE

98. I am unsure
99. I prefer not to say

J3. **[ASK IF D1= YES (CODE 1-3); SINGLE RESPONSE]** Because of your organization's previous participation in an Efficiency Nova Scotia program and what you learned from it, you/your organization looked at the cost effectiveness of the energy efficiency measures in your new building by evaluating the different options available.

INSERT 0-10 SCALE WITH END POINTS: 1=COMPLETELY DISAGREE AND 10=COMPLETELY AGREE

98. Don't know
99. I prefer not to say

J4. **[SINGLE RESPONSE]** Before participating in the New Construction program, had you seen energy efficiency promotional materials distributed by Efficiency Nova Scotia through its website, advertisements, brochures, newsletters or presentations?

- 1. Yes
- 2. No
- 98. I am unsure
- 99. I prefer not to say

[IF D4=2, 98 OR 99: GO TO END]

[ASK D5 TO D7 IF D4=YES; SHOW INTRO AND D5-D7 ON SAME PAGE] To what extent do you agree or disagree with the following three statements:

J5. **[ASK IF D4=YES; SINGLE RESPONSE]** The energy efficiency promotional materials distributed by Efficiency Nova Scotia through its website, brochures, newsletters, or presentations were a major factor in your organization's decision to build a better-than-code building.

INSERT 0-10 SCALE WITH END POINTS: 0=COMPLETELY DISAGREE AND 10=COMPLETELY AGREE

- 98. I am unsure
- 99. I prefer not to say

J6. **[ASK IF D4=YES; SINGLE RESPONSE]** The energy efficiency promotional materials distributed by Efficiency Nova Scotia through its website, brochures, newsletters or presentations prompted you/your organization to ask a technical staff member or energy modeler to examine the energy efficiency options for your building project.

INSERT 0-10 SCALE WITH END POINTS: 0=COMPLETELY DISAGREE AND 10=COMPLETELY AGREE

- 98. I am unsure
- 99. I prefer not to say

J7. **[ASK IF D4=YES; SINGLE RESPONSE]** The energy efficiency promotional materials distributed by Efficiency Nova Scotia through its website, brochures, newsletters, or presentations prompted you/your organization to consider the cost effectiveness of the energy efficiency measures in your new building by evaluating the different options offered to your organization.

INSERT 0-10 SCALE WITH END POINTS: 0=COMPLETELY DISAGREE AND 10=COMPLETELY AGREE

- 98. I am unsure
- 99. I prefer not to say

END: [PHONE: These are all the questions I have for you.] [ONLINE SURVEY: That's all the questions we have for you.] Thank you very much for your time and cooperation!

APPENDIX IX

New Construction Participant Interview Guide (Completed Projects)

CUSTOM NEW CONSTRUCTION PROGRAM EVALUATION

GUIDE FOR INTERVIEWS WITH PARTICIPANT BUILDERS

Table 1: Overview of Data Collection Activity

Descriptor	This Instrument
Instrument Type	Semi-directed in-depth interview
Estimated Time to Complete	15-20 Minutes
Target Audience	› Participant Builders
› Expected Number of Completions	› Participant Builders (n = 12)
Contact List Source	Efficiency One
Fielding Firm	Econoler
Estimated Timeline for Fielding	November 2025

Table 2: Research Objectives and Questions

Research objective	Research Questions	Section #
› Calculate net results	› What are the free-ridership levels for New Construction projects?	B, C
› Program satisfaction	› What is the satisfaction of participants in New Construction	E

To be adapted by Econoler **[Blue text]**

Import variables from database < **LIKE THIS** >

Skip pattern or programming instructions **[LIKE THIS]**

Black text: instructions for interviewer **[NOTE: xxxx]** / **[PROBE: xxxx]**



Introduction

I am with _____ and we are performing an evaluation of the Custom New Construction program service offered by Efficiency Nova Scotia.

This interview should take about 15-20 minutes. Is this still a good time for you?

In this interview, we'd like to better understand your organization's decisions around building an energy efficient building, especially your choice to use materials and equipment that exceed the energy efficiency requirements of the building code. Throughout the interview, I will refer to this as your decision "to build a better-than-code building".

Your responses will be kept confidential, and the results will be combined with those of other program participants. Your responses will not affect the incentive amount you will receive for this project.

A. Identifying Key Decision-makers

A1. Were you directly involved in your organization's decision to build a better-than-code building? Were you a key decision-maker?

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

A2. **[IF A1=YES OR DK/REFUSE]** Please briefly describe your role in the decision-making process for this project.

96. Specify:

A3. **[IF A1= YES]** Did others play a key role in the decision to build a better-than-code building? If so, can you provide the name, role, and contact information (either email or telephone) of one or two of the key decision-makers? **[IF NEEDED: WE WILL ONLY CONTACT THEM IF WE REQUIRE FURTHER INFORMATION ABOUT YOUR COMPANY'S DECISION TO BUILD A BETTER-THAN-CODE BUILDING]**

96. Specify:

[IF G1= YES: GO TO SECTION B]

A4. **[IF A1=NO]** Who were the people who played a key role in the decision to build a better-than-code building? Can you provide their names, roles, contact information of these decision-makers?

96. Specify:

[IF G1= NO, DK or REFUSED: END] These are all the questions I have for you. Thank you very much for your time and cooperation! **SCHEDULE INTERVIEW WITH KEY DECISION-MAKERS**

B. Free-ridership

B1. Why did your organization decide to build a better-than-code building? **[DO NOT READ. MULTIPLE RESPONSE]**

- 1. Lower operation costs
- 2. Energy policy in my organization
- 3. Environmental reasons/energy efficiency
- 4. Competitors are doing it
- 96. Other, specify: _____
- 98. Don't know
- 99. Refused

B2. Had your organization finalized the design of the new building BEFORE knowing that you would receive an incentive from Efficiency Nova Scotia?

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

B3. **[IF B2=YES]** At the time you decided to build a better-than-code building – that is, during the design stage, were you very, somewhat, not very, or not at all confident you would receive an incentive from Efficiency Nova Scotia? **[READ]**

- 1. Very confident
- 2. Somewhat confident
- 3. Not very confident
- 4. Not at all confident
- 98. Don't know
- 99. Refused

- B4. I would like to understand how the incentive you received from Efficiency Nova Scotia influenced the financial case for your building. Which of the following four statements best describes the role the incentive played? Did the financial incentives **[READ]**?
1. Reduce the cost of the building's additional energy efficiency measures to bring the project **within the pre-determined financial thresholds for approval**. OR
 2. Reduce the cost of the building's additional energy efficiency measures, significantly **strengthening the case for the overall project from a financial perspective**. OR
 3. Reduce the cost of the building's additional energy efficiency measures, **but even without financial support, you would have included the same measures** for other reasons. OR
 4. Did not have a significant impact on the decision.
98. (Don't know)
99. (Refused)
- B5. You received an incentive of **<MODELING INCENTIVE \$\$\$>** from Efficiency Nova Scotia for your energy model. Without this incentive, would you have definitely, probably, probably not, or definitely not hired an energy modeling consultant for your project?
1. Definitely would have
 2. Probably would have
 3. Probably would not have
 4. Definitely would not have
98. Don't Know
99. Refused
- B6. **[IF B5 ≠ 98 OR 99]** Did the energy modeling consultant help you assess different options available for building envelope and HVAC equipment?
1. Yes
 2. No
98. Don't know
99. Refused
- B7. You received an incentive of **<IMPLEMENTATION INCENTIVE \$\$\$>** from Efficiency Nova Scotia specifically for the implementation of the energy efficiency measures. Without this incentive, would you have **[READ]**?
1. Designed the exact same building. OR
 2. Designed a less efficient building, but still exceeded the minimum energy efficiency requirements of the building code. OR
 3. Designed a less efficient building that only met the minimum energy efficiency requirements of the building code.
98. (Don't know)
99. (Refused)

- B8. **[IF I7 = 2]** Without the incentive from Efficiency Nova Scotia or the energy modeler's expertise, would you have definitely, probably, probably not, or definitely not selected **HVAC equipment as efficient as those you installed in the building?**
1. Definitely would have **[DO NOT READ; FOR CALCULATION ONLY: SCORE = 100%]**
 2. Probably would have **[DO NOT READ; FOR CALCULATION ONLY: SCORE = 75%]**
 3. Probably would not have **[DO NOT READ; FOR CALCULATION ONLY: SCORE = 25%]**
 4. Definitely would not have **[DO NOT READ; FOR CALCULATION ONLY: SCORE = 0%]**
 98. Don't know
 99. Refused
- B9. **[IF I7 = 2]** Without the incentive from Efficiency Nova Scotia or the energy modeler's expertise, would you have definitely, probably, probably not, or definitely not design **a building envelope as efficient as the one you designed for your building, including insulation levels and glazing performance?**
1. Definitely would have **[DO NOT READ; FOR CALCULATION ONLY: SCORE = 100%]**
 2. Probably would have **[DO NOT READ; FOR CALCULATION ONLY: SCORE = 75%]**
 3. Probably would not have **[DO NOT READ; FOR CALCULATION ONLY: SCORE = 25%]**
 4. Definitely would not have **[DO NOT READ; FOR CALCULATION ONLY: SCORE = 0%]**
 98. Don't know
 99. Refused
- B10. **[IF B7 = 2]** Without the incentive from Efficiency Nova Scotia or the energy modeler's expertise, would you have definitely, probably, probably not, or definitely not incorporated **as many efficiency measures as you included in your building?**
1. Definitely would have **[DO NOT READ; FOR CALCULATION ONLY: SCORE = 100%]**
 2. Probably would have **[DO NOT READ; FOR CALCULATION ONLY: SCORE = 75%]**
 3. Probably would not have **[DO NOT READ; FOR CALCULATION ONLY: SCORE = 25%]**
 4. Definitely would not have **[DO NOT READ; FOR CALCULATION ONLY: SCORE = 0%]**
 98. Don't know
 99. Refused
- B11. **[IF B7 = 2 AND IF AVERAGE (B8,B9,B10) ≥ 75%]** You mentioned that, without the incentive from Efficiency Nova Scotia or the energy modeler's expertise, you would have designed a less efficient building. Can you describe how your building would have been different than what it is right now?

Record: _____

B12. How important were each of the following factors in your decision to include energy efficiency measures in your new building? Please answer using the following scale: very important, somewhat important, not very important, or not at all important. Let's start with...

- a. The New Construction program financial incentive for energy modeling.
- b. The New Construction program financial incentive for the implementation of energy efficiency measures.
- c. Insights from the energy modeling about the energy savings of each potential measure.
- d. Recommendations and technical assistance from the energy modeler, Business Development Manager, onsite energy manager, or other Efficiency Nova Scotia staff.
- e. Non-technical information offered by the energy modeler, Business Development Manager, onsite energy manager, or other Efficiency Nova Scotia staff on better-than-code buildings, such as market trends, building certifications, operating costs, and availability of tradespeople, among other things.

For each sub-question:

1. Very important
2. Somewhat important
3. Not very important
4. Not at all important
98. Don't know
99. Refused

C. Cross-Influence

C1. Before participating in the Custom New Construction program for the building we discussed today, had you previously taken part in Custom New Construction this program or in another Efficiency Nova Scotia program?

1. Yes, Custom New Construction
2. Yes, in another Efficiency Nova Scotia program
3. Yes, both
4. No **[SKIP TO C4]**
98. Don't know **[SKIP TO C4]**
99. Refused **[SKIP TO C4]**

[ASK C2 AND C3 IF C1= YES (codes 1-3)] For the following two statements, please respond with either "agree" or "disagree".

- C2. **[ASK IF C1= YES (codes 1-3)]** As a result of your past participation in an Efficiency Nova Scotia program and what you learned from it, you asked a technical staff member or energy modeler to examine the energy efficiency options for your current project. Agree, or disagree?
1. Agree
 2. Disagree
 98. Don't know
 99. Refused
- C3. **[ASK IF C1= YES (codes 1-3)]** As a result of your past participation in an Efficiency Nova Scotia program and what you learned from it, you considered the cost effectiveness of the energy efficiency measures in your new building by evaluating the different options available. Agree, or disagree?
1. Agree
 2. Disagree
 98. Don't know
 99. Refused
- C4. Before participating in the New Construction program, had you seen any energy efficiency promotional materials from Efficiency Nova Scotia, such as on its website, or in advertisements, brochures, newsletters or presentations?
1. Yes
 2. No **[SKIP TO D1]**
 98. Don't know **[SKIP TO D1]**
 99. Refused **[SKIP TO D1]**

[ASK C5 TO C7 IF C4=YES] For the following three statements, please respond with either “agree” or “disagree”.

- C5. **[ASK IF C4= YES]** The Efficiency Nova Scotia energy efficiency promotional materials you saw were a major factor in your decision to build a better-than-code building. Agree, or disagree?
1. Agree
 2. Disagree
 98. Don't know
 99. Refused

C6. **[ASK IF C4= YES]** The Efficiency Nova Scotia energy efficiency promotional materials you saw prompted you to ask a technical staff member or energy modeler to examine the energy efficiency options for your project. Agree, or disagree?

1. Agree
2. Disagree
98. Don't know
99. Refused

C7. **[ASK IF C4= YES]** The Efficiency Nova Scotia energy efficiency promotional materials you saw prompted you to consider the cost effectiveness of the energy efficiency measures in your new building by evaluating the different options for your organization. Agree, or disagree?

1. Agree
2. Disagree
98. Don't know
99. Refused

D. Program satisfaction

D1. On a scale from 1 to 10 (where 1 = not at all satisfied and 10 = very satisfied) ...

- a. how would you rate your satisfaction with each of the following aspects of the New Construction program?
- b. If less than 8, please explain the reason(s) for your score.

Aspects of the program [READ AND RANDOMIZE]	Score	Reason
1. The responsiveness of Efficiency Nova Scotia employees to your requests and enquiries in a timely manner	__ Response __98 DK __99 Ref __97 N/A	
2. The speed with which the application was approved	__ Response __98 DK __99 Ref __97 N/A	
3. The value of the program or service relative to the time and cost involved	__ Response __98 DK __99 Ref __97 N/A	
4. The ability to provide estimates of the savings or return on investment associated with the program	__ Response __98 DK __99 Ref __97 N/A	
5. The technical expertise of Efficiency Nova Scotia employees related to the program	__ Response __98 DK __99 Ref __97 N/A	

D2. Using the same 10-point scale, how satisfied are you with Efficiency Nova Scotia's overall performance in working with your organization?

Response: **[DO NOT ACCEPT A RANGE]**

98. Don't Know

99. Refused

97. Not applicable / Did not interact with Efficiency Nova Scotia

D3. **[ASK IF D2 < 5]** Why are you dissatisfied with Efficiency Nova Scotia's overall performance in working with your organization?

Response:

98. Don't Know

99. Refused

D4. Based on your personal experience, would you definitely, probably, probably not, or definitely not recommend the programs offered by Efficiency Nova Scotia to others? **[DO NOT READ, CODE ONE ONLY]**

1. Definitely

2. Probably

3. Probably not

4. Definitely not

96. Not Eligible for other programs

98. Don't know

99. Refused

D5. If your organization qualified, how likely would you be to participate in other programs offered by Efficiency Nova Scotia? Would you say definitely, probably, probably not, or definitely not participate in other programs? **[CODE ONE ONLY]**

1. Definitely

2. Probably

3. Probably not

4. Definitely not

98. Don't know

99. Refused

D6. Do you have any suggestions to improve the program? **[OPEN RESPONSE]**

Record: _____

☐ No suggestion at this time

END

Those are all the questions I have for you today. Thank you for your time and the valuable feedback you have provided.

APPENDIX X

New Construction Energy Model Review Protocol

Project Review Protocol



Custom New Construction
Efficiency Nova Scotia
Simulation Model Review Protocol

1. General Information

Review Date: _____ Contact Name: _____
Project ID: _____ Contact Title: _____
Project Type: _____ Contact Phone: _____
Project Status: _____ Email: _____
Project Name: _____
Address: _____

Project Energy Efficiency Measure(s)

Information Sent by E1 Sufficient to Review the Project? _____ (Y/N)

Call or Virtual Visit Needed _____ (Call/Visit)

List of people participating to the virtual visit/call: _____

2. Facility Operation Schedules

These data should be asked prior the virtual visit by email or phone to the final beneficiary of the building or found in documentation sent by E1

People/ Document giving information _____

Facility Description: _____ *Outline a quick description of the facility and its primary operation/purpose.*

NOTE: PC Users "Alt+Enter" for new line in cell. MAC Users "CMD+Option+Enter".



Facility Annual Schedule:

Gather info for each occupancy schedule reported by the site contact as occupancy could vary for each section of the facility. Use additional lines if necessary. Ensure info is for a typical year (non-COVID).

HVAC System Operation Schedule:

Gather info for each HVAC system.

3. Virtual Visit, Call or Document Review Summary

4. Adjustments to Energy Model per Measure

The reviewer must verify the model following guidance defined in the tab "Modelling Review Checklist".

Description from project documentation	
Virtual visit, call or document	
As modeled by participant	
Changes to model by Econoler	

Description from project documentation	
Virtual visit, call or document	
As modeled by participant	
Changes to model by Econoler	

Description from project documentation	
Virtual visit	
As modeled by participant	
Changes to model by Econoler	

Description from project documentation	
Virtual visit, call or document	
As modeled by participant	
Changes to model by Econoler	

Description from project documentation	
Virtual visit	
As modeled by participant	
Changes to model by Econoler	

	EOne	Evaluator
Basecase		
Proposed		

[illegible]

Energy Savings from Tracking Sheet:		kWh/yr	Project Estimated Finish Month:	
Demand Savings from Tracking Sheet:			Notes on Project Status:	
Diversity Factor Used by ENSC:	100%			

Adjustments made to energy savings?		(Y/N)	Percent of Tracked Energy Savings	#DIV/0!
Adjustments made to demand savings?		(Y/N)	Percent of Tracked Peak Demand Savings	#DIV/0!
Adjustments made to PCF?		(Y/N)	Client Rate Code	
			Line Loss Factor Used	

[illegible]

Modelling Review Checklist

Reminder of Evaluation Goals and Key Principles

While developing the checklist, the Evaluator kept in mind the key evaluation goals and the five guiding principles presented in the 2020-2022 Overall Strategic Evaluation Plan.

Notably for New Construction, Principle 4 states that:

For some complex program services (e.g. Custom New Construction), the Evaluator thoroughly reviews measures that contribute the most savings to a project but does not comprehensively review the entire model or measurement and verification (M&V) procedures. Thus, the evaluation review should not be interpreted as vetting all modelling or M&V practices.

Simulation Model Review Checklist

The checklist consists of the six main items below. This checklist should be considered as general guidelines. Simulation model reviews are treated on a case by case basis and other items may be considered depending on the building type, complexity of the HVAC systems, energy efficiency measures installed etc.

1 Results General Overview

- Check savings (in %) for each end use and identify where the major savings lie. Crosscheck with the energy efficiency measure list to validate if the savings claimed make sense.
- Verify GJ/m² and check benchmarking data to verify if energy intensity is normal based on the type of building. Pay attention to differences in buildings that can explain discrepancies
(e.g. two apartment buildings with the same area will not have a comparable GJ/m² if only one of them has an underground parking).

2 Envelope Review

- Check envelope resistance value (wall/fenestration/roof/etc.) and validate with shop drawings and construction details. Make sure that effective R/RSI – U/USI values are used in the simulation.
- Pay particular attention to curtain walls. Although the nominal insulation value may be high (up to R15-20), the effective value rarely exceeds R8 because of the effect of the frame.
- Verify fenestration-to-wall ratio (%) in the proposed model. If the ratio is above baseline allowance, validate that the reference model ratio has been reduced to maximum allowance.
- Validate that the values used for the reference are in accordance with the specifications of the code used.

3 Parametrization and Zoning

- For buildings with a repetitive storey pattern, if the “Copy” function is used, the modeller often forgets to check the “Over conditioned space” option, which may create an “exterior floor”.
- Verify the zoning to make sure it is appropriate.

4 Loads and Schedules

- Validate occupancy and plug-load values according to NECB.
- Validate lighting loads by spot-checking installed lighting power in random rooms vs. electrical plans and shop drawings.
- Validate domestic hot water (DHW) loads according to the guideline developed by EfficiencyOne for DHW consumption values.
- Validate that the schedules used are typical for the type of building modelled.



5 HVAC Systems

This section can be very complex, depending on the building modelled, so the following should be considered as general guidelines.

Please refer to E1 White Paper - Baseline HVAC System in MURBs for MURBS

- Validate that all HVAC inputs concord with shop drawings.
- In the case of a dedicated outside air system, pay attention to how it has been modelled.
- Validate that the systems selected are in accordance with the specification of the code used (type of system, efficiency, sizing) for the reference building.
- Carefully read the operating sequence and verify that the HVAC systems operate accordingly.
- Take special care to validate the modelling of energy efficiency measures.
- Make sure that the air flow (cfm) of installed systems match the cfm modelled (reference and proposed) for fresh air.
- Be on the lookout if known bugs/miscalculations in the modelling software are present due to the system types used within the model. If present, see if the energy modeller can address them.

6 External Calculations

- Review external calculations, if any.

APPENDIX XI

New Construction Algorithm for Free-Ridership Calculation

Table 1: Participant Interview Questionnaire and Free-ridership Algorithm

Question		Answer	Score
A1	We hope to interview the key decision-makers that played a role in the decision to build a better-than-code building. Were you a key decision-maker?	1) Yes	EMPTY
		2) No	
		98) DK/Refuse	
A2	[IF A1=YES] Please describe your role in the decision-making process.	Answer: _____	Contextual information to help identify if respondent is a key decision-maker
A3	[IF A1=YES] Were there other key decision-makers that played a role in the decision to build a better-than-code building? If so, can you provide their names, roles, and contact information?	Answer: _____	Contextual information to help identify other key decision-makers to interview. If participant is unable to identify other key decision-makers, the Evaluator will ask EOne if they are aware of other key decision-makers.
A4	[IF A1=NO, DK or REFUSED] Who were the key decision-makers that played a role in the decision to build a better-than-code building? Can you provide their names, roles, contact information?	Answer: _____ [IF A4= NO, DK or REFUSED: END] These are all the questions I have for you. Thank you very much for your time and cooperation!	Contextual information to help identify other key decision-makers to interview
B1	Can you explain why your organization decided to build a better-than-code building? [DO NOT READ]	Answer: _____ Pre-coded answers [DO NOT READ]: 1) Lower operation costs 2) Energy policy in my organization 3) Environmental reasons/energy efficiency 4) Competitors are doing it 96) Other, specify: _____ 98) DK/Refuse	Contextual information to help explain free-ridership results.
		1) Yes	Use B3
		2) No	0%
		98) DK/Refuse	
B3	[ASK IF B2=1] When you decided to build a better-than-code building, how confident were you that you would receive an incentive from Efficiency Nova Scotia? [READ]	1) Very confident	0%
		2) Somewhat confident	25%
		3) Not very confident	75%
		4) Not at all confident	100%
		98) DK/Refuse	50%
Planning Score (PS)			B2 adjusted by B3

Question		Answer	Score
B4	I would like to understand the impact of the financial incentives offered by Efficiency Nova Scotia on the financial business case for your new building project. Which of the following best represents the role of the financial incentive? [READ]	Reduced the cost of the additional energy efficiency measures included in the building to bring the project within the pre-determined financial thresholds for approval.	0%
		Reduced the cost of the energy efficiency measures, significantly strengthening the case for the overall project from a financial perspective.	25%
		Reduced the cost of the additional energy efficiency measures included in the building, but even without financial support, you would have included the same measures for other reasons.	IF B6 ==> 75% OR EMPTY = 100% IF B6 < 75% = 50%
		Did not have a significant impact on the decision.	IF B6 ==> 75% OR EMPTY = 100% IF B6 < 75% = 50%
		98) DK/Refuse	EMPTY
B5	You received an incentive of <\$\$\$> from Efficiency Nova Scotia for your energy model. Without the Efficiency Nova Scotia incentive, what is the likelihood that you would have hired an energy modeling consultant for your project?	1) Definitely would have	100%
		2) Probably would have	75%
		3) Probably would not have	25%
		4) Definitely would not have	0%
		98) DK/Refuse	EMPTY
B6	[ASK IF B5 ≠ 98] Did the energy modeling consultant help you assess different options available for building envelope and HVAC equipment?	1) Yes	B5 Score
		2) No	EMPTY
		98) DK/Refuse	EMPTY
Cost Score (CS)			B4 adjusted by B5 & B6
B7	You [received/will also be receiving] an incentive based on energy savings once your building is complete. Without the implementation incentive from Efficiency Nova Scotia, which of the following scenarios would have been the most likely?	1) Would have designed the exact same better-than-code building.	100%
		2) Would have designed a less efficient building but would have still exceeded the minimum energy efficiency requirements prescribed in the building code.	AVERAGE (B8, B9, B10)
		3) Would have designed a less efficient building that met the minimum energy efficiency requirements prescribed in the building code.	0%
		98) DK/Refuse	EMPTY

Question		Answer	Score
B8	[ASK IF B7=2] Without Efficiency Nova Scotia or the energy modeler, what is the likelihood that you would have designed a building with HVAC equipment as efficient as you did?	1) Definitely would have	100%
		2) Probably would have	75%
		3) Probably would not have	25%
		4) Definitely would not have	0%
		98) DK/Refuse	EMPTY
B9	[ASK IF B7=2] Without Efficiency Nova Scotia or the expertise provided by the energy modeler, what is the likelihood that you would have designed a building with a building envelope as efficient as you did, including insulation levels and glazing performance?	1) Definitely would have	100%
		2) Probably would have	75%
		3) Probably would not have	25%
		4) Definitely would not have	0%
		98) DK/Refuse	EMPTY
B10	[ASK IF B7=2] Without Efficiency Nova Scotia or the expertise provided by the energy modeler, what is the likelihood that you would have designed a building with as many efficiency measures as you included?	1) Definitely would have	100%
		2) Probably would have	75%
		3) Probably would not have	25%
		4) Definitely would not have	0%
		98) DK/Refuse	EMPTY
B11	[ASK IF B7=2 AND IF AVERAGE (B8, B9, B10) ≥ 75%] You explained that, without an incentive from Efficiency Nova Scotia or the energy modeler, you would have designed a less efficient building. Can you explain how your building would have been different?	Answer: _____	Inconsistency Test Analyze verbatim. If building would have been different in the absence of the program: AVERAGE (B8, B9, B10)/2
Efficiency and Quantity Score (EQS)			B7 adjusted by B8, B9, B10 & validated with B11
INTENTION Score (IS): AVERAGE (B2, B4, B7) (B2: Adjusted with B3; B4: Adjusted by B5-B6; B7: Adjusted with B8, B9, B10 and validated with B11)			

Question		Answer	Score
B12	How important were the following factors in your decision to implement the planned energy efficiency measures in your new building through the New Construction program?	For each sub-question:	For each sub-question: Score
	a. The program financial incentive for energy modeling. b. The program financial incentive for implementation of energy efficiency measures. c. The insights gained from the energy modeling regarding the energy savings associated with each potential measure. d. The recommendations and technical assistance provided by the energy modeler, Business Development Manager, onsite energy manager, or other Efficiency Nova Scotia staff. e. The non-technical information offered by the energy modeler, Business Development Manager, onsite energy manager, or other Efficiency Nova Scotia staff on building better-than-code buildings, for example, the market trends, building certifications, operating costs, and tradespeople availability.	1) Very important 2) Somewhat important 3) Not very important 4) Not at all important 98) DK/Refuse	0% 25% 75% 100% EMPTY
INFLUENCE Score (IS): MINIMUM (B12a, B12b, B12c, B12d, B12e)			
Free-Ridership (FR): (INTENTION + INFLUENCE)/2			

Table 2: Cross-Influence

Cross Influence		
Question	Answer	Score
C1 Before participating in the Custom New Construction program service for this building, had you already participated in Custom New Construction or in another Efficiency Nova Scotia program?	Yes, Custom New Construction	To determine if participants should respond to questions C2 and C3.
	Yes, in another Efficiency Nova Scotia program	
	1) Yes, both	
	2) No (SKIP TO D4)	
	98) DK/Refuse (SKIP TO D4)	
C2 Do you agree or disagree that with the following statements...? Because of your previous participation in an Efficiency Nova Scotia program and what you learned from it, you asked a technical staff member or energy modeler to examine the energy efficiency options for your building project.	1) Agree 2) Disagree 98/99) DK/Refuse	1 EMPTY EMPTY
C3 Because of your previous participation in an Efficiency Nova Scotia program and what you learned from it, you looked at the cost effectiveness of the energy efficiency measures in your new building by evaluating the different options available.	1) Agree 2) Disagree 98/99) DK/Refuse	1 EMPTY EMPTY
D4 Before participating in the Custom New Construction program service, had you had seen energy efficiency promotional materials distributed by Efficiency Nova Scotia through its website, brochures, newsletters or presentations?	1) Yes	To determine if participants should respond to questions C5, C6, and C7.
	2) No (Thank and terminate)	
	98) DK/Refuse (Thank and terminate)	
C5 Do you agree or disagree that with the following statements...? The energy efficiency promotional materials distributed by Efficiency Nova Scotia through its website, brochures, newsletters, or presentations were a major factor in your decision to build a better-than-code building.	1) Agree 2) Disagree 98/99) DK/Refuse	1 EMPTY EMPTY
C6 The energy efficiency promotional materials through its website, brochures, newsletters, or presentations distributed by Efficiency Nova Scotia prompted you to ask a technical staff member or energy modeler to examine the energy efficiency options for your building project.	1) Agree 2) Disagree 98/99) DK/Refuse	1 EMPTY EMPTY
C7 The energy efficiency promotional materials through its website, brochures, newsletters, or presentations distributed by Efficiency Nova Scotia prompted you to consider the cost effectiveness of the energy efficiency measures in your new building by evaluating the different options offered to your organization.	1) Agree 2) Disagree 98/99) DK/Refuse	1 EMPTY EMPTY
Inconsistency Test		The Evaluator will analyze project file notes to validate the consistency of the answers provided by participants with EOne knowledge of the project. If the Evaluator finds that an answer is inconsistent, the score will be "EMPTY".
Cross-Influence (CI): IF (C5 =Agree; 1) + IF (MAX(C2, C6) =Agree; 1) + IF(Max(C3, C7)=Agree; 1)		
Revised Free-Ridership:		IF CI = 0 OR 1: Revised FR = FR IF CI = 2: Revised FR = FR*0.75 IF CI = 3: Revised FR = FR*0.50

APPENDIX XII

New Construction Tracking Sheet Audit

This appendix presents the main results of the tracking sheet audit performed by the Evaluator, which was aimed at:

- › Verifying that all data fields required for the evaluation were included and filled out in the tracking sheet submitted by E1
- › Ensuring that tracked results were accurate by:
 - › Verifying that parameters used to calculate program results (gross and net electrical energy and peak demand savings at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were performed consistently

Table 1 presents the corrected tracked savings resulting from all changes made by the Evaluator.

Table 1: 2024 Custom Corrected Tracked Savings

Program Component Result	Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	
Gross Electrical Energy Savings – at the Generator	18.713	GWh	18.713	GWh	0.00%
Gross Peak Demand Savings – at the Generator	6.239	MW	6.239	MW	0.00%
Net Electrical Energy Savings – at the Generator	13.473	GWh	13.473	GWh	0.00%
Net Peak Demand Savings – at the Generator	4.492	MW	4.492	MW	0.00%

There were no differences between the tracked and corrected tracked electrical energy and peak demand savings.



APPENDIX XIII

Custom 2025 Recommendations

The Evaluator made no specific recommendation as part of the 2025 Custom evaluation.

APPENDIX XIV

SEM Tracking Sheet Audit

This appendix presents the main results of the tracking sheet audit performed by the Evaluator, which was aimed at:

- › Verifying that all data fields required for the evaluation were included and filled out in the tracking sheet submitted by EfficiencyOne (E1)
- › Ensuring that tracked results were accurate by:
 - › Verifying that parameters used to calculate program results (gross and net electrical energy and peak demand savings at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were performed consistently

Table 1 presents the corrected tracked savings resulting from all changes made by the Evaluator.

Table 1: 2025 SEM Corrected Tracked Savings

Program Component Result	Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	
Gross Electrical Energy Savings at the Generator	4.228	GWh	4.228	GWh	-0.01%
Gross Peak Demand Savings at the Generator	0.421	MW	0.421	MW	0.01%
Net Electrical Energy Savings at the Generator	4.228	GWh	4.228	GWh	-0.01%
Net Peak Demand Savings at the Generator	0.421	MW	0.421	MW	0.01%

The minor changes in electrical energy and peak demand savings were due to adjustments made to line loss factors.

Page 10 of 10

Phone interviews or site visits were conducted after a review of E1 digital project files. As part of the project file review, the Evaluator noted questions to be answered by participants during the interview or site visit, and the protocol was also used to consign their answers.



ECONOLER

Energy Conservation
Optimization Network Ltd.

Strategic Energy Management
Efficiency Nova Scotia
Project Review Protocol

Interview/Site Visit Date:		Team:		Contact Name:	
Project ID:				Contact Title:	
NSPI Rate Code:				Phone:	
Company Name:				Email:	
Address:					
List of people met during the visit:					
Person(s) Responsible for SEM:					
Type of building:	Commercial/institutional		Industrial/manufacturing		
	Municipal		Other (specify)		

Number of years in program (1st, 2nd, et.c)	
What was the savings quantification approach last year (bottom-up or top-down)	
Last year measure list	
Last year savings	

4. Impact Evaluation & Savings Adjustments

Reporting period	
Overall M&V approach and reasoning	

Which measures were implemented and do they generate incremental energy and demand savings?

Measure	Implementation date	Expected to generate incremental savings for this year?	Time period when generating savings	PCF

Bottom-up Approach

Measure 1	Notes
Measure Description	
Validation of the measure (is it installed and operational?)	
Savings calculation approach - What is it and is it appropriate?	
What is the baseline and is it appropriate?	
Are savings annualized for a standard year?	
Are IE considered?	
EUL	

		Tracked	Evaluated	% of Tracked savings			
Electricity Savings	kWh/yr						
Peak Demand Savings	kW						
Peak Coincidence Factor	-						

Top-down Approach		Short answer	NOTES
Periods and boundaries			
Project Measurement Boundary (full facility meter, subsystem?)			
Reporting Period (Days and dates)			
Baseline Period (Days and dates)			
Summary of Non-Routine Baseline Adjustments in Current Model			
Regression Equation Analysis			
Regression Equation Used			
Coefficient of Determination (R2)			
Is R2 IPMVP Compliant (0.75 or greater)?			
Coefficient of Variation (CV)			
Is the CV below 10%			
Is the p-value for independent variables below 10%?			
Is the equation adequate (form and independent variables?)			
Are the baseline and reporting period appropriate?			
When did the change occur?			
Is the baseline period adequate?			
Does the reporting period need to be extrapolated?			
Do any adjustments need to be made for COVID impacts?			
Does the model account for changes in energy consumption due to factors other than the ECM?			
Are there changes other than the ECM between the baseline and			
Does the ECM cause other impacts outside of the measurement			
Savings Adjustments			
Documented Savings Calculations	Tracking Sheet	Annual report	
Energy Savings (kWh)			
Peak Demand Savings (kW)			
PCF			
Evaluator's Savings Calculations	Value	Notes	
Energy Savings (kWh)			
Peak Demand Savings (kW)			
PCF			
Summary of Adjustments			
Energy Adjustment Ratio (%)	#DIV/0!		
Peak Demand Adjustment Ratio (%)	#DIV/0!		

Summary of Evaluator's Findings and Adjustment			
(TO BE COPIED IN THE SUMMARY FILE SHARED WITH EONE)			

APPENDIX XVI

SEM Detailed Project Review Adjustments

Table 1: 2025 SEM Electrical Energy Savings Adjustments

Project	Tracked Savings (kWh)	Evaluated Savings (kWh)	Adjustment Ratio	Explanation for Adjustment
1	344,071	344,071	1.000	None.
2	290,240	281,650	0.970	The Evaluator agrees that the unitary method is acceptable for this measure, although three variables required adjustment. Both the heating capacity and heating efficiency factor were taken at the 47°F/8°C value instead of at the standard 0°C; thus the Evaluator revised these factors by linear interpolation of the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) testing data for the +8°C and -8°C values. The Evaluator could not find this heat pump on the Northeast Energy Efficiency Partnership Cold Climate Air Source Heat Pump (NEEP CCHP) list to identify more accurate data points for the heating capacity or heating efficiency factor.
3	137,195	167,310	1.220	For one measure, the Evaluator adjusted the power formulas to include SQRT(3) and reduced the operating hours to 6,144 based on a confirmed four-week shutdown during the site visit.
4	616,493	616,493	1.000	None.
5	498,682	498,682	1.000	None.
6	1,191,468	988,035	0.829	To calculate the efficiency of the compressed air system at various loads, the service provider used a model that is a mix of actual and nameplate data. The Evaluator conducted a bin analysis using the actual flow and power data from the past year instead, which reduced the savings slightly.
7	91,150	90,652	0.995	The Evaluator adjusted the electrical energy savings to account for the new fan motor efficiency.
8	128,531	121,764	0.947	The Evaluator adjusted the electrical energy savings to more accurately reflect the normal operating conditions (production and operating hours) of the process. In reviewing the last five years of process production and operating hours, the Evaluator noted that the tracked savings included 2024 data, which coincided with the highest production and operating hours from the last five years. The Evaluator adjusted the savings to instead use the average production and operating hours from the last three years (2023-2025), which more closely represented the 2025 operating profile of the facility.
9	61,467	62,628	1.019	The Evaluator adjusted the electrical energy savings to account for a 9 p.m. system restart instead of an 11 p.m. restart, as confirmed in the project documentation.
10	120,437	120,437	1.000	None.
11	547,271	547,271	1.000	None.
Total	4,027,005	3,838,993	0.953	

Table 2: 2025 SEM Peak Demand Savings Adjustments

Project	Tracked Savings (MW)	Evaluated Savings (MW)	Adjustment Ratio	Explanation for Adjustment
1	0.041	0.041	1.000	None.
2	0.047	0.030	0.643	Although the manufacturer documentation states the unit will operate in heating mode at -30°C, it does not provide the heating capacity at low temperatures and cannot be verified from the NEEP database. As the capacity and efficiency at low temperature conditions cannot be confirmed, demand savings are revised to zero to be conservative.
3	0.005	0.005	1.000	None.
4	0.000	0.000	1.000	None.
5	0.057	0.057	1.000	None.
6	0.136	0.113	0.831	To calculate the efficiency of the compressed air system at various loads, the service provider used a model that is a mix of actual and nameplate data. The Evaluator conducted a bin analysis using the actual flow and power data from the past year instead, which reduced the savings slightly.
7	0.000	0.000	1.000	None.
8	0.025	0.014	0.558	The peak demand savings were also adjusted to reflect the average operating conditions of the facility over the last three years.
9	0.004	0.008	2.170	The Evaluator adjusted the peak demand savings for one measure as no peak demand savings were originally calculated despite the measure resulting in savings during the peak period.
10	0.014	0.014	1.000	None.
11	0.073	0.073	1.000	None.
Total	0.401	0.355	0.884	



APPENDIX XVII

SEM 2025 Recommendations

The Evaluator made no recommendations as part of the 2025 SEM evaluation.



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ECONOLÉR



EfficiencyOne

DIRECT INSTALLATION PROGRAM

Final Report

2025 DSM EVALUATION

March 12, 2026



ECONOLUX



ABBREVIATIONS

AR	Adjustment ratio
BER	Business Energy Rebates
BER-AR	Business Energy Rebates Application Rebates
BNI	Business, non-profit, and institutional
CDI	Commercial Direct Install (Pilot)
CFL	Compact fluorescent lamp
CIS	Customer Information System
DIY	Do-it-yourself
DLC	DesignLights Consortium
DR	Demand response
DSM	Demand-side management
DSM MA	Demand-side Management Measure Assessment
E1	EfficiencyOne
ENS	Efficiency Nova Scotia
EUL	Effective useful life
GHG	Greenhouse gas
HVAC	Heating, ventilation, and air conditioning
IE	Interactive effects
LED	Light-emitting diode
NS Power	Nova Scotia Power
NSEB	Nova Scotia Energy Board
NSUARB	Nova Scotia Utility and Review Board
NTGR	Net-to-gross ratio
SBEA	Small Business Energy Auditor
SBES	Small Business Energy Solutions

DEFINITIONS

Accuracy	Reflects the proximity of measurements to the true value.
Adjustment ratio	The ratio of evaluated results to tracked results. This ratio expresses the adjustment made to tracked savings or other tracked values such as effective useful life (EUL) values.
Available demand response capacity	The capacity which is available to Nova Scotia Power (NS Power) to reduce system peak demand. This capacity is calculated based on the first two hours of all events called between December and February, excluding weekends and holidays. If an event is shorter than two hours, only the first hour is used to measure the available DR capacity. Available DR capacity is evaluated per-participant based on the average demand reduction observed for each event in which the participant was scheduled to participate. E1's total available DR capacity is the sum of each participant's available DR capacity.
Baseline	To determine gross savings, a baseline (or base case) is established, providing detailed information about the reference (e.g. pre-existing or standard) measure or equipment chosen to be compared with the efficient measure or equipment. For the reference measure or equipment, the baseline may include such information as the hours of operation, wattage, and base consumption.
Bias	Systematic deviations of measurements from the true value.
Billing calibration	An activity that consists of adjusting the expected electrical energy savings based on the relative difference between the results of energy simulations and the actual energy consumption of a building or system.
Confidence interval	The estimated range of values that is likely to include unknown population parameters.
Demand response	Demand response measures generate savings in the form of available capacity or load reduction in response to events called by the electric utility (NS Power) to reduce the load at strategic moments. These events can be called at any time and for any duration, although they are usually called for one to four hours during peak periods.
Displaced wattage	Displaced wattage is defined as the difference between the wattage values of the baseline equipment or product and the efficient equipment or product.
EnerGuide rating	An EnerGuide (official brand of Natural Resources Canada) rating is a standard measure of home energy performance. It is a measure of the efficiency of the building only and does not take into account occupant behaviour. It shows how energy efficient a home is through modelled home heat losses based on several factors that include building envelope characteristics, heated volume, heating systems, and air leakage.
Effective useful life	The period a measure is expected to be in service and provide both electrical energy and peak demand savings. This value combines equipment life and measure persistence that includes factors such as business turnover or early retirement.
Equipment life	The number of years installed equipment will operate before it fails.



Equivalent CO2	A unit of measurement indicating the amount of carbon dioxide to which various kinds of emitted greenhouse gases (GHGs) are equivalent in terms of warming effects. In this report, gas global warming potential is estimated over a timescale of 100 years.
Equivalent effective useful life	The number of years by which the first-year savings estimate is multiplied to obtain lifetime electrical energy savings. This value takes into account variations in annual electrical energy savings throughout the effective useful life due to increased baselines.
Evaluated savings	Gross and net electrical energy or peak demand savings calculated by the Evaluator using the parameters (unitary savings values, installation rates, interactive effects, net-to-gross ratios, etc.) validated or measured during the evaluation process. Unless otherwise specified, evaluated savings are first-year savings.
Evaluation plan	The evaluation plan summarizes the program description, objectives, base cases, documentation, evaluation methodology, budget, and schedule.
First-year savings	The first full year of electrical energy or peak demand savings generated by an energy efficiency measure.
Free-ridership	Percentage of gross savings attributable to participants who would have implemented the same or similar energy efficiency measures, with no change in timing, in the absence of the program.
Gross savings	Change in energy consumption and/or demand that results directly from program-related actions taken by participants in an efficiency program, regardless of why they participated.
Induced consumption	Energy consumption of appliances that would have been unplugged and not replaced by participants in the absence of the program.
Interactive effects	Effects on the energy consumption of other systems in a building (such as heating and cooling) due to the installation of an energy efficient measure.
In-service rate	The proportion of incentivized products that are installed and operating. This rate is usually applied to programs through which in-store rebates are offered and products are likely to be stored for a certain period before being installed, such as light-emitting diode (LED) lamps.
Installation rate	The proportion of incentivized products reported as installed and that remain installed and operating at the time of evaluation. This rate is usually applied to direct install or mail-in rebate programs through which measures are expected to be installed immediately at the time of participation.
Lifetime electrical energy savings	The electrical energy savings that occur over the lifetime of an energy efficiency measure. Lifetime electrical energy savings account for the effective useful life of a measure and any increase in the baseline efficiency level (which reduces attributable annual savings) over its lifetime.
Line loss factor	The multiplier to convert savings at the customer meter to savings at the utility generator. It accounts for the electrical losses of the transmission and distribution system.
Margin of error	The amount of random sampling error.
Market effects	The impacts of a program on the market (in terms of product availability, practices, and prices) that extend beyond changing program participant behaviours. These include spillover among non-participants.

Net savings	Electrical energy savings or peak demand savings that can be reliably attributed to a program. These include effects such as free-ridership and spillover that negatively or positively affect the savings attributable to a program.
Net-to-gross ratio	The ratio of net electrical energy savings to gross electrical energy savings.
Non-sampling error	Errors arising during all survey activities other than sampling. Non-sampling errors tend to lead to bias in measurements and are very difficult to quantify.
Peak coincidence factor	The percentage of measure demand savings that coincides in time with the annual peak demand of the entire electricity system.
Peak demand savings	The demand savings that coincide in time with the expected annual peak demand period of the entire electricity system. For industrial participants on an interruptible rate, peak demand savings may include savings on non-firm loads, i.e. loads that may be interrupted when NS Power's 10-minute reserve is low.
Precision	The extent to which repeated measurements agree with one another.
Random sampling error	An error in measurement because the measurements are taken from a subset of the population and not the entire population.
Realization rate	The ratio of evaluated savings to tracked savings.
Sample size	The number of observations or replicates included in a statistical sample.
Secondary market impacts	Energy consumption of appliances that would have been transferred to the secondary market if said appliances had not been retired.
Spillover	Savings attributable to participants who continue to implement the energy efficiency measure introduced by a program after participating in it once, without participating in the program a second time.
Tracked savings	Gross and net savings calculated based on various parameters such as number of participants or units installed or sold, unitary savings values, installation rates, interactive effects, and net-to-gross ratios. Those parameters, except the number of participants or units installed or sold, are obtained from the previous evaluation.
Unitary savings	Electrical energy or peak demand savings established on a unitary basis. A unit can either be a product (e.g. an 8 W LED lamp), a capacity (e.g. one-tonne capacity of an air-source heat pump), or a participant (e.g. one participant taking part in a behaviour-based program).



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EXECUTIVE SUMMARY

This report presents the 2025 demand-side management (DSM) results of the Direct Installation program administered by EfficiencyOne (E1). This program is comprised of the Small Business Energy Solutions (SBES) program component. SBES offers incentives and resources to encourage Nova Scotia small businesses to implement energy efficiency upgrades in their facilities.

Evaluation Approach

The objectives of the 2025 evaluation were to calculate program component gross and net results, namely electrical first-year and lifetime energy savings, peak demand savings, as well as avoided greenhouse gas (GHG) emissions. Table 1 summarizes the type of evaluation conducted and the corresponding methodology.

Table 1: Summary of 2025 Direct Installation Program Evaluation

Program Component	Evaluation Type			Methodology
	Impact	Process	Market	
Small Business Energy Solutions	Condensed	-	-	› Tracking sheet audit › Use of adjustment ratios (ARs) from 2023 evaluation, with adjustments for new interactive effects (IE) methodology › 2025 Business Energy Rebates Application Rebates (BER-AR) jurisdictional scan › Application of 2024 Measure Assessment lighting interactive effects methodology to 2025 results › Use of 2023 NTGR results › Calculations using evaluation results › GHG emission reduction calculations

Program Performance

Table 2 presents the participation levels, net-to-gross ratios (NTGRs), evaluated gross and net savings at the generator, annual GHG emission reductions, as well as effective useful life (EUL) values for the Direct Installation program.

Table 2: Overall 2025 Direct Installation Participation and Evaluated Savings

	Participation Level		Gross Savings		NTGR*	Net Savings	
	Value	Unit	Value	Unit	Value	Value	Unit
Electrical Energy Savings	62,011	Units rebated	9.774	GWh	0.80	7.862	GWh
Lifetime Electrical Energy Savings			65.605	GWh	0.81	52.874	GWh
Peak Demand Savings			1.759	MW	0.80	1.414	MW
Annual GHG Emission Reductions			4,587	Tonnes of CO2 eq	0.80	3,689	Tonnes of CO2 eq
EUL			6.7	Years		6.7	Years
* The average NTGR values presented in this table correspond to the ratios of net savings to gross savings for SBES.							

Direct Installation was aimed at achieving 12.616 GWh in net electrical energy savings and 2.621 MW in net peak demand savings at the generator in 2025. The program fell short of its electrical energy and peak demand savings targets by 38% and 46% respectively.

SBES Findings and Recommendations

This subsection presents the key findings from the 2025 SBES evaluation.

2025 SBES-Finding: SBES fell short of the net electrical energy savings and net peak demand savings targets by 38% and 46% respectively.

2025 SBES-Finding: The evaluated net electrical energy savings were slightly lower than the net savings tracked by E1, while the evaluate net peak demand savings were slightly higher.

2025 SBES-Finding: SBES participation in terms of units rebated increased by 1% in 2025 compared to 2024 levels. The DIY path remained the most popular, accounting for 99% of all units rebated.

Program Tracked and Evaluated Savings

Table 3 below compares E1 tracked electrical energy and peak demand savings compared to evaluated savings at the generator. It also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings. The NTGRs are also presented and correspond to the rounded averages obtained by dividing net savings by gross savings, which explains why the NTGR values differ from those presented in other sections.

Table 3: Comparison of 2025 SBES Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR	Net Savings		Realization Rate
	Value	Unit		Value	Unit	
Electrical Energy Savings						
Tracked Savings by E1	9.805	GWh	0.80	7.886	GWh	100%
Evaluation Results	9.774	GWh	0.80	7.862	GWh	
Peak Demand Savings						
Tracked Savings by E1	1.741	MW	0.81	1.400	MW	101%
Evaluation Results	1.759	MW	0.80	1.414	MW	

INTRODUCTION

EfficiencyOne (E1), an independent, non-profit organization, is responsible for helping Nova Scotians improve the energy efficiency of their homes and workplaces by designing, marketing, and delivering demand-side management (DSM) for Nova Scotians. E1 provides energy efficiency, demand response, and carbon mitigation services through the Efficiency Nova Scotia (ENS) franchise. Regulatory oversight of its DSM activities is provided by the Nova Scotia Energy Board (NSEB). E1 receives funding for its electricity DSM activities from Nova Scotia Power (NS Power) ratepayers.

E1 has a DSM portfolio of three residential programs, three business, non-profit, and institutional (BNI) programs, and one demand response (DR) program that are marketed to Nova Scotians through the ENS franchise. Each program has one or more program components. E1 commissioned Econoler to evaluate E1's 2025 DSM program portfolio.

This evaluation report relates to the Direct Installation program, which is comprised of a single component: Small Business Energy Solutions (SBES). Table 4 below lists the Direct Installation program component and the type of evaluation conducted in 2025. A condensed impact evaluation involves using some or all of the impact evaluation parameters from the previous year, such as unitary savings values, adjustment ratios, installation rates, and NTGRs, to provide evaluated results.

Table 4: Type of Evaluation Conducted for SBES, 2025

Program	Program Component	2025		
		Process	Market	Impact
Direct Installation	SBES	-	-	Condensed

For each program, the Evaluator prepared a DSM evaluation report presenting key findings, electrical first-year and lifetime energy savings, peak demand savings, and avoided greenhouse gas (GHG) emissions.¹

¹ Unless specified otherwise, electrical energy savings refer to first-year electrical energy savings rather than lifetime electrical energy savings throughout this report.



1 SBES Overview

This section describes the Small Business Energy Solutions (SBES) program component, follows up on past evaluation recommendations, and provides an overview of participation history.

1.1 SBES Description

SBES offers incentives and resources to Nova Scotia small businesses to encourage them to implement energy efficient upgrades in their facilities. To be eligible, businesses must annually consume less than 600,000 kWh in electricity. Businesses with electricity consumption higher than this limit are directed toward the E1 Custom or Business Energy Rebates program components. SBES offers on-bill financing for eligible businesses provided they are NS Power customers and their accounts are in good standing.

SBES offers two paths for participation: Audit and Do-it-yourself (DIY). The Audit path provides a no-cost energy audit conducted by a Small Business Energy Auditor (SBEA). The Audit path is intended for participants who request assistance in identifying potential energy-saving measures for implementation. The DIY path does not include an energy audit and is intended for participants who have identified one or more energy-saving measures that they wish to implement. Participants have 180 days following preapproval to complete their projects.

SBES applicants have the choice of two program applications that partially serve to determine whether their project will follow the Audit or DIY path:

- › Opportunity Worksheet: Participants who do not know which measures to implement or are interested in receiving a no-cost energy audit use the Opportunity Worksheet to apply. E1 uses the information from the Opportunity Worksheet and the business' electricity consumption history provided by NS Power to determine whether the applicant is eligible for SBES and if an audit would help identify additional potential energy-saving upgrades.
 - › Participants who are approved for a no-cost audit proceed via the Audit path.
 - › Participants who are not approved for a no-cost audit may choose to have an audit conducted at their own expense and proceed via the DIY path.
 - › Participants who are not approved for a no-cost audit and who choose not to conduct an audit at their own expense may proceed via the DIY path.
- › Before You Buy Commercial Product Rebate Application: Participants who know which measures they plan to implement and are not interested in receiving a no-cost audit complete the Before You Buy Commercial Product Rebate Application. Once approved by E1, these participants proceed via the DIY path.

Figure 1 and Figure 2 below illustrate the key steps of the participation process for the Audit and DIY paths respectively.

Figure 1: 2025 Audit Path Participation Process

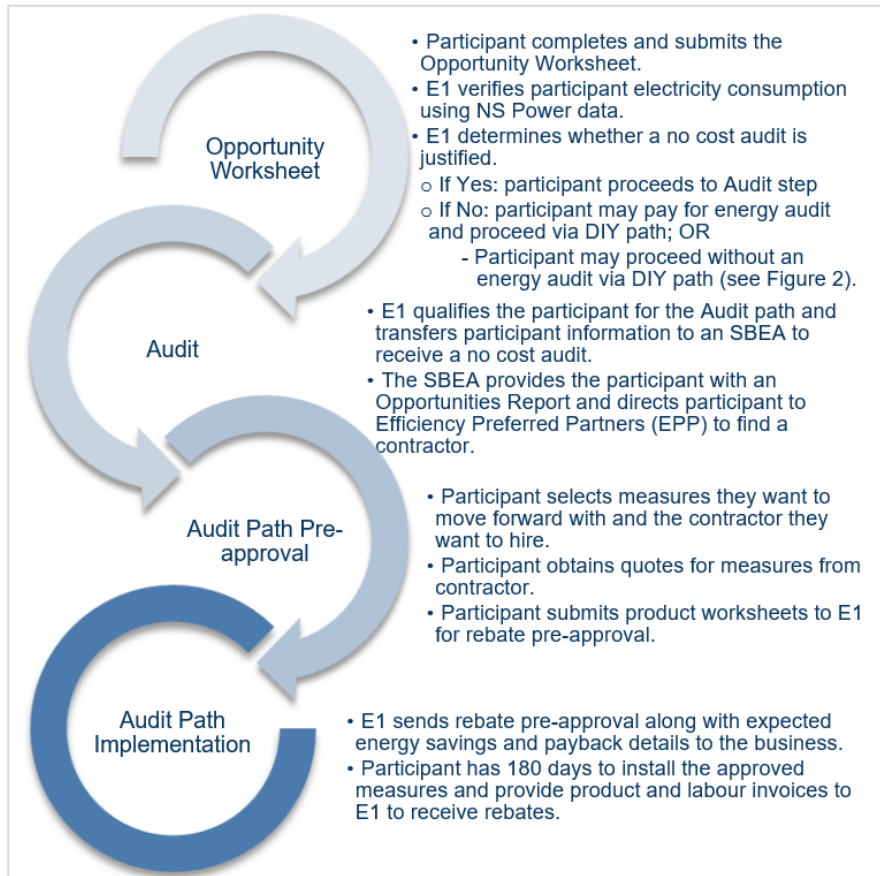
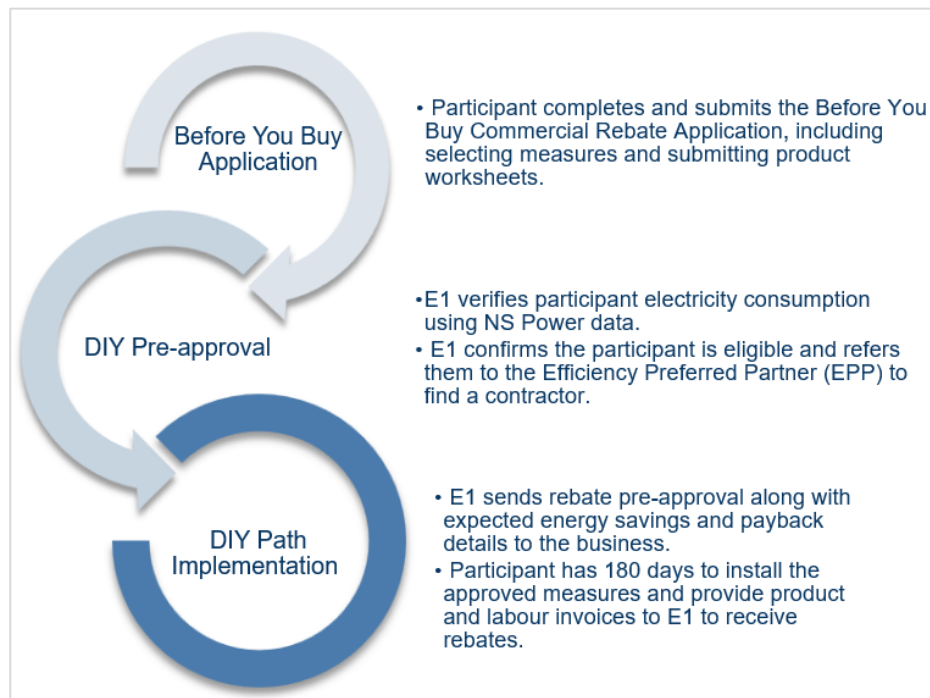


Figure 2: 2025 DIY Path Participation Process





Rebates vary according to factors related to specific technologies, including incremental costs, adoption rates, and the strategic importance of a given technology to SBES and the E1 portfolio.

In 2021, E1 launched the Commercial Direct Install (CDI) Pilot. The pilot provides small businesses with free-of-charge direct installations of energy efficient products. E1 indicated that the pilot was no longer offered in 2025.

SBES was aimed at achieving net electrical energy savings of 12.616 GWh and net peak demand savings of 2.621 MW at the generator in 2025.

1.2 Follow-up on Past Evaluation Report Recommendations

The Evaluator issued improvement recommendations pursuant to evaluating SBES in previous years. Table 5 below provides a summary of the implementation status of past recommendations that were carried forward. The Evaluator notes that all remaining recommendations are in progress.

Table 5: Implementation Status of Past Recommendations for SBES

#	Past Recommendations	Status	Comments
2023-SBES-R1	Consider improvements to the Customer Information System (CIS), ² notably by reviewing how missing entries are treated and extracting more information from the CIS to enable validating automated calculations.	Deferred	E1 and the Evaluator reviewed the recommendation and determined that missing entries were likely specific to 2023. The Evaluator recommended that E1 not take further action on this item until the next comprehensive evaluation (including project reviews) is completed to confirm whether issues with CIS data quality has improved.

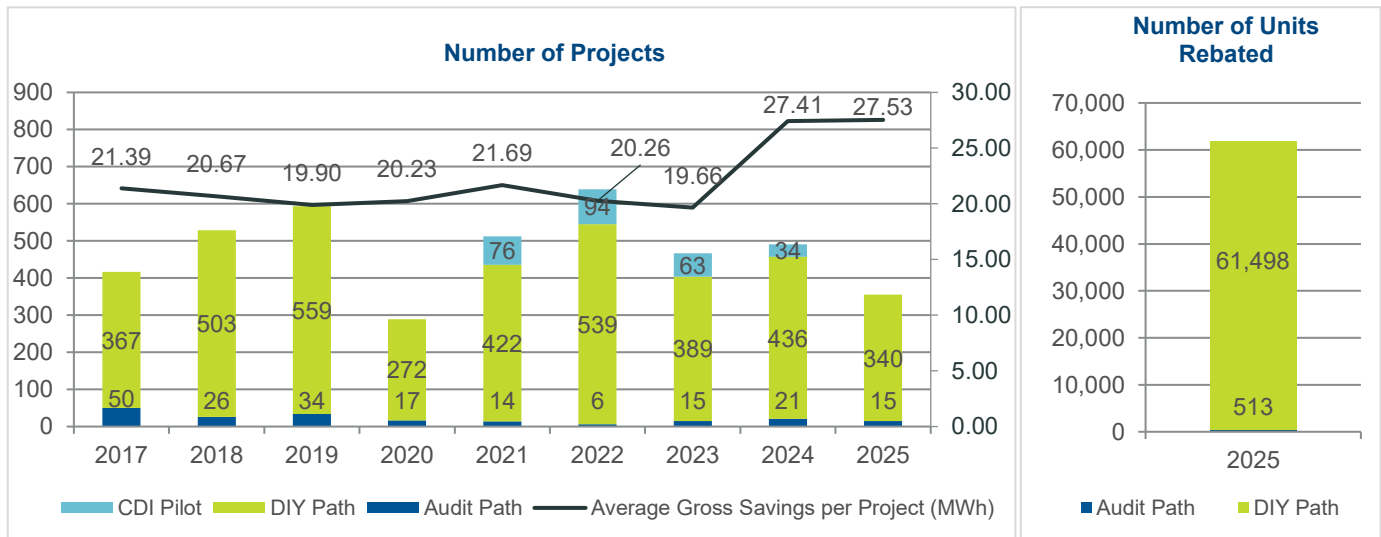
1.3 Participation History

In 2025, SBES rebated a total of 62,011 units, 513 through the Audit path and 61,498 through the DIY path. There were no units rebated under the CDI Pilot in 2025, since the Pilot was no longer offered in 2025. In terms of units rebated, SBES participation³ increased by 1% compared to 2024 levels. This increase was mainly due to the DIY path that represented 99% of total units rebated and in which participation increased by 2% compared to 2024 levels. Despite the higher number of units rebated, the total number of projects decreased by 28% compared to 2024 levels.

² The CIRx Screening Tool is an internal tool provided by E1 and that presents the savings calculation methodologies, assumptions, and calculation parameters for measures implemented under SBES.

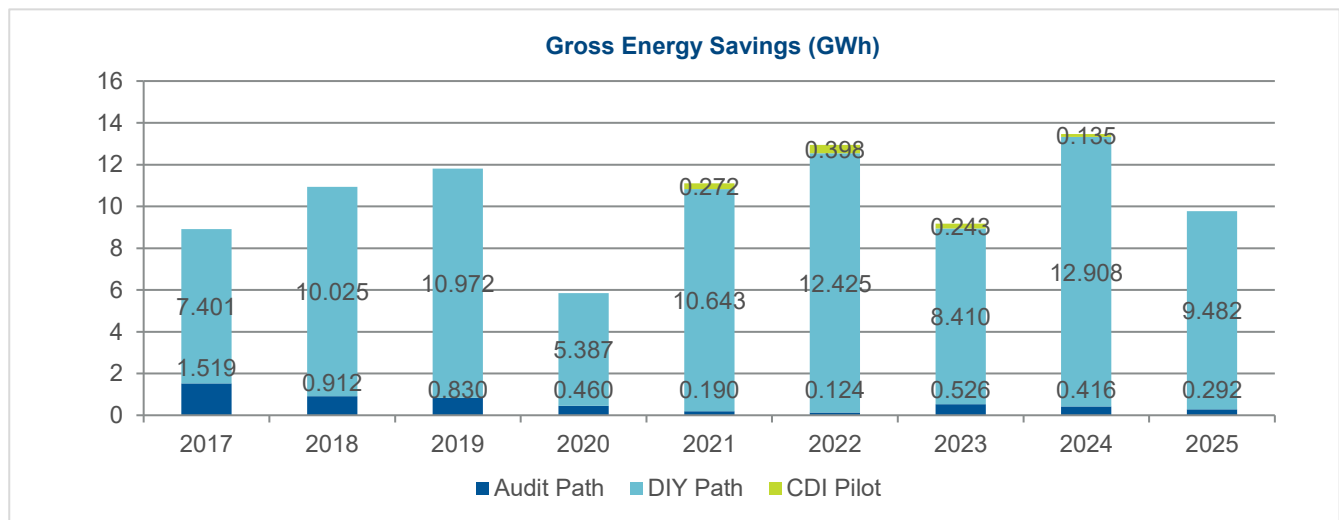
³ As of 2024, the SBES participation metric used is the number of rebated units. However, prior to 2024, SBES participation was reported in terms of projects completed; hence, this metric is also included in Figure 3 to provide historical context.

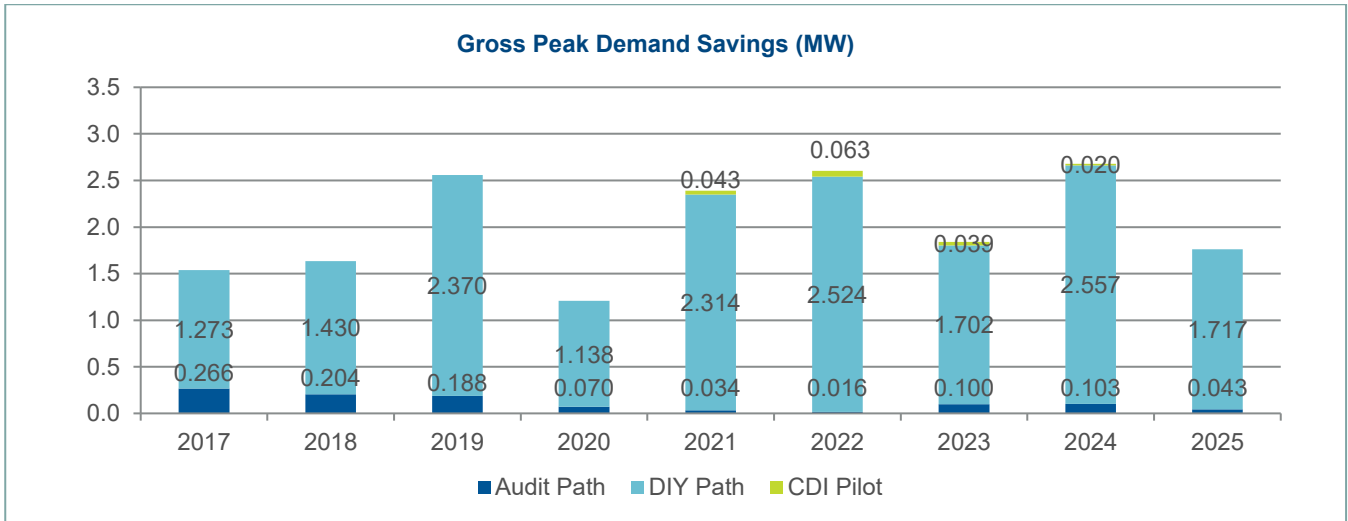
Figure 3: Overview of SBES Participation, 2017-2025



The decreased participation is reflected in gross electrical energy and peak demand savings, as illustrated in Figure 4 below. In 2025, gross electrical energy and peak demand savings decreased respectively by 27% and 34% compared to 2024 levels.

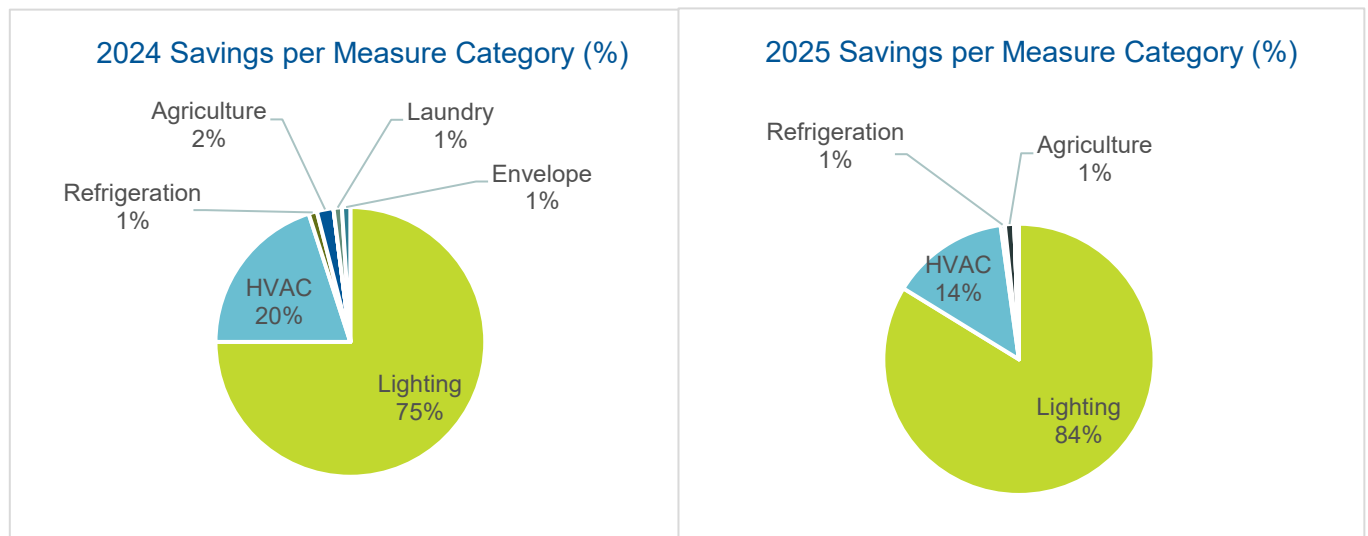
Figure 4: Evolution of SBES Gross Savings, 2017-2025





As presented in Figure 5 below, lighting represented a slightly larger proportion of total program electrical energy savings in 2025 compared to 2024 levels, while heating, ventilation, and air conditioning (HVAC) represented a smaller share.

Figure 5: Comparison of 2024 to 2025 SBES Electrical Energy Savings per Measure Category



2 SBES Evaluation Approach

The 2025 SBES evaluation consisted of a condensed impact evaluation that also covered the CDI Pilot. The main objectives of the 2025 SBES evaluation were as follows:

- › Calculate gross and net SBES results, namely electrical first-year and lifetime energy savings, peak demand savings, as well as avoided GHG emissions

The Evaluator identified key research questions aimed at achieving the above objectives. Table 6 outlines the evaluation objectives and maps them to the Evaluator's research questions, methods, and sample sizes (n). Each method is described further below.

Table 6: 2025 SBES Evaluation Approach

Evaluation Objectives	Research Questions	Methodology
Calculate gross results	› Are the data in the tracking sheet complete, accurate, and consistent? › What are the average interactive effect factors, including provisions for recessed fixtures? › How should a LED baseline be applied to the EUL of LED fixtures incented by BER-AR and SBES? › What are the evaluated first-year and lifetime gross electrical energy and peak demand savings?	› Tracking sheet audit › Use of adjustment ratios from 2023 evaluation, with adjustments for new IE methodology › Calculations using evaluation results › 2025 BER-AR jurisdictional scan › Application of 2024 Measure Assessment lighting interactive effects methodology to 2025 results
Calculate net results	› What are the evaluated first-year and lifetime net electrical energy and peak demand savings? › What are the net GHG emission reductions in CO2 eq?	› Use of 2023 NTGR results › Calculations using evaluation results › GHG emission reduction calculations

Tracking Sheet Audit

Prior to performing the savings calculation review, the Evaluator performed an audit of the final 2025 tracking sheet to ensure it was complete and the entered data were consistent. The detailed protocol used for the tracking sheet audit and the results obtained are presented in Appendix I.

Effective Useful Life Update

The Evaluator reviewed the EUL values for all measure categories and recalculated the EUL values of lighting measures for which baseline changes are anticipated during the measure lifetimes.

Calculations Using Evaluation Results

Building on all the above methods and collected data, the Evaluator calculated the first-year and lifetime gross electrical energy and peak demand savings as per the calculation methodology presented in Subsection 3.2 below.

GHG Emission Reduction Calculations

To obtain net avoided GHG emissions in CO2 eq for SBES, the Evaluator multiplied the net energy savings by the latest Nova Scotia-specific factor for GHG emissions generated by electricity production. This factor was established using Nova Scotia Power (NS Power) data.

Note on Margins of Error

For evaluation activities that yield quantitative results based on a sample, the Evaluator aimed to achieve a maximum margin of error of 10% at a confidence level of 90%. This means that, if measurements were conducted many times with different samples, the data would be within 10 percentage points above or below the percentage reported 90% of the time. Thus, the margin of error indicates the relative level of precision⁴ of a measurement, while its associated confidence level indicates the probability of a measurement falling within the margin of error.⁵

As part of the 2025 SBES evaluation, no data-collection activities warranted the calculation of margins of error. The margins of error are listed alongside free-ridership results obtained as part of the 2023 evaluation in the applicable sections herein. Examples of calculations used to establish margins of error are provided in Appendix II of the 2025 DSM Program Evaluation Executive Summary.

⁴ Precision refers to how reproducible a set of measurements is. However, it does not consider how close the measured values are to the true values; this would refer to accuracy.

⁵ As part of this evaluation, the confidence levels and margins of error only take random sampling errors into account; they do not reflect non-sampling errors or biases such as data entry errors, inaccurate responses from respondents, or the inability to contact certain people.



3 SBES Impact Evaluation

The objectives of the 2025 SBES impact evaluation were to determine gross and net electrical energy and peak demand savings, annually avoided GHG emissions, as well as EUL values and associated lifetime electrical energy savings.

3.1 Tracking Sheet Audit

To ensure program component results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1. The results obtained from the tracking sheet audit are presented in Appendix I. The tracked savings results presented in this report, therefore, refer to the corrected tracked savings established by the Evaluator.

3.2 Gross Savings

Gross savings correspond to the change in energy consumption resulting from actions taken by participants compared to the consumption level had those actions not occurred.⁶ For each SBES Audit or DIY project, E1 calculates gross savings in CIS using equations or the custom calculations⁷ performed by energy auditors or E1 SBES staff.

3.2.1 Unitary Energy Savings and Peak Demand Savings

Savings for SBES Audit and DIY projects are established through calculations using data specific to each project. The 2025 Demand-side Management Measure Assessment (DSM MA)⁸ provides detailed descriptions of inputs, references, and unitary savings calculations for all measure categories.

3.2.2 Installation Rates

Installation rates are accounted for in the adjustment ratios for SBES Audit and DIY projects, as documented in the 2025 DSM MA.

3.2.3 Interactive Effects

Interactive effects occur when the implementation of energy efficiency measures has an impact on the energy consumption of other elements such as heating and cooling. For the SBES Audit and DIY paths, these are taken into account through the gross savings standard equation in the E1 CIRx Screening Tool. Since 2016, building-specific interactive effects factors have been used for both electrical energy and peak demand savings.

⁶ Definition adapted from National Renewable Energy Laboratory, “Chapter 21: Estimating Net Savings – Common Practices”, The Uniform Methods Project, October 2017, p. 3, available at: <https://www.nrel.gov/docs/fy17osti/68578.pdf>.

⁷ Equations and calculations are within the CIRx Screening Tool which is an internal tool that presents the savings calculation methodologies, assumptions, and calculation parameters for measures implemented under SBES.

⁸ The 2025 DSM MA is a reference document that provides an in-depth review of all parameters necessary to calculate the annual and lifetime gross electrical energy and peak demand savings of all prescriptive measures and most semi-prescriptive measures offered through E1's DSM program portfolio. In addition, the MA includes effective useful life values for all measures offered in E1's program portfolio. For the evaluation conducted during the last year of the 2023-2025 DSM cycle, the Evaluator refers to the values presented in the 2025 DSM MA.

As part of the 2023 SBES evaluation, the Evaluator ensured that E1 used the correct interactive effects factors for reviewed projects based on site visit observations. Where applicable, the Evaluator adjusted the interactive effects factor based on the CIRx Screening Tool value that most accurately corresponded to the situation observed on site. The interactive effects adjustments are included in the adjustment ratios established in 2023,⁹ and this assumption remained valid in 2025.

The interactive effects factors for the commercial sector are based on the same interactive effects as in previous years, as detailed in the 2025 DSM MA, except for recessed fixtures for which interactive effects factors are multiplied by 57% to account for the limited interaction between recessed fixtures and heating or cooling systems. This adjustment applies to lighting measure categories that include recessed fixtures, specifically LED linear fixtures and LED linear lamps.

3.2.4 Effective Useful Life

As part of the 2025 DSM MA activities, the Evaluator reviewed the EUL values used in the calculation of electrical energy savings that are expected to persist over time. The EUL values established in previous evaluations remained valid for the 2025 evaluation with the exception of the EUL values for LED linear fixture, LED linear lamp, and LED outdoor fixture measures for which the baselines are expected to change over the lifetimes of the measures. Detailed explanations of this calculation methodology are provided in the 2025 DSM MA.

The tracked and evaluated EUL values are presented in Table 7. The table includes only those values modified by the Evaluator during the 2025 evaluation.

Table 7: 2025 SBES Equivalent EUL for Updated Measures

Product	Tracked Equivalent EUL [years]	Evaluated Equivalent EUL [years]
Indoor - Four-pin Base Replacement Lamps for Compact Fluorescent Lamps (CFLs)	11.9	1.9
Indoor - High-bay Luminaires (DesignLights Consortium [DLC] Premium)	23.7	4.8
Indoor - High-bay Luminaires (DLC Standard)	23.8	4.8
Indoor - Linear Ambient Luminaires	11.9	4.8
Indoor - Linear Replacement Lamps	11.9	4.8
Indoor - Low-bay Luminaires	11.9	4.8
Indoor - Stairwell and Passageway Luminaires	14.3	2.9
Indoor - Troffers	21.3	4.8
Outdoor - Case Lighting for Sign Retrofit Applications	11.8	4.8
Outdoor - Flood and Spot Luminaires	17.4	4.5
Outdoor - Parking Garage Luminaires	23.1	4.6
Outdoor - Pole/Arm-mounted Area Luminaires	13.9	3.5
Outdoor - Pole/Arm-mounted Decorative Luminaires	23.2	3.5
Outdoor - Wall-mounted Area Luminaires (Full-cutoff)	17.4	4.5
Outdoor - Wall-mounted Area Luminaires (Non-cutoff and Semi-cutoff)	23.2	4.5
BER/SBES Custom - Envelope	52.5	30.0

⁹ The adjustment ratios for each path and each measure category are documented in the 2025 DSM MA.



The evaluated equivalent EUL values are applied to the gross and net first-year electrical energy savings of each measure to obtain gross and net lifetime electrical energy savings. As a result, the weighted average EUL value for gross and net savings is equal to 6.7 (see Subsections 3.2.5 above and 3.3.4 below).

3.2.5 Evaluated Gross Savings

To obtain evaluated gross savings, the Evaluator applied the adjustment ratios¹⁰ established as part of the 2023 SBES impact evaluation to 2025 tracked savings. Table 8 and Table 9 below present the evaluated total gross savings at the meter and at the generator for both SBES paths respectively.

The Gross savings at the generator were calculated by applying the appropriate line loss factor for each participant based on their rate code¹¹. The line loss factors were updated in 2019 and correspond to the values submitted to the Nova Scotia Utility and Review Board (NSUARB), now named the Nova Scotia Energy Board (NSEB), as part of the 2014 Cost of Service Study Progress Update.¹²

¹⁰ The adjustment ratios for each path and each measure category are documented in the 2025 DSM MA.

¹¹ For municipal utility participants, the line loss factor of the most similar NS Power rate code was assumed.

¹² Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.

Table 8: Evaluated 2025 SBES Gross Electrical Energy and Peak Demand Savings – Audit Path

Category of Measure	Agriculture	Commercial Kitchen	HVAC	Laundry	Lighting	Refrigeration	Total for All Categories
Electrical Energy Savings							
Gross Electrical Energy Savings Without Adjustment Ratio or IE – at the Meter (GWh)	0.035	0.001	0.108	0.009	0.129	0.003	0.286
Adjustment Ratio on Electrical Energy Savings	1.000	1.000	0.980	1.000	1.070	1.000	-
Interactive Effects on Electrical Energy Savings (%)	100%	100%	100%	100%	87%	100%	-
Gross Electrical Energy Savings – at the Meter (GWh)	0.035	0.001	0.106	0.009	0.120	0.003	0.274
Line Loss Factor	1.0583	1.0631	1.0671	1.0631	1.0634	1.0631	-
Gross Electrical Energy Savings – at the Generator (GWh)	0.037	0.001	0.113	0.010	0.127	0.004	0.292
Effective Useful Life (years)	15.0	12.0	18.2	11.0	4.3	13.1	-
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	0.554	0.011	2.057	0.108	0.551	0.047	3.328
Peak Demand Savings							
Gross Peak Demand Savings Without Adjustment Ratio or IE - at the Meter (MW)	0.010	0.000	0.016	0.001	0.017	0.001	0.045
Adjustment Ratio on Peak Demand Savings	1.000	1.000	1.009	1.000	0.917	1.000	-
Interactive Effects on Peak Demand Savings (%)	100%	100%	100%	100%	71%	100%	-
Gross Peak Demand Savings – at the Meter (MW)	0.010	0.000	0.016	0.001	0.011	0.001	0.040
Line Loss Factor	1.0595	1.1003	1.0895	1.0700	1.0700	1.0700	-
Gross Peak Demand Savings – at the Generator (MW)	0.010	0.000	0.018	0.002	0.012	0.001	0.043

Table 9: Evaluated 2025 SBES Gross Electrical Energy and Peak Demand Savings – DIY Path

Category of Measure	Agriculture	Commercial Kitchen	HVAC	Laundry	Lighting	Motor	Refrigeration	Envelope	Total for all Categories
Energy Savings									
Gross Electrical Energy Savings Without Adjustment Ratio – at the Meter (GWh)	0.067	0.003	1.184	0.007	7.399	0.018	0.042	0.028	8.750
Adjustment Ratio on Electrical Energy Savings	1.000	1.000	0.980	1.000	1.070	1.000	1.000	1.000	-
Interactive Effects on Electrical Energy Savings (%)	100%	100%	100%	100%	95%	100%	100%	100%	-
Gross Electrical Energy Savings – at the Meter (GWh)	0.067	0.003	1.161	0.007	7.539	0.018	0.042	0.028	8.866
Line Loss Factor	1.0863	1.0631	1.0850	1.0901	1.0669	1.0947	1.0746	1.0882	-
Gross Electrical Energy Savings – at the Generator (GWh)	0.073	0.003	1.259	0.008	8.043	0.020	0.045	0.031	9.482
Effective Useful Life (years)	14.9	12.0	18.0	11.5	4.5	15.0	14.9	30.0	-
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	1.084	0.042	22.672	0.092	36.481	0.303	0.678	0.926	62.277
Peak Demand Savings									
Gross Peak Demand Savings (MW)	0.019	0.001	0.477	0.003	1.342	0.002	0.005	0.019	1.867
Adjustment Ratio on Peak Demand Savings	1.000	1.000	1.009	1.000	0.932	1.000	1.000	1.000	-
Interactive Effects on Peak Demand Savings (%)	100%	100%	100%	100%	84%	100%	100%	100%	-
Gross Peak Demand Savings – at the Meter (MW)	0.019	0.001	0.481	0.003	1.046	0.002	0.005	0.019	1.576
Line Loss Factor	1.1256	1.0700	1.1165	1.1003	1.0752	1.1466	1.0769	1.1466	-
Gross Peak Demand Savings – at the Generator (MW)	0.022	0.001	0.537	0.003	1.125	0.002	0.006	0.022	1.717

Table 10 summarizes the gross electrical energy and peak demand savings for each path and SBES as a whole.

Table 10: Evaluated 2025 SBES Gross Electrical Energy and Peak Demand Savings – Both Paths

Program Path	Audit Path	DIY Path	Total
Electrical Energy Savings			
Gross Electrical Energy Savings – at the Meter (GWh)	0.274	8.866	9.140
Line Loss Factor	1.0642	1.0696	-
Gross Electrical Energy Savings – at the Generator (GWh)	0.292	9.482	9.774
Effective Useful Life (years)	11.4	6.6	-
Gross Lifetime Electrical Energy Savings – at the Generator (GWh)	3.328	62.277	65.605
Peak Demand Savings			
Gross Peak Demand Savings – at the Meter (MW)	0.040	1.576	1.615
Line Loss Factor	1.0736	1.0895	-
Gross Peak Demand Savings – at the Generator (MW)	0.043	1.717	1.759

Figure 6 and Figure 7 below compare tracked gross savings to evaluated gross savings for electrical energy and peak demand savings respectively. Evaluated gross electrical energy savings were slightly lower (0.3%) than the values tracked by E1 and the evaluated gross peak demand savings were 1.0% higher than the values tracked by E1 primarily due to corrections to interactive effects factors made by the Evaluator.

Figure 6: 2025 SBES Tracked and Evaluated Gross Electrical Energy Savings at the Generator

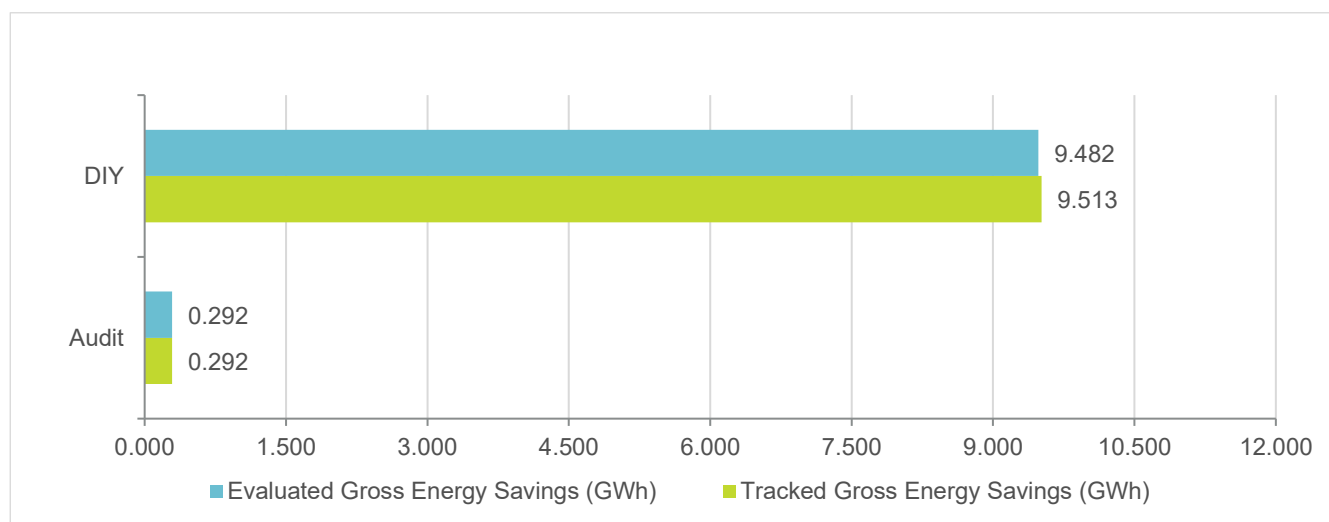
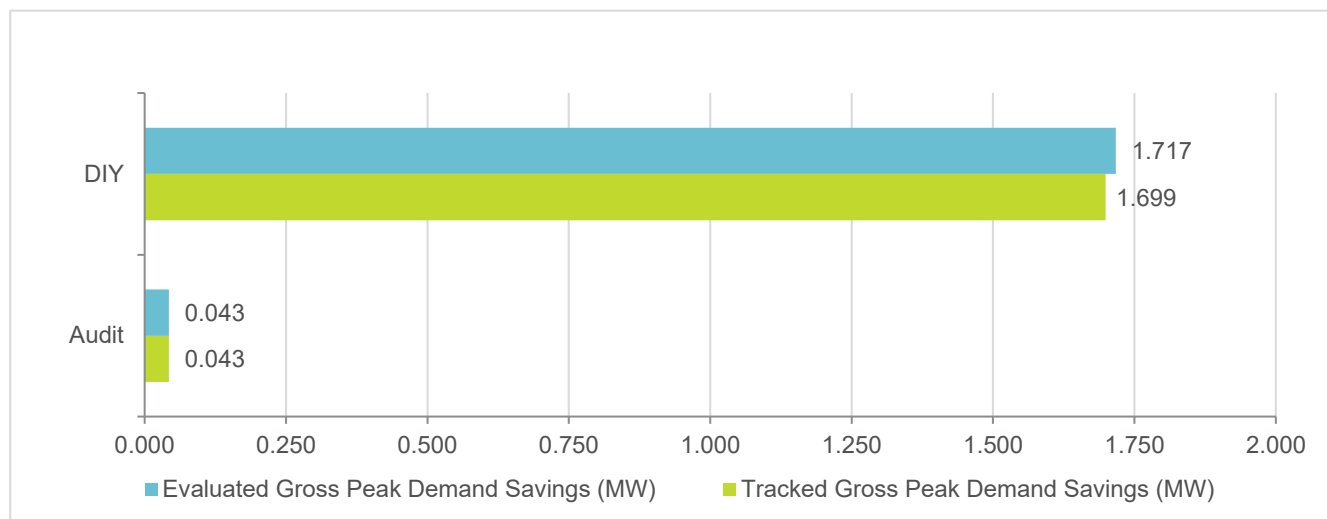


Figure 7: 2025 SBES Tracked and Evaluated Gross Peak Demand Savings at the Generator



As presented in Table 11 below, GHG emission reductions were calculated by applying the Nova Scotia-specific factor¹³ for GHG emissions generated by electricity production to SBES gross savings.

Table 11: Evaluated 2025 SBES GHG Gross Emission Reductions

	Total
Gross Electrical Energy Savings – at the Generator (GWh)	9.774
Nova Scotia-specific GHG Emissions Factor for Electricity Production (tonnes of CO2 eq/GWh)	469.3
Gross Annual GHG Emission Reductions (tonnes of CO2 eq)	4,587

3.3 Net Savings

The Evaluator determined the net electrical energy and peak demand savings, i.e. the electrical energy and peak demand savings that can be reliably attributed to the program component, by estimating the NTGR. More precisely, the Evaluator established the NTGR by accounting for free-ridership and spillover effects that positively or negatively affect the electrical energy savings generated by the program component.

3.3.1 Free-ridership

For SBES, free-ridership occurs when participants would have implemented energy efficiency upgrades in the absence of the program component. The free-ridership levels for DIY and Audit projects were assessed during the 2023 evaluation using a self-report approach that involved asking participants a set of questions during a telephone survey. Since no data collection aimed at updating the free-ridership levels was conducted in 2025, the Evaluator used the 2023 free-ridership levels.

Table 12 outlines the free-ridership levels used for the 2025 SBES evaluation.

¹³ At the time of writing, 2025 data were not yet available. The Nova Scotia-specific factor was obtained from Nova Scotia Power's 2024 total system emissions data (5,314,847 CO2 eq tonnes) and total electricity generation (11,326 GWh) was drawn from the following two sources: Nova Scotia Power, Total System Emissions, <https://www.nspower.ca/clean-energy/air-emissions-reporting> (last accessed August 26, 2025) and Emera Inc., Emera Inc. 2024 Annual Report, p. 32, available at https://s205.q4cdn.com/781121964/files/doc_financials/2024/ar/2024_Emera_Annual_Report.pdf (last accessed August 26, 2025).

Table 12: 2025 SBES Free-ridership Levels

Project Path	Average Free-ridership Level	Margin of Error
DIY (based on 2023 results)	20%	5.2%
Audit (based on 2019 results)	12%	6.5%

3.3.2 Participant Spillover

For SBES, spillover occurs when participants implement eligible energy efficiency measures due to the influence of having previously participated in the program component without receiving any kind of additional support. As there was no data collection to update participant spillover levels in 2025, the Evaluator used the 2023 spillover levels, which were found to be nil.

3.3.3 Net-to-gross Ratio Calculation

The NTGR results from the comprehensive impact evaluation performed in 2023 were used for the 2025 evaluation, the results of which are presented in Table 13 below.

The SBES NTGR was calculated using the following equation.

$$NTGR = (1 - \% \text{ Free-ridership} + \% \text{ Participant Spillover})$$

Table 13: 2025 SBES NTGRs

Project Path	Free-ridership	Participant Spillover	NTGR
DIY	20%	0%	0.80
Audit	12%	0%	0.88

3.3.4 Evaluated Net Savings

Net savings are defined as the energy use reductions that are specifically attributable to SBES. Program component net impacts were estimated by applying the above NTGRs to the revised gross savings by using the following equation.

$$\text{Net Savings} = \text{Revised Gross Savings} \times NTGR$$

This equation was used to calculate both electrical energy savings and peak demand savings.

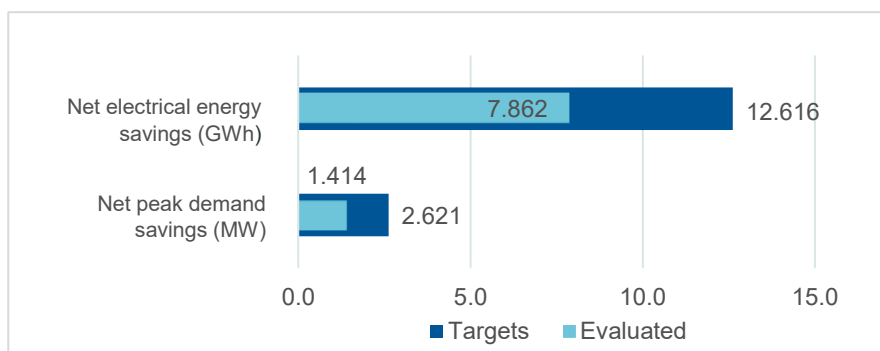
The detailed results are listed in Table 14 below. The net electrical energy savings resulted in 3,689 tonnes of CO2 eq in net annual GHG emission reductions.

Table 14: Evaluated 2025 SBES Net Electrical Energy and Peak Demand Savings

Measure Category	Audit Path	DIY Path	Total
Electrical Energy Savings			
Gross Electrical Energy Savings – at the Meter (GWh)	0.274	8.866	9.140
NTGR	0.88	0.80	-
Net Electrical Energy Savings – at the Meter (GWh)	0.241	7.110	7.352
Line Loss Factor	1.0642	1.0696	-
Net Electrical Energy Savings – at the Generator (GWh)	0.257	7.605	7.862
Effective Useful Life (years)	11.4	6.6	-
Net Lifetime Electrical Energy Savings – at the Generator (GWh)	2.928	49.946	52.874
Peak Demand Savings			
Gross Peak Demand Savings – at the Meter (MW)	0.040	1.576	1.615
NTGR	0.88	0.80	-
Net Peak Demand Savings – at the Meter (MW)	0.035	1.264	1.299
Line Loss Factor	1.0736	1.0895	-
Net Peak Demand Savings – at the Generator (MW)	0.037	1.377	1.414

As outlined in Figure 8 below, SBES fell short of its 12.616 GWh net electrical energy savings target by 38% and also fell short of its 2.621 MW net peak demand savings target by 46%.

Figure 8: 2025 SBES Targets and Evaluated Results



3.4 Realization Rate

Table 15 below compares the tracked electrical energy and peak demand savings values established through this evaluation to those calculated in the 2025 tracking sheet. It also includes the realization rate, representing the ratio of evaluated net savings to tracked net savings, for both electrical energy savings and peak demand savings.

Table 15: Comparison of 2025 SBES Tracked and Evaluated Savings at the Generator

	Gross Savings		NTGR*	Net Savings		Realization Rate
	Value	Unit		Value	Unit	
Electrical Energy Savings						
Tracked Savings by E1	9.805	GWh	0.80	7.886	GWh	100%
Evaluation Results	9.774	GWh	0.80	7.862	GWh	
Peak Demand Savings						
Tracked Savings by E1	1.741	MW	0.81	1.400	MW	101%
Evaluation Results	1.759	MW	0.80	1.414	MW	
* The average NTGR values presented in this table correspond to the ratios of net savings to gross savings for SBES.						

The evaluated net electrical energy savings were slightly lower (0.3%) than the values tracked by E1, while the evaluated net peak demand savings were 1.0% higher than the tracked values. The minor differences are mainly due to corrections to interactive effect factors made by the Evaluator.



4 SBES Key Findings and Recommendations

The main objectives of the 2025 SBES evaluation were as follows:

- › Calculate gross and net electrical energy and peak demand savings, annually avoided GHG emissions, as well as EUL values and associated lifetime electrical energy savings.

This section provides the Evaluator's key findings and recommendations in relation to the above objectives.

2025 SBES-Finding: SBES did not meet its net electrical energy and peak demand savings targets.

In 2025, SBES achieved 7.862 GWh in net electrical energy savings and 1.414 MW in net peak demand savings, thus falling short of its targets by 38% and 46% respectively.

2025 SBES-Finding: The evaluated net electrical energy savings were slightly lower than the net savings tracked by E1, while the evaluated net peak demand savings were slightly higher.

Electrical energy and peak demand savings were calculated using the parameters provided by E1. The Evaluator applied the NTGR and adjustment ratios determined in the 2023 evaluation. For some lighting measures, the EULs and interactive effect factors were updated for the 2025 evaluation. Thus, the evaluated net electrical energy savings were slightly lower (0.3%) than the value tracked by E1, while the evaluated net peak demand savings were 1.0% higher than the tracked values.

2025 SBES-Finding: SBES participation increased in 2025 compared to 2024 levels.

A total of 62,011 units were rebated through SBES in 2025, including 513 units through the Audit path and 61,498 units through the DIY path. Overall, units rebated through SBES in 2025 increased by 1% compared to 2024 levels, with the DIY path continuing to be the most popular, representing 99% of all units rebated.

CONCLUSION

Table 16 below summarizes the participation level, net-to-gross ratios (NTGRs), evaluated gross and net savings at the generator, annual GHG emission reductions, as well as EUL values for Direct Installation as a whole.

Table 16: Overall 2025 Direct Installation Participation and Evaluated Savings

	Participation Level		Gross Savings		NTGR*	Net Savings	
	Value	Unit	Value	Unit	Value	Value	Unit
SBES							
Electrical Energy Savings	62,011	Units rebated	9.774	GWh	0.80	7.862	GWh
Lifetime Electrical Energy Savings			65.605	GWh	0.81	52.874	GWh
Peak Demand Savings			1.759	MW	0.80	1.414	MW
Annual GHG Emission Reductions			4,587	Tonnes of CO2 eq	0.80	3,689	Tonnes of CO2 eq
EUL			6.7	Years		6.7	Years
* The average NTGR values presented in this table correspond to the ratios of net savings to gross savings for SBES.							

As illustrated in Figure 9 and Figure 10 below, Direct Installation fell 38% short of its 12.616 GWh net electrical energy savings target and fell 46% short of its 2.621 MW net peak demand savings target.

Figure 9: 2025 Direct Installation Targeted and Evaluated Net Electrical Energy Savings

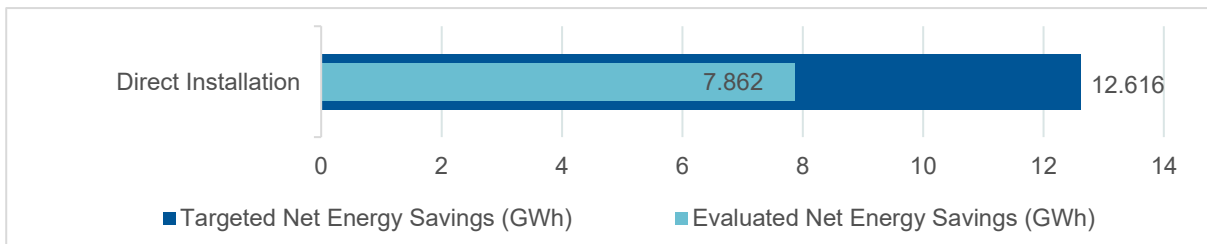
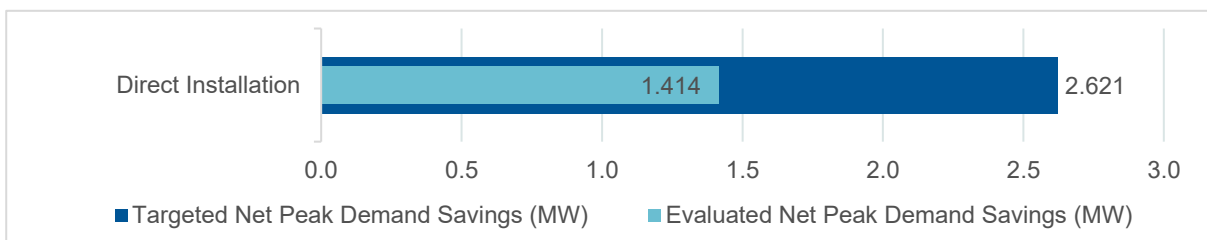


Figure 10: 2025 Direct Installation Targeted and Evaluated Net Peak Demand Savings





LIST OF APPENDICES

The following are presented in the Direct Installation Program – Appendices document.

Small Business Energy Solutions

Appendix I SBES: 2025 Tracking Sheet Audit

Appendix II SBES: 2025 Recommendations



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DIRECT INSTALLATION PROGRAM

Final Appendix Report

2025 DSM EVALUATION

March 12, 2026



ECONOLUX



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APPENDIX I

SBES 2025 Tracking Sheet Audit

This appendix presents the main results of the Small Business Energy Solutions (SBES) tracking sheet audit performed by the Evaluator, which was aimed at:

- › Verifying that all data fields required for the evaluation were included and properly filled out in the tracking sheet submitted by EfficiencyOne (E1)
- › Ensuring that tracked results were accurate by:
 - › Verifying that parameters used to calculate program results (gross and net electrical energy and peak demand savings at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were performed consistently

Table 1 presents the corrected tracked savings resulting from all changes made by the Evaluator.

Table 1: 2025 SBES Corrected Tracked Savings

Program Component Results	Value Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	Value
SBES – Audit & DIY					
Gross Electrical Energy Savings – at the Generator	9.779	GWh	9.805	GWh	0.26%
Gross Peak Demand Savings – at the Generator	1.737	MW	1.741	MW	0.25%
Net Electrical Energy Savings – at the Generator	7.847	GWh	7.886	GWh	0.50%
Net Peak Demand Savings – at the Generator	1.393	MW	1.400	MW	0.49%

Since the Evaluator and E1 used the same net-to-gross ratios and line loss factors to calculate savings, SBES corrected tracked savings are very similar to those tracked by E1. The variations mainly relate to differences in how values were rounded to establish the tracked and corrected values.



APPENDIX II

SBES 2025 Recommendations

The Evaluator made no specific recommendation as part of the 2025 evaluation of SBES.



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DEMAND RESPONSE PROGRAM

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ABBREVIATIONS

AMI	Advanced metering infrastructure
BNI	Business, non-profit, and institutional
BNI DR	Business, Non-profit, and Institutional Demand Response (program component)
BYOD	Bring Your Own Device (pathway)
C&I Aggregator	Commercial and Industrial Aggregator (pathway)
CSAT	Customer satisfaction
DERMS	Distributed energy resource management system
DHW	Domestic hot water
DHW DLC	Domestic Hot Water Direct Load Control (pathway)
DLC	Direct load control
DR	Demand Response (program)
DR	Demand response
DSM	Demand-side management
DSM MA	Demand-side Management Measure Assessment
E1	EfficiencyOne
EBB	Electric baseboard
ENS	Efficiency Nova Scotia
EPI	Efficient Product Installation (program component)
EUL	Effective useful life
EVs	Electric vehicles
GMP	Green Mountain Power
HWC	Hot water controller
IESO	Independent Electricity System Operator (Ontario)
M&V	Measurement and verification
MSHP	Mini-split heat pump
NPS	Net Promoter Score
NS Power	Nova Scotia Power
NSEB	Nova Scotia Energy Board
NSUARB	Nova Scotia Utility and Review Board
O&M	Operation and maintenance
OEM	Original equipment manufacturer



PSE	Puget Sound Energy
Residential DR	Residential Demand Response (program component)

DEFINITIONS

Accuracy	Reflects the proximity of measurements to the true value.
Adjustment ratio	The ratio of evaluated results to tracked results. This ratio expresses the adjustment made to tracked savings or other tracked values such as effective useful life values.
Available demand response capacity	The capacity that is available to Nova Scotia Power (NS Power) to reduce system peak demand. This capacity is calculated based on the first two hours of all events called between December and February, excluding weekends and holidays. If an event is shorter than two hours, only the first hour is used to measure available demand response (DR) capacity. Available DR capacity is evaluated per-participant based on the average demand reduction observed for each event in which the participant was scheduled to participate. E1's total available DR capacity is the sum of each participant's available DR capacity.
Baseline	To determine gross savings, a baseline (or base case) is established, providing detailed information about the reference (e.g. pre-existing or standard) measure or equipment chosen to be compared with the efficient measure or equipment. For the reference measure or equipment, the baseline may include such information as the hours of operation, wattage, and base consumption.
Bias	Systematic deviations of measurements from the true value.
Billing calibration	An activity that consists of adjusting the expected electrical energy savings based on the relative difference between the results of energy simulations and the actual electrical energy consumption of a building or system.
Confidence interval	The estimated range of values that is likely to include unknown population parameters.
Demand response	Demand response measures generate savings in the form of available capacity or a load reduction in response to events called by the electric utility (NS Power) to reduce the load at strategic moments. These events can be called at any time and for any duration, although they are usually called for one to four hours during peak periods.
Displaced wattage	The displaced wattage is defined as the difference between the wattage values of the baseline equipment or product and that of the efficient equipment or product.
EnerGuide rating	An EnerGuide (official brand of Natural Resources Canada) rating is a standard measure of home energy performance. It is a measure of the efficiency of the building only and does not take into account occupant behaviour. It shows how energy efficient a home is through modelled home heat losses based on several factors including building envelope characteristics, heated volume, heating systems, and air leakage.

Effective useful life	The period a measure is expected to be in service and provide both electrical energy and peak demand savings. This value combines equipment life and measure persistence that includes factors such as business turnover or early retirement.
Equipment life	The number of years installed equipment will operate before it fails.
Equivalent CO2	A unit of measurement indicating the amount of carbon dioxide to which various kinds of emitted greenhouse gases are equivalent in terms of warming effects. In this report, gas global warming potential is estimated over a timescale of 100 years.
Equivalent effective useful life	The number of years by which the first-year savings estimate is multiplied to obtain lifetime electrical energy savings. This value takes into account variations in annual electrical energy savings throughout the effective useful life of a measure due to increased baselines.
Evaluated savings	Gross and net electrical energy savings or peak demand savings calculated by the Evaluator using the parameters (unitary savings values, installation rates, interactive effects, net-to-gross ratios, etc.) validated or measured during the evaluation process. Unless otherwise specified, evaluated savings are first-year savings.
Evaluation plan	The evaluation plan summarizes the program description, objectives, base cases, documentation, evaluation methodology, budget, and schedule.
First-year savings	The first full year of electrical energy or peak demand savings generated by an energy efficiency measure.
Free-ridership	Percentage of gross savings attributable to participants who would have implemented the same or similar energy efficiency measures, with no change in timing, in the absence of the program.
Gross savings	Change in energy consumption and/or demand that results directly from program-related actions taken by participants in an energy efficiency program regardless of why they participated.
Induced consumption	Energy consumption of appliances that would have been unplugged and not replaced by participants in the absence of the program.
Interactive effects	Effects on the energy consumption of other systems (such as heating and cooling) in a building due to the installation of an energy efficiency measure.
In-service rate	The proportion of incentivized products installed and operating. This rate is usually applied to programs through which rebates are offered in-store and products are likely to be stored for a certain period before being installed, such as light-emitting diode (LED) lamps.
Installation rate	The proportion of incentivized products reported as installed and that remains installed and operating at the time of evaluation. This rate is usually applied to direct install or mail-in rebate programs through which measures are expected to be installed immediately at the time of participation.

Lifetime electrical energy savings	The electrical energy savings that occur over the lifetime of an energy efficiency measure. Lifetime electrical energy savings account for the effective useful life of a measure and any increase in the baseline efficiency level (which reduces attributable annual savings) over its lifetime.
Line loss factor	The multiplier to convert savings at the customer meter to savings at the utility generator. It accounts for the electrical losses of the transmission and distribution system.
Margin of error	The amount of random sampling error.
Market effects	The impact of a program on the market (in terms of product availability, practices, and prices) and that extends beyond changing program participant behaviours. Market effects include spillover among non-participants.
Net savings	Electrical energy or peak demand savings that can be reliably attributed to a program. These include effects such as free-ridership and spillover that negatively or positively affect the savings attributable to a program.
Net-to-gross ratio	The ratio of net electrical energy savings to gross electrical energy savings.
Non-sampling error	Errors arising during the course of all survey activities other than sampling. Non-sampling errors tend to lead to bias in measurements and are very difficult to quantify.
Peak coincidence factor	The percentage of measure demand savings that coincides in time with the annual peak demand of the entire electricity system.
Peak demand savings	The demand savings that coincide in time with the expected annual peak demand period of the entire electricity system. For industrial participants on an interruptible rate, peak demand savings may include savings on non-firm loads, i.e. loads that may be interrupted when NS Power's 10-minute reserve is low.
Precision	The extent to which repeated measurements agree with one another.
Random sampling error	An error in measurement due to the fact that measurements are taken from a subset of the population and not the entire population.
Realization rate	The ratio of evaluated savings to tracked savings.
Sample size	The number of observations or replicates included in a statistical sample.
Secondary market impacts	The energy consumption of appliances that would have been transferred to the secondary market if said appliances had not been retired.
Spillover	Savings attributable to participants who implement additional an energy efficiency measure(s) introduced by a program after participating in it once and without participating in the program a second time.
Tracked savings	Gross and net savings calculated based on various parameters such as number of participants or units installed or sold, unitary savings values, installation rates, interactive effects, and net-to-gross ratios. Those parameters, with the exception of the number of participants or units installed or sold, are obtained from the previous evaluation.
Unitary savings	Electrical energy or peak demand savings established on a unitary basis. A unit can either be a product (e.g. an 8 W LED lamp), a capacity (e.g. one tonne capacity of an air-source heat pump), or a participant (e.g. one participant taking part in a behaviour-based program).



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EXECUTIVE SUMMARY

This report presents the 2025 demand-side management (DSM) results of the Demand Response (DR) program administered by EfficiencyOne (E1). This program is comprised of two components: Residential DR and Business, Non-profit, and Institutional (BNI) DR. Residential DR generated available DR capacity through the Eco Shift pathway, while BNI DR generated available DR capacity through the Smart Synergy pathway. Combined, these program components encourage homeowners and businesses to reduce their electric loads during peak events called by Nova Scotia Power (NS Power) by providing financial incentives for the DR capacity made available for those events.

Evaluation Approach

The 2025 evaluation was aimed at calculating program component results, namely new and total available DR capacity. Table 1 summarizes the types of evaluation conducted for each program component and the corresponding methodology.

Table 1: Summary of 2025 Demand Response Program Evaluation

Program Component	Evaluation Type			Methodology
	Process	Market	Impact	
Residential Demand Response	X		Comprehensive	› Non-participant survey › Program staff interviews › Service provider/technical partner interviews › Jurisdictional scan (interviews with staff from select jurisdictions) › Tracking sheet audit › Metering data analysis by measure type › Calculations using evaluation results
BNI Demand Response			Comprehensive	› Tracking sheet audit › Project reviews › Calculations using evaluation results

Program Performance

Table 2 presents the participation levels and evaluated new and total available DR capacity for each program component and for the Demand Response program as a whole.

Table 2: Overall 2025 Demand Response Participation and Evaluated Results

	Participation Level		Evaluated Results	
	Value	Unit	Value	Unit
Residential DR				
Available DR Capacity	3,676	Participants	0.854	MW
BNI DR				
Available DR Capacity	143	Participants	5.941	MW
Total				
Available DR Capacity			6.795	MW

For 2025, Demand Response was aimed at achieving 17.861 MW in available DR capacity at the generator. The program fell short of the planned total available DR capacity since both Residential DR and BNI DR did not meet targets. BNI DR continued to be the largest contributor to program available DR capacity.

The following subsections present evaluation results at the program component level.

Residential DR Findings and Recommendations

This subsection presents the key findings and recommendations from the 2025 Residential DR evaluation. The recommendations are also outlined in Appendix VII.

2025 Res DR-Finding: Residential DR offers a comprehensive mix of eligible device types compared to other jurisdictions. All reviewed programs offer smart thermostats, with five out of nine jurisdictions offering electric vehicle (EV) chargers, home batteries, and hot water controllers.

2025 Res DR-Finding: Service providers indicated that the program component is running smoothly from their perspective and the relationship with E1 is positive and collaborative.

2025 Res DR-Finding: For the 2024/25 DR season,¹ all four Residential DR device pathways, including the Domestic Hot Water Direct Load Control (DHW DLC) pathway that used to be operated separately, were integrated into a streamlined offer from the participant perspective and externally named Eco Shift.

2025 Res DR-Finding: Lessons learned in delivering Residential DR have led to necessary updates to the program design, including component offerings, eligibility criteria, and the enrollment process. As the program component matures, eligibility and enrollment have been refined, with slower future growth expected due to the need for extended testing and pilot phases to validate reliable demand reductions and clearly demonstrate participant value.

¹ Uses of the term 2024/25 herein refer to the DR season while uses of the term 2025 refer to the evaluation year.



2025 Res DR-Finding: Program documentation has not kept pace with program changes. Residential DR information is blended with BNI DR information in the program manual, without clear delineation between sectors.

2025 Res DR Recommendation 1: Include all changes to the pilot and program in the program manual, including historical changes since the pilot was launched. Include dates of all changes, a description of the change, along with the rationale for the change. Clearly define all eligibility criteria by pathway in the program manual. Reorganize the demand response program manual to create two distinct and continuous sections for residential and BNI given key differences in the approach by sector for demand response initiatives.

2025 Res DR-Finding: Residential DR participation increased substantially during the 2024/25 DR season, reaching 3,676 participants and 11,405 enrolled devices across all four pathways, an increase of 907% compared to 2023/24 levels. Smart thermostats remained the most common device with 10,200 enrolled units, followed by 1,002 DHW controllers, 191 EV telematics and chargers, and 12 batteries.

2025 Res DR-Finding: In 2025, Residential DR generated available DR capacity of 0.854 MW at the generator, thus not reaching the planned available DR capacity of 7.135 MW despite the substantial increase in participation.

2025 Res DR-Finding: Residential DR service providers report that participant retention is high, with over 90% of participants remaining enrolled over the long-term.

2025 Res DR-Finding: Similarly to other jurisdictions, E1 leverages energy efficiency programs, notably Efficient Product Installation (EPI), to create a channel of DR participants, although the absence of a unique identifier across both program components and inconsistent collection of device information by installers lead to gaps in enrollment tracking, indicating that the process could be fine-tuned.

2025 Res DR/EPI Recommendation 2: Ensure that participant data and the information collected through the EPI installation process are complete and accurate. Ensure EPI installers properly and accurately record device information to ensure connectivity in Residential DR after device installation. Program component tracking sheets should be linked via a unique participant identifier between EPI and Residential DR to allow for enrollment monitoring. This would enable E1 to automate identifying EPI participants that encounter issues with enrolling in Residential DR and provide timely enrollment support to those participants.

2025 Res DR-Finding: Non-participants identified incentives and contributing to peak demand reduction in Nova Scotia as key perceived benefits, while enrollment challenges, discomfort with external control of heating systems, privacy concerns, and limited understanding of demand response were identified as key barriers to participation. This feedback can be leveraged to enhance program messaging and communications as well as increase participation.

2025 Res DR Recommendation 3: Leverage key awareness channels to increase program participation in Residential DR within and without the current and past EPI participant population. Focus key messaging on program benefits, including available incentives and contributing to reducing strain on the grid, while clearly outlining privacy protection mechanisms and the flexibility and control that participants maintain over their devices once enrolled. Clearly define how Residential DR works, the importance of participating in events, and how to achieve ongoing participation incentives (participation in 50%+ of DR events).

2025 Res DR-Finding: Maximizing the number of devices enrolled per household was unanimously shared as a key strategy for the program component moving forward.



2025 Res DR-Finding: Participants and service providers provided information on communication strategies and event design that may reduce DR event opt-out rates, which include post-event communications, improved educational and engagement initiatives, and better alignment of event design with EV participant behaviours.

2025 Res DR-Finding: Despite strong enrollment, not all devices participated in every event due to ongoing enrollment, connectivity issues, device availability, and opt-outs. As a result, participation rates varied significantly by pathway:

- › DHW controllers participated at an average rate of 22.5% mostly because of connectivity issues.
- › Batteries participated at an average rate of 63.2% due to both connectivity issues in the first event and opt-out rates in other events.
- › EV devices participated at an average rate of 2.9% mainly because of device availability since EVs must be actively charging during the event window to reduce loads.
- › Thermostat participation rates were implicitly accounted for through a statistical regression approach.

2025 Res DR Recommendation 4: Through continuous engagement with enrolled participants, encourage participation in DR events and enrollment of more devices per household (additional device types and additional smart thermostats installed on heating systems in all contiguous living areas in regular use only).

2025 Res DR Recommendation 5: Investigate ways to improve EV device potential for DR considering the low participation rate in DR events. To improve participation, consider additional opportunities for EV devices to participate in DR events, such as leveraging bidirectional chargers to use EVs as batteries during events.

2025 Res DR-Finding: Incentive levels and structures vary across researched North American jurisdictions. Residential DR incentive levels are comparable on average.

2025 Res DR-Finding: Residential DR offered participation incentives to all participants regardless of participation levels in DR events in the 2024/25 DR season. Beginning in the 2025/26 season, participation incentives will be issued only to participants who participate in 50% or more of the events within a season.

2025 Res DR Recommendation 6: Monitor the impact of introducing a participation threshold to qualify for ongoing participation incentives. Should event participation rates not improve in the 2025/26 DR season, consider reviewing the Residential DR incentive structure and levels. In that review, consider both the incentive structure in terms of the enrollment incentive level compared to the ongoing participation incentive level and the effectiveness of the 50% participation threshold to qualify for ongoing participation incentives to encourage higher DR event participation rates. Ensure that the incentive structure encourages enrollment growth and increases ongoing DR event participation as both strategies are required to achieve targets in DR programs.

2025 Res DR-Finding: While reliable unitary available DR capacity values were established to obtain the 2025 evaluated results, further analyses are needed to ensure that these values remain consistent year over year. This is particularly important given the notable differences between 2024 and 2025 evaluation results for the Smart Thermostat Direct Load Control (DLC) pathway and the fact that the EV Telematic and Charger Control and Battery Control pathways were evaluated for the first time in 2025.

2025 Res DR Recommendation 7: To ensure that the unitary available DR capacity values are consistent year over year, reconduct metering data analyses for each pathway in the next evaluation if the required data are available.



2025 Res DR-Finding: The evaluated available DR capacity for Residential DR was 58% higher than the value tracked by E1. This difference is mainly due to the higher unitary available DR capacity values established for smart thermostats, with only minor differences for other pathways.

BNI DR Findings and Recommendations

This subsection presents the key findings and recommendations from the 2025 BNI DR evaluation.

2025 BNI DR-Finding: In 2025, BNI DR available DR capacity at the generator amounted to 5.941 MW. Therefore, BNI DR did not reach the target of 10.726 MW in available DR capacity.

2025 BNI DR-Finding: DR events that occur in the morning, on average, generate more available DR capacity than events that occur in the evening. On average, BNI DR generated 6.774 MW in available DR capacity during morning events compared to 4.928 MW during evening events.

2025 BNI DR-Finding: Participation increased by 88% from 76 participants in the 2023/24 DR season to 143 participants in the 2024/25 season. Conversely, the available DR capacity per participant decreased from 106 kW in 2023/24 to 42 kW in 2024/25. This decrease is largely due to the lack of participation in events by enrolled participants, with reviewed event non-participation increasing from 31% in 2023/24 to 60% in 2025.

2025 BNI DR Recommendation 1: Conduct a process evaluation in 2026 to determine strategies to increase the enrolled participant rate of participation in events.

2025 BNI DR-Finding: The BNI DR available DR capacity calculation guidelines developed by E1 were generally followed in 2025 and reflect the changes recommended by the Evaluator pursuant to the 2024 evaluation. The Evaluator project reviews resulted in modest downward adjustments to available DR capacity estimates, primarily where participant response was not evident in event load profiles.

2025 BNI DR-Finding: The use of a stratified sample of meters for project reviews enabled the Evaluator to establish reliable adjustment ratios and produce accurate evaluated available DR capacity results for 2025. The adjustment ratios differed from those observed in the previous evaluation, indicating that these ratios should not be assumed to remain stable year over year.

2025 BNI DR Recommendation 2: Conduct project reviews again in 2026 to establish evaluated savings.

2025 BNI DR-Finding: The evaluated available DR capacity was 11% lower than the value tracked by E1. This difference is due to the adjustments made through the project reviews.

Program Tracked and Evaluated Savings

Table 3 below presents a comparison of E1 tracked available DR capacity and evaluated results, as well as the realization rate, which represents the ratio of evaluated available DR capacity to tracked results.

**Table 3: Comparison of 2025 Demand Response Tracked and Evaluated
Available DR Capacity at the Generator**

		Available DR Capacity		Realization Rate
		Value	Unit	
Residential DR	Available DR Capacity			
	Tracked by E1	0.540	MW	158%
	Evaluation Results	0.854	MW	
BNI DR	Available DR Capacity			
	Tracked by E1	6.648	MW	89%
	Evaluation Results	5.941	MW	

INTRODUCTION

EfficiencyOne (E1), an independent, non-profit organization, is responsible for helping Nova Scotians improve the energy efficiency of their homes and workplaces by designing, marketing, and delivering demand-side management (DSM) for Nova Scotians. E1 provides energy efficiency, demand response (DR), and carbon mitigation services through the Efficiency Nova Scotia (ENS) franchise. Regulatory oversight of its DSM activities is provided by the Nova Scotia Energy Board (NSEB). E1 receives funding for its electricity DSM activities from Nova Scotia Power (NS Power) ratepayers.

E1 has a DSM portfolio of three residential programs, three business, non-profit, and institutional (BNI) programs, and one DR program that are marketed to Nova Scotians through the ENS franchise. Each program has one or more program components. E1 commissioned Econoler to evaluate its 2025 DSM program portfolio.

This evaluation report relates to the DR program comprised of the Residential DR and BNI DR program components. Residential DR is branded as Eco Shift, while BNI DR is branded as Smart Synergy.

Table 4 lists the DR program components and the types of evaluations conducted in 2025.

Table 4: Types of Evaluations Conducted for Each Program Component, 2025

Program	Program Component	Pathway	2025		
			Process	Market	Impact
Demand Response	Residential Demand Response (DR)	Eco Shift	X		Comprehensive
	BNI Demand Response	Smart Synergy			Comprehensive

For the DR program, the Evaluator prepared this DSM evaluation report presenting key findings as well as the savings generated through DR initiatives, which are presented in terms of available DR capacity corresponding to the total DR capacity that was available during the evaluated period. The new available DR capacity is also presented in this report; it corresponds to added available DR capacity compared to the previous year.

Available DR capacity differs from peak demand savings reported in other DSM evaluation reports since the former considers the load reduction that was made available by participating devices during the events called for the DR season instead of the load reduction that coincided with the utility peak period. This distinction was made since E1 does not control the calling of events and, thus, does not control how the resources made available to NS Power are used to reduce peak demand.

Available DR capacity is evaluated based on events called from December to February, excluding weekends and holidays. Events called at any time during the day (morning or evening) are included. Available DR capacity is measured over the first two hours of a DR event and is evaluated on a per-participant basis based on the average demand reduction observed for each event in which the participant took part regardless of whether events are in the morning or evening. E1's total available DR capacity is the sum of each participant's available DR capacity. In addition, reported available DR capacity corresponds to events that occurred during the winter and that ended during the evaluated year, e.g. the 2025 available DR capacity corresponds to the DR capacity made available between December 2024 and February 2025 inclusively. Throughout this report, this period is referred to as the 2024/25 DR season.

1 Residential DR Overview

This section describes the Residential DR program component, follows up on past evaluation recommendations, and provides an overview of Residential DR participation history.

1.1 Residential DR Description

In 2023, E1 officially launched Residential DR. Since the fall of 2020, E1 has implemented several initiatives focused on reducing demand during the Nova Scotia peak period.

The Residential DR program component provides NS Power with available DR capacity through four pathways: 1) Smart Thermostat Direct Load Control (DLC) for Electrically-heated Homes; 2) Electric Vehicle (EV) Telematic and Charger Control; 3) Battery Control; and 4) Domestic Hot Water Direct Load Control (DHW DLC).

To be eligible for a Residential DR program component pathway, participants must: 1) Be a NS Power customer and responsible for the account; 2) not be enrolled on the time-of-day rate; 3) have an eligible device(s) that is(are) owned by the participant, electrically powered, commonly operated between December and February, and consistently connected to the Internet; and 4) not be enrolled in another E1 DR program.

The Residential DR incentives are outlined in Table 5 below.

Table 5: Summary of Residential DR Incentives

Device Pathway	Enrollment Incentive	Ongoing Participation Incentive
Smart Thermostat DLC	\$25 for one thermostat and \$20 for each additional thermostat (up to \$105)	\$30/year
EV Telematic and Charger Control	\$50	\$50/year
Battery Control	\$500	\$300/kW averaged across all DR events within a year
DHW DLC	N/A	\$20/year

Note that, for the 2025/26 DR season, E1 will issue ongoing participation incentives to those who participate in 50% or more of all DR events. Of note, this update to the program component incentive structure was not in place in the 2024/25 DR season, the period included in this evaluation.

For the first three pathways listed in the table above, Residential DR is a bring-your-own-device program, with smart thermostats also being installed through the Efficient Product Installation (EPI) program component.² The technical partner Virtual Peaker provides the software that serves to control participating devices. When NS Power calls DR events, participating devices are remotely controlled via Virtual Peaker to reduce their loads. For example, smart thermostat setpoints are reduced and EV chargers stop charging if the EV battery is above 50% of its capacity. CLEAResult is the service provider that manages Residential DR for those pathways, notably by managing enrollment, coordinating incentive payments, and facilitating coordination between E1 and Virtual Peaker.

² As of May 2025, EPI participants who receive a smart thermostat are required to enroll in Residential DR. Beginning in August 2024, the option was recommended to all EPI participants, although enrollment in Residential DR was not mandatory until May 2025.



For the DHW DLC pathway, installation services are provided through the EPI program component offered by E1. The technical partner, Shifted Energy, provides the controllers to be installed as well as technical support. E1 manages the other aspects of the program such as enrollment and incentive payments.

DHW DLC participants are not notified of an event call. Other participants are notified prior to 4 p.m. the day before an event. EV participants are also notified 15 minutes before an event. All participants are notified once an event has ended. Participants may opt out of any event. Events can last from two to four hours and be called any time between 7 a.m. and 11 a.m. or between 5 p.m. and 9 p.m. on non-holiday weekdays, and events cannot be called more than once per day. As presented in Table 6, NS Power called eight events during the 2024/25 DR season.

Table 6: Residential DR 2024/25 Event Summary

Event #	Date	Start Time	Duration (Hours)	Outdoor Temperature at Event Start (°C)
1	12-04-2024	5 p.m.	4	-3
2	12-20-2024	7 a.m.	4	-3
3	12-23-2024	5 p.m.	4	-8
4	01-21-2025	5 p.m.	4	-8
5	01-22-2025	7 a.m.	4	-13
6	02-05-2025	5 p.m.	4	-12
7	02-06-2025	7 a.m.	4	-13
8	02-12-2025	5 p.m.	4	-6

For Residential DR, an enrolled device corresponds to a device that was ready to be controlled during an event, yet it was not necessarily controlled, i.e. not all thermostat setpoints were necessarily reduced. A participating device corresponds to a device that was controlled during an event.

Residential DR was aimed at generating 7.135 MW in available DR capacity at the generator in the 2024/25 DR season.

1.2 Follow-up on Past Evaluation Report Recommendations

The Evaluator evaluated Residential DR in 2023 and 2024 and issued improvement recommendations. Table 7 below outlines the status of those recommendations that were carried forward.

Table 7: Implementation Status of Past Recommendations for Residential DR

#	Recommendation	Status	Comments
2023 – Res-DR-R1	Ensure that available DR capacity tracked by E1 includes the in-service rate as well as the unitary available DR capacity values	Complete	E1 agrees with this recommendation. In-service rates and unitary available DR capacity values were tracked for the 2024-2025 heating season and have been integrated in regular tracking for upcoming DR seasons.
2024 – Res-DR-R1	Gather and analyze Eco Shift Pilot data again in 2025 to improve the accuracy of unitary available DR capacity values and ensure they are consistent over multiple years	Complete	E1 agrees with this recommendation. In the 2025 evaluation, the Evaluator established the available DR capacity generated from smart thermostats, EV telematics and chargers, and battery control devices. For smart thermostats, the Evaluator updated the unitary available DR capacity using the same metering data analysis methodology as that of the previous evaluation. For EV telematics and chargers and battery control devices, the Evaluator quantified the available DR capacity through metering data analysis and developed models that predict the expected average hourly load per participant and compared the expected and actual hourly loads during DR events. For DHW DLC devices, the Evaluator relied on the unitary available DR capacity established in the 2023 evaluation. Further details are provided in the 2025 DSM Demand Response Program Evaluation report to be filed with the Nova Scotia Energy Board on March 31, 2026.

1.3 Participation History

For Residential DR, participation is defined as the number of households participating in each technology pathway. Therefore, a household participating in both the Smart Thermostat DLC and EV Telematic and Charger Control pathways would count as two participants.

As presented in Figure 1 and Figure 2 below, there were 3,676 participants in Residential DR in the 2024/25 DR season, with a total of 11,405 enrolled devices. In 2024/25, participation in all four pathways increased, resulting in a 907% increase in participants enrolled in Residential DR compared to 2023/24 levels. Smart thermostats continued to be the most enrolled device type, representing 89% of the enrolled devices.

Figure 1: Overview of Residential DR Participation, 2021/22-2024/25

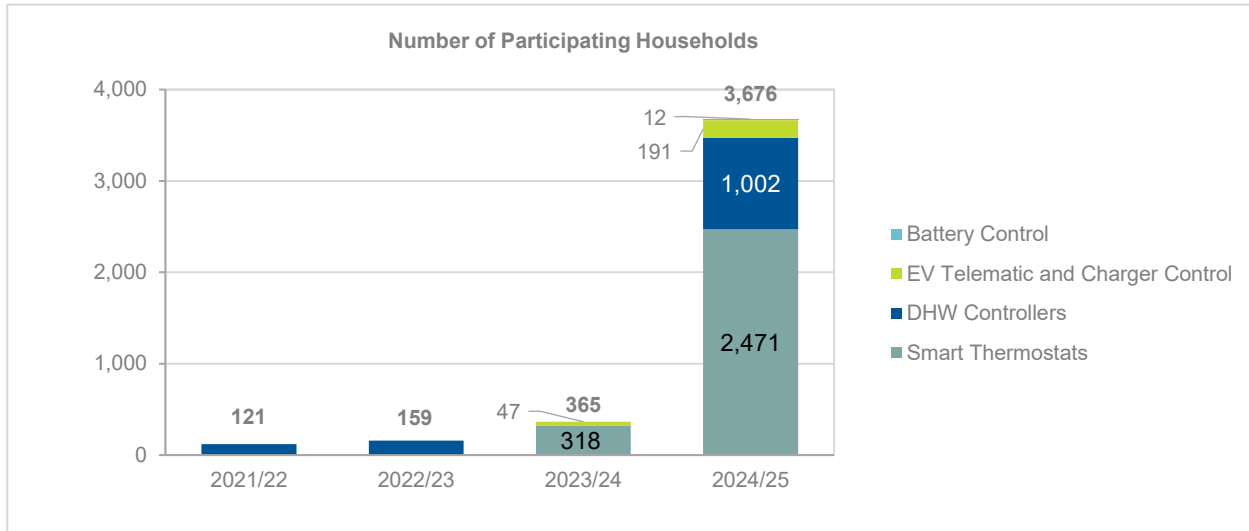
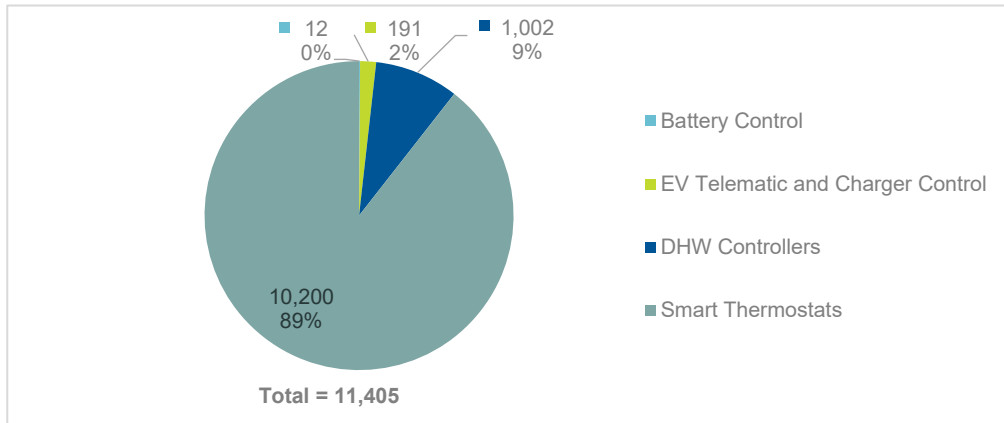


Figure 2: Residential DR Number of Enrolled Devices, 2024/25



Since participants continued to enroll throughout the DR season and they could opt out of any event, not all enrolled devices participated in each event. Table 8 below presents the number of devices enrolled in each event as well as at the end of the DR season. Moreover, connectivity issues and device availability meant that not all enrolled participants actually participated in each event; the number of devices that participated is discussed in Subsection 4.2.1 further below.

Table 8: Residential DR Device Enrollment Throughout the 2024/25 DR Season

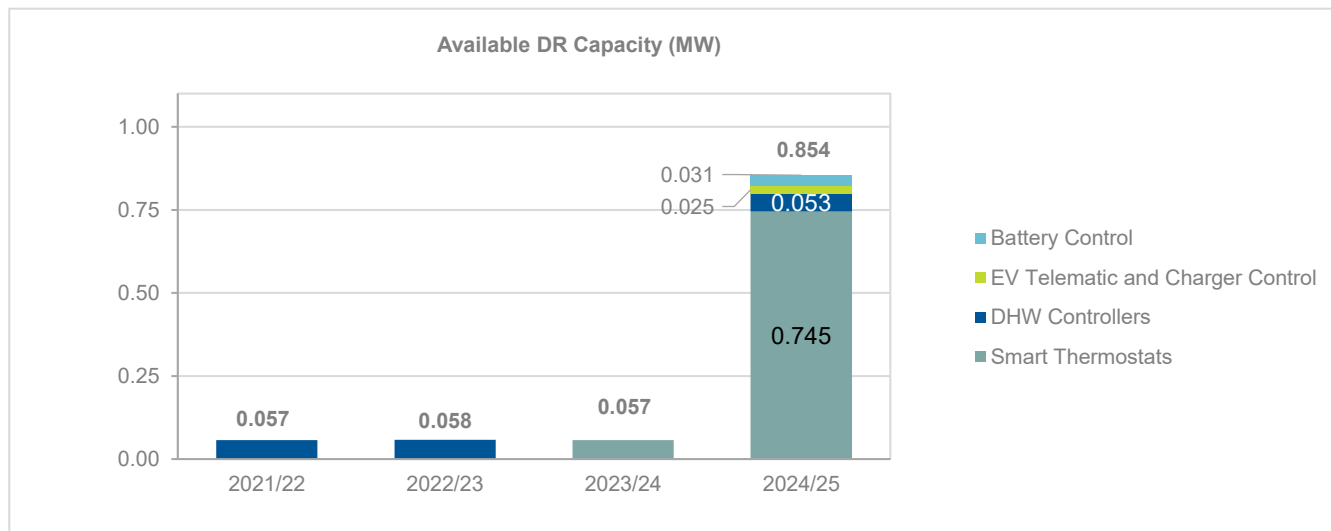
Event #	Event Date	Number of Devices Enrolled per Event				
		Smart Thermostats	DHW Controllers	EV Telematic and Charger Controls	Battery Control	Total
1	12-04-2024	3,066	-*	174	11	3,251
2	12-20-2024	4,567	-*	175	12	4,754
3	12-23-2024	4,846	-*	178	12	5,036
4	01-21-2025	8,017	781	184	12	8,994
5	01-22-2025	8,184	820	183	12	9,199
6	02-05-2025	9,374	926	193	12	10,505
7	02-06-2025	9,396	936	191	12	10,535
8	02-12-2025	9,886	1,002	191	12	11,091
End of Season		10,200	1,002**	191**	12**	11,405

* Due to issues during the three first events, no DHW controllers could have been called to reduce their load. To align with the definition of an enrolled device provided in Subsection 1.1 above, DHW controllers were considered enrolled only after Event 3.

** For DHW controllers, EV telematics and charger controls, and battery controls, it was assumed that the number of enrolled devices at the end of the DR season matched the number of enrolled devices during the last event of the season since no enrollment data were available past this date.

Figure 3 below presents the evolution of Residential DR available DR capacity since 2022. Following the large increase in participation, available DR capacity considerably increased in 2025. Smart thermostats had the largest contribution to available DR capacity in 2025.

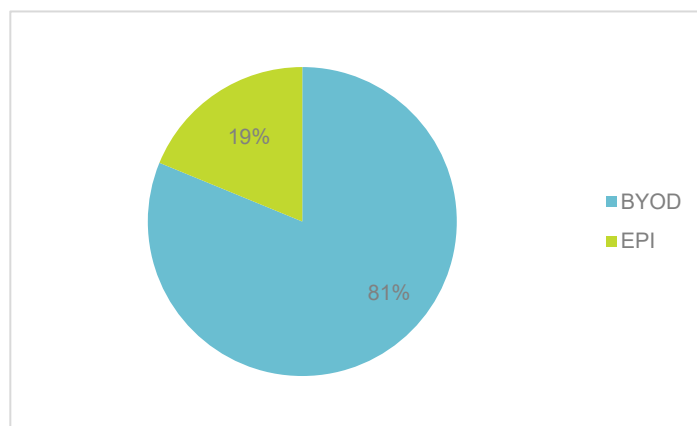
Figure 3: Evolution of Residential DR Available DR Capacity at the Generator, 2021/22-2024/25



1.3.1 Participation by Enrollment Pathway

Figure 4 below outlines participation in Residential DR for Smart Thermostat DLC by the Bring Your Own Device (BYOD) and EPI enrollment pathways. In 2025, 81% of Residential DR Smart Thermostat DLC participants enrolled through the BYOD pathway, while 19% had a free smart thermostat installed through EPI and were then enrolled in Residential DR.

Figure 4: 2025 Participation in Residential DR for Smart Thermostat DLC by enrollment pathway



The Evaluator compared the EPI program tracking sheet with the Residential DR program tracking sheet and estimates that approximately 40% of EPI participants who had a smart thermostat installed did not successfully enroll in Residential DR in the 2024/25 DR season.

Given the absence of a unique identifier linking the 2024 EPI participant tracking sheet with the 2025 Residential DR tracking sheet, a matching exercise using secondary fields such as email address, phone number, or account address was completed to arrive at results presented below. As a result, the results presented should be considered indicative only and are intended to provide an order-of-magnitude estimate rather than precise counts.

2 Residential DR Evaluation Approach

The 2025 Residential DR evaluation consisted of a comprehensive impact evaluation and a process evaluation. The main objectives of the overall 2025 Residential DR evaluation were as follows:

- › Collect feedback from program staff, service providers, other jurisdictions, and non-participants on increasing/maintaining participation along with opportunities for operational improvements.
- › Calculate Residential DR results, namely new and total available DR capacities

The Evaluator identified key research questions aimed at achieving the above objectives. Table 9 outlines the Residential DR evaluation objectives and maps them to the research questions, methods, and sample sizes (n). Each method is described further below.

Table 9: 2025 Residential DR Evaluation Approach

Evaluation Objectives	Research Questions	Methodology
Collect feedback from program staff, service providers, other jurisdictions, and non-participants on increasing/maintaining participation along with opportunities for operational improvements	› What is the level of program awareness among non-participants? › What do non-participants see as the potential benefits for taking part in the program component? › What are the key barriers to participation among non-participants? › How can program communications and marketing be improved to attract more participants? › What key operational improvements could be implemented to achieve delivery efficiencies from a program administrator perspective? Are there opportunities for further process automation? (Lessons learned from other jurisdictions) › What processes and resourcing (internal and external) do other jurisdictions have in place for similar scale residential demand response programs? › What would increase participation in the program component and in individual events? What participant retention methods are recommended? › What works well and what are the key challenges for the program component? How could E1 improve the program component? › What are the challenges and opportunities for the program component? (In the short, medium, and long terms)	› Non-participant survey (n=103)³ › Program staff interview (n=1) › Service provider/technical partner interviews (n=2) › Jurisdictional scan (interviews with select jurisdictions) (n=2)

³ In July 2025, Narrative Research conducted a satisfaction survey of participants (n=831) in each of the Residential DR program component pathways (Smart Thermostat DLC, EV Telematic and Charger Control, Battery Control, and DHW DLC). Given how recent the satisfaction survey was and the large sample size achieved, the Evaluator focused on non-participant perspectives and a scan of similar programs in other North American jurisdictions for the 2025 process evaluation.

Evaluation Objectives	Research Questions	Methodology
Calculate available DR capacity results	For each pathway: › Are the data in the tracking sheet complete, accurate, and consistent? › What is the unitary available DR capacity value that should be used for each DR measure? › Did participants' systems respond to all DR events? What is the in-service rate? For each pathway and the program component: › How is available DR capacity tracked? What would be the best way to track available DR capacity in future years? › What was the average available DR capacity achieved by all participants during DR events? › What was the average hourly available DR capacity achieved by all participants during DR events? › How do evaluated demand response calculations compare to the estimates tracked by E1? › What is the persistence (effective useful life [EUL]) of the available DR capacity achieved by Residential DR? › What are the new and total available DR capacities achieved by Residential DR?	› Tracking sheet audit › Metering data analysis by measure type › Calculations using evaluation results

Non-participant Survey

In November and December 2025, Narrative Research conducted a web survey with a total of 103 non-participants. The average length of the survey was six minutes. The sample was created based on 2024 Efficient Product Installation (EPI) participants who received a free smart thermostat but did not enroll in Residential DR. The questionnaire used is presented in Appendix I, while complete survey results are outlined in Appendix II. Drawing a random sample of 103 participants from a population of 1,337⁴ yields a margin of error of 7.8% at a 90% confidence level.

Interviews with Service Providers

In November 2025, the Evaluator conducted interviews with two service providers⁵ involved in Residential DR to obtain their perspectives on the program component, with a focus on operational improvements. The guide used for the service provider interviews is presented in Appendix III.

Jurisdictional Scan and Interviews with Selected Jurisdictions

In November 2025, the Evaluator performed a scan across nine jurisdictions throughout Canada and the United States (US) to identify strategies that enhance operational efficiency when scaling programs from the pilot phase to the full implementation phase. In December 2025, the Evaluator also conducted interviews with two selected Canadian jurisdictions to gather insights on best practices and lessons learned. The jurisdictional scan and interviews findings are discussed in Subsections 3.6 and 3.7 below.

⁴ EPI participants who opted out from receiving further communications, along with those who received a satisfaction survey, were excluded.

⁵ Interviews were completed with CLEAResult (service provider for Smart Thermostat DLC, Battery Control, and EV Telematic and Charger Control pathways) and Shifted Energy (service provider for Domestic Hot Water DLC pathway). Virtual Peaker is responsible for running the demand response events for the Smart Thermostat DLC, Battery Control, and EV Telematic and Charger Control pathways. An interview with Virtual Peaker was not included in the scope of this evaluation as CLEAResult manages the participant experience with the program component.



Tracking Sheet Audit

Prior to performing the available DR capacity calculation review, the Evaluator audited the final 2025 tracking sheet to ensure it was complete and the entered data were consistent. The results obtained are presented in Appendix IV.

Metering Data Analysis

To establish the available DR capacity generated from smart thermostats, the Evaluator updated the unitary available DR capacity using the same metering data analysis methodology as the previous evaluation. The Evaluator analyzed the available participant whole-house consumption meter data and established a unitary available DR capacity value per participant, which was then converted to a unitary available DR capacity per thermostat and multiplied by the number of enrolled thermostats. Whole-house data were preferred to device-level data since they included interactive effects. The detailed methodology and results obtained are presented in Subsection 4.2.2.

No new metering data analysis was conducted for DHW controllers in 2025. The Evaluator relied on the unitary available DR capacity value established in the 2023 Residential DR evaluation, which had been established using device-level data since no significant interactive effects are expected for this measure and reliable data were available. A new in-service rate was established in 2025 since implementation issues occurred making the previous in-service rate not suitable for the 2025 evaluation.

For EV telematics and chargers, the Evaluator used device-level data to establish the consumption during and after the event and calculate what would have been drawn from the grid during the event in the absence of the program's intervention, which represents the unitary available DR capacity. Device-level data were used since no significant interactive effects are expected for this measure. The detailed methodology and results obtained are presented in Subsection 4.2.2.

For battery control, the Evaluator used device-level data to establish the battery discharge during the event window, which counted as available DR capacity as long as no charging occurred during the event windows. This assumes that any load met by the battery would have been met by the grid; this assumption was validated by determining if batteries are regularly used outside of event times using the device-level data. Device-level data were used since no significant interactive effects are expected for this measure. The detailed methodology and results obtained are presented in Subsection 4.2.2.

Calculations Using Evaluation Results

Building on all the above methods and collected data, the Evaluator calculated the amount of available DR capacity as per the calculation methodology presented in Section 4 below.

Note on Margins of Error

For evaluation activities that yield quantitative results based on a sample, the Evaluator typically aimed to achieve a maximum margin of error of 10% at a confidence level of 90%. This means that, if measurements were conducted many times with different samples, the data would be within 10 percentage points above or below the percentage reported 90% of the time. Thus, the margin of error indicates the relative level of precision⁶ of a measurement, while its associated confidence level indicates the probability of a measurement falling within the margin of error.

⁶ Precision refers to how reproducible a set of measurements is. Moreover, it does not consider how close the measured values are to the true values; this would refer to accuracy.



As part of the Residential DR evaluation, the Evaluator calculated the margins of error for the unitary and per-event available DR capacities. Although the entire populations of devices were included in the analyses, they were considered samples since the unitary savings are intended to be used for future program years. The margins of error are listed alongside results in the applicable sections herein. Examples of calculations used to establish margins of error are provided in Appendix II of the 2025 DSM Programs Evaluation Executive Summary document.



3 Residential DR Process Evaluation

This section presents the findings from the process evaluation of Residential DR, beginning with a summary of the findings of the program documentation review conducted by the Evaluator as well as non-participant awareness levels and their perspectives on perceived program benefits and barriers. Details on the findings from the non-participant survey are then presented, followed by a summary on the perspectives shared by program service providers. This section concludes with a presentation of the results of a jurisdictional scan of nine Residential DR programs in North America.

3.1 Existing Research and Documentation Review Findings

3.1.1 Participant Satisfaction Survey (July 2025)

E1 contracted Narrative Research to perform a customer satisfaction survey in July 2025. Narrative Research shared the survey customer satisfaction (CSAT) results with the Evaluator to enable the latter to consider these in the 2025 Residential DR process evaluation. The satisfaction survey included a sample of Residential DR participants (n=831)⁷ in each of the Residential DR program component pathways (Smart Thermostat DLC, Battery Control, EV Telematic and Charger Control and DHW DLC). The survey was in field from May 9 to June 25, 2025, with results reported in July 2025. This survey provides results utilized for internal E1 reporting purposes. The survey results indicate a strong level of satisfaction with events (80% satisfaction rating between 7-10 on a 10-point scale) among participants in all pathways. Survey findings also indicate that participants who are confused about demand response are less likely to be satisfied with the program component. Top sources of program awareness shared by participants were E1 marketing emails (35%) and through device manufacturers (19%). Participants were also asked about their likelihood of recommending Residential DR to others⁸ resulting in a positive Net Promoter Score (NSP) of 39 in 2025.

This participant satisfaction survey report also provides key information that may improve event opt-out rates. As an example, participants indicated that DR events that take place in the morning hours are preferred. Over half of participants (57%) also indicated they would be interested in receiving a post-event participation notification.

Participants were also asked about additional eligible devices in their household that could be enrolled in Residential DR. Four in 10 participants indicated that they have an eligible and operational smart thermostat that is not currently enrolled in the program. Among the 40% of participants who have further eligible devices, nearly four in 10 (37%) stated they were unsure of the process for enrolling additional devices when asked why they have not enrolled additional devices in Residential DR.

⁷ 31% response rate.

⁸ The NPS is calculated by subtracting the percentage of participants who provided a score of 0-6 (detractors) when asked their likelihood to recommend the program to others from the percentage of those who provided a score of 9-10 (promoter). As such, a positive NPS indicates a surplus of promoters relative to detractors.



3.1.2 Operational Review Workshop Results (April 2025)

CLEAResult (the service provider for the Smart Thermostat, EV, and Battery pathways) facilitated a workshop on April 14, 2025 focused on the second DR season (2024/25). The workshop was a debrief session attended by CLEAResult, E1, and NS Power and was focused on potential future program improvements. The workshop served to summarize key highlights from the 2024/25 DR season, including but not limited to the growth of the Residential DR in terms of new enrollments (highlighted in the participation findings, see Subsection 1.3), the success of manufacturer integrations, and the operations of the eight events that took place. The workshop action items following the brainstorming activities included several items such as a focus on existing device management by ensuring connectivity, development of a participant education plan to increase engagement, and work with device manufacturers to amplify educational messaging and request more data and metrics from distributed energy resource management system (DERMS) providers. The third season (2025/26) workshop will include the Evaluator.

3.2 Recent Residential DR Program Component Changes

During staff interviews, it was noted that participant eligibility criteria have been changed as the program component has evolved and, while EPI participants are now required to enroll in Residential DR when they receive a free smart thermostat, this is a recent change. The Evaluator ascertained these details through a series of interviews. The program manual that includes both residential and BNI demand response information combined into one document does not include a log of program changes or all current details on participant eligibility.

3.3 Non-participant Perspectives

3.3.1 Non-participant Recruitment

To gather feedback from the non-participant perspective, the Evaluator conducted a survey among Efficient Product Installation (EPI) participants who received a smart thermostat in 2024 but who had not enrolled in Residential DR.⁹ The Evaluator notes that there was not a unique identifier present linking the EPI and Residential DR program participant tracking sheets, which led to difficulties in identifying with certainty EPI participants who did not enroll in Residential DR.

Among all respondents, two-thirds (66%) of EPI participants confirmed through the survey that the smart thermostat(s) they received from the EPI program is(are) not enrolled in Residential DR. Two in 10 (20%) indicated that they are currently enrolled in Residential DR,¹⁰ and 15% are unsure whether they are enrolled in Residential DR or not. Because the evaluation focuses on non-participants, the following findings reflect the perspectives of the EPI participants who confirmed they were not enrolled in Residential DR or were unsure (n=103). The respondents who indicated that they were enrolled in Residential DR (n=25) were excluded from the analysis. Only EPI participants who had technical difficulties enrolling in or those who opted not to enroll in Residential DR by not installing the thermostat application or removing their thermostat, in other words non-participants, were asked to share feedback on the benefits of and barriers to demand response. An overview of the results of the non-participant survey (EPI participants who did not complete their enrollment in Residential DR) is outlined in the subsections that follow.

⁹ EPI participants are now required to enroll in Residential DR when they receive a smart thermostat; this change was implemented in May 2025. Beginning in August 2024, the option was introduced but not mandatory.

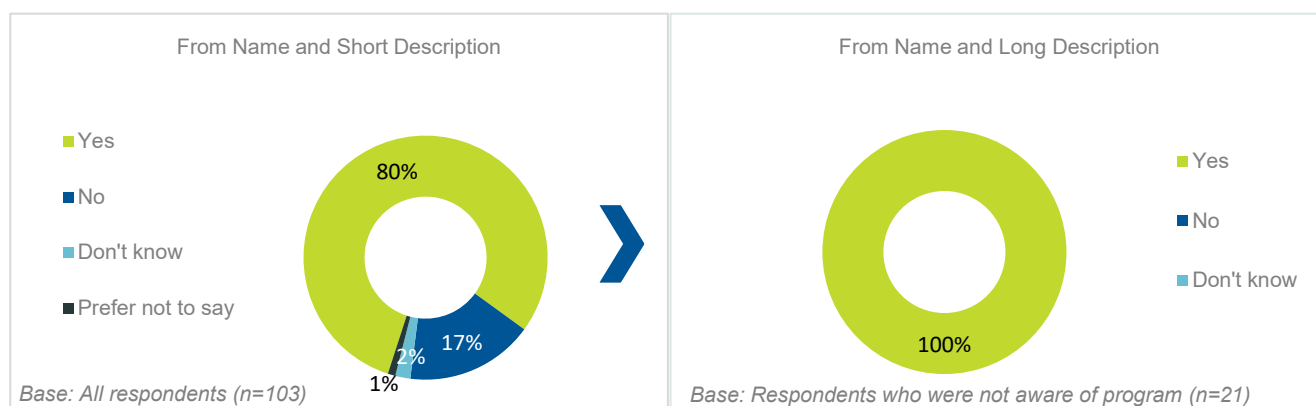
¹⁰ Of those who indicated they are enrolled in Residential DR, enrolling via email invitation was shared as the most popular enrollment method; one-half (52%) received an invitation email to enroll, while 12% enrolled through the website and eight percent enrolled through the app on their device. A further 12% enrolled through some other means. Finally, 16% were unsure how they enrolled.

3.3.2 Level and Sources of Program Awareness Among Non-participants

Awareness About Residential DR

EPI program participants who had technical difficulties enrolling in or opted not to enroll in Residential DR by not installing the thermostat application or removing their thermostat, in other words non-participants, were asked about their awareness about the program both by name and short description and then by describing the program component more completely. Eight in 10 participants (80%) were aware of Residential DR after reading the name and short description, and all non-participants were aware of the program after a long description was provided.¹¹

Figure 5: Program Awareness



Sources of Awareness

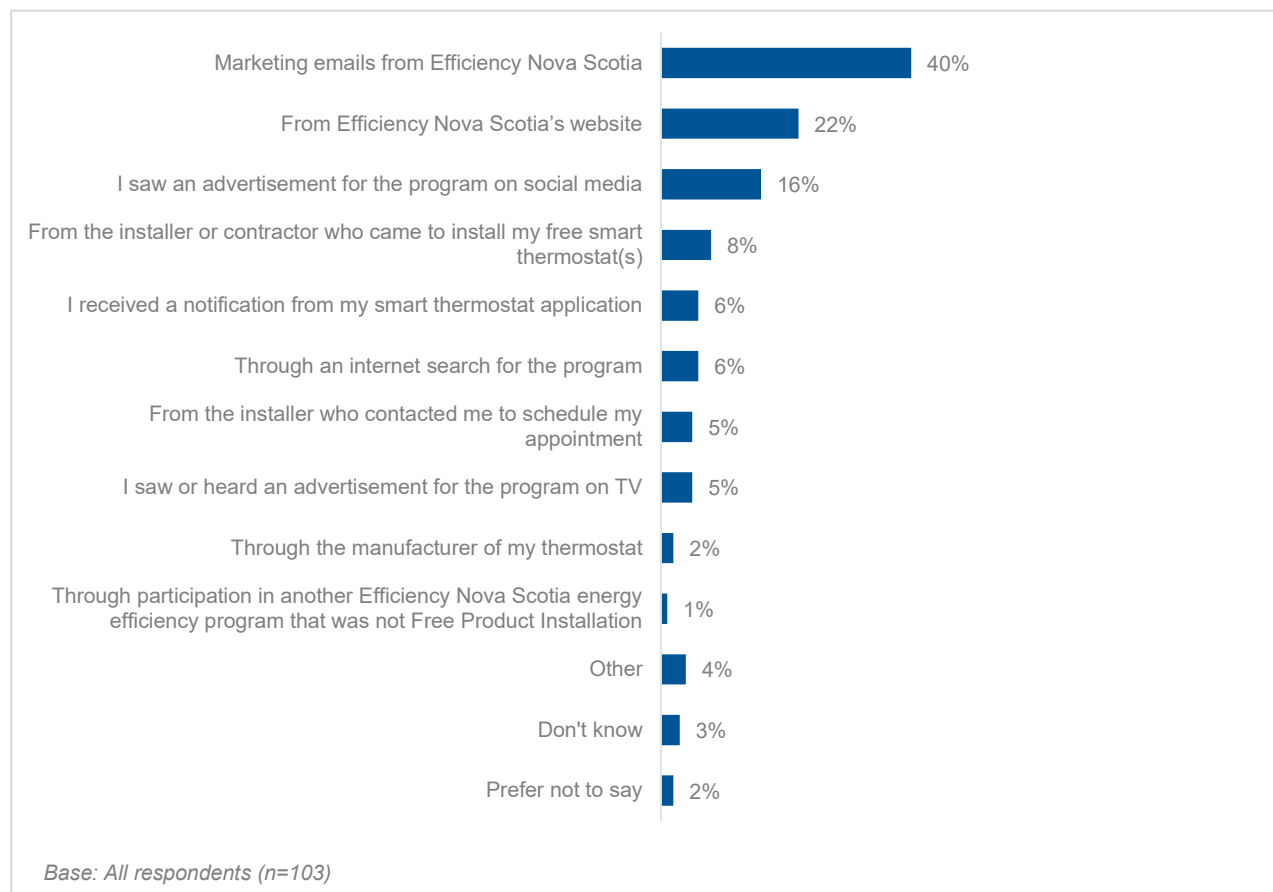
Marketing emails from E1 are the most common source of program awareness among non-participants (40%).¹² This is followed by approximately two in 10 (22%) who indicate they became aware of the program through the E1 website, followed by 16% who saw an advertisement for the program on social media.

Less common sources of awareness include hearing about the program from an installer or contractor who came to install free smart thermostats (8%) as well as receiving a notification from their smart thermostat application (6%) or through an internet search for the program (6%). All other sources of program awareness were each mentioned by five percent or fewer non-participants.

¹¹ Women tend to be more likely than men to be aware of Residential DR through the name and a brief description (89% vs. 78%).

¹² The results of the July 2025 participant satisfaction survey conducted by Narrative Research also indicate that E1 marketing emails are the top source of Residential DR awareness with 35% of participants indicating this source of awareness.

Figure 6: Sources of Awareness About Residential DR



3.4 Motivations and Barriers to Participation

3.4.1 Enrollment and Participation Challenges Among Non-participants

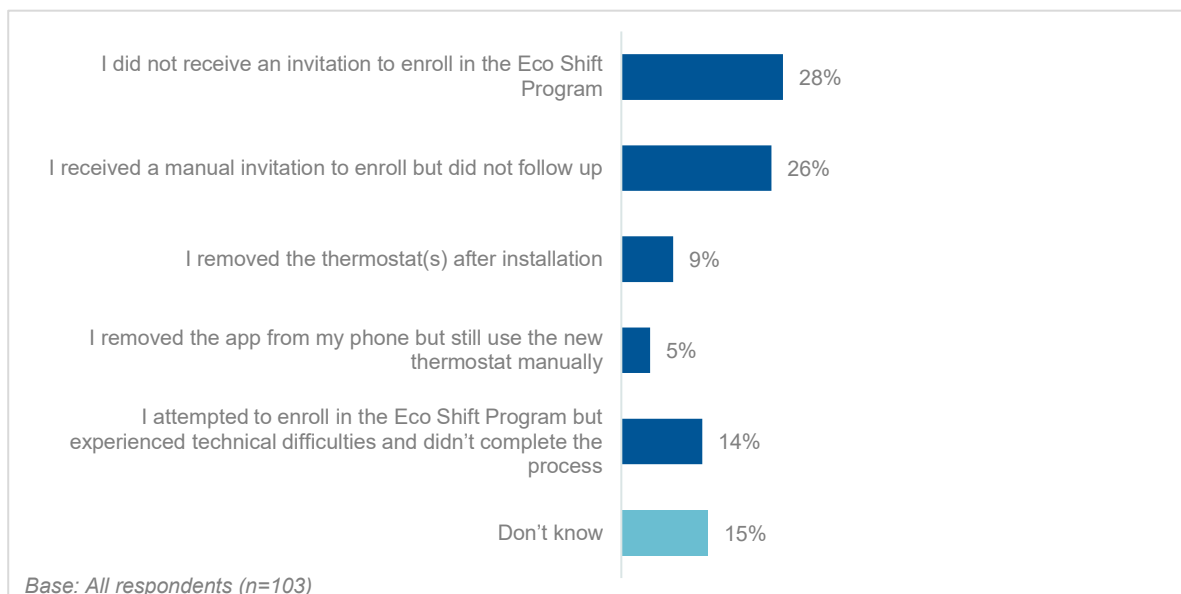
Enrollment Challenges

Non-participants cited various reasons for not continuing the Residential DR enrollment process following their participation in EPI. Three in 10 (28%) indicated that they did not recall receiving an invitation to enroll in Residential DR, followed closely by almost one-quarter (26%) who indicated they received a manual invitation¹³ to enroll in Residential DR but did not follow up. A further one in 10 (9%) indicated they removed their smart thermostat(s) after installation, and five percent indicated they removed the app from their phone but still use their new smart thermostat(s) manually.

Over one in 10 non-participants (14%) indicated that they attempted to enroll in Residential DR but experienced technical difficulties, leaving them unable to do so.

¹³ If auto-enrollment of a device is not successful, the EPI participant receives follow-up communication via email to manually enroll their device in Residential DR.

Figure 7: Reason for not Enrolling in Residential DR via EPI



Non-participants who received a manual invitation to enroll in Residential DR but did not follow up were asked why they did not complete their enrollment. One-half (52%) said they were not interested in participating in the program, followed by two in 10 (19%) who indicated that they did not see the benefit of enrolling. These responses are followed by seven percent indicating that either they did not have time to follow up or they did not understand what was required to enroll, while four percent experienced technical issues when trying to enroll.

Among the nine non-participants who removed their thermostat(s) after installation,¹⁴ five indicated that they did so because it did not work properly, while two explained how their new thermostat was too complicated to use. These reasons were followed by one non-participant not wanting to control the thermostat with a smartphone app and one saying they needed to replace the thermostat with another model.

Among the 14 non-participants who mentioned having technical difficulties when trying to enroll their smart thermostat and could not complete the process, six indicated they were not sure how to complete the process. This was followed by four non-participants who encountered technical issues during the enrollment process, three who found out they were not eligible for the program, and one who did not receive enrollment confirmation.

Additional Information Required to Reconsider Enrollment

Non-participants also shared the additional information they would need to reconsider enrollment in Residential DR, with nine indicating that they would like more information overall. This was followed by seven non-participants noting the process was confusing and complicated, and five saying that they would like manual control over the heating.

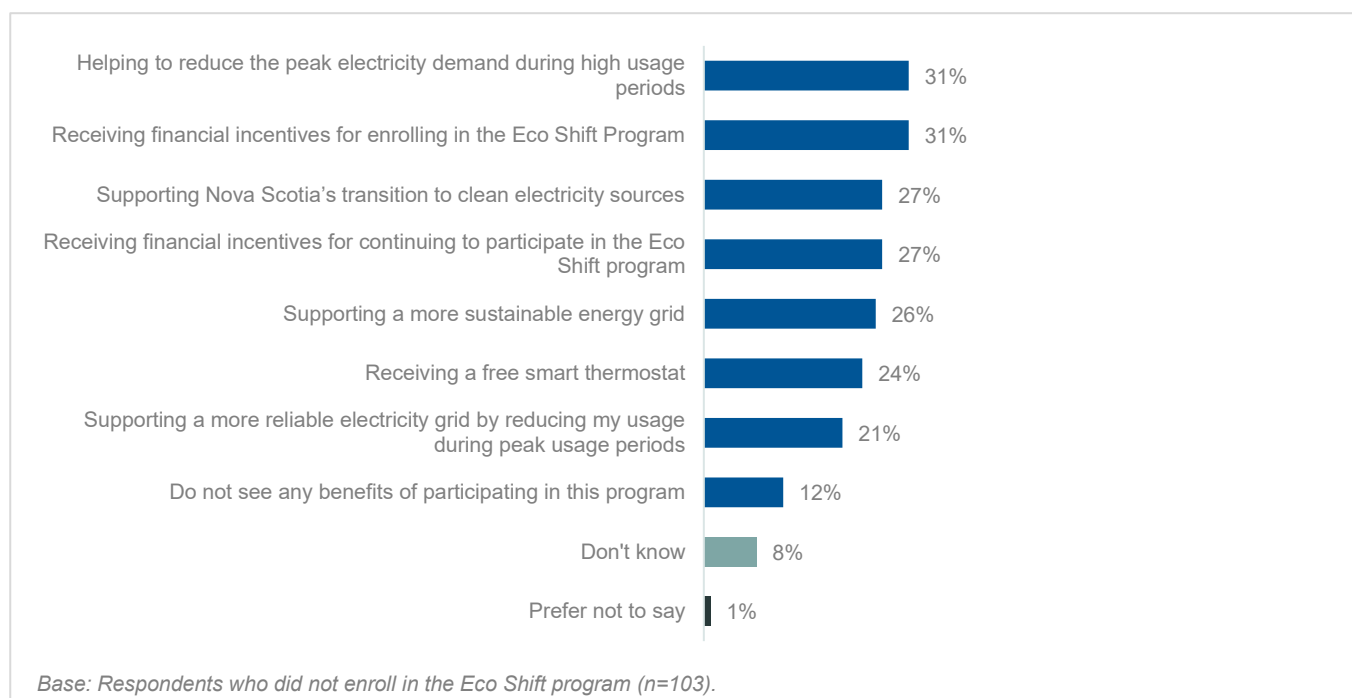
¹⁴ EPI applies an installation rate established as part of the 2024 evaluation to thermostat savings to account for a small portion of participants that does not use the thermostats after installation.

3.4.2 Perceived Potential Benefits Among Non-participants

Non-participants cited various perceived benefits of Residential DR. Most notably, three in 10 indicate a key benefit of participating in Residential DR is contributing to reductions in peak electricity demand during high usage periods (31%). Three in 10 non-participants (31%) also state the receipt of financial incentives for enrolling in Residential DR as a key participation benefit. This was followed by approximately one-quarter noting either the program supports Nova Scotia's transition to clean electricity sources (27%), the program supports a more sustainable energy grid (26%), participants receiving financial incentives for continuing to participate in Residential DR (27%), or participants receiving a free smart thermostat (24%). Lastly, two in 10 stated Residential DR supports a more reliable electricity grid by reducing energy usage during peak demand periods (21%) as benefits of participation.

Only 12% of non-participants do not see any benefits to participating in Residential DR.¹⁵

Figure 8: Perceived Potential Benefits of Residential DR Participation



¹⁵ Those with household incomes of \$70,000 or less (21%) are more likely than those between \$70,001 and \$100,000 (8%) and more than \$100,000 (11%) to see no benefit in participating in Residential DR.

3.4.3 Barriers to Participation Among Non-participants

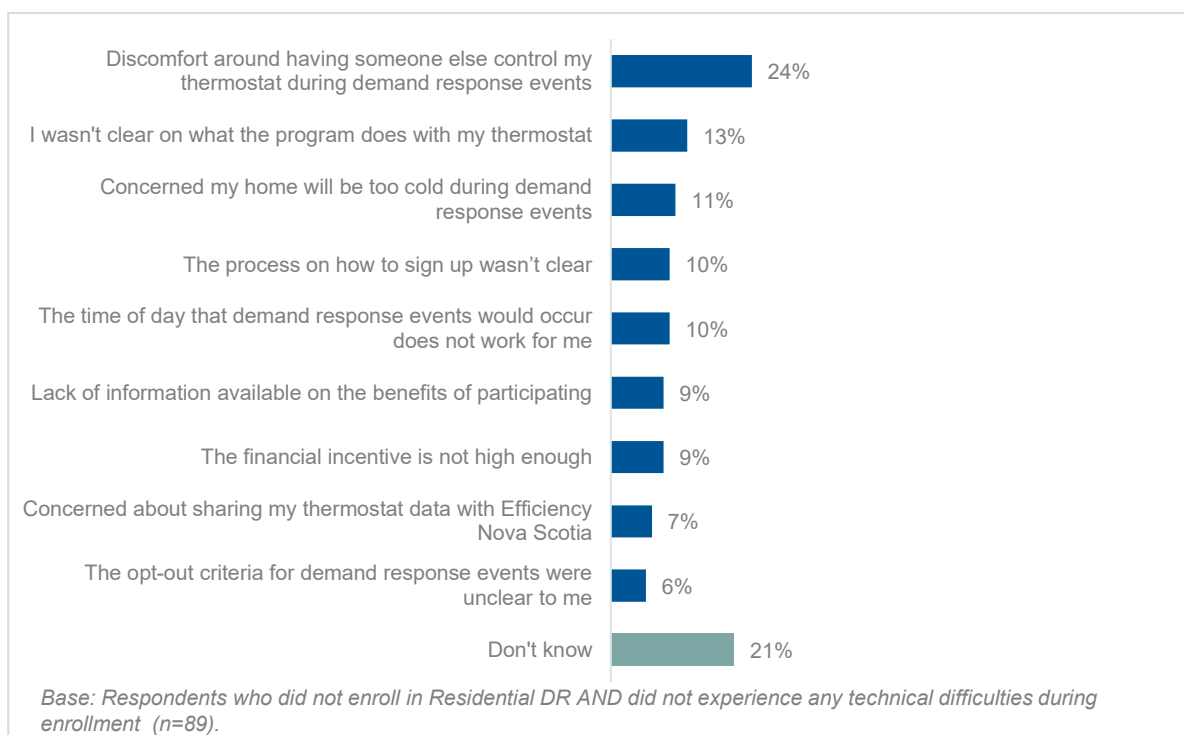
Non-participants also identified several general barriers to participating in Residential DR beyond the enrollment issues they encountered.¹⁶ The most common concern, raised by one-quarter of non-participants, was the discomfort with allowing someone else to control their thermostats during DR events. This was followed by 13% who were unsure what the program would actually do to their thermostats.

Additional barriers were cited by smaller, but meaningful proportions of non-participants. For instance, about one in 10 (11%) reported worrying that their home would become too cold during DR events, the sign-up process was unclear (10%), the timing of events would not work for them (10%), they had not seen enough information about the benefits of participating (9%), and that the financial incentive was not high enough (9%).

Lastly, seven percent expressed concern about sharing their thermostat data with E1, while six percent said that the opt-out criteria for DR events were unclear to them.

Figure 9 below outlines the main barriers to participation for non-participants who did not experience any technical difficulties during enrollment (n=89).

Figure 9: Barriers to Participation



¹⁶ Those with a university degree (29%) are more likely than those with high school or less education (7%) and those with a trade or college degree (19%) to indicate they did not enroll in Residential DR because they are uncomfortable having someone else control their thermostat during demand response events. Those with household incomes of more than \$100,000 are more likely than their respective counterparts to agree with the same sentiment (household income < \$70K: 12%, \$70,001 to \$100K: 10%, +\$100K: 31%). Additionally, women are more likely than men to indicate they did not enroll in Residential DR because they are uncomfortable having someone else control their thermostat during demand response events (28% vs. 18%).



3.5 Service Provider Perspectives

This subsection presents an analysis of service provider perspectives on Residential DR. The information presented below was gathered through two qualitative interviews with CLEAResult and Shifted Energy. CLEAResult is responsible for the delivery of the Smart Thermostat, EV, and Battery pathways, and Shifted Energy is responsible for DHW Controller pathway delivery.

When Residential DR was introduced to the market, the DHW Controller pathway was offered as a separate initiative from the Smart Thermostat, EV, and Battery pathways. The pilots are now integrated into Residential DR as a single offer from the customer facing view, but they continue to be operated mostly separately with two distinct service providers.

Smart Thermostat DLC, Battery Control, EV Telematic and Charger Control Pathway

CLEAResult is responsible for the Smart Thermostat DLC, Battery Control, and EV Telematic and Charger Control pathway program delivery. CLEAResult reports that the program is well coordinated between the service provider and E1 and that program retention is high with more than 97% of participants remaining enrolled in Residential DR. CLEAResult notes some redundancy in the call centre process with delays in the transfer process between the E1 Call Centre (first line) and CLEAResult. More external support resources are required at the beginning of each DR season to support connectivity issues and a higher volume of inbound calls. CLEAResult has adjusted resourcing to reflect this increased need at the start of the DR season. In the past, when sales increased on smart thermostats, for example, during Instant Savings campaign events, this uptick in enrollments would result in processing delays. That issue has been since resolved, and participants receive incentives within 10 business days at present.

CLEAResult notes that each manufacturer of program-eligible devices requires different data permission and connection processes, and approximately 5-10% of participants require support to connect their devices at the time of enrollment. CLEAResult provides one-on-one support to participants experiencing such issues. CLEAResult shared that there can be issues with the EPI enrollment pathway related to unique identifiers on devices not recorded properly by installers, which may require further investigation. During the 2024/25 DR season, an issue with thermostats in auto-mode not responding during an event was discovered. This issue has been resolved for the 2025/26 DR season.

CLEAResult does not receive many inbound communications from participants who are dissatisfied with Residential DR, aside from a small percentage of participants who are concerned that they will not qualify for an incentive that DR season if they opt out and some that do not understand the pre-heating function of their thermostats. EV participants have reported difficulty with participating in evening events during the 4:00 p.m. – 7:00 p.m. window as they are actively driving their vehicle home from work during that time. CLEAResult noted that privacy concerns are shared by participants more frequently in Nova Scotia compared to in other Canadian jurisdictions.

CLEAResult reports that real-time monitoring during events is not available and participants do not receive any immediate feedback confirming their participation in an event. This prevents CLEAResult from monitoring in-event participation rates. CLEAResult reports that they have received some feedback from participants not knowing whether their participation in an event was successful as they do not receive post-event notifications. Participation in 50% of events or more is required for participants to receive the participation incentive. All participants received this incentive in the 2024/25 DR season as the criteria to achieve this incentive were not clear to many participants.



CLEAResult shared some improvement opportunities that included decreasing the enrollment incentive and increasing the participation incentive to encourage further event participation. A further opportunity for program improvement shared by CLEAResult was seizing the opportunity to maximize the number of devices enrolled per household to increase participation. CLEAResult indicated that maximizing the number of smart thermostats enrolled per household may also ensure back-up heating sources do not come online during events. Additionally, adding an educational component to Residential DR was shared as a further opportunity for potential and current program participant engagement.

Domestic Hot Water Controller Pathway

Shifted Energy (recently acquired by Resource Innovations) is the service provider and technology partner for the DHW DLC used in Residential DR. Shifted Energy provides the load control devices, training for installers, and is responsible for running DR events with real-time monitoring in place. Shifted Energy shared with the Evaluator that the relationship with E1 is positive and productive. Shifted also reported that participants have not yet provided any negative feedback on this pathway and do not notice the change in water temperature during events. Participants do not receive any communication from Shifted Energy when an event is taking place. Shifted Energy also reported that there have not yet been any participants who have opted out from this pathway.

Shifted reported that connectivity issues are minimal with the devices installed in areas with a strong cellular network signal, even given the fact that water tanks are usually located in basements. In the past, there were issues with connectivity in rural areas in Nova Scotia due to cell signal weakness. Shifted Energy created a solution for weak signal conditions and the unique Canadian signal format that now alleviates rural connectivity issues.

Shifted Energy would like to see E1 continue to ensure that there is equitable access for participants in all areas of the province, stating that E1's engagement of rural residents is commendable and not often seen as a priority in other jurisdictions. Shifted Energy also suggested that E1 maximize the number and variety of devices enrolled in Residential DR per household, which is in line with a suggestion provided by CLEAResult.

3.6 Jurisdictional Scan Results

This subsection presents the results of the jurisdictional scan that involved collecting data on residential DR programs available in other North American jurisdictions. The scan was aimed at identifying strategies that enhance operational efficiency when scaling programs from the pilot phase to the full implementation phase. To inform this analysis, Econoler reviewed participation levels, program operations, and program design elements such as eligible devices and incentive levels (where information was published) in nine jurisdictions offering residential DR programs, five in the United States (US) and four in Canada. Jurisdictions included in the research are BC Hydro, DTE Energy (Michigan), Green Mountain Power (Efficiency Vermont), Hydro-Québec, the Independent Electricity System Operator (IESO, Ontario), National Grid (Massachusetts), Puget Sound Energy (PSE, Washington State), Rhode Island Energy, and Yukon Energy. All the information in the following subsections was publicly available unless otherwise indicated.

3.6.1 Program Design

The jurisdictional scan findings related to DR program aspects such as eligible devices, enrollment process, eligibility criteria, and incentive structure levels are highlighted in this section and organized by device type if applicable.

Eligible Devices

The Evaluator compared products offered in the researched jurisdictions to those offered by E1. Similarly to E1, two jurisdictions (PSE and BC Hydro) offer DR programs for four device types, namely smart thermostats, electric vehicles (EVs) and EV chargers, home batteries, and hot water controllers (HWCs). While every jurisdiction includes a DR program for smart thermostats except Green Mountain Power, all of them, except the IESO, offer one or more of the other three device types. Table 10 below outlines the device types included in the DR program of each jurisdiction. A “✓” in the table indicates the product is or recently was eligible in the program and jurisdiction.

Table 10: Types of Devices Included in DR Programs per Jurisdiction

Program Administrator	Smart Thermostats	EV and EV Chargers	Home Batteries	Hot Water Controllers
Efficiency Nova Scotia	✓	✓	✓	✓
BC Hydro	✓	✓	✓	✓
DTE Energy	✓	✓	-	✓
Green Mountain Power	-	-	✓	-
Hydro-Québec	✓	✓	-	✓
IESO	✓	-	-	-
National Grid	✓	-	✓	-
Puget Sound Energy	✓	✓	✓	✓
Rhode Island Energy	✓	✓	✓	-
Yukon Energy	✓	-	-	✓

Enrollment Process

All programs adopt a bring-your-own-device (BYOD) option requiring participants to own or purchase and install eligible smart devices to enroll. Hydro-Québec and Yukon Energy are the only jurisdictions combining both BYOD and direct installation or rebate options in their DR program.

However, as presented in Table 11 below, five of the nine jurisdictions also have energy efficiency programs, within their portfolio, associated to DR programming and providing participants with free or discounted devices often for self-installation or at 0% financing options.

In two of the five jurisdictions that offer rebates or direct installation through energy efficiency programs associated to DR (IESO and Rhode Island Energy), devices obtained through rebates or free installation are not automatically enrolled in the DR program; participants must complete an optional separate enrollment step. In two jurisdictions (Puget Sound Energy and BC Hydro), automatic enrollment or mandatory sign up depends on the device type. Finally, at National Grid, participants must agree to or sign up for the 0% loan under the DR program.

Table 11: DR Program Enrollment Pathways by Jurisdiction

Program Administrator	Is there a Complimentary Energy Efficiency Program Associated with DR?	DR Enrollment Pathway via Energy Efficiency Program?
Efficiency Nova Scotia	✓ (EPI: Free smart thermostats and hot water controllers [HWCs])	Automatically enrolled in Residential DR ¹⁷
BC Hydro	✓ (rebates on smart thermostats, ¹⁸ EV chargers, ¹⁹ and batteries) ²⁰	Mandatory sign-up (smart thermostats) in Peak Save Optional (EV chargers and batteries) ²¹ in Peak Saver
IESO	✓ (free ²² or rebates ²³ on smart thermostats)	Optional enrollment in Peak Perks (smart thermostats)
National Grid	✓ (0% financing loans ²⁴ for batteries)	Mandatory sign-up in ConnectedSolutions (batteries)
Puget Sound Energy (PSE)	✓ (rebates on smart thermostats, ²⁵ EV chargers, ²⁶ and free smart water links) ^{27,28}	Automatically enrolled (smart thermostats and EV chargers) in Flex Smart Optional (smart water links) in Flex Water
Rhode Island Energy	✓ (rebates on EV chargers ²⁹ and batteries) ³⁰	Optional in ConnectedSolutions

DTE Energy, Green Mountain Power, Hydro-Quebec and Yukon Energy do not have Energy Efficiency Programs associated with DR.

Participant Eligibility Criteria

Eligibility criteria for participation in residential DR programs are similar across jurisdictions and device types. The standard requirements include:

- › Being a customer of the utility and the account holder
- › Having an eligible device installed
- › Having a reliable Internet connection

None of the programs are restricted to homeowners, tenants are also eligible as long as they meet all eligibility requirements (e.g. being the utility account owner).

¹⁷ As of October 2024, EPI participants who receive a smart thermostat are required to enroll in Residential DR. Prior to October 2024, the option was recommended to all EPI participants but enrollment in Residential DR was not mandatory.

¹⁸ \$50 rebate available through In-Store Instant Discount Offer at Costco.

¹⁹ Up to 50% rebate of the cost, up to a maximum of \$350 available through the EV Charger Rebate program for single-family homes.

²⁰ Up to \$5,000 rebate available for battery installations.

²¹ Although participation remains optional, the incentive structure will be changed on April 1, 2026, with higher rebates offered to those with batteries enrolled in the DR program than those without enrolled batteries.

²² Available for low-income residents through the Energy Affordability Program.

²³ \$75 rebate available through the Home Renovation Savings Program.

²⁴ Available through the Mass Save HEAT loan.

²⁵ \$106 rebate and up to \$247 additional rebate for low-income customers available through Instant PSE Discounts.

²⁶ \$300 rebate available on Level 2 chargers through the PSE Up & Go Electric Home Charging program or \$600 rebate available for low-income customers through the Empower Mobility program.

²⁷ Smart water links are modules connected to water heater controls acting as HWCs.

²⁸ Available through the Instant PSE Discount program.

²⁹ Up to \$800 rebate available for the purchase of an EV charger and up to \$1,000 rebate available for the installation through PowerUpRI. Additional rebates are also available for low-income customers.

³⁰ Available through the Solar System program.



Approximately half of the scanned jurisdictions do not allow participants to enroll if they are on a variable pricing plan, while the other half allow them. For two jurisdictions (DTE Energy^{COU} and Hydro-Québec), participants enrolled in their DR program automatically benefit from variable pricing plans. The Hydro-Québec Hilo Program has evolved throughout 2025, switching from an incentive-based model to variable pricing in 2025.

Incentive Structure and Levels

This section is organized by device type because the incentive structure and levels vary greatly between devices for most of the jurisdictions. For each subsection, incentives are organized by enrollment incentive followed by participation incentive. The enrollment incentive is the one-time initial benefit participants receive upon enrolling in the program, while the participation incentive is the benefit they receive at the end of a period for reducing peak demand or taking part in events and remaining enrolled. When the participation incentive is performance-based, participants receive it after each event based on their actual performance. When the participation incentive is a fixed amount, it is paid at the end of the DR season. Incentive comparisons between jurisdictions can be difficult because of regional specificities such as varying costs of living or energy costs.

Smart Thermostats

Table 12 below indicates the structures and levels offered by the scanned jurisdictions for smart thermostats.

Enrollment Incentive

As in Nova Scotia, all jurisdictions with an eligible smart thermostat DR program, except DTE Energy, offer incentives at enrollment. While E1 offers an incentive per device with a lower amount for additional devices enrolled after the first one, some of the other jurisdictions offer a fixed amount per device or per household (Hydro-Québec, IESO, BC hydro, and Rhode Island Energy).

The amounts also vary by customer type such as higher incentives offered for income-qualifying participants in National Grid's program, or by thermostat type, such as low-voltage compared to line-voltage connected thermostats in PSE's program. Finally, Yukon Energy provides a rebate on device purchases and installations as an enrollment incentive, while Hydro-Québec offers either a per-device incentive or a free thermostat.

Participation and Other Incentives

Most jurisdictions, similar to E1, offer a fixed annual incentive per household, ranging from \$20 for the IESO to \$71 for DTE Energy. PSE and Rhode Island Energy both offer an amount per device, with PSE offering a higher incentive for low-voltage thermostats compared to line-voltage thermostats.

While Hydro-Québec participants benefit from lower electricity rates during peak periods, they do not receive any participation incentive, as is the case for Yukon Energy, for participating and staying enrolled in the DR program.

In addition to incentives, PSE offers monthly gift card giveaways for enrolled participants, while Yukon makes a \$5,000 prize draw contest available for households enrolled in the DR program.

Table 12: Smart Thermostat Incentive Structures and Levels per Jurisdiction

Program Administrator ^a	Enrollment Incentive	Participation Incentive	Other
Efficiency Nova Scotia	\$25 for the 1 st device, \$20/each additional one ^b	\$30/household/year	None
BC Hydro	\$100/household	\$50/household/year	-
DTE Energy	-	\$71/household/year	-
Hydro-Québec	Up to \$210/device if BYOD or free Hilo thermostat	-	Higher electricity rates during peak times (Rate Flex D)
IESO	\$75/household	\$20/household/year	-
National Grid	Low income: \$141/household Non-low income: \$71/household	\$28/household/year	None
Puget Sound Energy (PSE)	Low-voltage thermostats: \$71/device Line-voltage thermostats: \$28/device	Low-voltage thermostats: \$28/device/year Line-voltage thermostats: \$14/device/year	\$353 gift card giveaways/month
Rhode Island Energy	\$71/device	\$28/device/year	-
Yukon Energy	Up to \$750/home on device purchase and installation	-	Annual \$5,000 prize draw contest

^a For all jurisdictions in the US, all amounts were converted from USD into CAD using an exchange rate of USD 1 = CAD 1.41 and rounded to the nearest decimal place.

^b Capped at \$105.

Green Mountain Power does not offer any DR program for smart thermostats.

EVs and EV Chargers

Table 13 below indicates the structures and levels offered by the scanned jurisdictions for smart thermostats.

Enrollment Incentive

Among the five jurisdictions with an EV program, three of them have an enrollment incentive ranging from \$71 per device or household to \$250 per household. By comparison, E1 provides \$50 per household, which is lower than other programs.

Participation Incentive and Other

Recurring incentives for continued enrollment vary widely. They may be a fixed annual amount per device or household, a monthly payment, or a performance-based amount per kilowatt reduced during DR events. One jurisdiction, Hydro-Québec, does not provide any incentive, although they allow lower electricity rates during peak events instead. With an annual incentive of \$50 per device, E1 offers a higher incentive than Rhode Island, with an offer of \$28 per device, and BC Hydro since the \$50 is for the entire household.

Table 13: EV and EV Charger Incentive Structures and Levels per Jurisdiction

Program Administrator ^a	Enrollment Incentive	Participation Incentive	Other
Efficiency Nova Scotia	\$50/household	\$50/device/year	-
BC Hydro	\$250/household	\$50/household/year	-
DTE Energy	-	\$7/month	-
Hydro-Québec	-	-	Lower electricity rates during peak times (Rate Flex D)
Puget Sound Energy (PSE)	\$71/household	\$0.50/kW reduced during events	\$353 gift card giveaways are drawn each month for enrolled participants
Rhode Island Energy	\$71/device	\$28/device/year	-

^a For all jurisdictions in the US, all amounts were converted from USD to CAD using an exchange rate of USD 1 = CAD 1.41 and rounded to the nearest decimal place.

Green Mountain Power, IESO, National Grid and Yukon Energy do not offer any DR program for EVs and EV chargers.

Home Batteries

Table 14 below indicates the structures and levels offered by the scanned jurisdictions for home batteries.

Enrollment Incentive

Only two of the five jurisdictions with a battery DR program offer an enrollment incentive, similar to E1. While the amount for E1 and BC Hydro are equal (\$500 per household), PSE offers a higher incentive of \$1,410 per battery enrolled.

Participation Incentive

All jurisdictions provide either a recurring seasonal incentive (per battery or per household) or a performance-based payment. In Vermont (Green Mountain Power), incentives vary by program type; for backup-only installations, participants receive \$1,199 per kW (up to 10 kW) for a three-hour duration at full chosen capacity or \$1,340 per kW (up to 10 kW) for a four-hour duration. An additional \$141 per kW (up to 10 kW) applies to installations in grid-constrained areas. For self-consumption, the incentive is \$1,199 for equipment paired with self-consumption. Conversely, E1 (\$300 per kW), while being lower than Green Power Mountain, is in the same range as National Grid (\$388 per kW) and Rhode Island Energy (\$282 per kW).

Table 14: Home Battery Incentive Structures and Levels per Jurisdiction

Program Administrator ^a	Enrollment Incentive	Participation Incentive
Efficiency Nova Scotia	\$500/household	\$300/average kW across all events
BC Hydro	\$500/household	\$250/household/year
Green Mountain Power (GMP)	-	- Backup only: \$1,199/kW for 3 hours or \$1,340/kW for 4 hours Additional \$141/kW for installations in GMP - Self consumption: \$1,199/equipment unit
National Grid	-	\$388/kW
Puget Sound Energy (PSE)	\$1,410/battery	\$705/battery/year
Rhode Island Energy	-	\$282/kW

^a For all jurisdictions in the US, all amounts were converted from USD to CAD using an exchange rate of USD 1 = CAD 1.41 and rounded to the nearest decimal place.

DTE Energy, Hydro-Québec, IESO and Yukon Energy do not offer any DR program for home batteries.

Hot Water Controllers

Table 15 below indicates the structures and levels offered by the scanned jurisdictions for HWCs.

Enrollment Incentive

PSE and BC Hydro offer an enrollment incentive of \$28 and \$100 per household respectively, while Yukon Energy offers a rebate of up to \$750 to purchase and install hot water controllers and Hydro-Québec offers up to \$125 per device, or free HWC.

Participation Incentive

Similarly to E1, only PSE and BC Hydro offer a recurring seasonal incentive of \$28 and \$50 respectively per household. Hydro-Québec and DTE Energy provide only preferred rates for water heaters, while Yukon Energy offers no incentives or preferred rates.

Table 15: Hot Water Controllers Incentive Structures and Levels per Jurisdiction

Program Administrator ^a	Enrollment Incentive	Participation Incentive	Other
Efficiency Nova Scotia	-	\$20/device/year	-
BC Hydro	\$100/household	\$50/household/year	-
DTE Energy	-	-	Participants benefit from a discounted electrical rate for the water heater
Hydro-Québec	Up to \$125/device if BYOD or free Hilo HWC	-	Lower electricity rates during peak times (Rate Flex D)
Puget Sound Energy (PSE)	\$28/household	\$28/household/year	\$353 gift card giveaways are drawn each month for enrolled participants
Yukon Energy	Up to \$750/home on device purchase and installation	-	-

^a For all jurisdictions in the US, all amounts were converted from USD to CAD using an exchange rate of USD 1 = CAD 1.41 and rounded to the nearest decimal place.

Green Mountain Power, IESO, National Grid and Rhode Island Energy do not offer any DR program for HWC.



3.6.2 Program Operations

This section highlights the jurisdictional scan findings related to DR program aspects such as event design, internal and external resources, and program metrics.

Event Design

Event duration is fairly consistent across jurisdictions, typically ranging from three to four hours. In contrast, event frequency varies significantly by jurisdiction and device type. For smart thermostats, the lowest frequency observed is nine events (IESO in 2024 – summer peaking), while Hydro-Québec reaches up to 30 events during the winter season. The reviewed EV programs involve up to 60 events annually (i.e. Rhode Island Energy), while battery programs involve up to 60 events per season (i.e. National Grid). For HWC programs, frequency is up to 200 events per year (i.e. PSE). However, these figures represent upper limits reported by utilities, and actual practice may involve fewer events depending on operational needs, weather conditions, and program constraints. See Table 16 for further information.

Table 16: Event Frequency and Length per Jurisdiction

Program Administrator	Peak Period	Smart Thermostats		EVs and EV Chargers		Home Batteries		Hot Water Controllers	
		# of Events	Length	# of Events	Length	# of Events	Length	# of Events	Length
Efficiency Nova Scotia	Winter	Up to 12	4 hours max	Up to 12	4 hours max	Up to 12	4 hours max	Up to 12	4 hours max
BC Hydro	Summer and Winter	15 to 20, typically	4 hours max	15 to 20, typically	4 hours max	15 to 20, typically	4 hours max	15 to 20, typically	4 hours max
DTE Energy	Summer (Smart Thermostats) July-Dec (Batteries) Summer and Winter (HWCs)	Up to 56 event hours	4 hours max						4 hours max
Green Mountain Power	Winter					5-8 times/month	3-6 hours		
Hydro-Québec	Winter	Up to 30	4 hours max	Up to 30	4 hours max			Up to 30	4 hours max
IESO	Summer	9 in 2024, 6 in 2023	3 hours max						
National Grid	Summer	15/year	3 hours max			60 to 600/summer	3 hours max		
Puget Sound Energy	Summer and Winter	Max 3 times per week and 15 times per season	4 hours max	15 events per season max	4 hours or less	30 times per season max	4 hours or less	200 times per year and 1 time per day max	4 hours max
Rhode Island Energy	Summer	15, typically 80 hours max	3 hours	60 times max	3 hours	60 times max	2-3 hours		
Yukon Energy	Winter	15 in 2024, 10 in 2023	4 hours max					15 in 2024, 10 in 2023	4 hours max

Program Implementation Resources

While information is not available for all jurisdictions, out of the five for which information was available, three use EnergyHub as a third-party implementation contractor, one uses Uplight to oversee program implementation, payment processing, and customer support, and one uses CLEAResult.

Participation Levels

Table 17 presents the participation levels per jurisdiction and per device type where information was publicly available.

Table 17: Participation Levels per Jurisdiction

Program Administrator	Smart Thermostats	EVs and EV Chargers	Home Batteries	Hot Water Controllers
Efficiency Nova Scotia	2025/26: 2,664 participating households and 9,886 enrolled devices	2025/26: 213 participating households	2025/26: 13 participating household	2025/26: 1,024 participating households
BC Hydro	2024/25: 90,000 customers enrolled			
DTE Energy	As of Dec 2024: 73,747 enrolled devices	As of Dec 2024: 2,300 enrolled EVs		As of Dec 2024: 43,431 enrolled customers
Green Mountain Power			Unavailable	
Hydro-Québec	2024/25: 60,000 households ^a Target 2025/26: 120,000 households			2024/25: 60,000 households ^b Target 2025/26: 120,000 households
IESO	As of Dec 2024: 200,000 enrolled thermostats			
National Grid	Unavailable		2024 Target: 4,668 customers (underperformed)	
Puget Sound Energy (PSE)	2023/24: 17,500 Target by end of 2025: 35,000	As of Dec 2024: Over 5,000 enrolled devices	Unavailable	Unavailable
Rhode Island Energy	14,163 devices (92% of target)	131 devices (26% of target)	926 devices (107% of target)	
Yukon Energy	2024/25: 179 households			2024/25: 227 households
^a Number of households with at least one device type enrolled in the DR program.				
^b Ibid.				

While data availability is limited for some jurisdictions, not all device types are covered, and participation metrics vary (number of households or number of devices), overall participation is stronger for smart thermostats than for other devices, except in one jurisdiction (Yukon Energy) where more households are enrolled with DHW. For EVs and EV chargers, one jurisdiction (Puget Sound Energy) leads with over 5,000 enrolled devices, while another (Rhode Island Energy) missed its target by 74%. For home batteries, one jurisdiction (National Grid) fell short of its target, whereas another (Rhode Island Energy) exceeded expectations. One jurisdiction (Hydro-Québec) has set an objective to double its number of participants with at least one device type installed.

A high-level comparative analysis was completed looking at total number of enrolled households in a DR program versus the total number of residential households in a given service territory or geographic area within the Canadian jurisdictions researched. This analysis was performed for smart thermostat participation only as it is the only device type that all Canadian jurisdictions include in DR programs. In terms of market coverage for smart thermostats, Nova Scotia enrolled participants represent approximately 0.5% of residential customers in the province, while the range is 2–10% in other Canadian jurisdictions.³¹ This comparison indicates that there is still potential for Residential DR program growth in Nova Scotia.

Budget

Table 18 presents the budgets allocated to DR programs across jurisdictions where information was publicly available. Budgets are highly dependent on jurisdiction-specific operational needs and local economic conditions. The information below is included for informational and not comparative purposes.

³¹ Comparative participation analysis conducted using the total number of residential customers in the Nova Scotia Power, Hydro Quebec, and BC Hydro service territories. The total number of households with central air conditioning was utilized for comparison purposes in Ontario. Yukon was not included in this comparative analysis due to the small population of the service territory.

Table 18: Budget per Jurisdiction

Program Administratora	Budget
Efficiency Nova Scotia	2025/26: \$2.84 million
BC Hydro	Budget 2025-27: \$110 million (DR programs for residential, commercial, and industrial customers) \$12.8 M forecast for residential capacity-focused programs in 2026
DTE Energy	2024: › Capital expenditures: \$9,784,417 › O&M expenses: \$6,298,803 Including: › CoolCurrents^b (capital): \$1,710,166 › Smart Savers^c (operation and maintenance [O&M]): \$4,287,032 › SmartCharge^d (O&M): \$897,254
Green Mountain Power	Unavailable
Hydro-Québec	Unavailable
IESO	Target 2025-27: \$18 million/year
National Grid	Planned budget 2025: \$15,083,117 Ratio incentive/administrative costs: 71%
Puget Sound Energy	All initiatives: DR administration 2024 budget: \$6,952,350 Including › Labour: \$851,006 › Overhead: \$765,905 › Marketing: \$2,115,000 › Employee/office: \$86,010 › Outside services: \$469,530 › Materials: \$28,200 › Miscellaneous: \$2,636,700 2024 actuals: \$3,555,215
Rhode Island Energy	2024 Connected Solutions cost: \$5,132,635. Including: › Planning and administration: \$105,235 › Rebates and other customer incentives: \$3,768,132 › Sales, technical assistance, and training: \$1,259,224 › Ratio incentive/administrative costs: 73%
Yukon Energy	Unavailable
^a For all jurisdictions in the US, all amounts were converted from USD into CAD using an exchange rate of USD 1 = CAD 1.41 and rounded to the nearest decimal place. ^b CoolCurrents is an air-conditioning and air-source heat pump summer peak DR program. ^c Smart Savers is a smart thermostats summer peak DR program. ^d SmartCharge is an EV and EV charger summer and autumn peak DR program.	

Savings

Table 19 presents the savings targets of DR programs across jurisdictions where information was publicly available. Savings targets are highly dependent on jurisdiction specific system needs and demographic characteristics. The information below is included for informational and not comparative purposes.

Table 19: Savings per Jurisdiction

Program Administrator ^a	Savings
Efficiency Nova Scotia	Actuals 2025: 0.958 MW (target: 7.135 MW) › Smart Thermostats Electric Baseboard (EBB) Only: 112 W/device › Smart Thermostats Mini-split Heat Pump (MSHP) only: 119 W/device › Smart Thermostats EBB and MSHP only: 69.1 W/device › Smart Thermostats Others: 92.6 W/device › DHW Controllers: 385 W/device › EV Telematics and Chargers: 4,015 W/device › Battery Controls: 3,515 W/device
BC Hydro	34 MW for all events 98 MW in new incremental capacity savings at customer meter in 2026
DTE Energy	Actuals 2024 Entire DR portfolio: 657 MW in summer <i>including</i> Smart Saver: 96 MW Cool Currents: 123 MW
Green Mountain Power	Unavailable
Hydro-Québec	Actuals 2024: about 200 MW total curtailed power
IESO	Target 2025: 208 MW annual peak demand savings
National Grid	Target 2025: 65 MW net summer capacity
Puget Sound Energy	› Smart Thermostats: Actuals 2024: 4.2 MW average total curtailment 0.28 kW average participant event-hour load curtailment › Batteries: Target 2025: 13 MW of distributed battery storage in service
Rhode Island Energy	Actuals 2024 › Smart Thermostats: 0.67 kW load shed/device (target: 0.65 kW) › Batteries: 5.29 kW load shed/device (target: 5.84 kW) › EV charger: 0 (program was launched late)
Yukon Energy	Actual 2024/25: average load reduction of 198 kW › Smart Thermostats: 111 kW/device › HWC: 315 kW/device

3.6.3 Comparison of Residential DR with Other DR Programs

E1's Residential DR program is broadly aligned with the residential DR programs included in this study and supports multiple device types (smart thermostats, EVs and EV chargers, batteries, and hot water controllers), while only two other programs offer all four options.

Household and participant eligibility criteria for Residential DR are aligned with those of all other jurisdictions researched. However, only half of the jurisdictions researched allow participants to enroll in both a DR program and a peak pricing rate plan simultaneously.

Like E1, most jurisdictions use a BYOD model and often offer rebates and/or free devices to participants through another organization or program from their portfolio. However, while some jurisdictions automatically pre-enroll these devices in their DR programs (as Residential DR does), others require participants to



complete a separate enrollment step.

While incentive structures vary widely across jurisdictions, the enrollment and participation incentives offered by E1 are aligned with other jurisdictions for thermostats and EV chargers but less so for hot water controllers as E1 offers lower participation incentives for this device type. Battery incentives vary across jurisdictions, while E1 enrollment and participation incentives are comparable to most jurisdictions that offer a fixed incentive structure.

With regard to event frequency, Residential DR runs up to 12 events per season, which is quite low compared to other jurisdictions, especially for batteries and hot water controllers.

Budgets and targets vary among the jurisdictions included in this research and comparisons to Nova Scotia are not possible due to variations in geographical size, demographics and electricity system needs versus other jurisdictions. When comparing participation levels against the total residential customer base in other Canadian jurisdictions, the results indicate that there is room to grow Residential DR in Nova Scotia. Program resourcing information is not available for all jurisdictions researched preventing the Evaluator from conducting a comparative analysis on this aspect of program operations.

3.7 In-depth Jurisdictional Perspectives

To further explore the findings from the jurisdiction scan, two qualitative interviews were conducted with program managers from Canadian jurisdictions. These jurisdictions were selected because they offer at least three of the four same device types as E1 and have several years of DR program experience within the Canadian context. Both utilities operate on a much larger scale than E1 and are vertically integrated; hence, some elements such as resource levels and organizational structures are not directly comparable to E1. The objectives were to gather not only further information and validate findings on program design and operations, but also insights on best practices and lessons learned.

3.7.1 Program Design

Enrollment Process

One interviewed Canadian program administrator offers two paths for smart thermostats to participate in DR events: behavioural and connected. The behavioural path³² allows participants to adjust their devices themselves during peak events, and enrollment is simple, straightforward, and completed online. The connected path allows the jurisdiction to take control of the devices to adjust them during peak events. According to this jurisdiction, offering a behavioural option helps attract more customers by removing concerns about external control. Once customers become familiar with the program and its processes, it is easier to transition them to the connected path.

One program administrator offers three pathways to enroll smart thermostats via the connected path:

- › Customers who already have eligible devices enroll through the BYOD path online, the simplest.
- › Customers without eligible devices purchase through an original equipment manufacturer (OEM) website and with whom the jurisdiction has agreements in place to pre-enroll the devices in the DR program.
- › Finally, customers without eligible devices purchase them through any retailer, and they use the regular BYOD process.

Another interviewed Canadian program administrator offers an online enrollment process, with 75% of enrollments completed fully online and 25% requiring assistance. Their DR program features two enrollment pathways, either BYOD or direct installation for both smart thermostats and HWCs, with approximately 90%

³² It should be noted that behavioural pathways were not included in the jurisdictional scan results presented in Subsection 3.6 above.



of enrollments completed through the BYOD option.

Incentive Structure and Levels

One of the interviewed Canadian program administrators introduced an enrollment incentive in September 2025 to help address barriers such as unfamiliarity, trust concerns, and technical or hardware issues. They also mentioned that, while enrollment incentives help lower barriers, they do not eliminate all of them and should be combined with education actions, activities to address trust issues, and other supportive actions.

Regarding participation incentives, the same program administrator differentiates between its two paths in terms of incentive structure. For the connected path, the main barrier is enrolling participants, so the focus is on the enrollment incentive as participants have no further actions to take afterward. However, while incentives are currently fixed for the season, the jurisdiction is considering moving to a pay-for-performance model. Rather than providing a fixed amount to participants at the end of the season regardless of performance, in a pay-for-performance model, incentives are linked to actual load reductions delivered during peak events. For the behavioural path, participation requires awareness about event timing and duration, making participation incentives or rewards more important to keep customers engaged and to acknowledge their effort.

The other interviewed Canadian program administrator transitioned all participants to a variable pricing rate for the 2025/26 DR season without offering any additional participation incentives. At the time of writing this report, some participants expressed concerns about low savings early in the season, although these are expected to increase as the season progresses. Recent media coverage on the DR program has generated more inbound calls, prompting them to increase communications to address customer concerns.

This jurisdiction has designed incentives based on performance rather than fixed amounts, typically requiring participants to engage in a certain proportion of events to qualify for the incentive. This approach fosters ongoing engagement and discourages participants from only meeting the minimum threshold.

3.7.2 Program Operations

Event Design and Operations

While the first Canadian program administrator does not guarantee a minimum or maximum number of events in theory, up to 300 events could be called during the winter season, as two events per day are possible. In practice, an average of 12 to 14 events are called each season. Not all events are strictly necessary for grid capacity, and some events are scheduled to build up experience and confidence that demand response works technically and how much in capacity savings can be achieved.

In the behavioural path, participants have a dedicated section in their customer portal that includes a calendar of events, instructions on how to opt out, and how much incentives they have earned, among other information. Before each event, email or text notifications are sent to participants. In 2026, the program administrator plans to launch an application that will enable participants to receive push notifications through the portal app.

On the connected enrollment path, participants are not notified during events, although they can see the event in progress on their thermostat display or in the OEM app. They usually do not notice any change, and they have the option to opt out if needed.

In terms of event participation, this jurisdiction conducted studies and found that, on the behavioural path, participants perceive it to be more difficult to participate as outdoor temperatures decrease even though their



ability to deliver capacity savings is greater. When outdoor temperatures drop below a certain threshold in winter, appetite to participate in events declines.

The second interviewed Canadian program administrator communicates with participants prior and during DR events through their mobile app. Participants receive real-time information during events, enabling them to track their savings as they occur. After each event, a detailed report is provided, demonstrating savings in both dollars and kWh. This information is also accessible through customer accounts, ensuring transparency and reinforcing engagement.

The same program administrator noticed that opt-outs tend to occur when several events are called in a short period of time.

Internal and External Resources

Publishable information on internal program administrator operations and resourcing levels was not available.

Marketing and Communications

According to the first Canadian program manager interviewed, most jurisdictions tend to position their marketing messaging around incentives and rebates. They believe a more sophisticated approach would be useful. For example, instead of directly asking residential customers to allow remote control of their devices, they suggest first encouraging customers to manage their devices manually (behavioural path) and, then, proposing automated control as a service so they do not have to do it themselves. This approach would change the message from a control request to a service offer. They also emphasize the importance of customer education on demand response (DR).

For the second Canadian program manager, the focus is on communicating potential bill savings while also educating customers about variable rates and other rate structures. While they don't invest much in marketing, they benefit from OEMs promoting the rebates for their devices, notably on social media, and from cross promotion with other programs in the same jurisdiction.

Cost-effectiveness

The first program administrator runs various cost-effectiveness tests on their program. This program administrator shared that it is a challenge to achieve cost-effectiveness thresholds in the first year of their program due to enrollment incentives.

3.7.3 Lessons Learned and Future Opportunities

Challenges and Lessons Learned

Technological Issues

One Canadian program administrator interviewed continues to face challenges related to database management and data flows and shared that achieving operational efficiencies in a demand response program requires a continuous improvement approach.

According to them, program administrators naturally face growing pains as they adopt cloud systems and new technologies. Since the nature of the work is still emerging, working through challenges and carrying out significant maintenance is inevitable and part of the learning process for every utility, especially when scaling from a pilot to a full program.



Another Canadian program administrator interviewed, benefits from being able to run DR events with direct connectivity to devices and full meter visibility. This dual view, as the utility and program administrator and implementer, of device and meter, significantly reduces operational challenges.

Behavioural Considerations

With regards to EV Chargers, one program administrator mentioned that actual customer usage patterns differ significantly from initial assumptions regarding charging behaviour. Rather than consistently returning home and plugging in immediately, many EV drivers use their vehicles like conventional cars, driving to destinations and performing less frequent but higher-volume charging sessions once every one or two weeks. These patterns had direct impact on participation to DR events, with only 30% of vehicles for participation at the beginning of events. In addition to that, the penetration of Level 2 chargers remains lower than expected, reducing the potential for DR. By tapping into the vehicle rather than the charger, EV telematics can serve as a solution to broaden participation and increase DR potential.

Future Opportunities

According to one Canadian program manager, smart thermostats, being inexpensive and having energy efficiency benefits, is a promising category to develop in the next couple of years.

To do so, they plan to work closely with manufacturers to combine smart thermostat sales with program enrollment, increasing the number of smart thermostats installed in the province while simultaneously increasing participation in the DR program. Shifting from instant rebates to enrollment incentives is also a strategy to increase enrollment, benefiting both manufacturers and the program manager. However, partnerships with manufacturers are challenging; when customers visit manufacturer websites like Mysa or Sinopé, they often face an overwhelming number of models, creating decision fatigue. To simplify enrollment, the enrollment process in the DR program must be streamlined and accessible. Co-branding between manufacturers and the program administrator should be consistent throughout the entire customer journey, from the advertising on manufacturer website to the receipt of the device by the customer, to reinforce trust and encourage participation.

The other Canadian program manager interviewed emphasized that the number and types of devices per home should be maximized. For direct-install devices, when an installer visits a home, they aim to install and enroll participants in other programs at the same time. Since participants are already aware of the programs, this is an opportunity to encourage additional enrollment.



4 Residential DR Impact Evaluation

The objective of the 2025 Residential DR impact evaluation was to determine available DR capacity.

4.1 Tracking Sheet Audit

To ensure program component results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1 as well as correcting the tracked available DR capacity as needed. The results are provided in Appendix IV. The tracked available DR capacity results presented in this report, therefore, refer to the corrected tracked available DR capacity obtained by the Evaluator.

4.2 Demand Response Capacity

For Residential DR, the metric is the available DR capacity that corresponds to the load reduction made available for DR events from participant homes. For each Residential DR pathway, the Evaluator established unitary available DR capacity values that were multiplied by the number of participating devices to obtain the evaluated available DR capacity. The number of participating devices was obtained by multiplying the number of enrolled devices by in-service rates.

4.2.1 In-service Rates

For Residential DR, the in-service rate was separated into two components, (1) the portion of the DR season during which devices were enrolled and (2) the participation rate of those enrolled devices during DR events. This structure reflects both mid-season enrollment changes and event-level performance.

Portion of the DR Season with Enrolled Devices

New participants continued to register throughout the DR season. To account for these, the Evaluator calculated, when applicable, the portion of the DR season with enrolled devices by dividing the average number of enrolled devices throughout the DR season by the number of devices enrolled at the end of the DR season.

This parameter was calculated for the Smart Thermostat DLC and DHW DLC pathways, while it was encompassed in the participation rate for the EV Telematic and Charger Control and Battery Control pathways.

Participation Rate

The participation rate captures all reasons enrolled devices did not participate. Indeed, participants can opt out of any event, not all EVs are connected to the grid during events, and connectivity issues can result in not all enrolled devices participating in each event.

For the Smart Thermostat DLC pathway, participants were not removed from the whole-house data analysis if they opted out of an event or had connectivity issues. Therefore, the participation rate is directly included in the unitary available DR capacity values.

For the other pathways, the number of participating devices and the resulting participation rates are presented in Table 20 below. For the Battery Control pathway, the Evaluator calculated the participation rate based on both enrolled devices (as presented in Table 20 below) and the battery enrolled capacity in kW (as presented in Table 23 further below). The participation rate accounted for dispatching issues that resulted in no battery controls participating in the first event.

The participation rate in the EV Telematic and Charger Control pathway was extremely low at 2.9%, which is explained by the fact that participants were typically not charging during the event window. To improve participation, leveraging bidirectional chargers to use EVs as batteries during events could be considered. In this configuration, EVs would not need to be actively charging to contribute; instead, energy stored in the EV battery could be temporarily used to reduce household loads during DR events, with vehicles being recharged afterward. While this approach has been implemented in other jurisdictions, it requires appropriate technology, participant education, and informed consent. As such, further assessments of feasibility, costs, and user acceptance are recommended before pursuing implementation.

Table 20: Residential DR Participation Rates per 2024/25 Event

Event #	Event Date	DHW Controllers			EV Telematics and Chargers			Battery Controls		
		Number of Enrolled Devices	Number of Participating Devices	Participation Rate	Number of Enrolled Devices	Number of Participating Devices	Participation Rate	Number of Enrolled Devices	Number of Participating Devices	Participation Rate
1	12-04-2024	-	-	-	174	4	2.3%	11	0	0.0%
2	12-20-2024	-	-	-	175	2	1.1%	12	8	66.7%
3	12-23-2024	-	-	-	178	9	5.1%	12	9	75.0%
4	01-21-2025	781	200	25.6%	184	6	3.3%	12	9	75.0%
5	01-22-2025	820	186	22.7%	183	1	0.5%	12	7	58.3%
6	02-05-2025	926	206	22.2%	193	10	5.2%	12	10	83.3%
7	02-06-2025	936	198	21.2%	191	4	2.1%	12	8	66.7%
8	02-12-2025	1,002	215	21.5%	191	6	3.1%	12	9	75.0%
Weighted Average Participation Rates		-	-	22.5%	-	-	2.9%	-	-	63.2%

4.2.2 Unitary Available DR Capacity

For the 2025 evaluation of the DHW DLC pathway, the Evaluator relied on the unitary available DR capacity established in 2023, as presented in the 2025 Demand-side Management Measure Assessment (DSM MA).³³ While the Evaluator considers the value from the 2023 evaluation still applicable, it is recommended that a new metering data analysis be conducted in future years to ensure that the unitary available DR capacity value remains consistent.

For the other three pathways, the Evaluator quantified the available DR capacity in the 2025 evaluation through metering data analyses. The Evaluator first established unitary available DR capacity values per participant and then calculated average available DR capacity per device or per enrolled capacity where applicable. To establish these unitary available DR capacity values, the Evaluator developed models that predict the expected average hourly load per participant and then compared the expected and actual hourly loads during DR events.

Metering Data Analysis Methodology

This subsection provides a high-level description of the methodologies used to establish smart thermostat DLC, EV telematic and charger, and battery control unitary available DR capacities for the 2025 evaluation.

Smart Thermostats

For the Smart Thermostat DLC pathway, the Evaluator applied the same methodology as in 2024. More precisely, the baseline was established using whole-house electricity consumption and a regression-based approach that accounts for time of week and outdoor temperature. Prior to modelling, the dataset was cleaned to ensure reliability. Participants with inconsistent load patterns, including households with electric vehicles or those that moved during the evaluation period, were excluded. In addition, datapoints with missing or incoherent values were removed. Of the 2,471 participants that had at least one smart thermostat enrolled in Residential DR during the 2024/25 DR season, 1,222 were included in the analysis.

With this considerably larger sample than that of the 2024 analysis, the Evaluator was able to conduct the analyses with subgroups to obtain unitary available DR capacity values for different types of space heating in households. Participants were grouped as follows:

- › Households with smart thermostats controlling only electric baseboards (EBBs)
- › Households with smart thermostats controlling only mini-split heat pumps (MSHPs)
- › Households with smart thermostats controlling a mix of EBBs and MSHPs and no other type of space heating
- › For the other types of space heating, the Evaluator used the average obtained for all participants since the number of participants in this last category was too small to obtain significant results. Other types of space heating consisted of either a central heat pump, a mix of a central heat pump and EBBs, or one unknown space heating system.

Additional details on the methodology, including data cleaning procedures and margin of error calculations, are provided in Appendix V. The regression coefficients for each hourly model are presented in Appendix VI.

³³ The 2025 DSM MA is a reference document that provides an in-depth review of all parameters necessary to calculate the annual and lifetime gross electrical energy and peak demand savings of all prescriptive measures and most semi-prescriptive measures offered through E1's DSM program portfolio. In addition, the MA includes effective useful life values for all measures offered in E1's program portfolio. For the evaluation conducted during the last year of the 2023-2025 DSM cycle, the Evaluator refers to the values presented in the 2025 DSM MA.



EV Telematics and Chargers

For EV telematics and chargers, the Evaluator used device-level data to establish consumption during and after DR events and calculate what would have been drawn from the grid during the events in the absence of the program. The result represents the unitary available DR capacity. The initial dataset was cleaned to eliminate duplicates (i.e. two measurements with the same timestamp) and average hourly power was calculated for each participating device for the four hours during each event as well as for the four hours following each event.

Hourly savings were calculated for each device separately by subtracting device energy consumption during a given event hour from device energy consumption four hours later. This approach was selected as it is assumed that a participating device stops charging during the event timeframe, and any charging that occurs in the four hours post-event would have occurred four hours earlier in the absence of a DR event. However, some devices stopped charging slowly or resumed charging early, which is why energy consumption during the event was subtracted from the post-period energy consumption. Additionally, devices that did not charge post-event or that showed negative savings were eliminated from the analysis and considered as not having responded. This slightly reduced the number of responding devices.

Battery Controls

For battery controls, the Evaluator used device-level data to establish the amount of battery discharge during each event window, which counted as available DR capacity as long as no charging occurred during the event windows. This assumes that any load met by the battery would have been met by the grid, and this assumption was validated by determining that batteries were not regularly used outside of event times using the device-level data.

The initial dataset was cleaned to eliminate duplicates (i.e. two measurements with the same timestamp), and average hourly power was calculated for each participating device for the four hours during each event. Hourly savings were calculated for each device separately using the average hourly power during each event hour. Devices that did not discharge during an event were eliminated from the analysis and considered as not having responded. This slightly reduced the number of responding devices.

Additionally, for each event hour, the Evaluator calculated the kW saved per kW of capacity available by dividing the average hourly power by the battery capacity. This analysis was conducted because the enrolled batteries are of different size, and this metric could be leveraged in the future to better estimate the available DR capacity associated with each participant.

Metering Data Analysis Results

Using the methodologies presented above, the Evaluator established the DR capacity made available at each event hour of the 2024/25 DR season for each pathway. As mentioned in the introduction, available DR capacity is measured over the first two hours of a DR event. Table 21 below, therefore, presents the results for the two first hours of each event of the 2024/25 DR season.

As indicated by red text in Table 21 below, a few of the event hours were considered outliers. Event 1 did not result in statistically significant savings for the “MSHP only” and “EBB and MSHP only” smart thermostat subgroups since not enough participants were enrolled at that time. Event 7 was considered an outlier for all smart thermostat subgroups since, after visualizing the baseline and actual consumption levels, the baseline was observed to not follow the daily consumption on that day; it was confirmed that multiple businesses, including schools, closed because of a snowstorm on that day, which explains why consumption throughout the day was higher than estimated.

E1 also indicated that communication issues occurred for many smart thermostats during Event 1. Similarly, E1 indicated that nearly half of enrolled heat pumps did not participate due to being in auto-mode instead of heating mode, which likely explains why the average available DR capacity for MSHP-only participants is lower than that of other participants. Since such issues can occur again, the Evaluator kept Event 1 data in the analysis unless the results were not statistically significant for a given subgroup.

Due to dispatching issues, no battery controls participated in the first event. The nil DR capacity made available during this event was not considered to establish average available DR capacity since it was considered in the in-service rate.

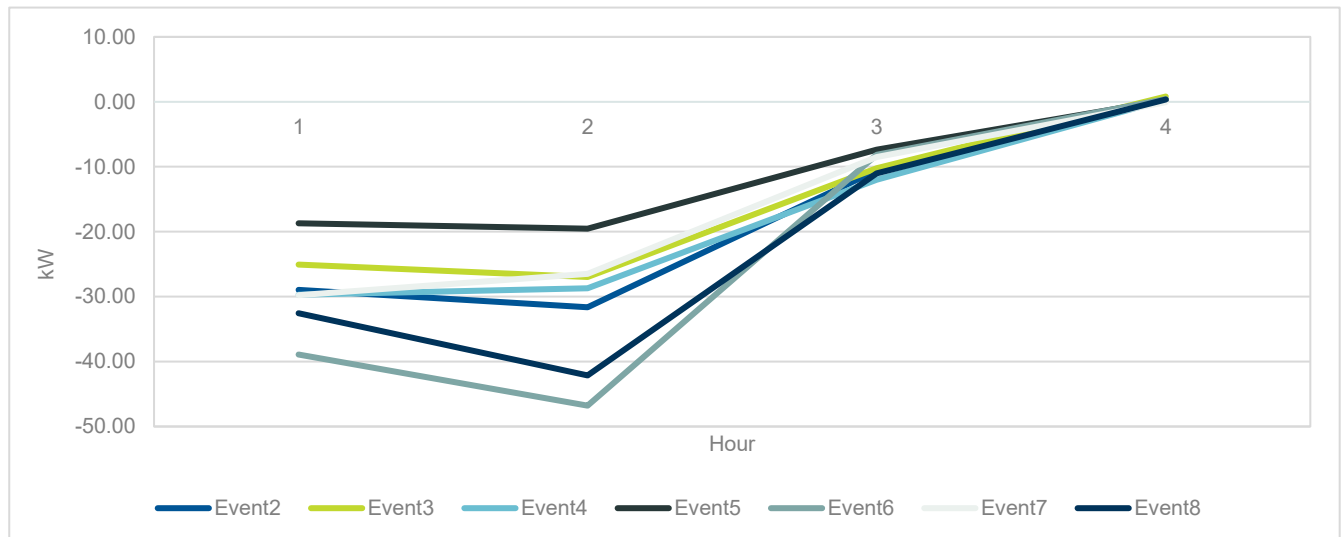
Table 21: 2024/25 Available DR Capacity per Participant per Event

Event #	Event Date	Event Hour	Available DR Capacity per Participant (W)					
			Smart Thermostats per Space Heating Type				EV Telematics and Chargers	Battery Controls
			EBB Only	MSHP Only	EBB and MSHP Only	Others		
1	12-04-2024	17	459	20	155	216	5,060	-
		18	389	173	79	217	3,947	-
2	12-20-2024	7	634	241	444	451	4,345	3,618
		8	551	240	350	409	3,013	3,955
3	12-23-2024	17	602	161	468	418	4,792	2,783
		18	466	160	570	375	3,635	2,997
4	01-21-2025	17	300	-21	131	155	4,124	3,301
		18	568	179	423	416	4,550	3,192
5	01-22-2025	7	624	199	391	438	4,638	2,670
		8	739	304	542	550	3,294	2,791
6	02-05-2025	17	531	212	538	425	3,154	3,890
		18	773	300	742	612	5,449	4,679
7	02-06-2025	7	222	-225	24	44	3,678	3,722
		8	344	-97	77	152	2,733	3,310
8	02-12-2025	17	652	375	698	572	3,833	3,620
		18	846	361	922	704	3,993	4,681
Average Available DR Capacity for All Events			544	161	410	385	4,015 ± 11%	3,515 ± 8%
Average Available DR Capacity Excluding Event 7			581 ± 8%	-	-	426 ± 7%	-	-
Average Available DR Capacity Excluding Events 1 and 7			-	226 ± 20%	518 ± 13%	-	-	-

Margins of errors are not all presented in Table 21 above to simplify the presentation; they are included in the table as percentages next to the average available DR capacity values that were used to calculate evaluated results. While not all hours of all events resulted in statistically significant available DR capacity, the average available DR capacity values observed across all events were statistically significant for each pathway and subgroup. While some margins of errors were slightly above the typical 10% threshold, the Evaluator considered that they were sufficiently low to be used to establish 2025 evaluated results and for E1 tracking for 2026. Although acceptable unitary available DR capacity values were established for 2025, further analyses will be needed to ensure that these values remain consistent year over year. Indeed, the consistency of these values remains to be confirmed, particularly given the notable differences between 2024 and 2025 results for smart thermostats and the fact that the EV and Battery pathways were evaluated for the first time in 2025.

To visualize the impact of each event in the case of batteries, the Evaluator created a chart illustrating the hourly discharge for each event, as seen in Figure 10 below. The total discharge increases as participation increases. Most batteries discharge within the first two hours of an event and exhibit reduced discharge during the third hour of an event. A slight charge can sometimes be observed in the fourth event hour, which should be avoided to prevent snapback on the grid.

Figure 10: Total Battery Hourly Discharge (kW) for Each 2024/25 Event



Unitary Available DR Capacity

While Table 21 above outlines the average available DR capacity value per participant for each pathway and subgroup, this subsection presents other relevant metrics that were assessed by the Evaluator.

Smart Thermostats

For smart thermostats, the Evaluator established unitary available DR capacity per thermostat since this metric is better aligned with how participation is tracked. The household data included in the metering analysis were used to establish the average number of smart thermostats per household for each subgroup, the results of which were then used to divide the average available DR capacity per household to obtain the unitary available DR capacity per thermostat. Table 22 below presents the resulting unitary available DR capacity per thermostat values that were used to calculate the 2025 evaluated available DR capacity for the Smart Thermostat DLC pathway.

Table 22: 2024/25 Available DR Capacity per Thermostat

	EBB Only	MSHP Only	EBB and MSHP Only	Others
Average Available DR Capacity Per Participant, Excluding Outliers (W/Participant)	581	226	518	426
Average Number of Smart Thermostats per Participant	5.2	1.9	7.5	4.6
Unitary Available DR Capacity per Thermostat (W/Thermostat)	112	119	69.1	92.6

Given the notable differences between the 2024 and 2025 evaluation results (39.4 W per thermostat in 2024), the Evaluator recommends that E1 use the values presented in Table 22 above to track the available DR capacity for 2026 and that another metering data analysis be conducted in future years (depending on AMI data availability).

EV Telematics and Chargers

The Evaluator established a unitary available DR capacity value per EV device since this metric is aligned with how participation is tracked. The calculated total available DR capacity was divided by the number of participating devices for each event, resulting in an average unitary available DR capacity value per EV device of **4,015 W**. This unitary available DR capacity per EV device value was used to calculate the 2025 evaluated available DR capacity for the EV Telematic and Charger Control pathway. The Evaluator recommends that E1 use this value to track available DR capacity for 2026 and that further metering data analysis be conducted in future years to ensure that the unitary available DR capacity value per EV device remains consistent year over year.

Battery Controls

As described above, the Evaluator first established a unitary available DR capacity per battery and also calculated an average available DR capacity per battery capacity. The latter was used to calculate the 2025 evaluated available DR capacity for the Battery Control pathway. To establish the average unitary available DR capacity per battery, the calculated total available DR capacity was divided by the number of participating devices for each event. This resulted in a unitary available DR capacity per battery of **3,515 W**.

To establish the average available DR capacity per battery capacity, the Evaluator divided the kW made available during each hour of each event by the kW of battery capacity available for each participating device, resulting in the values presented in Table 23 below. Since this metric accounts for the size of each enrolled battery and provides similar results to the average available DR capacity per battery, the value of **0.763 kW/enrolled kW** was used, along with the participation rate of 58.0% of enrolled kW, to calculate the 2025 evaluated available DR capacity.

Table 23: 2024/25 Available DR Capacity in kW/kW for Batteries

Event #	Event Date	Event Hour	Available DR Capacity (kW/Enrolled kW)	Participation Rate (% of Enrolled kW)
1	12-04-2024	17	-	0.0%
		18	-	0.0%
2	12-20-2024	7	0.904	52.6%
		8	0.989	52.6%
3	12-23-2024	17	0.699	58.9%
		18	0.753	58.9%
4	01-21-2025	17	0.829	58.9%
		18	0.802	58.9%
5	01-22-2025	7	0.635	48.4%
		8	0.664	48.4%
6	02-05-2025	17	0.732	87.4%
		18	0.880	87.4%
7	02-06-2025	7	0.637	76.9%
		8	0.566	76.9%
8	02-12-2025	17	0.695	77.1%
		18	0.899	77.1%
Average Available DR Capacity for All Events			0.763	58.0%

The Evaluator recommends that E1 use the value of 0.763 kW/enrolled kW to track the available DR capacity for 2026 and that further metering data analysis be conducted in future years to ensure that the unitary available DR capacity value per battery capacity remains consistent year over year.

4.2.3 Interactive Effects

In a home, interactive effects occur when the implementation of energy efficiency products has an impact on the energy consumption of other elements such as heating and cooling.

For the Smart Thermostat DLC pathway, all interactive effects from reducing smart thermostat setpoints are included in the evaluation analysis since the latter is based on whole-house metering data. Based on a literature review of residential DR program evaluation best practices conducted in 2024, the Evaluator preferred participant whole-house consumption data (advanced metering infrastructure [AMI]) to device-level data since the former allow for the inclusion of interactive effects from equipment such as other heating systems (e.g. heat pumps) not controlled by participating smart thermostats and for offsetting the reduced load associated with participating thermostats.

For the DHW DLC pathway, the Evaluator assumed that only negligible interactive effects occur since the temperature of the tank (which exchanges heat with ambient air) is only lowered by a few degrees, and DHW tanks are mostly located in unconditioned spaces. For the EV Telematic and Charger Control as well as Battery Control pathways, the Evaluator also assumed that negligible interactive effects occur due to the nature of the devices and their lack of interaction with conditioned spaces. Since interactive effects were considered negligible, the use of whole-house consumption (AMI) data was not needed, and the Evaluator therefore relied on device-level data.



4.2.4 Effective Useful Life

Although no electrical energy savings are expected from DR initiatives, the Evaluator established an EUL value since the available DR capacity can persist over time. For the Residential DR, an EUL value of one year should be used since participation includes all active participants, not only new participants; therefore, the available DR capacity of a participant is counted each year and does not need to be extrapolated over its lifetime.

4.2.5 Evaluated Available DR Capacities

For Residential DR, available DR capacity is obtained by multiplying the number of enrolled devices by the unitary available DR capacity value, the participation rate, and the portion of the DR season with enrolled devices, as presented in the equation below.

$$\begin{aligned} \text{Available DR Capacity} \\ &= \text{Number of Enrolled Devices} \times \text{Unitary Available DR Capacity} \times \text{Participation Rate} \\ &\quad \times \text{Portion of DR Season with Enrolled Devices} \end{aligned}$$

Table 24 below presents the 2025 available DR capacity results for Residential DR. As presented in the table, available DR capacity at the generator amounted to 0.854 MW.

The available DR capacity at the generator was estimated using residential line loss factors. The line loss factors were updated in 2019 and correspond to the values submitted to the Nova Scotia Utility and Review Board (NSUARB), now named the Nova Scotia Energy Board (NSEB), as part of the 2014 Cost of Service Study Progress Update.³⁴

³⁴ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.

Table 24: Evaluated 2025 Residential DR Available DR Capacities

	Smart Thermostats per Space Heating Type					DHW Controllers	EV Telematics and Chargers	Battery Controls	Total
	EBB Only	MSHP Only	MSHP and EBB Only	Others	Subtotal				
Number of Enrolled Devices	5,853	1,516	2,680	151	10,200	1,002	191	12	11,405
Enrolled Battery Capacity (kW)	-	-	-	-	-	-	-	60.8	-
Unitary Available DR Capacity (W per device)	112	119	69.1	92.6	-	385	4,015	-	-
Unitary Available DR Capacity (kW/kW enrolled)	-	-	-	-	-	-	-	0.763	-
Participation Rate (%)	-	-	-	-	-	22.5%	2.9%	58.0%*	-
Portion of DR Season with Enrolled Devices (%)	62.2%	61.1%	66.9%	54.7%	-	53.4%	-	-	-
Available DR Capacity – at the Meter (MW)	0.408	0.110	0.124	0.008	0.650	0.046	0.022	0.027	0.745
Line Loss Factor	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466	1.1466
Available DR Capacity – at the Generator (MW)	0.468	0.126	0.142	0.009	0.745	0.053	0.025	0.031	0.854

* For battery control, the participation rate used in this calculation corresponds to the rate presented in Table 23 since the unitary available DR value is based on total enrolled battery capacity in kW.

The Evaluator compared the 2025 evaluated available DR capacity for all participants to that of 2024. As outlined in Table 25 below, returning participants generated 22% more available DR capacity than they did in 2024 due to the higher unitary available DR capacity value established for smart thermostats. New participants generated 0.799 MW, representing 93% of the 2025 available DR capacity. In 2025, the new available DR capacity, which corresponds to added available DR capacity compared to the previous year, was established at 0.797 MW.³⁵

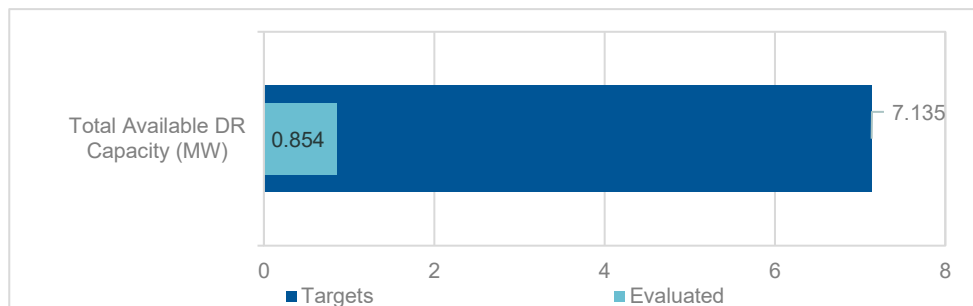
Table 25: Change in Available DR Capacity from 2024 to 2025

	Available DR Capacity (MW)	% of 2024 Total Available DR Capacity
Total 2024 Capacity (A)	0.057	N/A
Change in Existing Participants Available DR Capacity (B)	0.012	22%
Loss Due To Participants Leaving the Program (C)	-0.013	-24%
Gain From New Participants Joining the Program (D – A – B – C)	0.799	1,406%
Total 2025 Capacity (D)	0.854	1,504%
New Available DR Capacity (D – A)	0.797	N/A

³⁵ Although some DHW controllers participated in Residential DR in 2023, all available DR capacity from DHW controllers is treated as new available DR capacity since this metric reflects additions relative to the previous year and no available DR capacity was claimed for DHW controllers in 2024.

Figure 11 outlines Residential DR evaluated and targeted available DR capacity.

Figure 11: 2025 Residential DR Target and Evaluated Available DR Capacity



4.3 Program Realization Rate

Table 26 below compares the available DR capacity established through this evaluation to the value tracked by E1 in the 2025 tracking sheet. The realization rate, representing the ratio of evaluated available DR capacity to tracked available DR capacity, was established at 158%.

Table 26: Comparison of 2025 Residential DR Tracked and Evaluated Available DR Capacities at the Generator

	Available DR Capacity		Realization Rate
	Value	Unit	
Available DR Capacity			
Tracked by E1	0.540	MW	158%
Evaluation Results	0.854	MW	

The evaluated available DR capacity was 58% higher than the value tracked by E1. This difference is mainly due to the higher unitary available DR capacity values established for smart thermostats, with only minor differences for other pathways.



5 Residential DR Key Findings and Recommendations

As previously mentioned, the main objectives of the 2025 Residential DR evaluation were as follows:

- › Collect feedback from program staff, service providers, staff from other jurisdictions, and non-participants on increasing/maintaining participation along with opportunities for operational improvements.
- › Calculate Residential DR results, namely new and total available DR capacities

This section provides the Evaluator's key findings in relation to the above objectives.

2025 Res DR-Finding: Residential DR offers a comprehensive mix of eligible device types compared to other jurisdictions. All reviewed programs offer smart thermostats, with five out of nine jurisdictions offering EV chargers, home batteries and hot water controllers.

Residential DR offers participants the opportunity to enroll four distinct device types, which is comparable with leading jurisdictions such as British Columbia and Puget Sound. Offers in other jurisdictions include one, two, or three pathways only.

2025 Res DR-Finding: Residential DR service providers report that the relationship with E1 is positive.

Service providers indicated that the program component is running smoothly from their perspective and the relationship with E1 is positive and collaborative.

2025 Res DR-Finding: For the 2024/25 DR season, all Residential DR device pathways were integrated into a streamlined offer from the participant perspective.

During the pilot phase, the DHW DLC pathway was operated as a separate offer from the Smart Thermostat DLC, Battery Control and EV Telematic and Charger Control pathways. The pathways are now offered as one customer-facing initiative externally named Eco Shift to allow for a more streamlined approach for potential participants to access all device pathways offered through Residential DR. Behind the scenes, the pathways continue to operate independently with distinct service providers and processes. As the program component matures, there may be opportunities for future integration of pathway operations leading to operational efficiency gains.

2025 Res DR-Finding: Lessons learned in delivering Residential DR have led to necessary updates to the program component offer, eligibility criteria, and enrollment process.

As Residential DR has evolved, lessons learned have been gathered and applied to program component design. Eligibility criteria and enrollment pathways have been adapted over time. An interviewed Canadian program manager noted that slower program growth is expected in demand response programs. A higher level of testing and a longer pilot phase is typically required for demand response programs compared to energy efficiency programs due to the value proposition being less tangible for participants and the importance of demonstrating that reliable demand reduction can be achieved for the grid.



2025 Res DR-Finding: Program documentation has not kept pace with program changes.

The Evaluator noted that Residential DR program changes, dates of program changes, and rationales thereof are not clearly documented in one document. Additionally, in the demand response program manual, information regarding Residential DR is blended with information regarding the BNI program component. In some sections of the manual, it is not clear which information relates to which sector.

2025 Res DR Recommendation 1: Include all changes to the pilot and program in the program manual, including historical changes since the pilot was launched. Include dates of all changes, a description of the change, along with the rationale for the change. Clearly define all eligibility criteria by pathway in the program manual. Reorganize the demand response program manual to create two distinct and continuous sections for residential and BNI given key differences in the approach by sector for demand response initiatives.

2025 Res DR-Finding: Residential DR participation grew substantially during the 2024/25 DR season.

In the 2024/25 DR season, Residential DR participation increased by 907% compared to 2023/24 levels, reaching 3,676 participants and 11,405 enrolled devices across all four pathways. Smart thermostats remained the most common device with 10,200 enrolled units, followed by 1,002 DHW controllers, 191 EV telematics and chargers, and 12 batteries.

2025 Res DR-Finding: Despite the substantial increase in participation, Residential DR did not achieve its available DR capacity target.

In 2025, Residential DR generated available DR capacity of 0.854 MW at the generator, thus not reaching the planned available DR capacity of 7.135 MW.

2025 Res-DR-Finding: Residential DR service providers report that participant retention is high.

Year-over-year participant retention is reported as high with over 90% of participants remaining enrolled in the program over the long-term.

2025 Res DR-Finding: Similar to other jurisdictions, E1 leverages energy efficiency programs, notably EPI, to create a channel of DR participants, and this process could be fine-tuned.

Mandatory enrollment in demand response when a participant receives an eligible device via an energy efficiency program is not uncommon in other North American jurisdictions.

EPI participants who receive a free, direct-install smart thermostat through that program component are now required to enroll in Residential DR. However, the Evaluator estimates that, based on a tracking sheet matching exercise, 40% of EPI participants who received a free smart thermostat in 2024 have not enrolled in Residential DR.

The Evaluator noted that there is not a unique participant identifier present in the EPI and Residential DR tracking sheets to easily discern which EPI participants have successfully completed enrollment in Residential DR following the installation of their smart thermostat through EPI. Additionally, a program service provider noted that there are instances whereby the EPI installer does not accurately collect the required device information, leading to difficulty identifying and auto-enrolling devices in Residential DR post-device installation.



2025 Res DR/EPI Recommendation 2: Ensure that participant data and the information collected through the EPI installation process are complete and accurate. Ensure EPI installers properly and accurately record device information to ensure connectivity in Residential DR after device installation.

2025 Res DR-Finding: Non-participants shared key perceived benefits and barriers that can be leveraged to enhance program messaging and communications as well as increase participation.

All EPI participants interviewed (Residential DR non-participants) indicated they were aware of Residential DR and shared key sources of awareness along with their perceived benefits and barriers to participation in Residential DR, including what prevented them from enrolling. Key sources of awareness for Residential DR include emails from E1 and the E1 website (among EPI and Residential DR participants). Top perceived benefits of Residential DR among non-participants are incentives and helping to reduce peak demand in Nova Scotia. Barriers to participation reported by non-participants relate to enrollment issues, discomfort with external control of their heating system, privacy concerns, and lack of clarity around what demand response entails. A service provider shared that privacy issues are heightened in Nova Scotia compared to in other jurisdictions. A Canadian program manager emphasized the importance of a simple enrollment process and continuous education around demand response in communications to potential and enrolled participants.

2025 Res DR Recommendation 3: Leverage key awareness channels to increase program participation in Residential DR within and outside the current and past EPI participant population. Focus key messaging on program benefits, including available incentives and contributing to reducing strain on the grid, while clearly outlining privacy protection mechanisms and the flexibility and control that participants maintain over their devices once enrolled. Clearly define how Residential DR works, the importance of participating in events, and how to achieve ongoing participation incentives (participation in 50%+ of DR events).

2025 Res DR-Finding: Maximizing the number of devices enrolled per household was unanimously shared as a key strategy for the program component moving forward.

A total of 40% of participants surveyed by Narrative Research in the summer of 2025 indicated that they have additional eligible devices not enrolled in Residential DR in their homes. Maximizing the number of devices installed per household was shared as a key strategy for consideration by several interviewees in this evaluation.

Implementing this strategy in the Smart Thermostat DLC pathway would also reduce the likelihood of back-up heating systems coming online during an event when only some thermostats in the home are registered in Residential DR, thus maximizing the available DR capacity per household. Adding smart thermostats to heating systems in residential spaces that are disconnected from the main living spaces (i.e. garages) or only occasionally used spaces (i.e. basement storage rooms) can be limited via the EPI enrollment pathway by ensuring that installers have instructions on appropriate locations for smart thermostat installations.



2025 Res DR-Finding: Participants and service providers provided information on communication strategies and event design that may reduce DR event opt-out rates.

Event design, frequency, and length vary greatly by jurisdiction included in the research due to the variety of system needs across North America. Therefore, some aspect may not be applicable in the Nova Scotia context. The participant survey conducted by Narrative Research (July 2025) includes participant preferences on event design and communications that may be leveraged to improve event-level opt-out rates, including the benefits of providing post-event communications. Additionally, the operational improvement workshop hosted by a program service provider suggested further educational and engagement initiatives aimed at increasing participation. A Canadian DR program manager and the Residential DR Service Provider both shared that EV charging patterns do not line up with expectations in terms of timing and frequency. This leads to many EVs not being plugged in during DR events both in Nova Scotia and in another Canadian jurisdiction.

2025 Res DR-Finding: Despite strong enrollment, not all devices participated in every event due to ongoing enrollment, connectivity issues, device availability, and opt-outs.

Since enrollment continued throughout the DR season and participants could opt out of events, the number of enrolled devices did not always correspond to the number of devices that participated in each event. As a result, participation rates varied significantly by pathway:

- › DHW controllers participated at an average rate of 22.5% mostly because of connectivity issues.
- › Batteries participated at an average rate of 63.2% due to both connectivity issues in the first event and opt-out rates in other events.
- › EV devices participated at an average rate of 2.9% mainly because of device availability since EVs must be actively charging during the event window to provide load reduction.

Thermostat participation rates were implicitly accounted for through the regression approach.

2025 Res DR Recommendation 4: Through continuous engagement with enrolled participants, encourage participation in DR events and enrollment of more devices per household (additional device types and additional smart thermostats installed on heating systems in all contiguous living areas in regular use only).

2025 Res DR Recommendation 5: Investigate ways to improve EV device potential for DR considering the low participation rate in DR events. To improve participation, consider additional opportunities for EV devices to participate in DR events, such as leveraging bidirectional chargers to use EVs as batteries during events.

2025 Res DR-Finding: Incentive levels and structures vary across researched North American jurisdictions. Residential DR incentive levels are comparable on average.

A service provider noted that there may be opportunities to reduce Residential DR enrollment incentives and maximize participation incentives to encourage participation in events and reduce opt-out rates. Additionally, an interviewed Canadian program administrator mentioned challenges with achieving first-year cost-effectiveness thresholds in DR programs due to enrollment incentives impacting first-year cost-effectiveness results.

2025 Res DR-Finding: Residential DR offered participation incentives to all participants regardless of participation in DR events in the 2024/25 DR season.

This strategy may have contributed to lower participation levels in DR events in the 2024/25 DR season. The Evaluator has confirmed that participation incentives will only be issued during the 2025/26 DR season in Nova Scotia to Residential DR participants who participate in 50% or more events within a season. Other North American jurisdictions also offer ongoing participation incentives (fixed or variable) based on participation in individual DR events by participants. That structure is often implemented to encourage lower DR event opt-out rates.

2025 Res DR Recommendation 6: Monitor the impact of introducing a participation threshold to qualify for ongoing participation incentives. Should individual event participation rates not improve in the 2025/26 DR season, consider reviewing the Residential DR incentive structure and levels. In that review, consider both the incentive structure in terms of the enrollment incentive level compared to the ongoing participation incentive level and the effectiveness of the 50% participation threshold to qualify for ongoing participation incentives to encourage higher DR event participation rates. Ensure that the incentive structure encourages enrollment growth and increases ongoing DR event participation as both strategies are required to achieve targets in DR programs.

2025 Res DR-Finding: While reliable unitary available DR capacity values were established to obtain the 2025 evaluated results, further analyses are needed to ensure that these values remain consistent year over year.

The unitary available DR capacity values developed for each pathway for the 2025 evaluation are based on comprehensive metering data analyses and reflect the best available estimates for this evaluation cycle. To ensure accurate and stable tracking over time, unitary available DR capacity values should be applied by thermostat type for the Smart Thermostat DLC pathway and per kW of enrolled capacity for the Battery Control pathway. However, the consistency of these values remains to be confirmed, particularly given the notable differences between 2024 and 2025 evaluation results for Smart Thermostat DLC and the fact that the EV Telematic and Charger Control and Battery Control pathways were evaluated for the first time in 2025.

2025 Res DR Recommendation 7: To ensure that the unitary available DR capacity values are consistent year over year, reconduct metering data analyses for each pathway in the next evaluation if the required data are available.

2025 Res DR-Finding: The evaluated available DR capacity value determined by the Evaluator was higher than the available DR capacity value tracked by E1.

The evaluated available DR capacity for Residential DR was 58% higher than the value tracked by E1. This difference is mainly due to the higher unitary available DR capacity values established for smart thermostats, with only minor differences for other pathways.

6 BNI DR Overview

This section describes the Business, Non-profit, and Institutional (BNI) Demand Response (DR) program component, follows up on past evaluation recommendations, and provides an overview of BNI DR participation history.

6.1 BNI DR Description

In 2023, E1 officially launched the BNI DR program component now branded as Smart Synergy. Since the fall of 2020, E1 had implemented several pilot initiatives focused on reducing demand during the Nova Scotia peak period. One of these was the DR Aggregator Pilot launched in the fall 2022, which turned into a full service offer in 2025, now called Commercial and Industrial (C&I) Aggregator, and is herein considered a pathway under the BNI DR program component.

Through the C&I Aggregator pathway, E1 hires aggregators that subscribe groups of BNI customers that can reduce their energy demand loads upon request. While some participants were recruited through a different aggregator, Parsons Inc. was the aggregator for the C&I Aggregator pathway for the period covered by this evaluation. When NS Power calls DR events, aggregators either remotely control some energy consuming systems in participant buildings or they contact participants to deploy their load reduction procedure that was developed with support from their aggregator. The actions taken to reduce loads typically include shutting down electricity consuming systems such as space heating or cooling (sometimes accompanied by pre-heating or pre-cooling), ventilation, water heating, or lighting. The event scheduling criteria are presented in Table 27.

Table 27: C&I Aggregator Event Criteria

Criteria	Requirement
Event Season	Winter is from December through February.
Event Windows	From 7:00-11:00 a.m. and 5:00-9:00 p.m., Monday to Friday excluding holidays, during winter.
Event Initiation Criteria	Events are called based on NS Power's day ahead forecasting of times of high load, often corresponding with colder temperatures.
Number of Events	Maximum of 12 events per season.
Event Durations	Maximum event duration of 4 hours. All events must be entirely contained within the event windows.
Event Frequency	No more than 1 event called per day per participant. No more than 3 events called within any given week (Monday to Friday). No more than 2 events called on consecutive days.
Event Notification	NS Power provides notice to Parsons Inc. by 4:00 p.m. the day before an event is scheduled.

As presented in Table 28 below, NS Power called eight events during the 2024/25 DR season.

Table 28: BNI DR 2024/25 Event History

Month	Number of Morning Events	Number of Evening Events	Total Number of Events	Average Length of Events (Hours)
December	1	2	3	3.7
January	1	1	2	3.5
February	2	2	3	3.7
Total	4	5	8*	3.6
* One event in February occurred during two time-windows on the same day, one in the morning and one in the evening. Participants were grouped into morning and evening platoons based on if they were better suited for participation in morning or evening events. Participants were contacted for only the morning or evening portion of the event according to their platoon.				

BNI DR was aimed at achieving 10.726 MW in available DR capacity at the generator in the 2024/25 DR season.

Throughout this report, **enrolled** available DR capacity corresponds to the potential available DR capacity estimated by the aggregator when a participant is recruited, i.e. before participating in the program. **Unadjusted** available DR capacity refers to the available DR capacity submitted by the aggregator, with the negative event savings values adjusted to zero. Unadjusted available DR capacity serves at the starting point for both E1 and Evaluator review and compilation. **Tracked** available DR capacity corresponds to the available DR capacity established by E1 based on metering data, while **evaluated** available DR capacity corresponds to the available DR capacity established by the Evaluator.

6.2 Follow-up on Past Evaluation Report Recommendations

The Evaluator evaluated BNI DR in both 2023 and 2024 and issued improvement recommendations. Table 29 provides a summary of the implementation status of each recommendation presented in the Executive Summary section of the 2023 and 2024 reports.

Table 29: Implementation Status of Past Recommendations for BNI DR

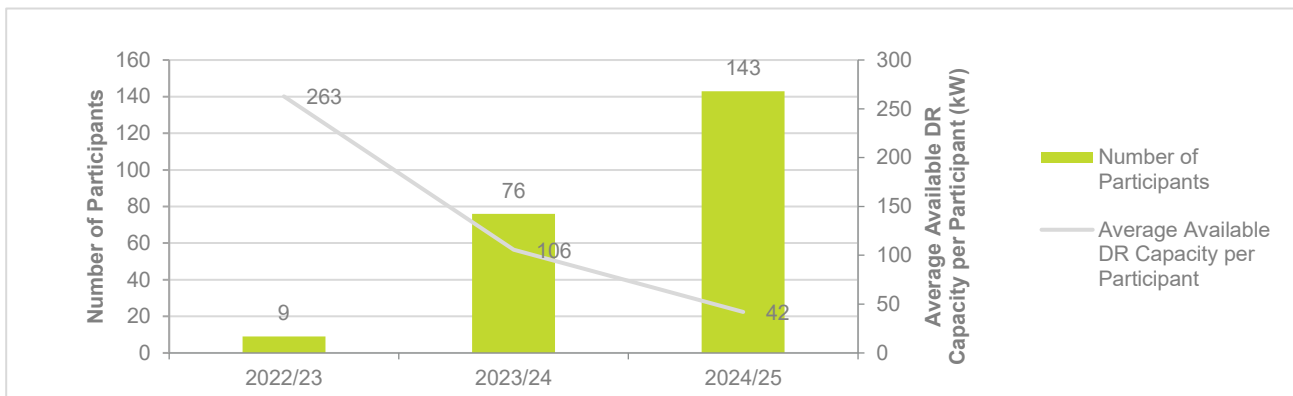
#	Recommendation	Status	Comments
2023 – BNI DR – R2	Establish enrolled capacity based on test events when feasible.	Complete	To ensure it is consistent with M&V guidelines, E1 has established enrolled capacity based on test events performed for the 2024/25 DR season. For participants who did not complete a test event, E1 program staff and the third-party aggregator reviewed the engineering calculations used to determine enrolled capacity to ensure available DR capacity targets are realistic. The Evaluator confirmed that test events were conducted for many participants in 2025.
2023 – BNI DR – R3	Determine which participants are best suited for morning events only, evening events only, or morning and evening events.	Complete	E1 identified participants best suited for morning and/or evening events. Program staff developed morning and evening platoons prior to the end of the 2023/24 season and continued this practice for the 2024/25 season. When two events were called on the same day, the platoons were used to call events based on the potential of each participant, and enrolled capacity was established based on the selected time of day. Events were called for all participants when there was only one event in a day.
2024 – BNI DR – R1	Update the BNI DR Baseline Considerations document to properly address all situations encountered through the project reviews.	Complete	The BNI DR Baseline Considerations document was updated in 2025 to address the situations encountered through the project reviews.

#	Recommendation	Status	Comments
2024 – BNI DR – R2	In the next evaluation, continue to use project reviews to establish tracked and evaluated available DR capacities.	Complete	E1 and the Evaluator again used project reviews in 2025 to establish the tracked and evaluated available DR capacities.

6.3 Participation History

As presented in Figure 12 below, BNI DR had a total of 143 participants in the 2024/25 DR season, an 88% increase in participation compared to the 76 participants in the 2023/24 season. Each BNI DR participant had at least one NS Power meter enrolled in curtailment events, although some participants had multiple enrolled meters. In 2024/25, there were a total of 158 participating meters, an 70% increase in enrolled meters compared to the 93 meters in 2023/24. The available DR capacity per participant decreased from 106 kW in 2023/24 to 42 kW in 2024/25. This is a substantial decrease compared to 2023/24 and is largely due to more participants not engaging in the program once enrolled. E1 has indicated that they plan to focus future enrollment efforts on participants who will consistently engage with the program by shedding loads when called upon in events.

Figure 12: Overview of 2025 BNI DR Participation, 2022/23-2024/25



Participation in Events

Based on the results of a review of 30 meters, it was found that participants did not participate in events around 60% of the time, compared to a non-participation rate of 31% in the 2023/24 DR season. In conducting project reviews, participants with lower available DR capacity were found to have participated in fewer events than those with higher available DR capacity. Non-participation was assumed when there was no substantial decrease in demand for a participant during an event or if the event occurred outside of facility operational hours. When considering the participation rate of the reviewed meters and extrapolating this as a ratio to all meters, the average number of meters participating in an event was established at 63.

Also, in response to a recommendation made in the 2023 evaluation, meters were categorized as being best suited to participate in morning events or evening events, each group being defined as morning and evening platoons. Of the 158 meters, 106 were grouped into the morning platoon, and 52 were grouped into the evening platoon. For one event, a dual event window consisted of a morning window and an evening window. In this case, participants were only contacted to participate in one of the windows according to their respective platoons. For the other seven events, events only had one event window, and all participants were contact for the event in these cases.

7 BNI DR Evaluation Approach

The 2025 BNI DR evaluation comprised a comprehensive impact evaluation. The main objective of the 2025 BNI DR evaluation was as follows:

- › Calculate BNI DR results, participation, and available DR capacity

The Evaluator identified key research questions aimed at achieving this objective. Table 30 outlines the BNI DR evaluation objective and maps it to the research questions and methods established by the Evaluator. Each method is described further below.

Table 30: 2025 BNI DR Evaluation Approach

Evaluation Objectives	Research Questions	Methodology
Establish available DR capacity results for the C&I Aggregator pathway	› Are the data in the tracking sheet complete, accurate, and consistent? › Was the applied measurement and verification (M&V) methodology consistent with the approach recommended by the Evaluator as a result of the 2024 evaluation? › What are the new and available DR capacities achieved by the C&I Aggregator pathway?	› Tracking sheet audit › Project reviews (n=30) › Calculations using evaluation results

Tracking Sheet Audit

Prior to performing the available DR capacity calculation review, the Evaluator audited the final 2025 tracking sheet to ensure it was complete and the entered data were consistent. The results obtained are presented in Appendix VIII.

Project Reviews with Meter Data Analysis

E1 staff sampled and reviewed a total of 30 meters to establish tracked available DR capacity. The sample was stratified so that the 20 meters generating the largest amount of tracked available DR capacity were all reviewed and then a second stratum of 10 randomly selected meters among the smaller meters were also reviewed. This stratified approach ensures the certainty of evaluated savings since the large stratum that represents 71% of the savings are directly evaluated, resulting in no margin of error.

The Evaluator reviewed all 30 meters that were reviewed by E1 staff and validated all adjustments that were made beyond the standard M&V methodology to obtain revised baseline demand, same-day adjustments, and available DR capacity. These project reviews served both to establish the evaluated available DR capacity based on the Evaluator review findings and to ensure that the M&V protocol agreed upon following the last two evaluations, including the treatment of exceptions, was correctly applied. The reviews involved recreating the calculation methodology using meter data to ensure there were no errors, as well as graphically reviewing load profiles of each event to compare against baseline load profiles. The results obtained are presented in Subsection 8.2.1 below.

Calculations Using Evaluation Results

Building on all the above methods and collected data, the Evaluator calculated the available and new DR capacity.

Note on Margin of Error

For evaluation activities that yield quantitative results based on a sample, the Evaluator aimed to achieve a maximum 10% margin of error at a 90% confidence level. This means that, if measurements were conducted many times with different samples, the data would be within 10 percentage points above or below the percentage reported 90% of the time. Thus, the margin of error indicates the relative level of precision³⁶ of a measurement, while its associated confidence level indicates the probability of a measurement falling within the margin of error.³⁷

For BNI DR, a margin of error was calculated for the adjustment ratios obtained from the project reviews as presented in Subsection 8.2.1 below.

³⁶ Precision refers to how reproducible a set of measurements is. However, it does not consider how close the measured values are to the true values; this would refer to accuracy.

³⁷ As part of this evaluation, the confidence levels and margins of error only take random sampling errors into account; they do not reflect non-sampling errors or biases such as data entry errors, inaccurate responses from respondents, or the inability to contact certain people.



8 BNI DR Impact Evaluation

The main objective of the 2025 BNI DR impact evaluation was to determine available DR capacity. In addition, the Evaluator validated that the M&V protocol agreed upon following the last two evaluations, including the treatment of exceptions, was correctly applied.

8.1 Tracking Sheet Audit

To ensure program component results were reliably compiled, the Evaluator first performed a tracking sheet audit aimed at verifying the completeness and consistency of the data submitted by E1. The verification and corrective actions taken by the Evaluator, where applicable, are described in Appendix VIII. The tracked available DR capacity results presented in this report therefore refer to the corrected tracked available DR capacity obtained by the Evaluator.

8.2 Demand Response Capacity

For BNI DR, the evaluated metric is referred to as available DR capacity and corresponds to the load reduction made available for peak demand events in participating businesses.

For the C&I Aggregator pathway, available DR capacity is established by comparing, using meter data, the predicted loads (baseline) to the actual loads during DR events. Baselines for DR events are established based on an average load during similar days prior to an actual event. More precisely, the baseline was the average load during the same hours of the given event for the six days with the highest loads among the 10 eligible days prior to that event (top six-of-ten), to which a same-day additive adjustment factor was applied. The eligible days correspond to non-holiday weekdays excluding event days and one day prior to each event. The same-day additive adjustment factor is the difference between the average load of the selected baseline days for a two-hour window starting three hours before the event (e.g. the load between 2 p.m. and 4 p.m. for an event starting at 5 p.m.) and the load on the event day for the same hours.

In the 2024 evaluation, it was established that all events that generate negative savings should be considered to have 0 available DR capacity. This step of the result compilation process now occurs before establishing and applying adjustment ratios. These values were established to be the unadjusted available DR capacity.

E1 reviews served to establish the tracked available DR capacity; thus, the tracked available DR capacity differs from the values directly obtained from applying the Aggregator pathway calculation methodology. The E1 review process follows guidelines that were laid out in a document entitled BNI DR Baseline Considerations, which is provided in Appendix X.

In the 2024 evaluation, the Evaluator recommended that the negative values be set to zero prior to identifying which meters are the 20 largest to be included for review since all reviewed events that had negative available DR capacity were adjusted to zero by the Evaluator in the project reviews. E1 implemented this change in 2025, resulting in higher impact meters being reviewed.

8.2.1 Project Reviews and Meter Data Analysis

The Evaluator conducted project reviews to establish the evaluated available DR capacity. The Evaluator reviewed the results for a stratified sample of 30 meters, which included the 20 meters with the most available DR capacity (stratum 1 using a census approach) and another 10 randomly selected meters (stratum 2). The project reviews also served to verify that E1 followed the calculation approach and project review guidelines established in the previous evaluation and the BNI DR Baseline Consideration document. Therefore, the meters reviewed by the Evaluator were the same as those reviewed by E1.

Project Review Findings

The most frequent adjustment made by the Evaluator to the available DR capacity calculation was to set the available DR capacity to zero due to non-participation in events. If no obvious load shed was observable for an event with positive available DR capacity, the available DR capacity was set to zero. Events that occurred outside of building operational hours, as determined with the building load profile, were also considered to have not participated and had available DR capacity set to zero. While this type of adjustment was also the most frequent made by E1 in their project reviews, the Evaluator set to zero the available DR capacity of 11 additional instances for which no obvious load shed was observed by the Evaluator.

When calculating tracked savings, E1 moved one participant's lookback window, used to determine same-day adjustment factors, to account for safe facility shutdowns by the participant. As recommended in 2024, the lookback window was moved consistently for all events for this participant. Through their project reviews, the Evaluator came to the same conclusion that the lookback window needed to be adjusted for this participant.

For one event, the Evaluator had originally set the available DR capacity to 0 due to no evident load reduction in the participant's daily load profile. E1 provided communications from the participant indicating that, in response to the event, the participant had scheduled facility operations such that power use would be lower for the entire day, not just during the event window. This evidence was sufficient for the Evaluator to reinstate savings for the event. However, because the participant had lower daily power consumption on the event day, the lookback window 20% cap was triggered, thereby limiting the available DR capacity calculation. Based on the participant confirming overall lower daily consumption due to the event, the Evaluator removed the 20% savings cap for this event, resulting in a higher available DR capacity than what E1 had tracked.

Globally, the Evaluator found that E1 project reviews were appropriate and followed E1 guidelines. As part of the 2024 evaluation, the Evaluator recommended that the BNI DR Baseline Considerations document explicitly define the criteria for removing event savings, the procedure and timing for adjusting participant lookback windows, and the conditions under which event savings should be excluded from the average savings calculation for a given participant. That document was updated to cover these edge cases, and 2025 project review results demonstrated improved consistency in the application of these rules.

Available DR Capacity

Table 31 below presents the tracked and evaluated available DR capacity following the project reviews. As highlighted therein, the Evaluator project reviews resulted in only small differences compared to E1 project reviews, with 3% less available DR capacity for stratum 1 meters and 26% less for stratum 2 meters. The discrepancy is due to the Evaluator setting the available DR capacity of 11 events to zero due to no obvious load shed, while E1 had not identified those events as such.

Table 31: 2024/25 Available DR Capacity of Reviewed Meters

Metric	Stratum 1	Stratum 2
Unadjusted Available DR Capacity (kW)	6,115	231
Tracked Results		
Tracked Adjustment Ratios*	0.67	0.74
Tracked Available DR Capacity	4,079	170
Evaluated Results		
Evaluated Adjustment Ratios*	0.65	0.55
Evaluated Available DR Capacity	3,974	127
* Adjustment ratios were obtained by dividing tracked and evaluated available DR capacity by the unadjusted available DR capacity.		

Table 32 below presents the adjustment ratios for each stratum. Given that all meters in stratum 1 were reviewed, each meter received direct adjustments, while the ratio determined in the review of stratum 2 meters was applied to all stratum 2 meters, including meters that were not reviewed. The Evaluator typically views a margin of error below 10% as statistically significant. In this instance, the 11% margin for the stratum 2 adjustment ratio remains acceptable given the limited sample size and the small number of changes that resulted in an adjustment ratio of 0.55.

Table 32: 2025 Evaluated Adjustment Ratios

Stratum	Adjustment Ratio	Margin of Error	Percentage of Total Available DR Capacity
Stratum 1	0.65	0%	71%
Stratum 2	0.55	11%	29%

Compared to the previous evaluation, the number of participants has grown while the rate of participation has decreased. This was the primary reason for the evaluated adjustment ratios being lower this year compared to the 2024 values of 0.99 and 0.73 for strata 1 and 2. E1 has indicated that they will focus more on engaging fewer total participants but will be working more closely with participants to increase the participation rate.

The Evaluator also noted that the resulting adjustment ratios from this evaluation varied substantially from the previous evaluation; therefore, the Evaluator does not consider them stable enough to apply them to meters in future years. The Evaluator recommends using project reviews again next year to establish evaluated savings since the adjustment ratios are not stable yet.

8.2.2 Interactive Effects

In a building, interactive effects occur when the implementation of energy efficiency products has an impact on the energy consumption of other elements such as heating and cooling. For the C&I Aggregator pathway, interactive effects are included in the available DR capacity calculation since meter data encompass whole building consumption.

8.2.3 Effective Useful Life

Although no energy savings were expected under the C&I Aggregator pathway, the Evaluator established an effective useful life (EUL) value to express for how many years available DR capacity might persist, i.e. as long as participants continue with the program. For the Aggregator pathway, an EUL value of one year should be used for available DR capacity since participation includes all active participants, not only new participants; therefore, the available DR capacity of a participant is counted each year and does not need to be extrapolated over its lifetime.

8.2.4 Evaluated Available DR Capacities

Table 33 below presents the evaluated available DR capacity results of BNI DR for 2025. As presented in Table 33, available DR capacity at the generator amounted to 5.941 MW.

The available DR capacity at the generator was estimated using the appropriate line loss factors for each participant based on the relevant rate codes. The values presented in Table 33 below are therefore weighted average line loss factors. The line loss factors correspond to the values submitted to the Nova Scotia Energy Board (NSEB) as part of the 2014 Cost of Service Study Progress Update.³⁸

Table 33: Evaluated 2025 BNI DR Available DR Capacity

	Stratum 1 Meters	Stratum 2 Meters	Total
Number of Participants*	20	138	158
Unadjusted Available DR Capacity – at the Meter (MW)	6.115	2.972	9.087
Adjustment Ratio	65%	55%	62%*
Available DR Capacity – at the Meter (MW)	3.974	1.626	5.599
Line Loss Factor	1.0610	1.0610	1.0610
Available DR Capacity – at the Generator (MW)	4.211	1.730	5.941
*This ratio is the result of dividing the evaluated available DR capacity by the unadjusted available DR capacity.			

The Evaluator compared the 2025 evaluated available DR capacity for all participants to that of 2024. As outlined in Table 34 below, returning participants generated 46% less available DR capacity than they did in 2024. New participants generated 1.736 MW of the total 2025 available DR capacity. The new available DR capacity for 2025 was -2.093 MW.

Table 34: Change in Available DR Capacity from 2024 to 2025

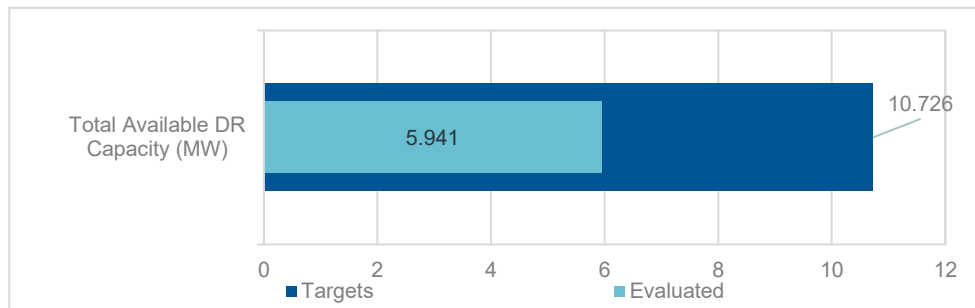
	Available DR Capacity (MW)	% of 2024 Total Available DR Capacity
Total 2024 Capacity (A)	8.034	N/A
Change in Existing Participants Available DR Capacity (B)	-3.696	-46%
Loss Due To Participants Leaving the Program (C)	-0.133	-2%
Gain From New Participants Joining the Program (D – A – B – C)	1.736	+21%
Total 2025 Capacity (D)	5.941	74%
New Available DR Capacity (D – A)	-2.093	N/A

³⁸ Nova Scotia Utility and Review Board, Matter M06555, 2014 Cost of Service Study Progress Update, Exhibit N-2.09, Appendix I1.

The Evaluator also noticed a difference between the volume of available DR capacity between morning and evening events. Not considering event 8,³⁹ morning events generated an average of 6.774 MW in available DR capacity compared to 4.928 MW for evening events, which indicates BNI DR performs better during morning events than during evening events.

Figure 13 below outlines the evaluated and targeted available DR capacity.

Figure 13: 2025 BNI DR Targets and Evaluated Available DR Capacity



Comparison of Enrolled and Evaluated Available DR Capacity

Table 35 presents the difference between enrolled available DR capacity and evaluated available DR capacity.

Table 35: Evaluated 2025 BNI DR Available DR Capacity

Metric	Stratum 1 Meters	Stratum 2 Meters	Overall
Enrolled Available DR Capacity (MW)	8.392	13.660	22.052
Evaluated Available DR Capacity (MW)	4.211	1.730	5.941
Available DR Capacity as Percentage of Enrolled DR Capacity	50%	13%	27%

It is important to establish proper estimates of enrolled available DR capacity to allow DR capacity to become a reliable electricity system resource during peak periods.

As presented in Table 35 above, meters from both strata substantially missed their enrolled DR capacity targets. The most significant cause of this is due to non-participation in events.

8.3 Program Realization Rate

Table 36 below compares the available DR capacity established through this evaluation to the value in the 2025 tracking sheet. The realization rate, representing the ratio of evaluated available DR capacity to tracked available DR capacity, was established at 89%.

³⁹ Event 8 was removed from this comparison because it was a split event, meaning some participants were called for morning events and some were called for evening events based on their prescribed platoon.

Table 36: Comparison of 2025 BNI DR Tracked and Evaluated Available DR Capacity at the Generator

	Available DR Capacity		Realization Rate
	Value	Unit	
Available DR Capacity			
Tracked by E1	6.648*	MW	89%
Evaluation Results	5.941	MW	
* This value is the result of applying the adjustments to the unadjusted available DR capacity made by E1 during their project reviews.			

Evaluated available DR capacity was 11% lower than the value tracked by E1. The difference is due to the adjustments made during project reviews as discussed in Subsection 8.2.1 above.



9 BNI DR Key Findings and Recommendations

As previously mentioned, the main objective of the 2025 BNI DR evaluation was as follows:

- › Calculate BNI DR results, namely the available DR capacity

This section provides the Evaluator's key findings and recommendations in relation to this objective. The recommendations are also outlined in Appendix XI.

2025 BNI DR-Finding: BNI DR did not meet the available DR capacity target.

Available DR capacity at the generator amounted to 5.941 MW. Therefore, BNI DR did not reach its target of 10.726 MW in available DR capacity.

2025 BNI DR-Finding: DR events that occur in the morning, on average, generate more available DR capacity than events that occur in the evening.

On average, the BNI DR program generated 6.774 MW in available DR capacity during morning events compared to 4.928 MW during evening events.

2025 BNI DR-Finding: BNI DR enrollment substantially increased compared to last year, while average available DR capacity per participant decreased.

Participation grew by 88% from 76 participants in the 2023/24 DR season to 143 participants in the 2024/25 season. Conversely, the available DR capacity per participant decreased from 106 kW in 2023/24 to 42 kW in 2024/25. This decrease is largely due to the lack of participation in events by enrolled participants, with reviewed event non-participation increasing from 31% in 2023/24 to 60% in 2024/25.

2025 BNI DR Recommendation 1: Conduct a process evaluation in 2026 to determine strategies to increase the enrolled participant rate of participation in events.

2025 BNI DR-Finding: The BNI DR available DR capacity calculation guidelines developed by E1 were generally followed and reflected the changes the Evaluator suggested pursuant to the 2024 evaluation.

E1 generally followed the BNI DR available capacity calculation guidelines and incorporated the changes recommended by the Evaluator pursuant to the 2024 evaluation. The Evaluator agreed with most adjustments made by E1 during the project review process. However, the independent project reviews conducted by the Evaluator resulted in available DR capacity values that were 3% lower for stratum 1 meters and 26% lower for stratum 2 meters than the values established by E1. The primary cause of this reduction was the Evaluator removed savings from events to which participant response was not evident in the event demand load profile.

The Evaluator confirmed that the changes proposed to the DR Baseline Considerations document in 2024 were successfully incorporated and that E1 applied the updated available capacity calculation guidelines during the 2025 project review process.

2025 BNI DR-Finding: The sampled meters allowed the Evaluator to establish reliable adjustment ratios to obtain accurate evaluated available DR capacity.

The evaluation revealed that reviewing and adjusting the results for a stratified sample of meters (20 meters with the largest available DR capacity and 10 randomly selected meters among the others) served to establish reliable evaluated available DR capacity. Indeed, the Evaluator project reviews resulted in an adjustment ratio of 0.65 for the 20 largest meters, and 0.55 for all other meters with an acceptable margin of error. The Evaluator also noted that the resulting adjustment ratios this year varied substantially from the previous evaluation and are therefore not considered to be stable enough to apply to meters in future years.

2025 BNI DR Recommendation 2: Conduct project reviews again in 2026 to establish evaluated savings.

2025 BNI DR-Finding: The evaluated available DR capacity determined by the Evaluator was lower than the available DR capacity tracked by E1.

The evaluated available DR capacity was 11% lower than the value tracked by E1. This difference is due to the adjustments made through the project reviews.

CONCLUSION

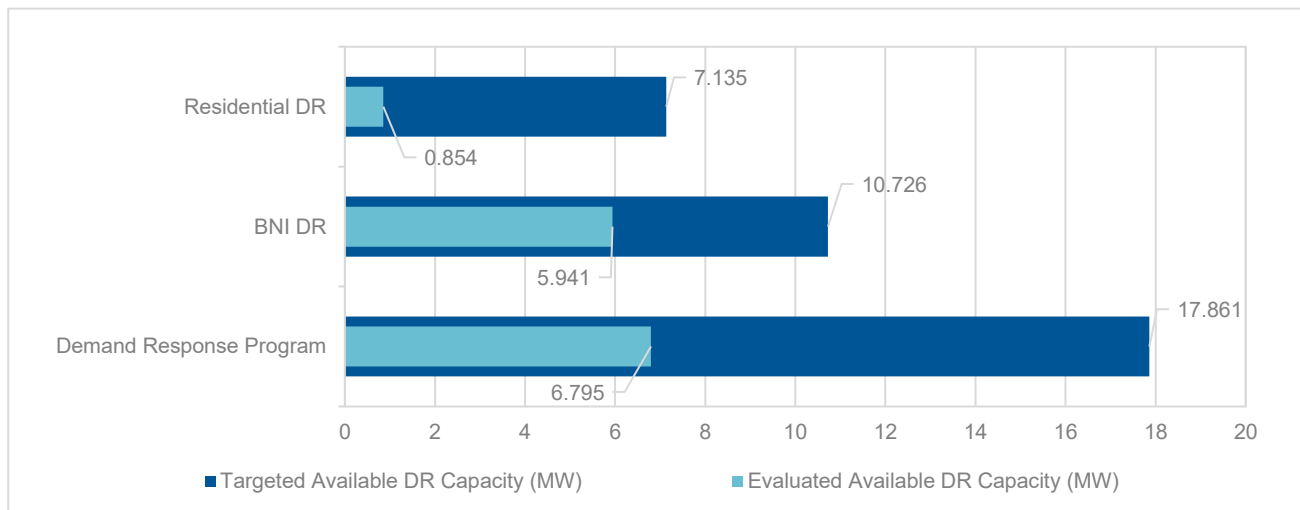
Table 37 presents the participation levels and evaluated new and total available DR capacities for each program component and for the Demand Response program as a whole.

Table 37: Overall 2025 Demand Response Participation and Evaluated Results

	Participation Level		Evaluated Results	
	Value	Unit	Value	Unit
Residential DR				
Available DR Capacity	3,676	Participants	0.854	MW
BNI DR				
Available DR Capacity	143	Participants	5.941	MW
Total				
Available DR Capacity			6.795	MW

Figure 14 below illustrates the evaluated available DR capacity for each program component, Demand Response as a whole, as well as whether targets were achieved in 2025. The program fell short of the planned available DR capacity since both Residential DR and BNI DR did not meet targets. BNI DR continued to be the largest contributor to program available DR capacity.

Figure 14: 2025 Demand Response Targeted and Evaluated Available DR Capacity





LIST OF APPENDICES

The following are presented in the Demand Response Program – Appendices document.

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Appendix I: Residential DR Non-participant Survey Questionnaire

Appendix II: Residential DR Non-participant Survey Results

Appendix III: Residential DR Service Provider Interview Guide

Appendix IV: Residential DR Tracking Sheet Audit

Appendix V: Residential DR Smart Thermostat DLC Detailed Metering Data Analysis Methodology

Appendix VI: Residential DR Smart Thermostat DLC Regression Coefficients

Appendix VII: Residential DR 2025 Recommendations

Business, Non-profit, and Institutional (BNI)

Appendix VIII: BNI DR Tracking Sheet Audit

Appendix IX: BNI DR Available DR Capacity Calculation Example

Appendix X: BNI DR Baseline Considerations

Appendix XI: BNI DR 2025 Recommendations



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ECONOLÉR



EfficiencyOne

DEMAND RESPONSE PROGRAM

Final Appendix Report

2025 DSM EVALUATION

March 20, 2026



ECONOLUX

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APPENDIX I

Residential DR Non-participant Survey Questionnaire

RESIDENTIAL DEMAND RESPONSE NON-PARTICIPANT SURVEY

Table 1: Overview of Data Collection Activity

Descriptor	This Instrument
Instrument Type	Online survey
Estimated Time to Complete	5-8 minutes
Target Audience	Non-participants who have received a smart thermostat from another program but did not enroll in DR
Expected Number of Completions	200
Contact List Source	EfficiencyOne
Fielding Firm	Narrative Research
Estimated Timeline for Fielding	November - December 2025

Table 2: Research Objectives and Associated Questions

Research Objectives	Questions
Introduction & Screener	A
Awareness & Key Barriers	B
Perceived Potential Benefits	C
Demographics	D

To be adapted by Econoler [Blue text]

Import variables from database < LIKE THIS >

Skip pattern or programming instructions [LIKE THIS]

Black text: instructions for interviewer [NOTE: xxxx] / [PROBE: xxxx]

A. Introduction & Screener

[PROMPT FOR TERMINATION at all questions where termination will occur: Those are all the questions I have for you. I thank you very much for your time and cooperation, and have a nice day!]

Welcome!

Thank you for taking part in this survey conducted by Narrative Research, a Halifax-based survey research company. We are performing an evaluation of energy efficiency services and programs provided by Efficiency Nova Scotia. As a thank you for completing this survey, you will receive a **\$15** gift card.

A1. Our records indicate that you participated in the Free Product Installation program and had (a) smart thermostat(s) for electric baseboards or mini-split heat pumps installed in your home.

[DISPLAY: As a reminder, the Free Product Installation program provides participants with free-of-charge direct installations of energy efficient products. Products offered may include not only smart thermostats, but also lighting, domestic hot water (DHW), air sealing, and other products].

Is that correct?

1. Yes	[CONTINUE]
2. No	[THANK AND TERMINATE]
3. Don't know	[THANK AND TERMINATE]

B. Awareness and Key Barriers

B1. Are you aware of a program, called Eco Shift, offered by Efficiency Nova Scotia where you can enroll your smart thermostat(s) in the program to help reduce peak demand in Nova Scotia?

[DISPLAY: When many people use electricity at the same time, like during cold mornings or evenings, it creates a surge in demand called peak demand, which puts extra stress on the power grid.]

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

B2. **[ASK IF B1=2, 98 OR 99]** Please indicate if you've heard of the Eco Shift program after reading the description below.

a) Eco Shift	The program offers rebates for enrolling devices to reduce the demand during peak periods in the winter. During demand response events, smart thermostats' temperature settings are remotely turned down slightly to reduce peak demand/lessen the load on the electricity grid in Nova Scotia.	1 Yes	2 No	98 Don't Know

B3. **[ASK IF B2aB6=2 OR 98]** The Eco Shift program offers financial rebates to participants who allow their smart thermostats to be adjusted slightly during peak electricity demand periods in winter. Would you consider participating in this program?

1. Yes **[THANK AND TERMINATE]**
2. No **[CONTINUE]**
98. Don't know **[THANK AND TERMINATE]**
99. Refused **[THANK AND TERMINATE]**

B4. **[ASK IF B3=2]** Why wouldn't you consider participating in this program?

1. Discomfort around having someone else control my thermostat during demand response events
2. Concerned about sharing my thermostat data with Efficiency Nova Scotia
3. Concerned my home will be too cold during demand response events
4. Lack of information available on the benefits of participating
96. Other, please specify: **[OPEN-ENDED RESPONSE]**
98. Don't know
99. Prefer not to say

[THANK AND TERMINATE AFTER B4 FOR ALL ANSWERS]

B5. **[ASK IF B1=1 OR B2a=1]** How did you learn about Efficiency Nova Scotia's Eco Shift Program? Please select all that apply. **[MULTIPLE RESPONSE. RANDOMIZE 1-10.]**

1. From the installer who contacted me to schedule my appointment
2. From the installer or contractor who came to install my free smart thermostat(s)
3. Marketing emails from Efficiency Nova Scotia
4. From Efficiency Nova Scotia's website
5. Through the manufacturer of my thermostat
6. Through an internet search for the program
7. I saw an advertisement for the program on social media
8. I saw or heard an advertisement for the program on TV
9. I received a notification from my smart thermostat application **ANCHOR**
10. Through participation in another Efficiency Nova Scotia energy efficiency program that was not Free Product Installation. **ANCHOR PLEASE SHARE THE PROGRAM NAME OR DESCRIPTION OF THE PROGRAM: _____)**
96. Other, please specify: **[OPEN-ENDED RESPONSE]**
98. Don't know
99. Prefer not to say

- B6. Our records indicate that the smart thermostat(s) you received from the Free Product Installation program are not enrolled in the Eco Shift program. Is that correct?
1. Yes, that is correct. I did not receive an invitation to enroll in the Eco Shift Program **[CONTINUE]**
 2. Yes, that is correct. I received a manual invitation to enroll but did not follow up **[CONTINUE]**
 3. Yes, that is correct. I removed the thermostat(s) after installation **[CONTINUE]**
 4. Yes, that is correct. I removed the app from my phone but still use the new thermostat manually **[CONTINUE]**
 5. Yes, that is correct. I attempted to enroll in the Eco Shift Program but experienced technical difficulties and didn't complete the process **[IF SELECTED, SKIP B9]**
 6. No, that is not correct. I am enrolled in the Eco Shift program. **[CONTINUE]**
 98. Don't Know **[CONTINUE]**

- B7. **[ASK IF B6=6]** How did you enroll in the Eco Shift program?

1. I received an invitation via email to enroll
2. I enrolled through the website
3. I enrolled via my device app
96. Other, please specify: **[OPEN-ENDED RESPONSE]**
98. Don't know

[SKIP TO D1 AFTER B7 FOR ALL ANSWERS]

- B8. **[ASK IF B6B6=5]** You mentioned having technical difficulties when trying to enroll your smart thermostat and didn't complete the process. Can you tell us more about what happened during your attempt?

1. I encountered technical issues during the enrollment process
2. I didn't receive confirmation of enrollment
3. I wasn't sure how to complete the process
4. I didn't receive support from the program (i.e. Efficiency Nova Scotia or its partners)
5. I didn't receive any emails with instructions to connect my thermostat
96. Other, please specify: _____
98. Don't know
99. Prefer not to say

[SKIP TO C1 AFTER B8 FOR ALL ANSWERS]

B9. Please select the main reason(s) why you didn't enroll in the Eco Shift program from the list below
[ACCEPT MULTIPLE RESPONSES. RANDOMIZE.]

[DISPLAY: As a reminder, "demand response events" are the time periods when the thermostat(s) enrolled in the Eco Shift Program would be turned down slightly during peak electricity usage periods in Nova Scotia.]

1. Discomfort around having someone else control my thermostat during demand response events
2. Concerned about sharing my thermostat data with Efficiency Nova Scotia
3. The financial incentive is not high enough
4. Concerned my home will be too cold during demand response events
5. Lack of information available on the benefits of participating
6. The time of day that demand response events would occur does not work for me
7. The frequency of possible demand response events was too high for me
8. The opt-out criteria for demand response events were unclear to me
9. The duration of the demand response events is too long of a time window for me
10. I didn't think I would receive sufficient notice prior to a demand response event
11. The process on how to sign up wasn't clear
12. The process on how to sign up was too much effort
13. I wasn't clear on what the program does with my thermostat
96. Other, please specify: **[OPEN-ENDED RESPONSE]**
98. Don't know
99. Prefer not to say

B10. **[ASK IF B6=2]** You mentioned receiving a manual invitation to enroll but did not follow up. What were the reasons for not completing the enrollment?

1. I didn't understand the invitation
2. I didn't understand what was required to enroll
3. I didn't have time to follow up
4. I wasn't interested in participating in the Eco Shift Program
5. I experienced technical issues when trying to enroll
6. I didn't see enough benefit in enrolling
96. Other, please specify: _____
98. Don't know
99. Prefer not to say

B11. **[ASK IF B6=3]** You mentioned removing the thermostat(s) after installation. Could you please tell us why?

1. The thermostat didn't work properly
2. I replaced the thermostat with another model
3. I moved to a new home
4. I didn't want to control the thermostat with a smartphone app
5. I had privacy concerns sharing my data
6. The new thermostat was too complicated to use
7. I wanted the thermostat but did not want to participate in the Eco Shift program.
8. Other, please specify: _____
98. Don't know
99. Prefer not to say

C. Perceived Potential Benefits

C1. What do you see as the potential benefits of taking part in the program? Select all that apply.
[MULTIPLE RESPONSE. RANDOMIZED 1-6]

1. Receiving financial incentives for enrolling in the Eco Shift Program
2. Receiving financial incentives for continuing to participate in the Eco Shift program
3. Receiving a free smart thermostat
4. Helping to reduce the peak electricity demand during high usage periods
5. Supporting a more sustainable energy grid
6. Supporting Nova Scotia's transition to clean electricity sources
7. Supporting a more reliable electricity grid by reducing my usage during peak usage periods
8. I do not see any benefits of participating in this program **[ANCHOR AT END OF SERIES, SINGLE RESPONSE IF SELECTED]**
96. Other, please specify: **[OPEN-ENDED RESPONSE]**
98. Don't know
99. Prefer not to say

C2. **[ONLY ASK IF 1-7 are selected at C1]** What additional information, if any, would you need to re-consider enrolling in the Eco Shift Program? **[OPEN ENDED RESPONSE. NOT REQUIRED.]**

D. Demographics

These final questions are asked for statistical purposes only. The information collected is strictly confidential.

D1. Were you enrolled in either rate plan from the Nova Scotia Power Time-Varying Pricing Rate Pilot Program?

[DISPLAY: The Nova Scotia Power Time-Varying Pricing Rate Pilot Program offered two alternative rate plans:

Rate Plan	Description
Time-of-Use Rate Pilot	From November to March, rates were higher during the peak hours when demand for electricity on the grid is high. In non-winter months (April to October) the price for electricity was less than the current standard rate and remained flat, so it did not change based on time of day.
Critical Peak Pricing Rate Pilot	The CPP rate plan offered lower electricity rates during off-peak hours during winter months. During Critical Peak events- four-hour periods when NS Power anticipated demand for electricity to be highest- rates were significantly higher, encouraging energy use to shift to off-peak times.

1. Yes
2. No
98. Don't know

D2. Who is primarily responsible for paying the energy bills in your household? **[SELECT ONE RESPONSE]**

1. I pay the energy bills
2. Someone else in my household pays the energy bills
3. The landlord or property manager pays the energy bills
96. Other [SPECIFY: _____]
98. Don't know
99. (Refused)

D3. In what age category do you fall? Are you... **[SELECT ONE RESPONSE]**

1. 18 to 24
2. 25 to 34
3. 35 to 44
4. 45 to 54
5. 55 to 64
6. 65 or over
99. (Refused)

D4. What is the highest level of education you have completed? **[SELECT ONE RESPONSE]**

1. Less than high school graduation diploma
2. High school graduation diploma and/or some post secondary
3. Trades certificate or diploma
4. College certificate or diploma
5. University degree, certificate or diploma
99. Refused

D5. How many people, including yourself, currently live in your household?

Number of people: _____

D6. Which of the following income categories best describes your total annual household income before taxes in 2024? **[SELECT ONE RESPONSE]**

1. \$30,000 or less
2. Between \$30,001 and \$40,000
3. Between \$40,001 and \$50,000
4. Between \$50,001 and \$60,000
5. Between \$60,001 and \$70,000
6. Between \$70,001 and \$80,000
7. Between \$80,001 and \$100,000
8. Between \$100,001 and \$150,000
9. More than \$150,001
98. (Don't know)
99. (Refused)

D7. Gender **[SELECT ONE RESPONSE]**:

1. Woman
2. Man
3. Non-binary
96. Not listed, please specify
99. Prefer not to answer

[END: Those are all the questions I have for you. I thank you very much for your time and cooperation and have a nice day!]

APPENDIX II

Residential DR Non-participant Survey Results

The participant survey results are presented in the following tables.

TABLE OWN_RENT:	
	OVERALL %
Own	98
Rent	2
SAMPLE SIZE (#)	128

TABLE B1:	
Are you aware of a program, called Eco Shift, offered by Efficiency Nova Scotia where you can enroll your smart thermostat(s) in the program to help reduce peak demand in Nova Scotia?	
	OVERALL %
Yes	84
No	14
Prefer not to say	1
Don't know	2
SAMPLE SIZE (#)	128

TABLE B2A:	
Please indicate if you've heard of the Eco Shift program after reading the description below.	
Eco Shift - The program offers rebates for enrolling devices to reduce the demand during peak periods in the winter. During demand response events, smart thermostats' temperature settings are remotely turned down slightly to reduce peak demand/lessen the load on the electricity grid in Nova Scotia.	
	OVERALL %
Yes	100
SAMPLE SIZE (#)	21

TABLE B5:	
How did you learn about Efficiency Nova Scotia's Eco Shift Program?	
	OVERALL %
Marketing emails from Efficiency Nova Scotia	41
From Efficiency Nova Scotia's website	25
I saw an advertisement for the program on social media	13
From the installer or contractor who came to install my free smart thermostat(s)	9
From the installer who contacted me to schedule my appointment	6
I received a notification from my smart thermostat application	5
Through an internet search for the program	5
I saw or heard an advertisement for the program on TV	5
Other	4
Through the manufacturer of my thermostat	4
Don't know	3
Prefer not to say	2
Through participation in another Efficiency Nova Scotia energy efficiency program that was not Free Product Installation	2
SAMPLE SIZE (#)	128

TABLE B6:

Our records indicate that the smart thermostat(s) you received from the Free Product Installation program are not enrolled in the Eco Shift program. Is that correct?

	OVERALL %
Yes, that is correct. I did not receive an invitation to enroll in the Eco Shift Program	23
Yes, that is correct. I received a manual invitation to enroll but did not follow up	21
Yes, that is correct. I removed the thermostat(s) after installation	7
Yes, that is correct. I removed the app from my phone but still use the new thermostat manually	4
Yes, that is correct. I attempted to enroll in the Eco Shift Program but experienced technical difficulties and didn't	11
No, that is not correct. I am enrolled in the Eco Shift program	20
Don't Know	15
SAMPLE SIZE (#)	128

TABLE B7:

How did you enroll in the Eco Shift program?

	OVERALL %
I received an invitation via email to enroll	52
Don't know	16
Other	12
I enrolled through the website	12
I enrolled via my device app	8
SAMPLE SIZE (#)	25

TABLE B8:

You mentioned having technical difficulties when trying to enroll your smart thermostat and didn't complete the process. Can you tell us more about what happened during your attempt?

	OVERALL %
I wasn't sure how to complete the process	43
I encountered technical issues during the enrollment process	29
Not eligible for the program	21
I didn't receive confirmation of enrollment	7
SAMPLE SIZE (#)	14

TABLE B9:

Please select the main reason(s) why you didn't enroll in the Eco Shift program from the list below.

	OVERALL %
Discomfort around having someone else control my thermostat during demand response events	24
Don't know	21
I wasn't clear on what the program does with my thermostat	13
Concerned my home will be too cold during demand response events	11
The process on how to sign up wasn't clear	10
The time of day that demand response events would occur does not work for me	10
Lack of information available on the benefits of participating	9
The financial incentive is not high enough	9
Concerned about sharing my thermostat data with Efficiency Nova Scotia	7
The opt-out criteria for demand response events were unclear to me	6
Prefer not to say	4
Thermostat not compatible/did not function properly with the program	4
Other	3
I didn't think I would receive sufficient notice prior to a demand response event	2
The duration of the demand response events is too long of a time window for me	2
The process on how to sign up was too much effort	1
The frequency of possible demand response events was too high for me	1
SAMPLE SIZE (#)	89

TABLE B10:

You mentioned receiving a manual invitation to enroll but did not follow up. What were the reasons for not completing the enrollment?

	OVERALL %
I wasn't interested in participating in the Eco Shift Program	52
I didn't see enough benefit in enrolling	19
I didn't have time to follow up	7
I didn't understand what was required to enroll	7
Other	4
Don't know	4
Prefer not to say	4
I experienced technical issues when trying to enroll	4
SAMPLE SIZE (#)	27

TABLE B11:

You mentioned removing the thermostat(s) after installation. Could you please tell us why?

	OVERALL %
The thermostat didn't work properly	56
The new thermostat was too complicated to use	22
I didn't want to control the thermostat with a smartphone app	11
I replaced the thermostat with another model	11
SAMPLE SIZE (#)	9

TABLE C1:
What do you see as the potential benefits of taking part in the program?

	OVERALL %
Helping to reduce the peak electricity demand during high usage periods	31
Receiving financial incentives for enrolling in the Eco Shift Program	31
Supporting Nova Scotia's transition to clean electricity sources	27
Receiving financial incentives for continuing to participate in the Eco Shift program	27
Supporting a more sustainable energy grid	26
Receiving a free smart thermostat	24
Supporting a more reliable electricity grid by reducing my usage during peak usage periods	21
I do not see any benefits of participating in this program	12
Don't know	8
Prefer not to say	1
SAMPLE SIZE (#)	103

TABLE C2:
What additional information, if any, would you need to re-consider enrolling in the Eco Shift Program?

	OVERALL %
More information overall (unspecified)	18
Complicated/confusing process	14
None/No additional information needed	12
More manual control over the heating	10
Clarity on eligibility criteria	8
Functional thermostats	8
Other	6
Energy and cost savings I would get	6
Better communications/customer service	6
I thought I was enrolled	6
New link/Resend invitation	6
Don't know	4
Data protection and privacy policies/Ensure my information is safe	4
SAMPLE SIZE (#)	50

TABLE D1:
Were you enrolled in either rate plan from the Nova Scotia Power Time-Varying Pricing Rate Pilot Program?

	OVERALL %
Yes	27
No	41
Don't know	32
SAMPLE SIZE (#)	128

TABLE D2:
Who is primarily responsible for paying the energy bills in your household?

	OVERALL %
I pay the energy bills	90
Someone else in my household pays the energy bills	10
SAMPLE SIZE (#)	128

TABLE D3:
In what age category do you fall? Are you...

	OVERALL %
18 to 24	0
25 to 34	5
35 to 44	15
45 to 54	14
55 to 64	27
65 or over	38
Prefer not to say	2
SAMPLE SIZE (#)	128

TABLE D4:
What is the highest level of education you have completed?

	OVERALL %
Less than high school graduation diploma	4
High school graduation diploma and/or some post secondary	14
Trades certificate or diploma	6
College certificate or diploma	23
University degree, certificate or diploma	50
Prefer not to say	2
SAMPLE SIZE (#)	128

TABLE D5:
How many people, including yourself, currently live in your household?

	OVERALL %
1	19
2	49
3	13
4+	20
SAMPLE SIZE (#)	128

TABLE D6:
Which of the following income categories best describes your total annual household income before taxes in 2024? Stop me when I reach the right category.

	OVERALL %
\$30,000 or less	7
Between \$30,001 and \$40,000	5
Between \$40,001 and \$50,000	4
Between \$50,001 and \$60,000	4
Between \$60,001 and \$70,000	8
Between \$70,001 and \$80,000	9
Between \$80,001 and \$100,000	14
Between \$100,001 and \$150,000	18
\$150,001 or more	10
Prefer not to say	21
SAMPLE SIZE (#)	128

TABLE D7:

Gender:

	OVERALL %
Woman	42
Man	50
Prefer not to say	7
Not listed	1
SAMPLE SIZE (#)	128

APPENDIX III

Residential DR Service Provider Interview Guide

RESIDENTIAL DEMAND RESPONSE (DR) EVALUATION GUIDE FOR INTERVIEW WITH SERVICE PROVIDER

Table 1: Overview of Data Collection Activity

Descriptor	This Instrument
Instrument Type	Semi-directed in-depth interview
Estimated Time to Complete	60 minutes
Target Audience	Service Provider
Expected Number of Completions	n=2
Contact List Source	Efficiency One
Fielding Firm	Econoler
Estimated Timeline for Fielding	October 2025

Table 2: Research Objectives and Associated Questions

Research Questions	Question #
Respondent Involvement in the Program	A1
What are some key operational improvements to achieve delivery efficiencies for the program from a program administrator perspective? Are there opportunities for further automation of processes?	B1-B5 (c), E1, E2
What works well and what are the key challenges for the program? How could E1 improve the program?	B1-B5
How can program communications and marketing be improved to attract more participants?	B6-B9
What would increase participation in the program and individual events? What participant retention methods are recommended?	C1-C3
What processes and resourcing (internal and external) do other jurisdictions have in place for similar scale residential demand response programs? [Depending on interviewee experience]	D1-D3
What are the challenges and opportunities for the program? (In the short-, medium- and long-term)	B1-B5 (b), E2-E4

Blue text: answer text [RESPONSE]

Black text: instructions for interviewer [TEXT]



Introduction

Hello, may I speak with **[CONTACT NAME]**?

My name is **[INTERVIEWER NAME]** and I'm calling from Econoler on behalf of Efficiency Nova Scotia.

Efficiency Nova Scotia is evaluating its Eco Shift Program. They let us know that you are a service provider for this program, and we are interested in your opinion regarding the program from your perspective. Are you the person most familiar with **[INSERT SP NAME]**'s involvement in the Eco Shift Program?

[CLEARResult only] As we go through the questions we **have** prepared, please note that we will prompt you to highlight any differences between device type (smart thermostats, EV chargers and batteries), where they exist.

Do you have any questions before we start?

[IF ASKED] The interview should take about 40 minutes.

A. Respondent Involvement in the Program

First, I would like to know more about your background and involvement with the program.

- A1. Please tell me your title and briefly describe your role in the Eco Shift Program. **[PROBE for: Collect this information for each interview attendee. Ask how many years delivering DR programs? Any experience in other jurisdictions?]**

B. Program Processes

- B1. Could you describe the enrollment and registration process for participants who enter the program via the bring your own device (BYOD) path? **[PROBE for: Any feedback from the participants' perspective?]**
- a. What is working well at this step?
 - b. What problems or issues, if any, have you faced?
 - c. What could be improved?
 - d. Any differences per technology (smart thermostats, EVs & Chargers, Home Batteries, Hot Water Controllers)?
- B2. Could you describe the enrollment and registration process for participants who enter the program via another Efficiency Nova Scotia program (such as the Free Product Installation program and HomeWarming)? **[PROBE for: Any feedback from participants' perspective?]**
- a. What is working well at this step?
 - b. What problems or issues, if any, have you faced?
 - c. What could be improved?

- 
- B3. Could you describe the full DR event process from calling the event to running it? **[PROBE for: How participants are notified during DR events? What systems are in place to call and monitor the event? Have you experienced connectivity or performance issues during events?]** **[PROBE for: Any feedback from participants' perspective?]**
- a. What is working well at this step?
 - b. What problems or issues, if any, have you faced?
 - c. What could be improved?
 - d. Any differences per technology (smart thermostats, EVs & Chargers, Home Batteries, Hot Water Controllers)?
- B4. Could you describe the opt-out process for participants? **[OPEN END]**
- a. What is working well at this step?
 - b. What problems or issues, if any, have you faced?
 - c. What could be improved?
 - d. Any differences per technology (smart thermostats, EVs & Chargers, Home Batteries, Hot Water Controllers)?
- B5. **[ASK CLEAR RESULT ONLY]** Could you explain the process to issue incentives? **[PROBE for: Any feedback received on timelines? Incentive levels?]**
- a. What is working well at this step?
 - b. What problems or issues, if any, have you faced?
 - c. What could be improved?
 - d. Any differences per technology (smart thermostats, EVs & Chargers, Home Batteries, Hot Water Controllers)?
- B6. Have you observed drop-outs during specific stages of the process? **[PROBE for: If needed, remind the different steps: enrollment and registration, event calls, opt-out process]** **[OPEN END]**
- B7. Are there any particular steps in the process that you would recommend changing? **[PROBE for: If needed, remind the different steps: enrollment and registration, event calls, opt-out process, incentives payment]** **[OPEN END]**



Marketing and Communications

- B8. Can you describe the Eco Shift Program's communications and marketing efforts? **[OPEN END]**
- B9. Do you have any suggestions for improvements to program's communications and marketing strategy **[If not mentioned, PROBE for: Any suggestions that might increase participation in the program?]**
- B10. **[IF NOT MENTIONED]** In your view, what are the most effective ways to position and/or communicate the benefits of participating in the Eco Shift Program?
- B11. **[ASK IF MENTIONED AS A PROGRAM ISSUE at B8]** Do you have any suggestions or recommendations around improving how the program is currently positioned or communicated about in the marketplace?

C. Participation Increase and Retention

- C1. From your experience, what would increase participation in the program? Any differences per technology (smart thermostats, EVs & Chargers, Home Batteries, Hot Water Controllers)? **[OPEN END]**
- C2. What factors would encourage enrolled participants to take part in individual DR events rather than opting out? Any differences per technology (smart thermostats, EVs & Chargers, Home Batteries, Hot Water Controllers)? **[PROBE for: if not mentioned in Section B, any issue with the technologies?]** **[OPEN END]**
- C3. What participant retention methods would you recommend to maintain engagement over time? Any differences per technology (smart thermostats, EVs & Chargers, Home Batteries, Hot Water Controllers)? **[OPEN END]**

D. Other Jurisdictions Best Practices

[ASK IF EXPERIENCE IN OTHER JURISDICTIONS SHARED IN INTRO, OTHERWISE SKIP TO SECTION E]

- D1. What innovative and/or efficient processes have other jurisdictions implemented to support residential DR programs at a similar scale that could be applicable to the Eco Shift Program? **[PROBE for: staffing, enrollment and incentives, event management, program management, marketing, customer support]**
- D2. Are there any best practices from other jurisdictions regarding resource allocation that the Eco Shift Program could consider improving program delivery? **[PROBE for: staffing levels, resourcing, etc.)]**
- D3. What about any best practices you can share from other jurisdictions around participant engagement and retention?



E. Suggestions for Improvements

- E1. Now that the program has grown from a pilot to a program, do you have any recommendations to improve operations (at a larger scale)?
- E2. Are there opportunities for further automation of processes?
- E3. Apart from what you have already mentioned, what other suggestions do you have for improving the EcoShift Program in the future, if any? **[PROBE for: near- and longer-term opportunities.]**
- E4. Is there anything else you'd like to mention about the program?

F. End of Interview

Thank you very much for your time and collaboration today!

END

APPENDIX IV

Residential DR Tracking Sheet Audit

This document presents the detailed results of the tracking sheet audit performed by the Evaluator, which was aimed at:

- › Verifying that all data fields required for the evaluation were included and filled out in the tracking sheet submitted by EfficiencyOne (E1)
- › Ensuring that tracked results were accurate by:
 - › Verifying that parameters used to calculate program results (available DR capacities at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were performed consistently

Table 1 presents the corrected tracked savings resulting from tracking sheet audit conducted by the Evaluator.

Table 1: 2025 Residential DR Corrected Tracked Available DR Capacity

Program Component Result	Available DR Capacity Tracked by E1		Corrected Tracked Available DR Capacity		Relative Difference
	Value	Unit	Value	Unit	Value
Smart Thermostats	0.498	MW	0.430	MW	86%
DHW Controllers	0.057	MW	0.053	MW	94%
EVs and EV Chargers	0.027	MW	0.027	MW	100%
Batteries	0.030	MW	0.030	MW	100%
Total	0.611	MW	0.540	MW	88%

The lower available DR capacities calculated by the Evaluator for smart thermostats and DHW controllers are due to the Evaluator excluding time-of-use and critical peak pricing participants as well as using different values for in-service rates. While E1 used the unitary savings values established in previous evaluations, they decided to use different in-service rates since the new available data indicated that the values from the previous evaluations were not applicable. The Evaluator reviewed the values used by E1 and established slightly different values that were used to establish the corrected tracked available DR capacities.

Since the performance of EV and battery measures had never been evaluated prior, the results tracked by E1 were used as the corrected tracked savings for these measures.

In addition to establishing the corrected tracked results, the Evaluator ensured that the spreadsheets provided by E1 included all the information needed to establish the evaluated results for each measure and that the information was complete and accurate. After review, the spreadsheets provided by E1 were sufficient for the Evaluator to calculate Residential DR results.



APPENDIX V

Residential DR Smart Thermostat DLC Detailed Metering Data Analysis Methodology

This appendix summarizes the methodology used by the Evaluator to establish the available DR capacity for the Smart Thermostat Direct Load Control (DLC) pathway as part of the 2025 evaluation of Residential DR.

To establish the available DR capacity generated from smart thermostats, the Evaluator updated the unitary available DR capacity using the same metering data analysis methodology as in the 2024 evaluation, with the only difference being that different unitary available DR capacity values were established for different subgroups of space heating systems controlled by smart thermostats in a household.

For each subgroup, the Evaluator analyzed the available participant whole-house consumption meter data and established a unitary available DR capacity value per participant, which was then converted into a unitary available DR capacity per thermostat and multiplied by the number of enrolled thermostats. To establish the available DR capacity values, the Evaluator developed a model that predicts the expected average hourly load per participant and then compared the expected and actual hourly loads during events. The average number of thermostats per household was obtained using the number of enrolled devices and number of participants specific to each event. Whole-house data were preferred to device-level data as they allow for the inclusion of interactive effects from equipment such as other heating systems not controlled by participating smart thermostats offsetting the reduced load associated with participating thermostats.

Form of the Regression

Following the 2024 methodology used in a literature review conducted to identify the most appropriate baseline methodology for such evaluations, the Evaluator used regression models that considers the time of week and outdoor temperature to establish a baseline. Such models take into account the impact of outdoor temperature on electricity consumption, thus creating a predictive model that can be extrapolated using the known temperature at the time of events while also recognizing that electricity consumption in a household varies based on other factors. Since the population consists only of residential households, the influence of such factors is expected to be similar on the entire population at a given time of the week, hence the creation of the time of week and temperature models. Regression models were preferred since they are the most common methodology for similar smart thermostat programs in the jurisdictions reviewed.¹ Moreover, regression models are based on a large dataset that includes datapoints for cold temperatures comparable to those of the events, while using previous similar days to establish a baseline may result in not using days that are as cold as the event days. As for the use of time of week, it allows to differentiate the impact of outdoor temperature at each time of the week, which is preferred since the setpoints are likely to differ at different hours of the day and days of the week.

¹ CADMUS, prepared for CenterPoint Energy, *2023 Demand Response Impact Evaluation FINAL REPORT*, March 2024. Retrieved from: <https://midwest.centerpointenergy.com/assets/downloads/planning/irp/IRP-vectren-demand-response-evaluation.pdf> (last accessed 04-10-2024). Demand Side Analytics, prepared for PG&E, *2022-2023 Load Impact Evaluation of Pacific Gas and Electric's Smart Thermostat Control Pilot*, May 2024. Retrieved from: [https://www.calmac.org/publications/PY2022-2023_Smart_Thermostat_Control_Pilot_Evaluation_Report_Final_\(003\).pdf](https://www.calmac.org/publications/PY2022-2023_Smart_Thermostat_Control_Pilot_Evaluation_Report_Final_(003).pdf) (last accessed 04-10-2024). Navigant, prepared for Eversource MA, Eversource CT, National Grid MA, and Unitil MA, *2019 Residential Wi-Fi Thermostat Direct Load Control Offering Evaluation*, April 2020. Retrieved from: <https://ma-eeac.org/wp-content/uploads/2019-Residential-Wi-Fi-Thermostat-DLC-Evaluation-Report-2020-04-01-with-Infographic.pdf> (last accessed 04-10-2024). EPRI, prepared for Lincoln Electric, *Lincoln Electric System Demand Response Pilot Evaluation (Generic Version) - 2017 Technical Report*, May 2017. Retrieved from: <https://www.epri.com/research/products/3002011250> (last accessed 04-10-2024). CADMUS, prepared for Portland General Electric Company, *Direct Install Smart Thermostat Pilot Evaluation Report*, September 2021. Retrieved from: <https://edocs.puc.state.or.us/efdocs/HAD/um1708had165015.pdf> (last accessed 04-10-2024).

The model used by the Evaluator for each subgroup consists of 168 regression models, i.e. one for each hour of the week. Each regression model establishes a correlation between the average participant hourly load at a time of week and the corresponding heating degree days.² To do so, all datapoints for a given time of week were grouped together to establish one of the 168 regressions. For example, if the dataset includes 20 participants and each participant's subset includes 10 datapoints for "Monday at 8 a.m.", the regression for "Mondays at 8 a.m." would be built based on 200 datapoints. Each of the 168 regressions is represented by the equation below; the coefficients ($\alpha_{D,H}$ and $\beta_{D,H}$) obtained by the Evaluator for each regression are presented in Appendix VI.

$$\text{Baseline } kW_{D,H} = \alpha_{D,H} \times x^* + \beta_{D,H}$$

Where:

- › $\text{Baseline } kW_{D,H}$ is the calculated baseline load in kW on a specified day of week (D) and hour of day (H) for a given temperature.
- › D, H is the time of the week where D is from 1 to 7 (Sunday to Saturday) and H is from 00 to 24 (midnight to 11 p.m.), representing each of the 168 hours of the week (1_00 to 7_23).
- › $\alpha_{D,H}$ is the coefficient to be multiplied by the heating degree days (HDD) to obtain the portion of the load attributable to heating.
- › x^* is the heating degree days (HDD) for a balance point of 15 °C at the event time at which the baseline is assessed.
- › $\beta_{D,H}$ is the portion of the load that is not attributable to heating.

To ensure a close match between outdoor temperature and participant location, all participants were assigned to one of eight weather stations based on their postal code and zones associated to each weather station instead of using one weather dataset for all participants.

Data Cleaning

The initial dataset included all participants with enrolled smart thermostats in 2025 (2,471). Among those, only 1,457 participants had available AMI data because account numbers are user-entered by participants, and they sometimes cannot be matched with the account number in E1's tracking system. The Evaluator only kept participants that did not have a participating EV charger or battery (221 of the 1,457 participants had either an EV charger or a battery) since the load from EV chargers and batteries created substantial noise in the dataset. In parallel, 14 participants were excluded because they either had less than half the expected datapoints or they had two premise addresses and were, therefore, considered to have moved during the metering period. All those exclusions resulted in a total of 1,222 participants being included in the final analysis, with a total of 5,497 smart thermostats included in the analysis.

Given this large sample, the Evaluator was able to conduct the analyses on subgroups to obtain unitary available DR capacity values for different types of space heating in households. Participants were grouped as follows:

- › Households with smart thermostats controlling only electric baseboards (EBBs)
- › Households with smart thermostats controlling only mini-split heat pumps (MSHPs)
- › Households with smart thermostats controlling a mix of EBBs and MSHPs and no other type of space heating

² Heating degree days were selected in lieu of outdoor temperature to better represent the heating load associated to each hour of the week. The heating degree days herein correspond to heating degree hours since they were calculated for each hour.

For the other types of space heating, the Evaluator used the average obtained for all participants since the number of participants in this last category was too small to obtain significant results. Other types of space heating consisted of either a central heat pump, a mix of a central heat pump and EBBs, and one unknown space heating system.

Table 1 below presents the evolution in the numbers of participants and devices available for the meter data analysis through the cleaning steps.³

Table 1: Numbers of Participants and Devices Available for the Meter Data Analysis

Type of Smart Thermostat DLC Participants	Number of Participants	Number of Devices
All participants in the tracking sheet	2,471	10,200
Participants with available AMI data	1,457	6,481
Participants with available AMI data and without an EV or battery	1,236	5,552
Participants with available AMI data, without an EV or battery, and with usable data	1,222	5,497
EBB only	573	3,015
MSHP only	416	799
EBB and MSHP only	224	1,673
Others	9	10

The Evaluator adjusted the initial 15-minute kW data to hourly data to be able to match them with hourly weather data. Hourly datapoints that did not include a full hour of data (0.1% of total datapoints) were excluded. The Evaluator also excluded hourly datapoints that demonstrated a load above 15 kW (0.1% of total datapoints) since they were considered outliers. The Evaluator also excluded data from holidays since consumption patterns differ on those days, rendering them unsuitable for establishing baselines.⁴

³ The average number of smart thermostats per participant presented in the report are slightly different than those obtained when dividing the number of devices by the number of participants in Table 1 since the appendix numbers are at the end of the season while the numbers in the report are averages throughout the season.

⁴ The excluded holidays were Thanksgiving Day, Remembrance Day, Christmas Eve, Christmas Day, Boxing Day, New Year's Eve, New Year's Day, and Nova Scotia Heritage Day.

Margin of Error

Once regression analyses were completed, the Evaluator ensured that all coefficients were significant (p-value < 0.05). The following equation was used to establish the margin of error on the **predicted load** for each hour (h).

$$Predicted\ kWh \pm E_{Predicted} = (\alpha_{D,H} \cdot x^* + \beta_{D,H}) \pm 1.64 \cdot RMSE_h \sqrt{\frac{1}{n_h} + \frac{(x^* - \bar{x}_h)^2}{n_h \sigma_h^2}}$$

Where:

- › $\beta_{D,H}$ is the regression intercept.
- › $\alpha_{D,H}$ is the regression slope.
- › $RMSE_h$ is the hourly model root mean square error.
- › n_h is the number of observations.
- › $\bar{x}_h$ is the mean heating degree days (HDDs).
- › σ_h^2 is the variance in HDDs.
- › x^* is the desired HDDs at which evaluations are performed.

The actual load is the average of all participant loads at a given hour, and the margin of error is, therefore, obtained by multiplying the standard error of the average by the Student's t distribution variable (t_v) as demonstrated in the following equation:

$$E_{Actual} = t_v \times Standard\ Error$$

Then, the predicted and actual load errors were propagated using the equation below to obtain the uncertainty on the calculated load reduction for each hour (h) of each event (EventX):

$$E_{Load\ Reduction, EventX, h} = \sqrt{E_{Predicted}^2 + E_{Actual}^2}$$

Finally, the error on the average load reduction per participant during events, which corresponds to the unitary available DR capacity, is calculated as:

$$E_{Unitary\ Savings} = \frac{\sqrt{\sum E_{LoadReduction, EventX, h}^2}}{n_{Events}}$$

APPENDIX VI

Residential DR Smart Thermostat DLC Regression Coefficients

Regression Coefficients for EBB-only Participants

Hour of Week	Mondays		Tuesdays		Wednesdays		Thursdays		Fridays	
	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)
00	0.229	0.111	0.499	0.096	0.425	0.096	0.484	0.095	0.322	0.115
01	0.177	0.107	0.413	0.094	0.339	0.094	0.377	0.095	0.277	0.107
02	0.133	0.108	0.311	0.099	0.245	0.097	0.296	0.097	0.207	0.109
03	0.083	0.110	0.267	0.102	0.217	0.100	0.238	0.101	0.161	0.112
04	0.077	0.111	0.313	0.102	0.252	0.100	0.285	0.100	0.213	0.110
05	0.257	0.112	0.476	0.103	0.454	0.101	0.449	0.101	0.407	0.107
06	0.539	0.120	0.789	0.111	0.765	0.108	0.735	0.110	0.688	0.114
07	0.599	0.135	0.726	0.136	0.751	0.128	0.725	0.130	0.708	0.133
08	0.593	0.128	0.725	0.124	0.786	0.115	0.760	0.120	0.716	0.126
09	0.694	0.113	0.800	0.109	0.853	0.098	0.829	0.107	0.808	0.112
10	0.875	0.096	0.870	0.099	0.905	0.093	0.907	0.097	0.903	0.101
11	0.946	0.090	0.964	0.089	0.947	0.087	0.923	0.094	0.960	0.096
12	0.995	0.089	0.981	0.087	0.948	0.093	0.927	0.096	1.011	0.093
13	0.952	0.089	0.967	0.085	0.908	0.097	0.941	0.093	1.021	0.089
14	0.887	0.093	0.958	0.085	0.893	0.098	0.933	0.093	1.002	0.090
15	0.929	0.094	0.992	0.088	0.926	0.099	0.957	0.096	1.064	0.088
16	1.152	0.091	1.175	0.091	1.090	0.101	1.051	0.103	1.178	0.093
17	1.255	0.104	1.290	0.103	1.287	0.104	1.159	0.111	1.262	0.104
18	1.387	0.103	1.316	0.111	1.311	0.111	1.148	0.124	1.222	0.112
19	1.210	0.112	1.263	0.111	1.283	0.111	1.059	0.129	1.094	0.114
20	1.200	0.106	1.130	0.114	1.180	0.110	1.013	0.126	1.011	0.112
21	1.054	0.105	0.937	0.114	1.074	0.106	0.858	0.126	0.852	0.113
22	0.948	0.097	0.742	0.110	0.935	0.096	0.725	0.119	0.655	0.116
23	0.754	0.093	0.590	0.100	0.736	0.089	0.512	0.116	0.511	0.111

Regression Coefficients for MSHP-only Participants

Hour of Week	Mondays		Tuesdays		Wednesdays		Thursdays		Fridays	
	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)
00	0.201	0.095	0.425	0.081	0.387	0.082	0.431	0.080	0.294	0.097
01	0.174	0.092	0.371	0.082	0.301	0.083	0.363	0.081	0.272	0.091
02	0.107	0.094	0.317	0.084	0.248	0.084	0.300	0.083	0.232	0.091
03	0.101	0.095	0.282	0.087	0.245	0.085	0.292	0.084	0.189	0.094
04	0.120	0.095	0.324	0.086	0.257	0.086	0.330	0.083	0.240	0.091
05	0.260	0.092	0.427	0.085	0.393	0.084	0.413	0.083	0.379	0.087
06	0.533	0.089	0.702	0.082	0.679	0.079	0.690	0.080	0.625	0.083
07	0.589	0.100	0.719	0.095	0.718	0.089	0.716	0.092	0.704	0.092
08	0.503	0.103	0.721	0.093	0.717	0.090	0.724	0.091	0.715	0.093
09	0.645	0.091	0.793	0.084	0.810	0.078	0.780	0.084	0.769	0.087
10	0.838	0.078	0.872	0.074	0.846	0.075	0.825	0.079	0.854	0.080
11	0.934	0.071	0.935	0.068	0.913	0.069	0.864	0.076	0.929	0.073
12	0.954	0.070	0.972	0.065	0.925	0.069	0.867	0.078	0.960	0.072
13	0.894	0.072	0.932	0.065	0.898	0.069	0.858	0.075	0.963	0.069
14	0.799	0.076	0.940	0.062	0.832	0.072	0.819	0.075	0.928	0.069
15	0.808	0.076	0.942	0.064	0.830	0.072	0.840	0.076	0.918	0.068
16	0.975	0.074	1.073	0.066	1.022	0.070	0.948	0.079	0.987	0.071
17	1.167	0.080	1.189	0.074	1.164	0.076	1.035	0.087	1.082	0.081
18	1.224	0.080	1.172	0.083	1.215	0.080	1.049	0.091	1.033	0.088
19	1.117	0.086	1.078	0.087	1.185	0.081	0.966	0.096	0.969	0.087
20	1.061	0.085	0.971	0.089	1.078	0.084	0.875	0.098	0.884	0.088
21	0.905	0.087	0.821	0.092	0.921	0.085	0.741	0.100	0.715	0.093
22	0.746	0.083	0.635	0.090	0.775	0.082	0.576	0.099	0.521	0.097
23	0.587	0.080	0.471	0.088	0.621	0.076	0.427	0.096	0.363	0.096

Regression Coefficients for EBB and MSHP-only Participants

Hour of Week	Mondays		Tuesdays		Wednesdays		Thursdays		Fridays	
	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)
00	0.284	0.112	0.560	0.098	0.456	0.100	0.545	0.098	0.331	0.120
01	0.137	0.115	0.441	0.098	0.325	0.102	0.407	0.098	0.273	0.115
02	0.111	0.114	0.359	0.102	0.258	0.103	0.356	0.101	0.228	0.113
03	0.078	0.116	0.340	0.104	0.267	0.103	0.320	0.102	0.208	0.114
04	0.117	0.116	0.376	0.105	0.270	0.107	0.368	0.103	0.253	0.114
05	0.355	0.114	0.538	0.107	0.490	0.107	0.504	0.105	0.468	0.111
06	0.544	0.126	0.773	0.117	0.759	0.113	0.814	0.112	0.700	0.118
07	0.705	0.132	0.806	0.132	0.873	0.121	0.826	0.127	0.783	0.127
08	0.559	0.132	0.834	0.122	0.808	0.117	0.816	0.118	0.776	0.124
09	0.658	0.120	0.902	0.108	0.902	0.101	0.887	0.109	0.865	0.112
10	0.933	0.100	0.991	0.099	0.975	0.095	0.963	0.101	0.992	0.100
11	1.013	0.094	1.050	0.092	1.040	0.090	1.002	0.097	1.067	0.096
12	0.981	0.093	1.061	0.087	0.989	0.089	0.958	0.100	1.069	0.095
13	0.935	0.092	1.037	0.082	0.979	0.090	0.968	0.093	1.064	0.087
14	0.878	0.095	0.977	0.086	0.922	0.095	0.942	0.094	1.031	0.088
15	0.870	0.102	0.987	0.088	0.917	0.099	0.990	0.094	1.087	0.086
16	1.056	0.096	1.054	0.093	1.109	0.093	1.098	0.098	1.142	0.089
17	1.299	0.101	1.273	0.099	1.276	0.101	1.162	0.111	1.268	0.099
18	1.300	0.111	1.318	0.111	1.318	0.110	1.124	0.127	1.271	0.109
19	1.263	0.111	1.253	0.113	1.342	0.105	1.164	0.120	1.195	0.111
20	1.220	0.111	1.141	0.114	1.298	0.109	1.122	0.121	1.088	0.112
21	1.023	0.115	0.940	0.117	1.129	0.108	0.926	0.128	0.831	0.121
22	0.949	0.101	0.715	0.114	0.974	0.099	0.740	0.121	0.683	0.118
23	0.793	0.095	0.588	0.104	0.788	0.092	0.533	0.119	0.491	0.115

Regression Coefficients for Others Participants

Hour of Week	Mondays		Tuesdays		Wednesdays		Thursdays		Fridays	
	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)	Baseload ($\beta_{D,H}$)	HDD Coefficient ($\alpha_{D,H}$)
00	0.232	0.106	0.486	0.091	0.418	0.092	0.476	0.091	0.316	0.110
01	0.169	0.103	0.405	0.090	0.323	0.092	0.377	0.091	0.276	0.103
02	0.122	0.104	0.324	0.095	0.248	0.094	0.309	0.093	0.221	0.104
03	0.093	0.106	0.287	0.098	0.236	0.095	0.273	0.096	0.179	0.106
04	0.103	0.107	0.330	0.097	0.259	0.097	0.318	0.095	0.232	0.104
05	0.282	0.106	0.473	0.098	0.445	0.096	0.452	0.096	0.414	0.101
06	0.547	0.110	0.760	0.103	0.741	0.098	0.740	0.100	0.675	0.104
07	0.618	0.123	0.740	0.121	0.764	0.113	0.742	0.117	0.723	0.118
08	0.559	0.120	0.744	0.113	0.769	0.106	0.757	0.109	0.725	0.115
09	0.676	0.106	0.818	0.100	0.848	0.092	0.824	0.099	0.806	0.103
10	0.876	0.090	0.893	0.090	0.898	0.087	0.889	0.091	0.906	0.093
11	0.956	0.084	0.972	0.082	0.952	0.081	0.917	0.088	0.971	0.088
12	0.981	0.083	0.994	0.079	0.949	0.084	0.914	0.091	1.006	0.086
13	0.934	0.083	0.971	0.077	0.918	0.086	0.919	0.087	1.011	0.082
14	0.859	0.087	0.959	0.077	0.880	0.088	0.898	0.087	0.981	0.083
15	0.880	0.089	0.976	0.080	0.895	0.090	0.924	0.089	1.020	0.081
16	1.078	0.086	1.120	0.083	1.074	0.089	1.025	0.094	1.107	0.085
17	1.239	0.095	1.251	0.093	1.244	0.094	1.118	0.103	1.202	0.095
18	1.322	0.096	1.265	0.102	1.281	0.100	1.109	0.114	1.165	0.103
19	1.194	0.103	1.197	0.103	1.264	0.099	1.049	0.116	1.071	0.104
20	1.157	0.100	1.076	0.106	1.171	0.101	0.986	0.115	0.981	0.104
21	1.000	0.101	0.900	0.107	1.032	0.099	0.835	0.117	0.802	0.108
22	0.882	0.093	0.700	0.104	0.888	0.092	0.676	0.113	0.614	0.110
23	0.704	0.089	0.551	0.097	0.703	0.086	0.485	0.110	0.456	0.107

APPENDIX VII

Residential DR 2025 Recommendations

This appendix summarizes all the recommendations made by the Evaluator as part of the 2025 evaluation of Residential DR.

Section	Recommendations
Executive Summary	2025 Res DR Recommendation 1: Include all changes to the pilot and program in the program manual, including historical changes since the pilot was launched. Include dates of all changes, a description of the change, along with the rationale for the change. Clearly define all eligibility criteria by pathway in the program manual. Reorganize the demand response program manual to create two distinct and continuous sections for residential and BNI given key differences in the approach by sector for demand response initiatives.
Executive Summary	2025 Res DR/EPI Recommendation 2: Ensure that participant data and the information collected through the EPI installation process are complete and accurate. Ensure EPI installers properly and accurately record device information to ensure connectivity in Residential DR after device installation.
Executive Summary	2025 Res DR Recommendation 3: Leverage key awareness channels to increase program participation in Residential DR within and outside the current and past EPI participant population. Focus key messaging on program benefits, including available incentives and contributing to reducing strain on the grid, while clearly outlining privacy protection mechanisms and the flexibility and control that participants maintain over their devices once enrolled. Clearly define how Residential DR works, the importance of participating in events, and how to achieve ongoing participation incentives (participation in 50%+ of DR events).
Executive Summary	2025 Res DR Recommendation 4: Through continuous engagement with enrolled participants, encourage participation in DR events and enrollment of more devices per household (additional device types and additional smart thermostats installed on heating systems in all contiguous living areas in regular use only).
Executive Summary	2025 Res DR Recommendation 5: Investigate ways to improve EV device potential for DR considering the low participation rate in DR events. To improve participation, consider additional opportunities for EV devices to participate in DR events, such as leveraging bidirectional chargers to use EVs as batteries during events.
Executive Summary	2025 Res DR Recommendation 6: Monitor the impact of introducing a participation threshold to qualify for ongoing participation incentives. Should individual event participation rates not improve in the 2025/26 DR season, consider reviewing the Residential DR incentive structure and levels. In that review, consider both the incentive structure in terms of the enrollment incentive level compared to the ongoing participation incentive level and the effectiveness of the 50% participation threshold to qualify for ongoing participation incentives to encourage higher DR event participation rates. Ensure that the incentive structure encourages enrollment growth and increases ongoing DR event participation as both strategies are required to achieve targets in DR programs.
Executive Summary	2025 Res DR Recommendation 7: To ensure that the unitary available DR capacity values are consistent year over year, reconduct metering data analyses for each pathway in the next evaluation if the required data are available.

APPENDIX VIII

BNI DR Tracking Sheet Audit

This document presents the detailed results of the tracking sheet audit performed by the Evaluator, which was aimed at:

- › Verifying that all data fields required for the evaluation were included and filled out in the tracking sheet submitted by E1
- › Ensuring that tracked results were accurate by:
 - › Verifying that parameters used to calculate program results (new and available DR capacities at the generator) were consistent with previous evaluation results
 - › Validating that all calculation steps were performed consistently

Table 1 presents the corrected tracked available DR capacity resulting from changes made by the Evaluator. Of note, there were no differences between the tracked and corrected tracked available DR capacity values.

Table 1: 2025 BNI DR Corrected Tracked Available DR Capacity

Program Component Result	Value Tracked by E1		Corrected Tracked Value		Relative Difference
	Value	Unit	Value	Unit	Value
Available DR Capacity	6.648	MW	6.648	MW	0%



APPENDIX IX

BNI DR Available DR Capacity Calculation Example

Per the definition agreed upon by E1 and NSP, available DR capacity is evaluated based on events called from December to February excluding weekends and holidays. Events called at any time during the day (morning or evening)⁵ are included. Available DR capacity is evaluated on a per-participant basis based on the average demand reduction observed for each event that the participant was scheduled to participate in regardless of whether events are in the morning or evening. Per this definition, E1's total available DR capacity is the sum of each participant's available DR capacity.

Per the definition, only performances of participants for which an event was called are included in the available DR capacity calculation. If there is an event in which a given participant is not called on to participate, the participant is not included in the available capacity calculation since they contributed 0 kW in load reduction during this event. Averaging load reductions at the participant level first (as required by the available DR capacity definition) rather than averaging events yields a higher average available DR capacity if some participants are not called on in all events. In 2025, there was one instance of participants not being called for a given event: On one day, both a morning event and evening event were called and participants participated in only one of the events based on which event is best suited for the given participant. All participants are categorized by E1 as either being better suited to morning events or to evening events and, for each event, E1 can decide to only call participants that are better suited to that time or to call all participants to take part in that event.

To illustrate how available DR capacity is calculated, the Evaluator prepared the example presented in Table 1 below. The example was developed using only five participants and five events to better visualize the impacts of events not called for all participants. The numbers provided are for illustrative purposes only and are not based on actual participant data. In this example, Event 3 was only called for morning-suited participants, while Event 5 included morning (Event 5.1) and evening (Event 5.2) event windows in which each participant took part only the morning or evening window based on the type of event for which they were best suited.

⁵ Available DR capacity for morning peak events includes all events prior to 12 p.m. and available DR capacity for evening peak events includes all events between 12 p.m. and 12 a.m. However, the events are typically called around 7 a.m. and 5 p.m.

Table 1: Available DR Capacity Calculation Example

Event Number	Event Period	Type of Participant for Which the Event Was Called	Load Reduction per Participant per Event (kW)					Sum of Load Reduction per Event (kW)
			Part. #1	Part. #2	Part. #3	Part. #4	Part. #5	
			Evening-suited	Evening-suited	Morning-suited	Morning-suited	Evening-suited	
1	Evening	All	690	470	530	660	380	2,730
2	Morning	All	330	540	610	290	920	2,690
3	Morning	Morning-suited			520	910		1,430
4	Morning	All	640	850	650	380	170	2,690
5.1	Morning	Morning-suited			100	570		670
5.2	Evening	Evening-suited	260	260			980	1,500
Average Load Reduction per Event								1,952
Average Available DR Capacity			480	530	482	562	613	2,667

In Table 1, the available DR capacity presented in the bottom right corner (2,667 kW) is the sum of the average available DR capacity of each participant (bottom line), which corresponds to E1's definition of available DR capacity. Therefore, E1 sums the participant average instead of the event average when reporting on average available DR capacity. As aforementioned, this value differs from the average of the load reduction per event (last column), which is 1,952 kW.

If all events had been called for all participants, the available DR capacity would be identical to the average load reduction per event. The magnitude of the difference between the two results increases if a higher proportion of events are called only for a portion of participants. As noted above, out of the eight events called during the 2024-2025 winter, E1 called one double-event day for which participants took part only in the morning or the evening event. Moving forward, E1 intends to call events for all participants on days with only one event and aims to call on morning-suited and evening-suited participants separately on days with more than one event.



APPENDIX X

BNI DR Baseline Considerations

General Guidelines

Following are general guidelines that serve as the de facto assumptions for any DR M&V

- › High 6 of 10 baseline
- › Additive adjustment
- › Adjustment lookback window spans two hours
- › Adjustment lookback window starts three hours before the event begins, i.e. the first hour before an event not included in adjustments
- › Adjustments are symmetric, i.e. curtailment can be adjusted up or down
- › Holidays and Weekends are excluded from the baseline
- › Adjustments are capped at $\pm 20\%$

Additive Adjustment

Additive adjustments involve a fixed kW adjustment across all event time intervals. It's suitable for situations where there's a known, constant change in the load that is not proportional to the baseline, like the addition or removal of a piece of equipment with a constant load.

Example: an industrial process is running on the day of the event which does not normally run and is not present in the baseline days. Or, it was a slow day and a process was shut down that is normally operational on baseline days.

Business Rules

- 1) Always use additive adjustments unless the curtailed load is temperature-sensitive.

Scalar Adjustment

Scalar adjustment are a percentage multiplier applied across all event time intervals. It's appropriate when the baseline needs to be adjusted proportionally due to predictable changes that affect the entire load profile, such as consistent changes in operational hours or production levels.

Example: the load being curtailed is primarily HVAC and is sensitive to outdoor temperature. It is a particularly cold day, and load was higher than on baseline days.



Business Rules

- 2) Only use a scalar adjustment if the curtailed load is known to be sensitive to changes in temperature.

Lookback window

Following are considerations when making adjustments to the lookback window:

Define Objectives

Determine what the lookback window should achieve, such as reflecting typical usage patterns, operational hours, or accounting for seasonal variations.

Analyze Historical Data

Look at historical consumption data to identify normal usage patterns and any anomalies.

Consider Variability

Account for variability in operations, weather conditions, and other factors that could affect energy usage.

Select Duration

Choose a duration that is long enough to provide a representative sample of usage but not so long that it includes outdated values.

Set Timing

Align the timing of the lookback window with the DR event's expected impact on consumption.

Test and Validate

Test the lookback window against past DR events to validate its effectiveness.

Review and Adjust

Regularly review the lookback window's performance and make adjustments as necessary.

Document and Communicate

Clearly document the methodology and communicate it to all stakeholders.

Business Rules

If the lookback window is observing an abnormal condition such as a building opening or closing earlier than normal, consider whether this point in time is a valid point of comparison.

Consider the example below. The facility shut down from ~10 AM to 4 PM. The facility then resumed normal operation. A DR event was scheduled for 5 PM, one hour before the facility normally closes. The adjustment window “sees” the abnormal shut down and creates a significant, negative additive adjustment. Because the facility resumed normal operation, the temporary one-off shut down before the event should not be used to calculate an adjustment. Any abnormal shutdown periods must be verified from the participant, through communicating with the E1 Business Development Manager (BDM).

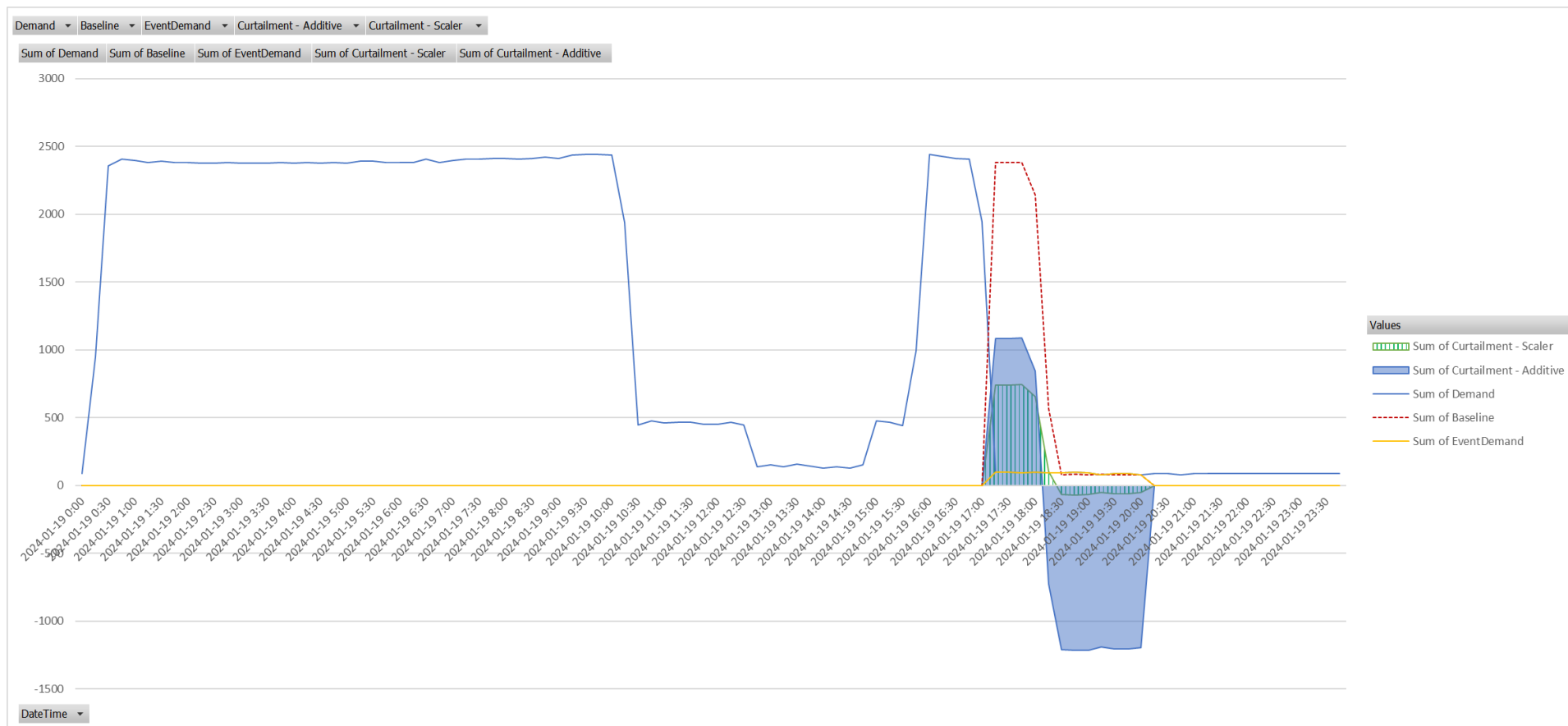


Figure 1: Business rule 3 example. Solid blue line load throughout the day; the dotted red line is the baseline before adjustment; the green shaded area is curtailment after scalar adjustment is applied; the blue shaded area is curtailment after additive adjustment is applied; the solid yellow line is the demand during the event, it always overlaps 100% with the solid blue line, and is only shown to isolate the load observed during the DR event.



Adjustment Cap

Following are considerations when making adjustments to the adjustment cap:

Reflect Actual Conditions

The cap should reflect the actual conditions and operational changes that could reasonably affect the DR event day's load.

Prevent Overcompensation

It should prevent overcompensation for reductions that would have occurred without the DR event.

Based on Historical Data

The cap can be based on a percentage of historical adjustments observed during similar DR events or established through statistical analysis.

Consider Program Goals

The cap should align with the overall goals of the DR program, whether it's peak shaving, load shifting, or emergency response.

Ensure Fairness

It should be fair and not disadvantage any participants, regardless of their size or consumption patterns.

Be Transparent

The methodology for establishing the cap should be transparent and well-documented to maintain stakeholder trust.

Allow for Exceptions

There should be provisions for exceptional circumstances where the standard cap may not be appropriate, with clear guidelines on how these exceptions are handled.

Regular Review and Update

The cap should be reviewed and updated regularly to ensure it remains relevant and effective as grid conditions and participant behaviors change.

Business Rules

- 1) If the default 20% adjustment cap does not accurately encompass the total curtailment for the specified event day, i.e. a very abnormal day was confirmed by the business, consider allowing for an exception on the default adjustment cap.

Symmetry

Adjustments are applied symmetrically, i.e. results could go up or down. The symmetric approach considers that day-of conditions can have a real impact on customer demand in both directions and therefore it can be argued that symmetric adjustments maximize the accuracy of a baseline calculation. The $\pm 20\%$ cap stated in the General Guidelines above will help reduce any negative consequences of a downward adjustment.

It is also worthwhile to consider moving the adjustment window to earlier than 2 hours before the event, or even moving it to after the event, to yield a better adjustment factor.



Business Rules

- 2) If the lookback window provides an abnormal positive or negative adjustment factor, the event should be flagged and considered with more detail, as a new adjustment period may need to be selected, including the hours proceeding the event, for a more accurate depiction of the customer's load. If the lookback window is observing an abnormal condition such as a building opening or closing earlier than normal, consider whether this point in time is a valid point of comparison. If the change is made for another reason than abnormal consumption, the same lookback change should be made consistently for all events for the given event timeframe for that specific participant (e.g. if the participant has an abnormal load specifically for all morning events, the adjustment needs to be made accordingly to all morning events).

Exclusion rules

Exclusion rules – Some days are excluded from consideration such as holidays, previous DR event days, weekends, thresholds and scheduled shutdowns (as these are not representative of “normal” operation).

Example: A facility was closed for a week due to renovations. During this time, Energy usage was abnormally low and is not representative of typical operation; these days should be excluded from the baseline calculation.

Business Rules

Business Rules

- 3) If there are known irregularities in customer usage that are not representative of typical operation, such days can be excluded from the baseline calculation. The rationale for exclusion must be documented in CIS for that customer. The E1 Business Development Manager (BDM) for the participant can also be contacted to determine the building operational hours, to determine if an event occurred outside of operational hours. Curtailment is considered zero outside of operational hours. Additionally, if there are gaps in the AMI meter data, certain events may be excluded on a per-participant basis due to the missing AMI meter data.

Business Rules

- 4) If there are two events in one day, the participants will be called either for the morning, or for the evening event, corresponding to their best performance. The event that they were not called for will be excluded from their average, and the cumulative performance of all participants on the day, for their respective morning or evening performance, will be added.



APPENDIX XI

BNI DR 2025 Recommendations

This appendix summarizes all the recommendations made by the Evaluator as part of the 2025 evaluation of Residential DR.

Section	Recommendations
Executive Summary	2025 BNI DR Recommendation 1: Conduct a process evaluation in 2026 to determine strategies to increase the enrolled participant rate of participation in events.
Executive Summary	2025 BNI DR Recommendation 2: Conduct project reviews again in 2026 to establish evaluated savings.



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ECONOLER



EfficiencyOne

2025 DSM MEASURE ASSESSMENT

Final Report

2025 EVALUATION EDITION

March 20, 2026



ECONOLUX



ABBREVIATIONS

AC	Air-conditioning
ADL	Average number of dried loads
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
AMH	Affordable Multi-family Homes (program component)
ARet	Appliance Retirement (program component)
ASFH	Affordable Single-family Home (program component)
ASHP	Air-source heat pump
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BER	Business Energy Rebates (program component)
BER-AR	Business Energy Rebates – Application Rebates (program component service)
BER-IR	Business Energy Rebates – Instant Rebates (program component service)
BNI	Business, non-profit, and institutional
BNI DR	BNI Demand Response (program component)
BOpt	Building Optimization
Btu	British thermal unit
CASHP	Central air-source heat pump
CDD	Cooling degree days
CDI	Commercial Direct Install
CEE	Consortium for Energy Efficiency
CEF	Combined energy factor
CFL	Compact fluorescent lamp
CFM	Cubic feet per minute
COP	Coefficient of performance
DEER	Database for Energy Efficiency Resources
DHW	Domestic hot water
DOE	U.S. Department of Energy
DR	Demand Response (program)/demand response
DSM	Demand-side management
DSM MA	Demand-side Measurement Measure Assessment
DWHR	Drain water heat recovery
DWHT	Domestic water heater timer

E1	EfficiencyOne
EER	Energy efficiency ratio
EISA	Energy Independence and Security Act
EPI	Efficient Product Installation (program component)
ESPF	Energy savings per foot of tape
e-TRM	e-Technical Reference Manual
EUL	Effective useful life
FLH	Full load hours
gpm	Gallons per minute
GSHP	Ground-source heat pump
HDD	Heating degree days
HEA	Home Energy Assessment (program component)
HOU	Hours of use
HPWH	Heat pump water heater
HSPF	Heating seasonal performance factor
HVAC	Heating, ventilation, and air conditioning
IESO	Independent Electricity System Operator
IMEF	Integrated Modified Energy Factor
ISR	In-service rate
LED	Light-emitting diode
MHEEP	Mi'kmaw Home Energy Efficiency Project (program component)
MSHP	Mini-split heat pump
NC	New Construction (program component)
NEEP	Northeast Energy Efficiency Partnership
NERHOU	Northeast Residential Lighting Hours-of-Use study
NHC	New Home Construction (program component)
NRCan	Natural Resources Canada
NYDPS	New York Department of Public Service
OPA	Ontario Power Authority
PCF	Peak coincidence factor
PMA	Prescriptive Measures and Assumptions (IESO list)
PUC	Pennsylvania Public Utility Commission
PV	Photovoltaic
RLHOU	Residential Lighting Hours-of-Use Quick Hit Study



RSF	Reduced Speed Factor
SBES	Small Business Energy Solutions (program component)
SEER	Seasonal energy efficiency ratio
SEM	Strategic Energy Management (program component)
TEWH	Three-element water heater
TRM	Technical Reference Manual
UMP	Uniform Methods Project

DEFINITIONS

Accuracy	Reflects the proximity of measurements to the true value.
Adjustment ratio	The ratio of evaluated results to tracked results. This ratio expresses the adjustment made to tracked savings or other tracked values such as effective useful life.
Available demand response capacity	The capacity which is available to NSP to reduce system peak demand. This capacity is calculated based on the first two hours of all events called between December and February, excluding weekends and holidays. If an event is shorter than two hours, only the first hour is used to measure the available DR capacity. Available DR capacity is evaluated on a per-participant basis, based on the average demand reduction observed for each event that the participant was scheduled to participate in. E1's total available DR capacity is the sum of each participant's available DR capacity.
Baseline	To determine gross savings, a baseline (or base case) is established providing detailed information about the reference (e.g. pre-existing or standard) measure or equipment chosen to be compared with the efficient measure or equipment. For the reference measure or equipment, the baseline may include such information as the hours of operation, wattage, and base consumption.
Bias	Systematic deviations of measurements from the true value.
Billing calibration	An activity that consists of adjusting the expected energy savings based on the relative difference between the results of energy simulations and the actual energy consumption of a building or system.
Confidence interval	The estimated range of values that is likely to include unknown population parameters.
Demand response	Demand response measures generate savings in the form of available capacity or load reduction in response to events called by the electric utility (Nova Scotia Power) to reduce the load at strategic moments. These events can be called at any time and for any duration, although they are usually called for two to four hours during peak periods.
Displaced wattage	The displaced wattage is defined as the difference between the wattage values of the baseline equipment or product and the efficient equipment or product.
EnerGuide rating	An EnerGuide (official brand of Natural Resources Canada) rating is a standard measure of home energy performance. It is a measure of the efficiency of the building only and does not take into account occupant behaviour. It shows how energy efficient a home is through modelled home heat losses based on several factors including building envelope characteristics, heated volume, heating systems, and air leakage.
Effective useful life	The period a measure is expected to be in service and provide both energy and peak demand savings. This value combines equipment life and measure persistence, which includes factors such as business turnover or early retirement.

Equipment life	The number of years installed equipment will operate before it fails.
Equivalent CO2	A unit of measurement indicating the amount of carbon dioxide to which various kinds of emitted greenhouse gases are equivalent in terms of warming effects. In this report, gas global-warming potential is estimated over a timescale of 100 years.
Equivalent effective useful life	The number of years by which the first-year savings estimate is multiplied to obtain lifetime energy savings. This value takes into account variations in annual energy savings throughout the effective useful life due to increased baselines.
Evaluated savings	Gross and net energy or peak demand savings calculated by the Evaluator using the parameters (unitary savings values, installation rates, interactive effects, net-to-gross ratios, etc.) validated or measured during the evaluation process. Unless otherwise specified, evaluated savings are first-year savings.
Evaluation plan	The evaluation plan summarizes the program description, objectives, base cases, documentation, evaluation methodology, budget, and schedule.
First-year savings	The first full year of energy or peak demand savings generated by an energy efficiency measure.
Free-ridership	Percentage of gross savings attributable to participants who would have implemented the same or similar energy efficiency measures, with no change in timing, in the absence of the program.
Gross savings	Change in energy consumption and/or demand that results directly from program-related actions taken by participants in an efficiency program regardless of why they participated.
Induced consumption	Energy consumption of appliances that would have been unplugged and not replaced by participants in the absence of the program.
Interactive effects	Effects on the energy consumption of other systems in a building (such as heating and cooling) due to the installation of an energy-efficiency measure.
In-service rate	The proportion of incentivized products that are installed and operating. This rate is usually applied to programs through which rebates are offered in-store and products are likely to be stored for a certain period before being installed, such as LED lamps.
Installation rate	The proportion of incentivized products reported as installed and that remain installed and operating at the time of evaluation. This rate is usually applied to direct install or mail-in rebate programs through which measures are expected to be installed immediately at the time of participation.
Lifetime energy savings	The energy savings that occur over the lifetime of an energy efficiency measure. Lifetime energy savings account for a measure's effective useful life and any increase in the baseline efficiency level (which reduces attributable annual savings) over its lifetime.
Line loss factor	The multiplier to convert savings at the customer meter to savings at the utility generator. It accounts for the electrical losses of the transmission and distribution system.

Margin of error	The amount of random sampling error.
Market effects	The impact of a program on the market (in terms of increased product availability, practices, and prices) that extends beyond changing program participant behaviours. This includes spillover among non-participants.
Net savings	Energy or peak demand savings that can be reliably attributed to a program. This includes effects such as free-ridership and spillover that negatively or positively affect the savings attributable to a program.
Net-to-gross ratio	The ratio of net energy savings to gross energy savings.
Non-sampling error	Errors arising during all survey activities other than sampling. Non-sampling errors tend to lead to bias in measurements and are very difficult to quantify.
Peak coincidence factor	The percentage of measure demand savings that coincide in time with the annual peak demand of the entire electricity system.
Peak demand savings	The demand savings that coincide in time with the expected annual peak demand period of the entire electricity system. For industrial participants on an interruptible rate, peak demand savings may include savings on non-firm loads, i.e. loads that may be interrupted when Nova Scotia Power's 10-minute reserve is low.
Precision	The extent to which repeated measurements agree with one another.
Random sampling error	An error in measurement because measurements are taken from a subset of the population and not the entire population.
Realization rate	The ratio of evaluated savings to tracked savings.
Sample size	The number of observations or replicates included in a statistical sample.
Secondary market impacts	Energy consumption of appliances that would have been transferred to the secondary market if said appliances had not been retired.
Spillover	Savings attributable to participants who implement the energy efficiency measure(s) introduced by a program after participating in it once, without participating in the program a second time.
Tracked savings	Gross and net savings calculated based on various parameters such as number of participants or units installed or sold, unitary savings values, installation rates, interactive effects, and net-to-gross ratios. Those parameters, except the number of participants or units installed or sold, are obtained from the previous evaluation.
Unitary savings	Energy or peak demand savings established on a unitary basis. A unit can either be a product (e.g. an 8 W LED lamp), a capacity (e.g. one-tonne capacity of an air-source heat pump), or a participant (e.g. one participant taking part in a behaviour-based program).



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RESIDENTIAL MEASURE ASSESSMENT CHANGE LOG

Table 1: Residential Measure Assessment Change Log

Change Type	Section	Description	Date
Update	2.2.3(7) Pipe Insulation	Update EUL value	2023-03-09
New Measure	2.3.3(10) Smart Thermostats for Electrical Heating Systems	Renamed from the smart thermostats for electric baseboards measure to smart thermostats for electrical heating systems and updated it to include smart thermostats for heat pumps and for in-floor radiant heating system	2023-03-09
New Measure	2.4.3(8) Efficient Washer-Dryer Combination Units	Added efficient washer-dryer combination units as a new measure in Instant Savings	2023-03-09
Update	2.1.3(5) LED Nightlights	Update interactive effects factor	2023-03-09
Update	2.1.3(1) LED Lamps 2.1.3(2) LED Fixtures	Update EUL values and rationale for using an equivalent EUL to account for LED lamps becoming the baseline in 2025	2023-03-09
Update	2.6.3(3) Domestic Water Heater Load Controls	Update savings value based on 2022 metering data	2023-03-09
Update	2.4.3(6) Clothes Dryer Replacements	Update savings value and combined energy factor of baseline for ARet	2023-03-09
Update	All Sections with EPI Mail-out Kit Measures	Updated sections with measures in the EPI Mail-out Kit pilot to include the assumptions for the pilot	2023-03-09
New Measure	2.1.3(6) Solar Fixtures	Added solar fixtures as an Instant Savings measure	2023-03-09
Update	2.4.3 (2) Refrigerator Retirements/Replacements 2.4.3 (3) Freezer Retirements/Replacements	Update savings calculation methodology, savings values, and savings parameter values	2023-03-09
Update	1.1.1(4) Room Air Conditioner Retirements	Update savings values based on information from the 2022 tracking sheet and an updated source for the energy efficiency ratio of the retired equipment	2023-03-09
Update	1.1.1(5) Dehumidifier Replacements	Update savings values to consider the performance of replacement units installed in 2022	2023-03-09
Update	1.1.1(1) Clotheslines and Outdoor Drying Racks	Update number of loads based on more recent and regional data	2023-03-09
Update	1.1.1(6) Clothes Dryer Replacement/ENERGY STAR® Certified Clothes Dryers	Update number of loads based on more recent and regional data as well as ARet efficiency levels	2023-03-09
Update	1.1.1(7) Efficient Clothes Washers	Update number of loads based on more recent and regional data	2023-03-09
Update	2.3.3(2) Central Air-source Heat Pumps	Update unitary peak demand savings value based on data from the 2022 tracking sheet	2023-03-09
Update	2.1.3(1) LED Lamps 2.1.3(2) LED Fixtures	Update unitary savings based on data from the Instant Savings 2022 tracking sheet	2023-03-09
Update	2.2.3(1) Drain Water Heat Recovery	Update unitary savings based on HOT2000 simulations	2023-03-09
Update	2.2.3(2) Solar Domestic Hot Water	Update unitary savings value for HEA	2023-03-09
New Measure	1.1.1(8) Window Film Kits	Added window film kits as an EPI measure	2023-03-09

Change Type	Section	Description	Date
Removal	2.2.3(1) Drain Water Heat Recovery (for HEA only), 1.1.1(6) Solar Air Heating and Solar DHW (for HEA only) 2.2.3(4) Low-flow Showerheads (for IS only)	Measures no longer incented as of 2022	2024-03-12
New Measure	2.4.3(10) ENERGY STAR Certified Dishwashers	Addition of ENERGY STAR certified dishwashers for IS	2024-03-12
Removal	2.6.3(1) Three-element Water Heaters, (2) Domestic Water Heater Timers and (3) Electric Thermal Storage (for HEA only)	These products were incorrectly listed as being available under HEA, while they were not	2024-03-12
Removal	2.4.3 (6) Clothes Dryer Replacements (ARet)	No longer offered	2024-03-12
Update	2.4.3 (2) Refrigerator Replacements and (3) Freezer Replacements	Measures are now listed under HomeWarming and MHEEP in place of ARet	2024-03-12
Update	2.6.3(4) Domestic Water Heater Load Controls	Updated unitary savings values	2024-03-12
Update	3 Effective Useful Life	Added AMH EUL values to the lists. Added MHEEP to the program for which a few EUL values were applicable	2024-03-12
Update	2.3.3(7) Air Sealing Kits	Name changed to Air Sealing Products, and savings are now presented per product rather than by kit	2024-03-12
Update	2.1.1 Interactive Effects	Updated heat pump Coefficient of performance (COP) value. Updated space heating and cooling system distribution for Instant Savings	2025-03-19
Update	2.1.3(1) LED Lamps	Updated HOU values. Updated EUL and equivalent EUL values to account for LED lamps becoming the baseline in 2025. Removed mention of mail-out pilot kit for EPI. Unitary savings values updated with final Instant Savings 2024 TS data. Updated EPI installation rate according to 2024 EPI on-site visit results	2025-03-19
Update	2.1.3(2) LED Fixtures	Updated HOU values for recessed downlight fixtures and LED fixtures. Updated EUL and equivalent EUL values to account for LED lamps becoming the baseline in 2025. HOU values for LED fixtures with motion sensors and unitary savings values updated with final Instant Savings 2024 TS data	2025-03-19
Update	2.1.3(3) Dimmer Switches	Updated HOU value and controlled wattage. Added as an EPI measure	2025-03-19
Update	2.1.3(4) Motion Sensors	Updated outdoor representative lamp mix. Added as an EPI measure (indoor and outdoor only)	2025-03-19
Update	2.1.3(5) LED Nightlights	Updated EUL and equivalent EUL values to account for LED lamps becoming the baseline in 2025. Removed mention mail-out pilot kit. Updated installation rate according to 2024 EPI on-site visit results	2025-03-19
Update	2.1.3(6) Solar Fixtures	Updated EUL value and outdoor representative lamp mix. Added as an EPI measure	2025-03-19
Update	2.2.1 Interactive Effects	Updated heat pump COP value based on HSPF2	2025-03-19

Change Type	Section	Description	Date
Update	2.2.3(3) Heat Pump Water Heaters	Updated space heating system distribution for IS. Updated share of electric water heaters for IS with EPI 2022-2023 TS data. Updated EUL value	2025-03-19
Update	2.2.3(4) Low-flow Showerheads	Removed mention of mail-out pilot kit. Updated installation rate and number of showerheads per household according to 2024 EPI on-site visit results. Updated electric water heating efficiency	2025-03-19
Update	2.2.3(5) Faucet Aerators	Removed mention of mail-out pilot kit. Updated installation rate and number of faucets per household according to 2024 EPI on-site visit results. Updated electric water heating efficiency	2025-03-19
Update	2.2.3(6) Thermostatic Shower Valves	Updated available flow rates to only include 2.5 gpm since other flow rates were discontinued. Updated installation rate and number of showerheads per household according to 2024 EPI on-site visit results. Updated electric water heating efficiency	2025-03-19
Update	2.2.3(7) Pipe Insulation	Removed mention of mail-out pilot kit	2025-03-19
Update	2.2.3(8) Hot Water Tank	Updated installation rate according to 2024 EPI on-site visit results. Updated electric water heating efficiency	2025-03-19
Update	2.3.3(1) Mini-split Heat Pumps	Unitary savings values to be updated with GH and HEA billing analyses	2025-03-19
Update	2.3.3(3) Ground-source Heat Pumps	Updated efficiencies to HSPF2 and SEER2. Updated FLH based on HEA heating load	2025-03-19
Update	2.3.3(4) Wood and Pellet Stoves/Fireplace Inserts	Updated heat pump COP based on HSPF2. Unitary savings values to be updated with GH and HEA billing analyses	2025-03-19
Update	2.3.3(7) Air Sealing Products	Updated unitary savings values following 2023 change in delivery in which products were delivered individually and not in a kit. Updated heat pump COP based on HSPF2. Removed mention of mail-out pilot kit. Updated installation rate according to 2024 EPI on-site visit results	2025-03-19
Update	2.3.3(8) Window Film Kits	Updated heat pump COP value based on HSPF2. Updated installation rate according to 2024 EPI on-site visit results. Updated unitary energy savings and unitary peak demand savings values to correct rounding error	2025-03-19
Update	2.3.3(9) Programmable Thermostats	Updated unitary savings value in IS to reflect an electronic thermostat baseline. Updated algorithm to provide two unitary savings values in MHEEP with an electronic thermostat baseline and an analog thermostat baseline	2025-03-19
Update	2.3.3(10) Smart Thermostats for Electrical Heating Systems	Updated average heating energy with HEA 2021-2023 TS data. Updated heat pump COP based on HSPF2. Updated installation rate according to 2024 EPI on-site visit results. Applied reduction to apartment unitary energy savings value to account for differences between single-family home and apartment heating loads in EPI	2025-03-19
New Measure	2.3.3(11) Advanced Learning Thermostats for Central Heating Systems	Added measure	2025-03-19

Change Type	Section	Description	Date
Removal	2.4.3(1) Clotheslines and Outdoor Drying Racks	Removed product in EPI as it is no longer a measure in that program component	2025-03-19
Update	2.4.3(2) Refrigerator Retirements	Updated annual consumption per size for appliances after 2002 for ARet. Updated product characteristics based on 2021-2023 average for ASFH and MHEEP through ARet. Proportion of refrigerators updated with final ARet 2024 TS	2025-03-19
Update	2.4.3(3) Freezer Retirements	Updated annual consumption per size for appliances after 2002 for ARet. Updated product characteristics based on 2021-2023 average for ASFH and MHEEP through ARet. Proportion of freezers updated with final ARet 2024 TS	2025-03-19
Update	2.4.3(4) Room Air Conditioner Retirements	Updated energy efficiency ratio (EER). Updated average capacity based on 2021-2023 average	2025-03-19
Update	2.4.3(5) Dehumidifier Replacements or Retirements	Energy factor of efficient dehumidifier updated with final 2024 TS for ASFH and MHEEP through ARet	2025-03-19
Update	2.4.3(6) ENERGY STAR Certified Clothes Dryers	Updated baseline unit combined energy. New unit combined energy factor updated with final Instant Savings 2024 TS data	2025-03-19
Update	2.4.3(7) Efficient Clothes Washers	Updated calculation of electric water heating percentage to exclude internal heaters. Updated DHW tank distribution with EPI 2022-2023 TS data. Integrated Modified Energy Factor updated with final Instant Savings 2024 TS data	2025-03-19
Update	2.4.3(8) Efficient Washer-Dryer Combination Units	Updated baseline unit combined energy factor. Updated calculation of electric water heating percentage to exclude internal heaters. Updated DHW tank distribution with EPI 2022-2023 TS data. New unit combined energy factor and Integrated Modified Energy Factor updated with final Instant Savings 2024 TS data	2025-03-19
Update	2.4.3(10) ENERGY STAR Certified Dishwashers	Updated baseline unit consumption. Updated percentage of electric DHW savings. Efficient unit consumption updated with final Instant Savings 2024 TS data	2025-03-19
New Measure	2.4.3(12) Humidity Sensors for Bathroom Exhaust Fans	Added measure	2025-03-19
Update	2.5.3(1) Smart Power Controllers for Audiovisual Equipment	Updated unitary savings value and installation rate for IS. Updated EPI installation rate according to 2024 EPI on-site visit results	2025-03-19
Update	2.5.3(2) Power Bars with Integrated Timers	Updated idle lighting wattage	2025-03-19
New Measure	2.7.3(1) Solar Photovoltaic Systems	Measure added (already existed, just not in the MA). Updated EUL	2025-03-19
Update	2.3.3.(1) Mini-split Heat Pumps	Updated unitary savings according to 2024 billing analysis	2025-03-19
Update	2.3.3(4) Wood and Pellet Stoves/Fireplace Inserts	Updated unitary savings according to 2024 billing analysis	2025-03-19
Removal	2.1.3(1) LED Lamps	Removed all ENERGY STAR certified non-A-type lamps from Instant Savings as they are no longer offered through that program component following change to LED baseline	2026-02-27

Change Type	Section	Description	Date
Update	2.1.3(2) ENERGY STAR Certified LED Fixtures with Motion Sensors	Removed ENERGY STAR certified LED recessed downlight fixtures and certified LED fixtures in Instant Savings as they are no longer offered through that program component following change to LED baseline; updated Instant Savings unitary energy savings for LED fixtures with motion sensors following LED baseline change. Updated unitary peak demand savings accordingly. Updated EUL to only account for motion sensor savings following change to LED baseline	2026-02-27
Update	2.1.3(3) Dimmer Switches	Updated Instant Savings unitary energy savings following LED baseline change. Updated unitary peak demand savings accordingly	2026-02-27
Update	2.1.3(4) Motion Sensors	Updated Instant Savings unitary energy savings for all motion sensors following LED baseline change. Updated unitary peak demand savings accordingly; removed indoor motion sensors with dimmer switches as they are no longer offered through Instant Savings	2026-02-27
Update	2.1.3(6) Solar Fixtures	Updated Instant Savings unitary energy savings following LED baseline change. Updated unitary peak demand savings accordingly. Updated EUL to only account for motion sensor savings following change to LED baseline	2026-02-27
Removal	2.2.3(3) Heat Pump Water Heaters	Removed measure in MHEEP as it is no longer offered through that program component	2026-02-27
Update	2.3.3(1) Mini-split Heat Pumps	Updated ASFH algorithm following modification to account for percentage of electric heating	2026-02-27
Update	2.3.3(10) Non-learning Smart Thermostats for Electrical Heating Systems	Updated measure name to add “non-learning” designation; updated percentage of heating load saved. Updated unitary energy savings values accordingly; removed measure in MHEEP as it is not offered through that program component; added calculations applicable to thermostats for central heat pumps and electric furnaces	2026-02-27
Removal	2.4.3(2) Refrigerator Retirements	Removed measure in HomeWarming and MHEEP as it is not offered through those program components	2026-02-27
Removal	2.4.3(3) Freezer Retirements	Removed measure in HomeWarming and MHEEP as it is not offered through those program components	2026-02-27
Removal	2.4.3(5) Dehumidifier Replacements or Retirements	Removed measure in Instant Savings as it is no longer offered through that program component	2026-02-27
New Measure	2.4.3(11) ENERGY STAR Certified Bathroom Exhaust Fans	Added existing measure for Instant Savings (removed by mistake)	2026-02-27
Update	2.4.3(12) Humidity Sensors for Bathroom Exhaust Fans	Removed measure in Instant Savings as it was never offered through that program component (added by mistake)	2026-02-27
Removal	2.5.3(1) Smart Power Controllers for Audiovisual Equipment	Removed measure in EPI as it is no longer offered through that program component	2026-02-27
Removal	2.6.3(1) Three-element Water Heaters	Removed measure in Green Heat as it is no longer offered through that program component	2026-02-27
Update	2.6.3(3) Domestic Water Heater Load Control	Removed mention of installation rate. Added mention of in-service rate. Updated in-service rate	2026-02-27

Change Type	Section	Description	Date
New Measure	2.6.3(4) Smart Thermostat Load Control	Added measure for Residential Demand Response	2026-02-27
New Measure	2.6.3(5) Battery Control	Added measure for Residential Demand Response	2026-02-27
New Measure	2.6.3(6) EV Telematic and Charger Control	Added measure for Residential Demand Response	2026-02-27



INTRODUCTION

The 2025 DSM Measure Assessment (DSM MA) presents the results of an in-depth review of all parameters necessary to calculate the annual and lifetime gross energy and peak demand savings of most prescriptive measures and some semi-prescriptive measures offered through the EfficiencyOne (E1) demand-side management (DSM) program portfolio.

Purpose

The objectives of this document are to:

- › Ensure consistency in gross savings values throughout the three-year DSM cycle and thus improve E1's ability to define and track targets for energy and peak demand savings
- › Consolidate E1's gross savings values into a single reference document that can easily be referred to by program staff and useful to populate E1's internal e-Technical Reference Manual (e-TRM)

Use and Application

For the evaluations conducted during the last two years of the 2023-2025 demand-side management (DSM) cycle, the Evaluator will refer to the values presented in the 2025 DSM MA.

The DSM MA includes the following elements:

- › Interactive effects
- › Peak demand-to-energy ratios and peak coincidence factors
- › Installation and in-service rates
- › Unitary savings

In addition to the elements listed above, the DSM MA includes effective useful life (EUL) values for all measures offered in E1's program portfolio. Also, the savings for some programs targeting demand response (DR) are called available DR capacity. DR measures differ from demand reduction measures because they only generate savings when events are called while demand reduction measures generate peak demand savings throughout the peak demand period.

Development and Review Process

Savings are established using one or more of the following approaches: Literature reviews of TRMs; metering studies and evaluation reports; engineering calculations; adjustments based on data collected through participant surveys or site visits; and secondary research about household/facility characteristics such as types of heating and cooling systems.



The Evaluator established guidelines to determine how average parameters are calculated from tracking sheet data. For Instant Savings, the Evaluator used all 2024 data to establish product characteristic averages, given the rapid changes from year to year in this program. For all other parameters taken from tracking sheets (e.g. number of people per household, heating loads, equipment capacity), the Evaluator used an average value over the last three complete years available, namely 2021 to 2023. Using an average value over three years that is updated once every DSM cycle takes into consideration trends in parameters while limiting the impact of yearly variations. An exception to this rule may be made if there is a clear increase or decrease of the parameter year over year, which would make the 2023 value the most relevant one for future years – if an exception is made, it will be clearly noted. In some cases, parameters were not updated because they are no longer available in the tracking sheet; footnotes indicate where that is the case.

Certain parameters are updated in a given year based on either applicable comprehensive evaluation results or changes to program offerings or delivery having occurred in a given year. The Measure Assessment Change Log lists these changes.

If new measures are introduced to the portfolio in a given year, they are reviewed as part of the evaluation for that year, and the Evaluator updates the DSM MA edition of that year accordingly. In the 2025 evaluation, no new measures were added.

Savings Calculations Equations

The savings calculations are based on the equations outlined below.

Electrical Energy Savings

The following equation is used to calculate electrical energy savings.

$$\begin{aligned} \text{Electrical Energy Savings (kWh)} \\ &= \text{Unitary Energy Savings (kWh)} \times (1 \\ &+ \text{Interactive Effects Factor for Energy Savings (\%)}) \\ &\times \text{"Installation Rate " or "In-service Rate" (\%)} \end{aligned}$$

Peak Demand Savings

Peak demand savings correspond to the demand savings that coincide in time with the peak demand of the electricity system. The projected electricity peak demand period in Nova Scotia is between 5 p.m. and 7 p.m. from December to February on non-holiday weekdays.

The following equation is used to calculate peak demand savings.

$$\begin{aligned} \text{Peak Demand Savings (W)} \\ &= \text{Unitary Peak Demand Savings (W)} \times (1 \\ &+ \text{Interactive Effects Factor for Peak Demand Savings (\%)}) \times \text{"Installation Rate " or "In} \\ &\text{– service Rate" (\%)} \end{aligned}$$



Available Demand Response Capacity

Available DR capacity differs from peak demand savings reported in other DSM reports since the former considers the load reduction that was made available by participating devices during events called for the DR season instead of the load reduction that coincided with the utility peak. This distinction was made since E1 does not control the calling of events and thus does not control how well the resources made available are used to reduce peak demand. Available DR capacity is calculated based on the following assumptions:

- › Available DR capacity is evaluated based on events called from December to February excluding weekends and holidays. Events called at any time during the day (morning or evening) can be included.
- › Available DR capacity is measured over the first two hours of a DR event.
- › If an event is longer than two hours, only the first two hours are used to measure capacity.
- › If an event is shorter than two hours, only the first hour is used to measure available capacity.
- › Available DR capacity is evaluated on a per-participant basis based on the average demand reduction observed for each event in which the participant was scheduled to participate.
- › E1's total available DR capacity is the sum of each participant's available DR capacity.

The following equation is used to calculate available DR capacity.

$$\begin{aligned} \text{Available DR Capacity}(W) &= \text{Unitary Available DR Capacity } (W) \times (1 \\ &\quad + \text{Interactive Effects Factor for Peak Demand Savings } (\%)) \times \text{"Installation Rate "or" In} \\ &\quad \text{– service Rate" } (\%) \end{aligned}$$

Lifetime Energy Savings

Lifetime energy savings correspond to the savings that occur over the lifetime of the measures installed. The following equation is used to calculate lifetime energy savings.

$$\text{Lifetime Energy Savings (kWh)} = \text{Electrical Energy Savings (kWh)} \times \text{Effective Useful Life (years)}$$

1 Residential Measure Assessment Scope

Table 2 below lists the residential measures and associated programs included in the 2025 DSM MA. The DSM MA includes all necessary parameters and calculations to obtain gross energy and peak demand savings for all portfolio prescriptive and semi-prescriptive measures. In addition, effective useful life values are included for all prescriptive, semi-prescriptive, and custom measures.

For reference, savings calculations for prescriptive measures use fixed assumptions for all participants. The savings are identical for all units installed and represent the average savings for all units. Conversely, savings calculations for custom measures use inputs that are specific to each unit installed and thus represent the actual savings for each unit. Semi-prescriptive measures use a mix of two previous approaches by using unit-specific inputs as well as certain non-specific inputs to determine savings.

Table 2: Included Residential Measures

Measure	Program Component
Lighting	
LED Lamps	EPI
ENERGY STAR Certified LED Fixtures with Motion Sensors	Instant Savings
Dimmer Switches	EPI, Instant Savings
Motion Sensors	EPI, Instant Savings
LED Nightlights	EPI
Solar Fixtures	EPI, Instant Savings
Water Heating	
Drain Water Heat Recovery	MHEEP
Solar Domestic Hot Water	Green Heat
Heat Pump Water Heaters	Instant Savings, HEA
Low-flow Showerheads	EPI
Faucet Aerators	EPI
Thermostatic Shower Valves	EPI
Pipe Insulation	EPI
Hot Water Tank Wraps	EPI

Measure	Program Component
Space Heating	
Mini-split Heat Pumps	ASFH, Green Heat, HEA, MHEEP
Central Air-source Heat Pumps	Green Heat, HEA
Ground-source Heat Pumps	Green Heat, HEA
Wood and Pellet Stove/Fireplace Inserts	Green Heat, HEA
Wood and Pellet Boilers and Furnaces	Green Heat, HEA
Solar Air Heating	Green Heat
Air Sealing Products	EPI
Window Film Kits	EPI
Programmable Thermostats	Instant Savings, MHEEP
Non-learning Smart Thermostats for Electric Heating Systems	ASFH, EPI, Instant Savings
Advanced Learning Thermostats for Central Heating Systems	EPI
Appliances	
Clotheslines and Outdoor Drying Racks	Instant Savings
Refrigerator Retirements/Replacements	ARet
Freezer Retirements/Replacements	ARet
Room Air Conditioner Retirements	ARet
Dehumidifier Replacements or Retirements/ENERGY STAR Certified Dehumidifiers	ARet, Instant Savings
ENERGY STAR Certified Clothes Dryers	Instant Savings
Efficient Clothes Washers	Instant Savings
Efficient Washer-Dryer Combination Units	Instant Savings
ENERGY STAR Certified Room Air Purifiers	Instant Savings
ENERGY STAR Certified Dishwashers	Instant Savings
ENERGY STAR Certified Bathroom Exhaust Fans	Instant Savings
Humidity Sensors for Bathroom Exhaust Fans	EPI
Plug Load Controls	
Smart Power Controllers for Audiovisual Equipment	Instant Savings
Power Bars with Integrated Timer	Instant Savings
Heavy-duty Outdoor Timers	Instant Savings
ENERGY STAR® Certified Pool Pumps	Instant Savings
Demand Reduction	
Domestic Water Heater Timers	Green Heat
Electric Thermal Storage	Green Heat
Domestic Water Heater Load Controls	Demand Response
Renewables	
Solar Photovoltaic Systems	HEA

2 Residential Measure Gross Savings Parameters

The following sections outline all necessary parameters to calculate gross energy savings for prescriptive residential measures. It should be noted that units in unitary savings summary tables are not always aligned with units in unitary savings algorithms.

2.1 Lighting

2.1.1 Interactive Effects

In a home, the implementation of energy efficient lighting products interacts with the energy consumption of other elements such as heating and cooling.

The interactive effects factors for residential lighting products listed in Table 3 below are based on a study conducted by ADS Groupe-Conseil Inc. in 1992 for Hydro-Québec. As presented in Appendix I, the climate data of Nova Scotia and Quebec for the duration of the heating and cooling seasons were analyzed as part of the 2015 evaluation and found to be comparable and thus the study results are applicable for EfficiencyOne (E1) lighting measures.

Table 3 presents the interactive effects factors for five different types of home based on the presence of electrical space heating and air conditioning. For measures offered through Instant Savings where no participant-specific data on heating and cooling systems are available, the interactive effects are based on the weighted average calculated in Table 3.

Table 3: Interactive Effects Factors for Residential Lighting Products Installed Indoors

Type of Home	% of Homes ¹	Energy Interactive Effects Factor ²	Peak Demand Interactive Effects Factor ³
Heat Pump Heating and Air Conditioning	38%	$-58\% / 1.8 + 6.4\% = -25.8\%$	-90%
Electrical Heating with Air Conditioning	2%	$-58\% + 3.1\% = -54.9\%$	-90%
Electrical Heating Without Air Conditioning	12%	-58%	-90%
No Electrical Heating with Air Conditioning	5%	3.1%	0%
With Neither Electrical Heating nor Air Conditioning	43%	0%	0%
Weighted Average	100%	-17.7%	-46.8%

¹ Based on 2022-2023 EPI participants. 2021 data were excluded because the separation of electrical and non-electrical savings generated that year skewed the results.

² ADS ASSOCIÉS, *Évaluations des effets énergétiques combinés des mesures d'économies d'énergie – résidence unifamiliale*, report presented to Hydro-Québec, 1992.

³ Based on the ADS report, it is assumed that 10% of the heat is released through exterior walls and ceilings and does not contribute to interactive effects.



Type of Homes

The detailed rationale for interactive effects for heating and cooling follows.

Interactive Effects on Electrical Heating

The Hydro-Québec study found that efficient lighting installed in electrically heated single-family homes without air conditioning results in an interactive effects factor for heating of -58%.

Interactive Effects on Heat Pump Heating

Since the interactive effects factors for electrical heating are based on a heating system efficiency of 100%, some adjustments are necessary for homes that use a heat pump as a primary heating system since the efficiency of this system is superior to 100%.

The interactive effects factor for heating (-58.0%) is divided by 1.8, the COP of a standard mini-split heat pump based on an HSPF2 Region V of 6.0, which is the value for a standard split heat pump as defined by the Federal Energy Efficiency Regulations.⁴ This yields an interactive effects factor of -32.2% for heating.

Interactive Effects on Air Conditioning

The Hydro-Québec study found that efficient lighting installed in homes with air-conditioning units results in an interactive effects factor for cooling of 3.6%. By analyzing the Hydro-Québec study, the Evaluator deduced that the 3.6% was obtained using the following formula.

$$IE_{cooling} = 22\% / COP \times \% \text{ Conditioned Home Area}$$

The value of 22% corresponds to the proportion of the energy savings that occurs during the cooling period and affects the cooling load. It was not possible to extract the exact values used by Hydro-Québec for the COP and the percentage of conditioned home area, but the Evaluator found that a COP for cooling of 2.5 (corresponding to an EER of 8.5) and a percentage of conditioned home area of 40% would be reasonable values. Since the efficiency level of air-conditioning units has increased since the Hydro-Québec study, the Evaluator made an adjustment to increase the COP of 2.5 (EER of 8.5) to a COP of 2.9 (EER of 10), which results in an interactive effects factor for air conditioning of 3.1%.

Interactive Effects on Heat Pump Cooling

As for cases where cooling is provided by a heat pump, the Evaluator adjusted the cooling interactive effects by dividing the 22% value by the efficiency ratio of mini-split heat pumps and AC units (COP 3.5/2.5). The cooling factor is also multiplied by the ratio of conditioned home area (100%/40%) to account for whole-home conditioning, which is typical of heat pumps. This yields an interactive effects factor of 6.4% for cooling.

Peak Demand

The Hydro-Québec report assumes that 10% of the heat is released through exterior walls and ceilings and does not contribute to interactive effects. Since the peak demand period occurs during the heating period when lighting and heating systems are assumed to be on, the interactive effects factor for peak demand savings in electrically heated homes is -90%. This factor also applies to homes with heat pumps based on the assumption that heat pumps have a 100% efficiency when operating in very cold conditions, which is typical during peak period conditions.

⁴ Minister of Justice, Canada, *Energy Efficiency Regulations*, 2016, <http://laws-lois.justice.gc.ca/PDF/SOR-2016-311.pdf> (last accessed December 5, 2019).

Indoor Usage

Lighting products cause interactive effects only if installed indoors. To account for this and obtain an overall interactive effects factor for all lighting products, the percentage of products installed indoors, listed in Table 4, is multiplied by the corresponding interactive effects factor.

Table 4: Proportion of Lighting Products Used Indoors

Type of Product	Program Component	% Indoor	Reference
A-type LED Lamps ⁵	EPI	97%	2021, 2022 and 2023 EPI Tracking Sheets
Reflector and Decorative LED Lamps ⁶ (Except PAR38)		100%	2024 EPI Evaluation (on-site visits)
PAR38 LED Lamps		0%	Assumption
LED Nightlights		100%	
Dimmer Switches		100%	
Indoor Motion Sensors		100%	
Outdoor Motion Sensors		0%	
Solar Fixtures		0%	
Reflector and Decorative LED Lamps ⁷	Instant Savings	92%	2016 Nova Scotia Socket Study ⁸
ENERGY STAR Certified LED Recessed Downlight Fixtures		100%	Assumption
ENERGY STAR Certified LED Fixtures		100%	2024 Instant Savings tracking sheet (10 most popular products)
ENERGY STAR Certified LED Fixtures with Motion Sensors		3%	2024 Instant Savings tracking sheet (10 most popular products)
Dimmer Switches		100%	Assumption
Indoor Motion Sensors		100%	
Outdoor Motion Sensors		0%	
Solar Fixtures		0%	

Summary

Combining the values presented in Table 3 and Table 4, Table 5 summarizes the interactive effects factor established for each lighting measure.

⁵ Including 9 W, 9.5 W, 10 W, 18 W, and 7 W black-out bulb LED lamps installed through EPI.

⁶ Including PAR20, PAR30, GU10, G25, and chandelier E12 LED lamps installed through EPI.

⁷ Including ENERGY STAR certified non-A-type lamps rebated through Instant Savings.

⁸ Corporate Research Associates Inc., *2016 Socket Study*, Final Report prepared for Efficiency Nova Scotia, December 2016.

Table 5: Overall Interactive Effects Factors for Residential Lighting Measures

Measure	Type of Home	Interactive Effects Factors	
		Energy Savings	Peak Demand Savings
EPI			
LED A-type Lamps ⁹	Heat Pump Heating and Air Conditioning	-25.8% x 97% = -25.0%	-90% x 97% = -87.3%
	Electrical Heating with Air Conditioning	-54.9% x 97% = -53.3%	-90% x 97% = -87.3%
	Electrical Heating Without Air Conditioning	-58% x 97% = -56.3%	-90% x 97% = -87.3%
	No Electrical Heating with Air Conditioning	3.1% x 97% = 3.0%	0% x 97% = 0%
	With Neither Electrical Heating nor Air Conditioning	0% x 97% = 0%	0% x 97% = 0%
Reflector and Decorative LED Lamps, LED Nightlights ¹⁰ (Except PAR38), Dimmer Switches and Indoor Motion Sensors	Heat Pump Heating and Air Conditioning	-25.8% x 100% = -25.8%	-90% x 100% = -90.0%
	Electrical Heating with Air Conditioning	-54.9% x 100% = -54.9%	-90% x 100% = -90.0%
	Electrical Heating Without Air Conditioning	-58% x 100% = -58.0%	-90% x 100% = -90.0%
	No Electrical Heating with Air Conditioning	3.1% x 100% = 3.1%	0% x 100% = 0%
	With Neither Electrical Heating nor Air Conditioning	0% x 100% = 0%	0% x 100% = 0%
PAR38 LED Lamps, Outdoor Motion Sensors and Solar Fixtures	Outdoor	0% x 0% = 0%	0% x 100% = 0%
Instant Savings			
Reflector and Decorative LED Lamps and LED Nightlights ¹¹	Weighted Average	-17.7% x 92% = -16.3%	-46.8% x 92% = -43.1%
ENERGY STAR Certified LED Recessed Downlight Fixtures	Weighted Average	-17.7% x 100% = -17.7%	-46.8% x 100% = -46.8%
ENERGY STAR Certified LED Fixtures	Weighted Average	-17.7% x 100% = -17.7%	-46.8% x 100% = -46.8%
ENERGY STAR Certified LED Fixtures with Motion Sensors	Weighted Average	-17.7% x 3% = -0.5%	-46.8% x 3% = -1.4%
Dimmer Switches	Weighted Average	-17.7% x 100% = -17.7%	-46.8% x 100% = -46.8%
Indoor Motion Sensors	Weighted Average	-17.7% x 100% = -17.7%	-46.8% x 100% = -46.8%
Outdoor Motion Sensors	Outdoor	0% x 0% = 0%	0% x 0% = 0%
Solar Fixtures	Outdoor	0% x 0% = 0%	0% x 0% = 0%

⁹ Including 9 W, 9.5 W, 10 W, 18 W, and 7 W black-out bulb LED lamps installed through EPI.

¹⁰ Including PAR20, PAR30, GU10, G25, chandelier E12 LED lamps, and LED nightlights installed through EPI.

¹¹ Including ENERGY STAR certified non-A-type lamps rebated through Instant Savings.

2.1.2 Peak Demand Savings Factors

For all indoor and outdoor LED lamps, nightlights, and fixtures, the peak demand-to-energy ratio is based on the Northeast Residential Lighting Hours-of-Use (NERHOU)¹² study, which established a peak-demand-to-energy ratio of 0.162 W/kWh with a peak coincidence factor (PCF) of 16% and 2.7 hours of use per day. The former value is very close to the 0.161 W/kWh established by the EPI Residential Lighting Metering Study,¹³ which consisted of a metering study conducted in 2016 and 2017 among 75 households in Nova Scotia to assess the daily hours of operation. Since the margin of error in the NERHOU study was lower and included outdoor lamps in its sample, the Evaluator recommends using 0.162 W/kWh. This value was also used for dimmer switches and solar fixtures.

For motion sensors, peak demand savings were calculated using the peak demand-to-energy ratios developed by Navigant in the 2016-2018 DSM Plan. These ratios were established for various product categories based on modelled system-coincident peak demand savings and energy savings for a projected deployment of products. Navigant used local data to establish the ratios applicable for 2016-2018. The Evaluator recommends using the same ratios during the 2020-2023 DSM cycle.

Table 6 summarizes the peak demand-to-energy ratios established for each lighting measure.

Table 6: Peak Demand-to-energy Ratios for Residential Lighting Measures

Measure	Peak Demand-to-energy Ratio (W/kWh)	Reference
LED Lamps	0.162	Northeast Residential Lighting Hours-of-Use Study
LED Fixtures		
LED Nightlights		
Dimmer Switches		
Solar Fixtures		
Motion Sensors	0.000	RES-Lighting-Control-OccSensors, Navigant 2016-2018 DSM Plan

¹² NMR Group Inc. and DNV GL, *Northeast Residential Lighting Hours-of-Use Study*, May 5, 2014, p. 69.

¹³ Econoler, *Residential Lighting Metering Study*, December 14, 2017.

2.1.3 Lighting Measures

(1) LED Lamps

Summary

Table 7 presents a summary of the values used to calculate A-type, reflector, and decorative LED lamp savings. The detailed methodology follows.

Table 7: LED Lamp Measure Summary

Parameter	EPI	Reference
Measure Description and Identification		
Measure	LED lamps (A-type, Reflector, and Decorative) with direct installation	-
Baseline	Existing incandescent or halogen lamps being replaced	
General Parameters		
Installation Rate	94%	See details below under Installation Rates
Effective Useful Life [years]	Varies depending on replaced and installed wattages as well as lamp type	See Subsection 3.1
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Varies depending on replaced and installed wattages. See Table 8 below	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.162	See Subsection 2.1.2
Unitary Peak Demand Savings [W]	Varies depending on replaced and installed wattages. See Table 9 below	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	Calculation based on home heating and air-conditioning systems for each installed unit	See Subsection 2.1.1
Interactive Effects Factor for Peak Demand Savings		

Electrical Unitary Energy Savings

The equation below determines the unitary savings values of LED lamps for each pairing of old and new wattages. Table 8 lists the parameters and corresponding values used in the equation and the resulting unitary savings values.

$$\text{Energy Savings} \left[\frac{kWh}{yr} \right] = \frac{(\text{Old Wattage} - \text{New Wattage})[W] \times HOU \left[\frac{h}{day} \right] \times 365 \left[\frac{day}{yr} \right]}{1,000 \left[\frac{W}{kW} \right]}$$

Table 8: Electrical Unitary Energy Savings Values for LED Lamps

Type of LED	Old Wattage (W)	New Wattage (W)	Displaced Wattage (W)	Operating Hours (hrs/day)	Unitary Savings Value (kWh/year)
EPI					
9 W Replacing 25 W	25	9	16	2.6	15.2
9 W Replacing 29 W	29	9	20		19.0
9 W Replacing 40 W	40	9	31		29.4
9 W Replacing 43 W	43	9	34		32.3
9 W Replacing 60 W	60	9	51		48.4
9 W Replacing 72 W	72	9	63		59.8
9 W Replacing 100 W	100	9	91		86.4
9 W Replacing 150 W	150	9	141		134
9.5 W Replacing 25 W	25	9.5	15.5		14.7
9.5 W Replacing 29 W	29	9.5	19.5		18.5
9.5 W Replacing 40 W	40	9.5	30.5		28.9
9.5 W Replacing 43 W	43	9.5	33.5		31.8
9.5 W Replacing 60 W	60	9.5	50.5		47.9
9.5 W Replacing 72 W	72	9.5	62.5		59.3
9.5 W Replacing 100 W	100	9.5	90.5		85.9
9.5 W Replacing 150 W	150	9.5	140.5		133
18 W Replacing 75 W	75	18	57		54.1
18 W Replacing 100 W	100	18	82		77.8
7 W Black-out Bulbs Replacing 60 W	60	7	53		50.3
9 W Installed Through the Mail-out Pilot	57.3	9	48.3		45.8
PAR20 7 W Replacing 50 W	50	7	43		40.8
PAR30 8 W Replacing 53 W	53	8	45		42.7
PAR30 8 W Replacing 75 W	75	8	67		63.6
PAR38 15 W Replacing 90 W	90	15	75		71.2
PAR38 15 W Replacing 120 W	120	15	105		99.6
PAR38 15 W Replacing 150 W	150	15	135		128
7 W GU10 Replacing 35 W	35	7	28		26.6
7 W GU10 Replacing 50 W	50	7	43		40.8
4.5 W G25 Replacing 40 W	40	4.5	35.5		33.7
5 W Chandelier E12 Replacing 40 W	40	5	35		33.2



Displaced Wattage

For Efficient Product Installation (EPI), displaced wattage is defined as the difference between the real wattage value of the old lamp and that of the new LED lamp. Both these values are available in the EPI tracking sheet. Previous evaluations confirmed that installed LED lamps had a light output wattage equivalent to that of the replaced lamps for almost all replacements. In other cases, the savings calculations are still based on the difference in real wattage values.

Hours of Operation

The daily hours of operation value is based on the 2020 Residential Lighting Hours-of-Use Quick Hit Study (RLHOU)¹⁴ in which the data collected through the 2014 Northeast Residential Lighting Hours-of-Use (NERHOU)¹⁵ study is reanalyzed to take into account the effects of efficient lamp saturation on hours of use (HOU). The Evaluator had previously determined that the NERHOU study was the most appropriate for E1 since its findings fell within the margin of error of the metering study conducted by the Evaluator in Nova Scotia, and because the NERHOU sample size was significantly larger than the Nova Scotia study. The newer RLHOU study found that the average runtime is 2.6 hours per day for all types of bulbs and 2.8 hours per day for efficient bulbs given the absence of a snapback effect, compared to respectively 2.7 and 2.9 hours in the NERHOU study.¹⁶

The NERHOU Study concluded that the daily HOU for all bulb types were 0.3 hours lower than those for high efficiency bulbs. Three theories have been put forward to explain why efficient bulbs are used over a greater number of hours, as follows.

- › Differential socket selection: The assumption is that the most used sockets in a household are selected to install efficient bulbs.
- › Shifting usage: The assumption is that once an efficient bulb is installed, it is favoured over other sockets containing inefficient bulbs.
- › Snapback effect: The assumption is that there is a tendency to use an efficient product more than a replaced inefficient product.

Since there is no indication that one theory overrides the others, each theory is assumed to represent an additional usage of 0.1 hours per day.

For EPI, the HOU are 2.6 hours per day since none of the theories explains a higher HOU for efficient bulbs. Differential socket selection and shifting usage do not apply to EPI since all eligible bulbs are replaced in participants' homes. The snapback effect is not considered to avoid overestimating savings by making calculations based on higher operating hours than those of the base case. The NERHOU study concluded that there was no difference in HOU between single-family homes and apartments. Thus, the HOU applied to obtain unitary savings for both dwelling types are identical.

Unitary Peak Demand Savings

Unitary peak demand savings are calculated by multiplying the unitary savings value by the peak demand-to-energy ratio.

¹⁴ NMR Group Inc. and DNV GL, *Residential Lighting Hours-of-Use Quick Hit Study*, March 31, 2020.

¹⁵ NMR Group Inc. and DNV GL, *Northeast Residential Lighting Hours-of-Use Study*, May 5, 2014, p. 69.

¹⁶ The snapback effect is an increase in usage following the installation of an efficient product because the operating cost is lower.

Table 9: Electrical Unitary Peak Demand Savings Values for LED Lamps

Type of LED	Unitary Energy Savings Value (kWh/year)	Peak Demand-to-energy Ratio (W/kWh)	Unitary Peak Demand Savings Value (W/year)
EPI			
9 W Replacing 25 W	15.2	0.162	2.46
9 W Replacing 29 W	19.0		3.08
9 W Replacing 40 W	29.4		4.76
9 W Replacing 43 W	32.3		5.23
9 W Replacing 60 W	48.4		7.84
9 W Replacing 72 W	59.8		9.69
9 W Replacing 100 W	86.4		14.0
9 W Replacing 150 W	134		21.7
9.5 W Replacing 25 W	14.7		2.38
9.5 W Replacing 29 W	18.5		3.00
9.5 W Replacing 40 W	28.9		4.68
9.5 W Replacing 43 W	31.8		5.15
9.5 W Replacing 60 W	47.9		7.76
9.5 W Replacing 72 W	59.3		9.61
9.5 W Replacing 100 W	85.9		13.9
9.5 W Replacing 150 W	133		21.5
18 W Replacing 75 W	54.1		8.76
18 W Replacing 100 W	77.8		12.6
7 W Black-out Bulbs Replacing 60 W	50.3		8.15
9 W Installed Through the Mail-out Pilot	45.8		7.42
PAR20 7 W Replacing 50 W	40.8		6.61
PAR30 8 W Replacing 53 W	42.7		6.92
PAR30 8 W Replacing 75 W	63.6		10.3
PAR38 15 W Replacing 90 W	71.2		11.5
PAR38 15 W Replacing 120 W	99.6		16.1
PAR38 15 W Replacing 150 W	128		20.7
7 W GU10 Replacing 35 W	26.6		4.31
7 W GU10 Replacing 50 W	40.8		6.61
4.5 W G25 Replacing 40 W	33.7		5.46
5 W Chandelier E12 Replacing 40 W	33.2		5.38

Installation Rates

Table 10 lists the installation rate for EPI LED Lamps.

Table 10: EPI LED Lamp Installation Rate

Installation Rate	Margin of Error	Reference
94%	3.0%	2024 EPI evaluation (on-site visits)

For upstream programs like Instant Savings, the UMP makes the following recommendation:

“In-service rates should be calculated through an in-home audit. Since program bulbs cannot be easily identified, the in-service rate can be calculated as the number of installed bulbs purchased in a recent 12-month period divided by the total number of bulbs purchased in the same 12-month period. If the sample size of homes with bulbs purchased in the recent 12-month period is insufficient to provide the necessary levels of confidence and precision, a long-term in-service rate can be used for all bulbs regardless of the time of purchase.”

The UMP provides examples from five recent studies that applied first-year in-service rates to LED upstream programs in the United States. These in-service rates varied between 84% and 99%, with four in-service rates being 95% or higher.

The UMP also mentions three main factors that cause in-service rates below 100%, notably: (1) deeply discounted prices; (2) program inclusion of LED multipacks; and (3) consumers waiting for bulbs to burn out before replacing them. Despite the rebate offered and the large majority (85%) of LED lamps purchased through Instant Savings since 2020 being in packs of two or more, the Evaluator considers it unlikely that most purchased LED lamps are left unused since more than 48% of participants interviewed during the fall online survey mentioned that they purchased lamps to replace functional lamps. The Evaluator also believes that it would not be accurate to use an in-service rate from a program that has a different context and design than Instant Savings.

First-year in-service rates measure the proportion of LED lamps installed within the first year after they are purchased although in-service rates do not capture LED lamps that are installed after that first year. Therefore, if an in-service rate were applied to LED lamp savings, some adjustment would need to be made to account for LED lamps installed after the first year, and the Evaluator believes that the savings deduction would be too low to be considered.

For the abovementioned reasons, in-service rates are not applied to LED lamps and all savings are claimed in the year during which LED lamps were purchased.

(2) ENERGY STAR Certified LED Fixtures with Motion Sensors

Summary

Table 11 presents a summary of the values used to calculate the savings for motion sensors. The detailed methodology follows.

Table 11: LED Fixture with Motion Sensor Measure Summary

Parameter	Instant Savings	Reference
Measure Description and Identification		
Measure	LED fixtures with motion sensors rebated in store	-
Baseline	Standard-compliant new fixtures	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	10	See Subsection 3.1
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	14.6	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio (W/kWh)	0.162	See Subsection 2.1.2
Unitary Peak Demand Savings [W]	2.37	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	-0.5%	See Subsection 2.1.1
Interactive Effects Factor for Peak Demand Savings	-1.4%	See Subsection 2.1.1

Electrical Unitary Energy Savings

The equation below determines the unitary savings values of LED fixtures. Table 12 lists the parameters and corresponding values used in the equation and the resulting unitary savings values.

$$\begin{aligned}
 & \text{Energy Savings} \left[\frac{\text{kWh}}{\text{yr}} \right] \\
 &= \frac{\left(\text{Wattage}_{\text{average equivalent}} [W] \times \text{HOU}_{\text{old}} \left[\frac{\text{hrs}}{\text{day}} \right] - \text{Wattage}_{\text{average}} [W] \times \text{HOU}_{\text{new}} \left[\frac{\text{hrs}}{\text{day}} \right] \right) \times 365 \left[\frac{\text{day}}{\text{yr}} \right]}{1,000 \left[\frac{W}{kW} \right]}
 \end{aligned}$$

Table 12: Electrical Unitary Savings Values for LED Fixtures with Motion Sensors

Average Wattage (W)	Average Equivalent Wattage (W)	Displaced Wattage (W)	Old Operating Hours (hrs/day)	New Operating Hours (hrs/day)	Unitary Savings Value (kWh/year)
22.4	22.4	-	4.69	2.90	14.6

Due to a change to the LED baseline assumption, savings are no longer claimed for scenarios in which a switch to an efficient bulb occurs. Therefore, the displaced wattage is assumed to be nil.

In 2024, the Evaluator found that 97% of the LED fixtures equipped with a motion sensor were designed for outdoor usage. For LED fixtures installed outdoors, the old and new hours of operation used are 4.75 and 2.95 hours per day respectively.¹⁷ For LED fixtures installed indoors, the old and new hours of operation used are 2.6 and 1.2 hours per day respectively (where 1.2 hours is calculated based on the 54% reduction in operating time).¹⁸ When accounting for the weight of indoor and outdoor fixtures, the average old and new hours of operation were established at 4.69 and 2.90 respectively.

Installation Rates

The installation rate is assumed to be 100%.

(3) Dimmer Switches

Summary

Table 13 presents a summary of the values used to calculate dimmer switch savings. The detailed methodology follows.

Table 13: Dimmer Switch Measure Summary

Parameter	Instant Savings	EPI	Reference
Measure Description and Identification			
Measure	Indoor dimmer switches rebated in store (Instant Savings) or with direct installation (EPI)	-	
Baseline	Existing indoor LED fixtures without dimmer controls		
General Parameters			
Installation Rate	100%	See details below under Installation Rates	
Effective Useful Life [years]	10	See Subsection 3.2	
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	3.42	See details below under Electrical Unitary Energy Savings	
Peak Demand-to-energy Ratio [W/kWh]	0.162	See Subsection 2.1.2	
Unitary Peak Demand Savings [W]	0.554	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio	
Interactive Effects Factor for Energy Savings	-17.7%	Calculation based on home heating and air-conditioning systems for each installed unit	See Subsection 2.1.1
Interactive Effects Factor for Peak Demand Savings	-46.8%		See Subsection 2.1.1

¹⁷ Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

¹⁸ Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

Electrical Unitary Energy Savings

The unitary savings value for dimmer switches is based on the general lighting equation adapted as follows to consider the effect of dimming on energy consumption.

$$\text{Energy Savings} \left[\frac{kWh}{yr} \right] = \frac{(\text{Average Wattage})[W] \times \%Dimmed \times HOU \left[\frac{h}{day} \right] \times 365 \left[\frac{day}{yr} \right]}{1,000 \left[\frac{W}{kW} \right]}$$

The value for each parameter and resulting unitary savings value are summarized in Table 14.

Table 14: Electrical Unitary Savings Values for Dimmer Switches

Parameter	EPI, Instant Savings	Reference
Average Wattage [W]	2 x 9 W = 18.0 W	Assumed two controlled LED lamps per motion sensor
Dimmed Wattage [%]	20%	2011 OPA Prescriptive Measures and Assumptions List ¹⁹
Daily Hours of Operation	2.6	RLHOU, 2020 ²⁰
Unitary Energy Savings [kWh/year]	3.42	Calculation

Installation Rates

The installation rate is assumed to be 100%.

¹⁹ Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

²⁰ NMR Group Inc. and DNV GL, *Residential Lighting Hours-of-Use Quick Hit Study*, March 31, 2020, p. 22.

(4) Motion Sensors

Summary

Table 15 presents a summary of the values used to calculate the savings for motion sensors. The detailed methodology follows.

Table 15: Motion Sensor Measure Summary

Parameter	Instant Savings		EPI		Reference
	Indoor Motion Sensor	Outdoor Motion Sensor	Indoor Motion Sensor	Outdoor Motion Sensor	
Measure Description and Identification					
Measure	Indoor and outdoor motion sensors rebated in store (Instant Savings) or with direct installation (EPI)				-
Baseline	LED indoor or outdoor fixtures without motion sensors				
General Parameters					
Installation Rate	100%				See details below under Installation Rates
Effective Useful Life [years]	10				See Subsection 3.2
Electrical Savings Parameters					
Unitary Energy Savings [kWh/year]	9.22	19.7	9.22	19.7	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.000				See Subsection 2.1.2
Unitary Peak Demand Savings [W]	0.00				Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	-17.7%	0%	Calculation based on home heating and air-conditioning systems for each installed unit	0%	See Subsection 2.1.1
Interactive Effects Factor for Peak Demand Savings	-46.8%	0%		0%	See Subsection 2.1.1

Electrical Unitary Energy Savings

Different unitary savings values apply according to the location of the motion sensor and additional devices.

Indoor Motion Sensors

The unitary savings value for indoor motion sensors is based on the general lighting equation adapted as follows to consider the effect of motion sensing on energy consumption.

$$\text{Energy Savings} \left[\frac{kWh}{yr} \right] = \frac{(\text{Average Wattage})[W] \times HOU \left[\frac{h}{day} \right] \times \%HOU \text{ Reduction} \times 365 \left[\frac{day}{yr} \right]}{1,000 \left[\frac{W}{kW} \right]}$$

The value for each parameter and resulting unitary savings value are summarized in Table 16.

Table 16: Electrical Unitary Savings Values for Indoor Motion Sensors

Parameter	EPI, Instant Savings	Reference
Average Wattage [W]	2 x 9 W = 18.0 W	Assumed two controlled LED lamps per motion sensor
Daily Hours of Operation [h/day]	2.6	RLHOU, 2020 ²¹
Daily Reduction of Hours of Operation [%]	54%	2011 OPA Prescriptive Measures and Assumptions List ²²
Unitary Energy Savings [kWh/year]	9.22	Calculation

Indoor Motion Sensors with Dimmer Switch

The unitary savings value for indoor motion sensors is based on the general lighting equation adapted as follows to consider the effects of motion sensing and dimming on energy consumption. The annual energy savings corresponds to the difference between the base consumption and the reduced consumption occurring with the motion sensor and dimmer switch.

$$\text{Energy Savings [kWh/yr]} = \text{Base Consumption} - \text{Reduced Consumption}$$

$$\begin{aligned} \text{Base Consumption [kWh/yr]} \\ = ((\text{Average Wattage})[W] \times HOU[h/day] \times 365[day/yr]) / 1,000[W/kW] \end{aligned}$$

$$\begin{aligned} \text{Reduced Consumption [kWh/yr]} \\ = ((\text{Average Wattage})[W] \times (1 - \%Dimmed) \times HOU[h/day] \\ \times (1 - \%HOU \text{ Reduction}) \times 365[day/yr]) / 1,000[W/kW] \end{aligned}$$

The value for each parameter and resulting unitary savings value are summarized in Table 17 below.

²¹ NMR Group Inc. and DNV GL, *Residential Lighting Hours-of-Use Quick Hit Study*, March 31, 2020, p. 22.

²² Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

Table 17: Unitary Savings Values for Indoor Motion Sensors with Dimmer Switch

Parameter	Value	Reference
Average Wattage [W]	2 x 9 W = 18.0 W	Assumed two controlled LED lamps per motion sensor
Dimmed Wattage [%]	20%	2011 OPA Prescriptive Measures and Assumptions List ²³
Daily Hours of Operation [h/day]	2.6	RLHOU, 2020 ²⁴
Daily Reduction of Hours of Operation [%]	54%	2011 OPA Prescriptive Measures and Assumptions List ²⁵
Unitary Energy Savings [kWh/year]	10.8	Calculation

Outdoor Motion Sensors

The unitary savings value for outdoor motion sensors is based on the general lighting equation adapted as follows to consider the effect of motion sensing on energy consumption.

$$Energy\ Savings\ \left[\frac{kWh}{yr}\right] = \frac{(Average\ Wattage)[W] \times (Old\ HOU - New\ HOU) \left[\frac{h}{day}\right] \times 365 \left[\frac{day}{yr}\right]}{1,000 \left[\frac{W}{kW}\right]}$$

The value for each parameter and resulting unitary savings value are summarized in Table 18.

Table 18: Unitary Savings Values for Outdoor Motion Sensors

Parameter	EPI, Instant Savings	Reference
Average Wattage [W]	2 x 15 W = 30.0 W	Assumed two controlled outdoor LED lamps per motion sensor
Old Operating Time [hrs/day]	4.75	2011 OPA Prescriptive Measures and Assumptions List ²⁶
New Operating Time [hrs/day]	2.95	2011 OPA Prescriptive Measures and Assumptions List ²⁷
Unitary Energy Savings [kWh/year]	19.7	Calculation

Installation Rates

The installation rate is assumed to be 100%.

²³ Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

²⁴ NMR Group Inc. and DNV GL, *Residential Lighting Hours-of-Use Quick Hit Study*, March 31, 2020, p. 22.

²⁵ Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

²⁶ Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

²⁷ Ibid.

(5) LED Nightlights

Summary

Table 19 presents a summary of the values used to calculate savings for LED nightlights. The detailed methodology follows.

Table 19: LED Nightlight Measure Summary

Parameter	EPI	Reference
Measure Description and Identification		
Measure	LED nightlights with direct installation	-
Baseline	Existing nightlight being replaced, which must be incandescent	
General Parameters		
Installation Rate	94%	See details below under Installation Rates
Effective Useful Life [years]	1.0	See Subsection 3.1
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	29.3	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.162	See Subsection 2.1.2
Unitary Peak Demand Savings [W]	4.75	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	Calculation based on home heating and air-conditioning systems for each installed unit	See Subsection 2.1.1
Interactive Effects Factor for Peak Demand Savings		

Electrical Unitary Energy Savings

Table 20 lists the parameters and corresponding values used in the equation below for LED nightlights and the resulting unitary values. The values for displaced wattages and hours of operation are consistent with the values used by other jurisdictions such as the State of Pennsylvania.²⁸

$$\text{Energy Savings} \left[\frac{kWh}{yr} \right] = \frac{(\text{Old Wattage} - \text{New Wattage})[W] \times HOU \left[\frac{h}{day} \right] \times 365 \left[\frac{day}{yr} \right]}{1,000 \left[\frac{W}{kW} \right]}$$

²⁸ Pennsylvania Public Utility Commission, *Technical Reference Manual Volume 2: Residential Measures*, August 2019 (revised February 2021), p. 8.

Table 20: Electrical Unitary Savings Values for LED Nightlights

Parameter	Value	Reference
Old Wattage [W]	7.0	Assumption based on the typical wattage value of an incandescent nightlight
New Wattage [W]	0.3	Wattage value of the LED nightlight installed through EPI (E1)
Average Displaced Wattage [W]	6.7	Calculation
Hours of Operation [hrs/day]	12	Assumption based on the average length of night
Unitary Energy Savings [kWh/year]	29.3	Calculation

Installation Rates

Table 21 lists the installation rate for EPI LED nightlights.

Table 21: EPI LED Nightlight Installation Rate

Installation Rate	Margin of Error	Reference
94%	3.0%	2024 EPI evaluation (on-site visits)

(6) Solar Fixtures

Summary

Table 22 presents a summary of the values used to calculate the savings for solar fixtures. The detailed methodology follows.

Table 22: Solar Fixture Measure Summary

Parameter	Instant Savings	EPI	Reference
Measure Description and Identification			
Measure	LED solar fixtures rebated in store (Instant Savings) or with direct installation (EPI)		-
Baseline	LED fixtures connected to the grid	Non-LED fixtures connected to the grid ²⁹	
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Effective Useful Life [years]	10	2.5	See Subsection 3.1
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	8.11	92.6	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio (W/kWh)	0.162		See Subsection 2.1.2
Unitary Peak Demand Savings [W]	1.31	15.0	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0.0%		See Subsection 2.1.1
Interactive Effects Factor for Peak Demand Savings	0.0%		See Subsection 2.1.1

Electrical Unitary Energy Savings

Since solar fixtures consume no electricity from the grid, all the electrical energy consumed by the baseline fixture is saved. The only solar fixtures offered are outdoor security fixtures with or without motion sensors. The same unitary savings value is currently used for both measures.

The unitary savings value for solar fixtures is based on the outdoor motion sensor equation adapted as follows to consider the nil consumption of the new fixtures.

$$Energy\ Savings\ \left[\frac{kWh}{yr}\right] = \frac{Baseline\ Wattage\ [W] \times Old\ HOU\ \left[\frac{h}{day}\right] \times 365\ \left[\frac{day}{yr}\right]}{1,000\ \left[\frac{W}{kW}\right]}$$

²⁹ For solar fixtures, E1 requires electricians to replace non-LED outdoor fixtures only.

The value for each parameter and resulting unitary savings value are summarized in Table 23 below.

Table 23: Unitary Savings Values for Solar Fixtures

Parameter	Instant Savings	EPI	Reference
Baseline Wattage [W]	4.68	53.4	<u>Instant Savings</u> : Standard-compliant lamps providing the same lighting output as the rebated solar fixtures <u>EPI</u> : See Table 24 for representative lamp mix calculation
Old Operating Time [hrs/day]	4.75		Used the old operating time for outdoor motion sensors in Table 18, as indicated in 2011 OPA Prescriptive Measures and Assumptions List ³⁰
Unitary Energy Savings [kWh/year]	8.11	92.6	Calculation

Table 24: Representative Lamp Mix Calculation for Solar Fixtures through EPI

Parameter	Value	Reference
Representative lamp mix wattage [W]	(100 W x 16% [incandescent] + 90 W x 7% [halogen] + 23 W x 33% [CFL]) / (16% + 7% + 33%) = 53.4 W	Assumed a representative lamp mix while excluding LED lighting using the United States Department of Energy residential lighting technology distribution for outdoor lighting ³¹ Wattages in this calculation are baseline technology equivalent values for 1,500 lumens

Installation Rates

The installation rate is assumed to be 100%.

³⁰ Ontario Power Authority (OPA), 2011 Prescriptive Measures and Assumptions Version 1, March 2011.

³¹ U.S. Department of Energy, 2020 U.S. Lighting Market Characterization, April 2024, p. 44.



2.2 Water Heating

2.2.1 Interactive Effects

Hot Water Insulation Measures

For hot water insulation measures, namely pipe insulation and hot water tank wraps, the interactive effects factors are based on engineering calculations to account for the duration of the heating and cooling seasons, cooling and heating system efficiency, and the percentage of heat generated inside the heated portion of the building envelope.

This section contains the detailed methodology for calculating interactive effects as well as the rationale for interactive effects for single-family homes and apartments. The distinction between interactive effects for these two types of dwellings comes from the assumption that domestic hot water (DHW) insulation measures are more likely to be installed in conditioned spaces in apartments than in single-family homes.

Single-family Homes

Based on site visit results from the 2015 evaluation³² and accounting for the proportion of DHW insulation measures installed in conditioned spaces, the average number of months during which heating interactive effects occur in a single-family home is 3.8 months. It is assumed that the impact of DHW on cooling loads is negligible since most measures were installed in basements or garages, which might be heated but are rarely air-conditioned. Similar to lighting measures, it is assumed that 10% of the heat released by the pipes and DHW is lost through exterior walls and ceilings and does not contribute to the interactive effects.

For single-family homes with heat pump heating, since the interactive effects factors are based on a heating system efficiency of 100%, some adjustments are necessary for homes that use a heat pump as a primary heating system because the efficiency of such systems is superior to 100%. To do so, the interactive effects factor for heating (-28.5%) is divided by 1.8, the COP of a standard mini-split heat pump based on an HSPF2 Region V of 6.0, which is the value for a standard split heat pump as defined by the Federal Energy Efficiency Regulations.³³

Apartments

Based on the assumption that DHW insulation measures are installed in conditioned spaces, a heating period of eight months was used as the average number of months during which heating interactive effects occur in an apartment. Similarly, cooling interactive effects occur for the duration of the cooling period, which is two months.

To adjust the potential interactive effects on air-conditioning systems, the Evaluator used an average COP of 3.5 for apartments with heat pumps and a COP of 2.9 for apartments with air conditioning, which are consistent with the assumptions outlined in Subsection 2.1.1.

Peak Demand

As for the impact on peak demand savings, it is assumed that all the DHW tanks in a conditioned or semi-conditioned space create interactive effects. Therefore, similar to lighting products, the interactive effects factor for peak demand savings in electrically heated homes is -90%.

³² Econoler, *Residential Direct Install 2015 Evaluation*, March 3, 2016.

³³ Minister of Justice, Canada, *Energy Efficiency Regulations*, 2016, <http://laws-lois.justice.gc.ca/PDF/SOR-2016-311.pdf> (last accessed December 5, 2019).

Table 25 summarizes the interactive effects factors for DHW insulation measures.

Table 25: Interactive Effects Factors for Pipe Insulation and Hot Water Tank Wraps

Parameter		Energy Interactive Effects During Heating Period	Energy Interactive Effects During Cooling Period	Total Energy Interactive Effects	Peak Demand Interactive Effects
Single-family Homes	Heat Pump Heating	$-90\% \times 3.8 / 12 / 1.8 = -15.8\%$	0.0%	-15.8%	-90.0%
	Electrical Heating	$-90\% \times 3.8 / 12 = -28.5\%$	0.0%	-28.5%	-90.0%
	No Electrical Heating	0.0%	0.0%	0.0%	0%
Apartments	Heat Pump Heating and Cooling	$-90\% \times 8 / 12 / 1.8 = -33.3\%$	$90\% / 3.5 \times 2 / 12 = +4.3\%$	-29.0%	-90.0%
	Electrical Heating with Air Conditioning	$-90\% \times 8 / 12 = -60.0\%$	$90\% / 2.9 \times 2 / 12 = +5.2\%$	-54.8%	-90.0%
	Electrical Heating Without Air Conditioning	$-90\% \times 8 / 12 = -60.0\%$	0.0%	-60.0%	-90%
	No Electrical Heating with Air Conditioning	0.0%	$90\% / 2.9 \times 2 / 12 = +5.2\%$	+5.2%	0%
	With Neither Electrical Heating nor Air Conditioning	0.0%	0.0%	0.0%	0%

Other DHW Measures

For the remaining DHW measures, interactive effects are nil, with the exception of HPWHs. For HPWH measures, interactive effects are already included in the engineering equation used to calculate the unitary savings value. Therefore, no additional interactive effects factor is applied to those savings.

Summary

Table 26 summarizes the interactive effects factors established for each water heating measure.

Table 26: Interactive Effects Factors for Water Heating Measures

Measure	Type of Home	Interactive Effects Factors for Energy Savings	Interactive Effects Factors for Peak Demand Savings	Reference
Drain Water Heat Recovery	N/A	0%	0%	Assumption
Solar Domestic Hot Water				
Heat Pump Water Heater		0%	0%	Included in engineering equation – refer to Subsection (3)
Low-flow Showerhead		0%	0%	Assumption
Faucet Aerator				
Thermostatic Shower Valve				
Pipe Insulation Hot Water Tank Wrap	Single-family Homes, Heat Pump Heating	-15.8%	-90%	Calculation
	Single-family Homes, Electrical Heating	-28.5%	-90%	
	Single-family Homes, no Electrical Heating	0%	0%	
	Apartments, Heat Pump Heating with Air Conditioning	-29.0%	-90%	
	Apartments, Electrical Heating with Air Conditioning	-54.8%	-90%	
	Apartments, Electrical Heating Without Air Conditioning	-60.0%	-90%	
	Apartments, no Electrical Heating with Air Conditioning	+5.2%	0%	
	Apartments with Neither Electrical Heating nor Air Conditioning	0%	0%	

2.2.2 Peak Demand Savings Factors

For most water heating measures, peak demand savings are calculated using the peak demand-to-energy ratios developed by Navigant in the 2016-2018 DSM Plan. These ratios were established for various product categories based on modelled system-coincident peak demand savings and electrical energy savings for a projected deployment of products. Navigant used local data to establish the ratios applicable for the 2016-2018 period. The Evaluator recommends using the same ratios during the 2023-2025 DSM cycle, since this end-use load shape is unlikely to have changed significantly since 2026.

For solar domestic hot water (DHW), the peak demand-to-energy ratio is nil. Solar DHW systems provide no peak demand savings because the sun has set during the peak demand period.

Table 27 below summarizes the peak demand-to-energy ratios established for each water heating measure.

Table 27: Peak Demand-to-energy Ratios for Water Heating Measures

Measure	Peak Demand-to-energy Ratio (W/kWh)	Reference
Drain Water Heat Recovery	0.162	RES-Water Heat, Navigant 2016-2018 DSM Plan
Heat Pump Water Heater		
Low-flow Showerhead		
Faucet Aerator		
Thermostatic Shower Valve		
Pipe Insulation		
Hot Water Tank Wrap	0.000	Solar DHW systems provide no peak demand savings because the sun has set during the peak demand period
Solar Domestic Hot Water		

2.2.3 Water Heating Measures

(1) Drain Water Heat Recovery

Summary

Table 28 presents a summary of the values used to calculate drain water heat recovery (DWHR) savings. The detailed methodology follows.

Table 28: Drain Water Heat Recovery Measure Summary

Parameter	MHEEP	Reference
Measure Description and Identification		
Measure	Drain water heat recovery for electric DHW heating with direct installation	-
Baseline	Shower drains without drain water heat recovery	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	20	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	599	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.162	See Subsection 2.1.2
Unitary Peak Demand Savings [W]	97.0	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.1.1
Interactive Effects Factor for Peak Demand Savings	0%	See subsection 2.1.1

Electrical Unitary Energy Savings

The DWHR unitary savings values were determined using the HOT2000 simulation tool since it includes DWHR as an option. Although a typical single-family home and multifamily building were modelled, the savings for DWHR were the same regardless of the building type when looking at savings per occupant. The unitary savings values were obtained using the equation below and the values presented in Table 29 afterward.

$$\text{Energy Savings}_{kWh} = \text{Savings per Occupant} \times \text{Number of Persons per Household}$$

Table 29: Electrical Unitary Energy Savings Values for Drain Water Heat Recovery Systems

Parameter	MHEEP	Reference
Inputs to the HOT2000 Simulation		
Number of Showers per Person per Day [shower]	0.67	Mayer, Oreo et al. ³⁴
Average Shower Duration ³⁵ [minutes]	8	DeOreo et al. ³⁶
Shower Flow Rate [litres/minute]	9.5	2019 Connecticut TRM ³⁷
Energy Savings Calculation		
Number of Persons per Household [person]	3.6	2022 MHEEP tracking sheet
Energy Savings per Occupant [kWh/person]	166.4	HOT2000 simulations
Unitary Energy Savings [kWh/year]	599	Calculated

Installation Rates

Installation rates for drain water heat recovery systems are estimated at 100% because they are installed by MHEEP contractors.

³⁴ Mayer, P. W., DeOreo W. B. and al., *Residential End Uses of Water*, published by the AWWA Research Foundation, 1999, pp. 99-102.

³⁵ Ibid.

³⁶ Mayer, P. W., DeOreo W. B. and al., *Residential End Uses of Water*, Version 2: Executive Report, published by Water Research Foundation, April 2016. pp. 5-8.

³⁷ United Illuminating Company and Connecticut Light & Power Company, *Connecticut Program Savings Document, 15th Edition for 2019 Program Year*, March 2019.

(2) Solar Domestic Hot Water

Summary

Table 30 presents a summary of the values used to calculate solar domestic hot water (DHW) savings. The detailed methodology follows.

Table 30: Solar Domestic Hot Water Measure Summary

Parameter	Green Heat	Reference
Measure Description and Identification		
Measure	Solar domestic hot water heating rebated after purchase	-
Baseline	Existing conventional electric water heater	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	20	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	N/A (Calculated using RETScreen)	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0	See Subsection 2.2.2
Unitary Peak Demand Savings [W]	0	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.2.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.2.1

Electrical Unitary Energy Savings

The unitary savings value for solar DHW systems installed through Green Heat is calculated for each system using a custom RETScreen model.

Unitary Peak Demand Savings

Solar DHW systems provide no peak demand savings because the sun has set during the peak demand period.

Installation Rates

Installation rates for solar DHW systems are estimated at 100% due to their relatively high cost.

(3) Heat Pump Water Heaters

Summary

Table 31 below presents a summary of the values used to calculate heat pump water heater (HPWH) savings. Savings are included for a market transformation HPWH program, in addition to other resource acquisition program components. The detailed methodology follows.

Table 31: Heat Pump Water Heater Measure Summary

Parameter	HEA		Instant Savings, HPWH		Reference
Measure Description and Identification					
Measure	Heat pump water heaters for electric DHW heating rebated after installation (HEA), rebated in store (Instant Savings) or installed as a result of a market transformation initiative (HPWH)				-
Baseline	Electric resistance water heating				
Application	Value for non-electric space heating	Value for electric resistance space heating	Value for heat pump space heating	Average value for non-electrical, electric resistance, and heat pump space heating	
General Parameters					
Installation Rate	100%				See details below under Installation Rates
Effective Useful Life [years]	15				See Subsection 3.2
Electrical Savings Parameters					
Unitary Energy Savings [kWh/year]	1,611	1,179	1,280	1,007	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio (W/kWh)	0.162				See Subsection 2.2.2
Unitary Peak Demand Savings [W]	261	191	207	163	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%				Included in engineering equation. See details under Electrical Unitary Savings
Interactive Effects Factor for Peak Demand Savings	0%				

Electrical Unitary Energy Savings

The unitary savings for HPWHs are taken from a metering study conducted for NEEA.³⁸ They include interactive effects. Instant Savings Average Unitary Energy Savings is a weighted average based on the share of space heating systems in Nova Scotia; it calculates the electric energy savings only, by taking into account the proportion of replaced water heaters that electric water heaters among households that have non-electric, electric resistance and heat pump space heating.

Table 32 below lists the equation parameters and corresponding values, as well as the resulting unitary savings values.

³⁸ Ecotope inc., *NEEA Heat Pump Water Heater Model Validation Study*, March 2, 2015.

Table 32: Electrical Unitary Savings Values for Heat Pump Water Heaters

Parameter	Symbol	HEA			Instant Savings, HPWH			Reference
		Non-electric Space Heating	Electric Resistance Space Heating	Heat Pump Space Heating	Non-electric Space Heating	Electric Resistance Space Heating	Heat Pump Space Heating	
Savings Including Interactive Effects [kWh/year]		1,611	1,179	1,280	1,611	1,179	1,280	2015 Ecotope inc. ³⁹
Share of Electric Water Heaters in Nova Scotia	-	N/A			57%	97%	83%	Based on 2022 and 2023 EPI tracking sheets ^{40,41}
Unitary Energy Savings [kWh/year]	-	1,611	1,179	1,280	918	1,144	1,062	Calculation
Share of Space Heating Systems in Nova Scotia	-	N/A			53%	26%	21%	Statistics Canada ⁴²
Average Unitary Energy Savings [kWh/year]	-	1,611	1,179	1,280	1,007			Calculation

Installation Rates

Installation rates for heat pump water heaters are estimated at 100% due to their relatively high cost.

³⁹ Ecotope inc., *NEEA Heat Pump Water Heater Model Validation Study*, 2015, p. 72.

Average of 3 non-ducted models in heating zone 3 (most comparable to Nova Scotia). All water heaters are assumed to be in heated spaces since HEA tracking sheet shows that is the case for more than 98% of homes. Used Interior "EFAF" for electric resistance space heating, "interior HP" for heat pumps space heating and "interior gas" for non-electrical space heating.

⁴⁰ The proportions of electric water heating published by NRCAN are not consistent and significantly lower than the value obtained from EPI participants. Therefore, the proportion of electrical water heating is based on EPI tracking sheet data.

⁴¹ Given the change in the EPI program in 2021, the data for the proportion of electric water heating didn't reflect what was previously observed. Therefore, data from only the 2022 and 2023 EPI tracking sheets were used.

⁴² Statistics Canada, *Table 38-10-0286-01 (formerly CANSIM 153-0145) Primary heating systems and type of energy*, 2021, December 12, 2022.

<https://www150.statcan.gc.ca/t1/tbl1/en/cv/recreate.action?pid=3810028601&selectedNodeIds=1D4&checkedLevels=1D1&refPeriods=20170101,20210101&dimensionLayouts=layout3,layout3,layout2&vectorDisplay=false> (last accessed September 13, 2024).

(4) Low-flow Showerheads

Summary

Table 33 presents a summary of the values used to calculate low-flow showerhead savings. The detailed methodology follows.

Table 33: Low-flow Showerhead Measure Summary

Parameter		EPI					Reference
Measure Description and Identification							
Measure	Low-flow showerheads for electric DHW heating with direct installation					-	
Baseline	Standard showerhead with a flow rate of at least 2 gpm					-	
Measure Subcategory	Single-family homes			Apartments			-
	Flow rate reduction of 0.5 gpm	Flow rate reduction of 0.75 gpm	Flow rate reduction of 1 gpm	Flow rate reduction of 0.5 gpm	Flow rate reduction of 0.75 gpm	Flow rate reduction of 1 gpm	
General Parameters							
Installation Rate	95%					See details below under Installation Rates	
Effective Useful Life [years]	10					See Subsection 3.2	
Electrical Savings Parameters							
Unitary Energy Savings [kWh/year]	197	296	395	225	338	450	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.162					See Subsection 2.2.2	
Unitary Peak Demand Savings [W]	31.9	48.0	64.0	36.5	54.8	72.9	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%					See Subsection 2.2.1	
Interactive Effects Factor for Peak Demand Savings	0%					See Subsection 2.2.1	

Electrical Unitary Energy Savings

The equations below are used to determine the annual unitary savings values for low-flow showerheads. The reduction in domestic hot water consumption is established by the difference between the base and efficient domestic hot water consumption levels, as presented in the second equation.

$$\begin{aligned}
 \text{Energy Savings} \left[\frac{kWh}{year} \right] &= \text{DHW Reduction} \left[\frac{gal}{day} \right] \times \frac{1}{\eta} \times Cp_{H2O} \left[\frac{Btu}{lb \cdot ^\circ F} \right] \times \rho_{H2O} \left[\frac{lb}{ft^3} \right] \times \Delta T_{H2O} [^\circ F] \times n_{days} \left[\frac{days}{year} \right] \\
 &\times UC1 \left[\frac{kWh}{Btu} \right] \times UC2 \left[\frac{ft^3}{gal} \right] \times \%DWH_{elec} \\
 \text{DHW Reduction} \left[\frac{gal}{day} \right] &= (q_{base} - q_{low}) [gpm] \times \frac{n_{people} [person]}{n_{showerheads}} \times \%DHW \times t_{shower} \left[\frac{min}{shower} \right] \\
 &\times n_{shower} \left[\frac{shower}{day \cdot person} \right]
 \end{aligned}$$

Table 34 below lists the parameters and corresponding values applied in the equations above for low-flow showerheads and the resulting unitary savings values.

Table 34: Electrical Unitary Energy Savings Values for Low-flow Showerheads

Parameter	Symbol	EPI		Reference
		Single-family Homes	Apartments	
Baseline Flow Rate [gpm]	q_{base}	Variable (2.0 gpm, 2.25 gpm, or 2.5 gpm)	Variable (2.0 gpm, 2.25 gpm, or 2.5 gpm)	Measure specific - use information in tracking sheet
Low-flow Rate [gpm]	q_{low}	1.5		2021 EPI Program Manual
Number of People per Household [person]	n_{people}	2.5	1.9	2020 EPI November tracking sheet
Average Number of Showers per Day per Person [shower/day/person]	n_{shower}	0.67		Mayer and Oreo ⁴³
Number of Showerheads per Household [showers]	$n_{showerheads}$	1.50	1	Single-family homes: 2024 EPI Evaluation (on-site visits) Apartments: Assumption
Average Shower Time per Person [min/shower]	t_{shower}	7.8		DeOreo et al. ⁴⁴
Percentage of Hot Water Used in Showers	$\%_{DHW}$	63%		DeOreo et al. ⁴⁵
Number of Days per Year [days/year]	n_{days}	365		Convention
Specific Heat of Water [Btu/lb°F]	C_{pH_2O}	1		Convention
Density of Water [lb/ft ³]	ρ_{H_2O}	62.43		Convention
Temperature Rise in Electrical Water Heater [°F]	ΔT_{H_2O}	79		2011 OPA ⁴⁶
Electrical Water Heater Efficiency	η	98%		Pennsylvania Public Utility Commission TRM ⁴⁷
Unit Conversion #1 [kWh/Btu]	UC1	0.000293083		Convention

⁴³ Mayer, P. W., Oreo W. B. et al., *Residential End Uses of Water*, published by the AWWA Research Foundation, 1999, pp. 99-102.

⁴⁴ DeOreo et al. (2016). *Residential End Uses of Water*, Version 2: Executive Report, published by Water Research Foundation, <http://www.waterrf.org/PublicReportLibrary/4309A.pdf> (March 16, 2017), pp. 5-8.

⁴⁵ Obtained based on the total domestic water consumption level in showers per household (28.1 gpd) and the hot water use for showers (17.8 gpd) in DeOreo et al. (2016). *Residential End Uses of Water*, Version 2: Executive Report, published by Water Research Foundation, <http://www.waterrf.org/PublicReportLibrary/4309A.pdf> (March 16, 2017), p. 5.

⁴⁶ Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

⁴⁷ Pennsylvania Public Utility Commission, *Technical Reference Manual Volume 2: Residential Measures*, September 2024, p. 82.

Table 35: Electrical Unitary Energy Savings Values for Low-flow Showerheads (Continued)

Parameter	Symbol	EPI		Reference
		Single-family Homes	Apartments	
Unit Conversion #2 [ft ³ /gal]	UC2	0.1337		Convention
Share of Participants with Electrical Water Heaters	%DHWelec	100%		EPI: Units claimed in DSM savings are installed in homes with electrical water heaters
Unitary Energy Savings [kWh/year]	Flow rate reduction of 0.5 gpm	197	225	Calculation
	Flow rate reduction of 0.75 gpm	296	338	Calculation
	Flow rate reduction of 1 gpm	395	450	Calculation

Installation Rates

Table 36 lists the installation rate for EPI low-flow showerheads.

Table 36: EPI Low-flow Showerhead Installation Rate

Installation Rate	Margin of Error	Reference
95%	4.7%	2024 EPI evaluation (on-site visits)

(5) Faucet Aerators

Summary

Table 37 presents a summary of the values used to calculate faucet aerator savings. The detailed methodology follows.

Table 37: Faucet Aerator Measure Summary

Parameter	EPI		Reference
Measure Description and Identification			
Measure	Faucet aerators for electric DHW heating with direct installation		-
Baseline	Standard faucet with no aerator		
Application	Single-family homes	Apartments	
General Parameters			
Installation Rate	92%		See details below under Installation Rates
Effective Useful Life [years]	10		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	118	128	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.162		See Subsection 2.2.2
Unitary Peak Demand Savings [W]	19.1	20.7	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%		See Subsection 2.2.1
Interactive Effects Factor for Peak Demand Savings	0%		See Subsection 2.2.1

Electrical Unitary Energy Savings

The equation below is used to calculate the annual unitary savings value for faucet aerators.

$$\begin{aligned}
 & \text{Energy Savings} \left[\frac{kWh}{yr} \right] \\
 &= \frac{(DHW_{base} - DHW_{efficient}) \left[\frac{gal}{day} \right] \times Cp_{H_2O} \left[\frac{BTU}{lb^{\circ}F} \right] \times \rho_{H_2O} \left[\frac{lb}{ft^3} \right] \times \Delta T_{H_2O} [^{\circ}F] \times n_{days} \left[\frac{days}{yr} \right] \times UC1 \left[\frac{kWh}{BTU} \right] \times UC2 \left[\frac{ft^3}{gal} \right]}{\eta}
 \end{aligned}$$

The base domestic hot water consumption value (DHW_{base}) is calculated with the equation below:

$$DHW_{base} \left[\frac{gal}{day} \right] = \frac{DW_{person} \left[\frac{gal}{day \cdot person} \right] \times n_{people} [person] \times \%_{DHW}}{n_{faucets}}$$

The efficient domestic hot water consumption value ($DHW_{\text{efficient}}$) is calculated by using the baseline flow rate (q_{base}), low-flow rate (q_{low}), and base domestic hot water consumption value, as illustrated in the equation below:

$$DHW_{\text{efficient}} \left[\frac{\text{gal}}{\text{day}} \right] = DHW_{\text{base}} \left[\frac{\text{gal}}{\text{day}} \right] \times \left(1 - \frac{q_{\text{base}} - q_{\text{low}}}{q_{\text{base}}} \right)$$

Table 38 lists the parameters and values applied in the three equations above for faucet aerators and the resulting unitary savings values.

Table 38: Electrical Unitary Savings Values for Faucet Aerators

Parameter	Symbol	Value for Single-family Homes	Value for Apartments	Reference
Baseline Flow Rate [gpm]	q_{base}	1.39	1.39	DeOreo et al. in <i>Residential End Uses of Water Study Update</i> , as cited in Illinois Commerce Commission (2016) ⁴⁸
Low-flow Rate [gpm]	q_{low}	0.94	0.94	DeOreo et al. in <i>Residential End Uses of Water Study Update</i> , as cited in Illinois Commerce Commission (2016) ⁴⁹
Number of People per Household [person]	n_{people}	2.5	1.9	2020 EPI November tracking sheet
DW Used per Person [gpd]	DW_{person}	9.9		DeOreo et al. ⁵⁰
Percentage of Hot Water Used by Faucet Aerator	$\%_{\text{DHW}}$	59%		DeOreo et al. ⁵¹
Number of Faucets per Household	n_{faucets}	2.85	2	<u>Single-family homes</u> : EPI 2024 on-site visits <u>Apartments</u> : Assumption
Specific Heat of Water [Btu/lb°F]	$C_{p_{\text{H}_2\text{O}}}$	1		Convention
Density of Water [lb/ft ³]	$\rho_{\text{H}_2\text{O}}$	62.43		Convention
Temperature Rise in Electrical Water Heater [°F]	$\Delta T_{\text{H}_2\text{O}}$	79		OPA Prescriptive Measures and Assumptions 2011 ⁵²
Electrical Water Heater Efficiency	η	98%		Pennsylvania TRM ⁵³
Number of Days per Year [days/year]	n_{days}	365		Convention
Unit Conversion #1 [kWh/Btu]	UC1	0.000293083		Convention
Unit Conversion #2 [ft ³ /gal]	UC2	0.1337		Convention
Unitary Energy Savings [kWh/year]	-	118	128	Calculation

⁴⁸ Illinois Commerce Commission, *Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 5.0 – Volume 3: Residential Measures*, February 11, 2016, p. 175.

⁴⁹ Ibid.

⁵⁰ Obtained based on the total domestic water consumption through faucets per household (26.3 gpd) and the average number of people per participating household (2.65) in DeOreo et al. *Residential End Uses of Water, Version 2: Executive Report*, published by Water Research Foundation, 2016, pp. 5-8.

⁵¹ Obtained based on the total domestic water consumption through faucets per household (26.3 gpd) and the hot water use through faucets (15.4 gpd) in DeOreo et al. *Residential End Uses of Water, Version 2: Executive Report*, published by Water Research Foundation, 2016. p. 5.

⁵² Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

⁵³ Pennsylvania Public Utility Commission, *Technical Reference Manual Volume 2: Residential Measures*, September 2024, p. 82.

Installation Rates

Table 39 lists the installation rate for EPI faucet aerators.

Table 39: EPI Faucet Aerator Installation Rate

Installation Rate	Margin of Error	Reference
92%	7.0%	2024 EPI evaluation (on-site visits)

(6) Thermostatic Shower Valves

Summary

Table 40 presents a summary of the values used to calculate thermostatic shower valve savings. The detailed methodology follows.

Table 40: Thermostatic Shower Valve Measure Summary

Parameter		EPI		Reference
Measure Description and Identification				
Measure	Thermostatic shower valves for electric DHW heating with direct installation		-	
Baseline	Showerheads with a flow rate of 2.5 gpm with no thermostatic shower valve			
Application	Single-family homes	Apartments		
General Parameters				
Installation Rate	89%		See details below under Installation Rates	
Effective Useful Life [years]	10		See Subsection 3.2	
Electrical Savings Parameters				
Unitary Energy Savings [kWh/year]	124	141	See details below under Electrical Unitary Energy Savings	
Peak Demand-to-energy Ratio [W/kWh]	0.162		See Subsection 2.2.2	
Unitary Peak Demand Savings [W]	20.1	22.8	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio	
Interactive Effects Factor for Energy Savings	0%		See Subsection 2.2.1	
Interactive Effects Factor for Peak Demand Savings	0%		See Subsection 2.2.1	

Electrical Unitary Energy Savings

The equation below is used to determine the annual unitary savings values for thermostatic shower valves. Energy savings are established by calculating the reduction in domestic hot water usage, as presented in the second equation below.

$$DHW \text{ Reduction } \left[\frac{gal}{year} \right] = q \left[\frac{gal}{min} \right] \times n_{people} [person] \times \%_{DHW} \times t_w \left[\frac{min}{shower} \right] \times n_{shower} \left[\frac{shower}{day \cdot person} \right] \times \frac{1}{n_{showerhead}}$$

Table 41 below lists the parameters and corresponding values applied to the two equations above and the resulting unitary savings values for thermostatic shower valves.

Table 41: Electrical Unitary Energy Savings Values for Thermostatic Shower Valves

Parameter	Symbol	Value for Single-family Homes	Value for Apartments	Reference
Flow Rate [gpm]	q	2.5 gpm		EPI 2024 Program Manual
Number of People per Household [person]	η_{people}	2.5	1.9	2020 EPI November tracking sheet
Average Number of Showers per Day per Person [shower/day/person]	η_{shower}	0.67		Mayer and Oreo ⁵⁴
Average Number of Showerheads per Household [showerhead]	$\eta_{\text{showerheads}}$	1.50	1	Single-family homes: 2024 EPI on-site visits Apartments: Assumption
Behavioural Waste Time [min/shower]	t_w	0.98		Pennsylvania Public Utility Commission TRM ⁵⁵
Percentage of Hot Water Used in Showers	%DHW	63%		DeOreo et al. ⁵⁶
Number of Days per Year [days/year]	n_{days}	365		Convention
Specific Heat of Water [Btu/lb·°F]	$C_{p\text{H}_2\text{O}}$	1		Convention
Density of Water [lb/ft ³]	$\rho_{\text{H}_2\text{O}}$	62.43		Convention
Temperature Rise in Electrical Water Heater [°F]	$\Delta T_{\text{H}_2\text{O}}$	79		OPA Prescriptive Measures and Assumptions 2011 ⁵⁷
Unit Conversion #1 [kWh/Btu]	UC1	1 / 3,412		Convention
Unit Conversion #2 [ft ³ /gal]	UC2	0.1337		Convention
Electrical Water Heater Efficiency	η	98%		Pennsylvania Public Utility Commission TRM ⁵⁸
Unitary Energy Savings [kWh/year]	-	124	141	Calculation

Installation Rates

Table 42 below lists the installation rate for thermostatic shower valves.

Table 42: Thermostatic Shower Valve Installation Rate

Installation Rate	Margin of Error	Reference
89%	17.6%	2024 EPI evaluation (on-site visits)

⁵⁴ Mayer, P. W., W. B. Oreo et al., *Residential End Uses of Water*, published by the AWWA Research Foundation, 1999, pp. 99-102.

⁵⁵ Pennsylvania Public Utility Commission, *Technical Reference Manual Volume 2: Residential Measures*, August 2019 (revised February 2021), p. 93.

⁵⁶ Obtained based on the total domestic water consumption level in showers per household (28.1 gpd) and the hot water use for showers (17.8 gpd) in DeOreo et al. (2016). *Residential End Uses of Water, Version 2: Executive Report*, published by Water Research Foundation, <http://www.waterrf.org/PublicReportLibrary/4309A.pdf> (March 16, 2017), p. 5.

⁵⁷ Ontario Power Authority (OPA), *OPA Prescriptive Measures and Assumptions List*, December 2010.

⁵⁸ Pennsylvania Public Utility Commission, *Technical Reference Manual Volume 2: Residential Measures*, September 2024, p. 82.

(7) Pipe Insulation

Summary

Table 43 presents a summary of the values used to calculate pipe insulation savings. The detailed methodology follows.

Table 43: Pipe Insulation Measure Summary

Parameter	EPI	Reference
Measure Description and Identification		
Measure	Pipe insulation of 0.75 in. in thickness for electric DHW heating with direct installation	-
Baseline	Pipes with no insulation	
Installation Rate		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	13	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings (per ft) [kWh/year]	12.7	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.162	See Subsection 2.2.2
Unitary Peak Demand Savings [W]	2.06	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	Calculation based on home heating and air-conditioning systems for each installed unit	See Subsection 2.2.1
Interactive Effects Factor for Peak Demand Savings		

Electrical Unitary Energy Savings

As presented in Table 44, the annual unitary savings value for pipe insulation was identified through Ontario Power Authority (OPA) 2011⁵⁹ values and amounts, established at 12.7 kWh per linear foot.

Table 44: Unitary Savings Value for Pipe Insulation

Parameter	EPI
Unitary Energy Savings (per ft) [kWh/year]	12.7

Installation Rates

Table 45 lists the installation rate for EPI pipe insulation.

Table 45: EPI Pipe Insulation Installation Rate

Installation Rate	Margin of Error	Reference
100%	0.0%	2024 EPI evaluation (on-site visits)

⁵⁹ Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011, p. 542.

(8) Hot Water Tank Wraps

Summary

Table 46 presents a summary of the values used to calculate hot water tank wrap savings. The detailed methodology follows.

Table 46: Hot Water Tank Wrap Measure Summary

Parameter	EPI		Reference
Measure Description and Identification			
Measure	Existing electric DHW heater with added tank wrap with direct installation		-
Baseline	Existing hot water tanks without wrap		
Application	Single-family homes	Apartments	
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Effective Useful Life [years]	7		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	157	117	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.162		See Subsection 2.2.2
Unitary Peak Demand Savings [W]	25.4	19.0	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	Calculation based on home heating and air-conditioning systems for each installed unit		See Subsection 2.2.1
Interactive Effects Factor for Peak Demand Savings			

Electrical Unitary Energy Savings

The following equations are used to determine the annual unitary savings associated with hot water tank wraps. The energy savings are equal to the difference in heat losses associated with tank circumference (Q_{tank}) before and after adding the tank wrap ($Q_{\text{tank}+\text{RSI } 1.21}$). The heat losses are calculated using the following formulas of heat transfer in an insulated cylinder:

$$R_{\text{layer}} = \frac{\ln(r_e/r_i)}{2\pi k}$$

$$R_{\text{cyl}} = R_{\text{layer1}} + R_{\text{layer2}}$$

$$Q_{\text{cyl}} = \frac{T_i - T_e}{R_{\text{cyl}}} L$$

$$Q_{\text{top}} = \frac{A_{\text{top}} \times (T_i - T_e)}{R_{\text{top}}}$$

$$Q_{\text{total}} = Q_{\text{cyl}} + Q_{\text{top}}$$

$$\text{Energy Savings}_{\text{kWh}} = \frac{(Q_{\text{total}}) \cdot \text{HOU}}{\eta_{\text{heater}}}$$

The calculation considers a typical domestic tank with a capacity of 60 imperial gallons and a hot water tank wrap with a thermal resistance of 1.21 m²·°C/W.

Table 47 below lists the values applied in equations presented above to obtain the unitary savings for tank wraps.

Table 47: Electrical Unitary Savings Values for Hot Water Tank Wraps

Parameter	Symbol	Value for Single-family Homes	Value for Apartments	Reference
Layer 1: Interior Insulation of Tank				
External Radius of the Layer [m]	r _e	0.300	0.280	Giant ⁶⁰
Internal Radius of the Layer [m]	r _i	0.249	0.229	Ibid
Thermal Conductivity of the Layer [W/m·°C]	k	0.024		Ibid
Thermal Resistance of the Layer of Material in the Cylinder (e.g. insulation inside the tank and tank wrap) [m ² ·°C/W]	R _{layer}	1.228	1.333	Calculation
Thermal Resistance of the Top of the Tank [m ² ·°C/W]	R _{Top}	2.113		Giant ⁶¹
Layer 2: Tank Wrap				
External Radius of the Layer [m]	r _e	0.351	0.331	Estimated from Frost King Insulation Blanket Specifications ⁶²
Internal Radius of the Layer [m]	r _i	0.300	0.280	Giant ⁶³
Thermal Conductivity of the Layer [W/m·°C]	k	0.042		Estimated from Frost King Insulation Blanket Specifications
Thermal Resistance of the Layer of Material Inside the Cylinder (e.g. insulation inside the tank and tank wrap) [m ² ·°C/W]	R _{layer}	1.823	1.965	Calculation
Thermal Resistance of the Top of the Tank [m ² ·°C/W]	R _{Top}	3.323		Sum of R-values of the insulation inside the tank and tank wrap
Heat Transfer				
Length of the Cylinder [m]	L	1.52	1.22	Giant ⁶⁴
Area of the Top of the Tank [m ²]	A _{top}	0.283	0.246	Calculated from Giant tank dimensions
Temperature at the External Radius of the Cylinder [°C]	T _e	21		Assumption for standard ambient indoor temperature
Temperature at the Internal Radius of the Cylinder [°C]	T _i	60		OPA Prescriptive Measures and Assumptions 2011 ⁶⁵
Hours of Use [h/year]	HOU	8,760		Assumption
Thermal Efficiency of Heating Element	η _{heater}	98%		Pennsylvania Public Utility Commission ⁶⁶
Heat Transfer Through the Tank [W]	Q _{total}	53.4	40.2	Calculation
Heat Transfer Through the Insulated Tank [W]	Q _{total}	35.8	27.1	Calculation
Unitary Energy Savings for Tank Wrap [kWh/year]	-	157	117	Calculation

⁶⁰ Giant Inc., *Engineering Submittal Data Sheet 172ETE Models*, <http://www.giantinc.com/tech-data/FT-172E-An.pdf> (last accessed February 18, 2015).

⁶¹ Ibid.

⁶² Frost King Weatherization Products, *Water Heater Insulation Blanket*, <http://www.frostking.com/water-heater-insulation-blanket/> (last accessed January 4, 2014).

⁶³ Giant Inc., *Engineering Submittal Data Sheet 172ETE Models*, <http://www.giantinc.com/tech-data/FT-172E-An.pdf> (last accessed February 18, 2015).

⁶⁴ Ibid.

Installation Rates

Table 48 lists the installation rate for EPI hot water tank wraps.

Table 48: EPI Hot Water Tank Wrap Installation Rate

Installation Rate	Margin of Error	Reference
100%	0.0%	2024 EPI evaluation (on-site visits)

2.3 Space Heating

2.3.1 Interactive Effects

Since space heating measures target heating and cooling loads directly, the impact of these measures on heating and cooling is considered in the unitary savings. Therefore, as presented in Table 49, the interactive effects factors for each space heating measure are assumed to be nil.

Table 49: Interactive Effects Factors for Space Heating Measures

Measure	Interactive Effects Factor for Energy Savings	Interactive Effects Factor for Peak Demand Savings	Reference
Mini-split Heat Pump	0%	0%	No interactive effects for space heating measures since impact on heating and cooling is included in unitary savings
Central Air-source Heat Pump			
Ground-source Heat Pump			
Wood and Pellet Stove/Fireplace Inserts			
Wood and Pellet Boilers and Furnaces			
Solar Air Heating			
Air Sealing Products			
Window Film Kits			
Programmable Thermostat			
Smart Thermostat for Electrical Heating Systems			
Advanced Learning Thermostats for Central Heating Systems			

⁶⁵ Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

⁶⁶ Pennsylvania Public Utility Commission, *Technical Reference Manual Volume 2: Residential Measures*, September 2024, p. 82.

2.3.2 Peak Demand Savings Factors

For most space heating measures, peak demand savings are not calculated using a peak demand-to-energy ratio. For more details, refer to Subsection 2.3.3(1) for mini-split heat pumps, Subsection 2.3.3(2) for central-air-source heat pumps, Subsection 2.3.3(3) for ground-source heat pumps, Subsection 2.3.3(4) for wood and pellet stoves and fireplace inserts, and Subsection 2.3.3(5) for wood and pellet boilers and furnaces.

For air sealing products, peak demand savings are calculated using a peak demand-to-energy ratio developed by Navigant in the 2016-2018 DSM Plan. These ratios were established for various product categories based on modelled system-coincident peak demand savings and electrical energy savings for a projected deployment of products. Navigant used local data to establish the ratios applicable for the 2016-2018 period. The Evaluator recommends using the same ratios during the 2020-2023 DSM cycle.

For programmable thermostats, several studies demonstrate peak demand savings when there are specific interventions to adjust heating operating times to minimize redundancy with the system peak. However, when there is no specific intervention related to the installation of programmable thermostats, the impact on the system peak is often assumed to be nil. Only one study was referenced with winter peak demand savings, but these demand savings were very low and difficult to replicate to the Nova Scotia market. Therefore, the peak demand-to-energy ratio for programmable thermostats is established at 0 kW/kWh.

For solar air heating, the peak demand-to-energy ratio is nil. Solar systems provide no peak demand savings because the sun has set during the peak demand period.

For smart thermostats, similar to programmable thermostats, the impact on the system peak is assumed to be nil since no specific intervention to minimize redundancy of operation with the system peak is in place. Therefore, the peak demand-to-energy ratio for smart thermostats is established at 0 W/kWh.

A literature review of programmable and smart thermostat peak demand savings found that nil peak demand savings is the most common assumption among other jurisdictions when thermostats are installed with no specific demand response intervention. In other words, peak demand savings for thermostats are assumed to be nil unless participants are taking part in a demand response program.

Table 50 summarizes the peak demand-to-energy ratios established for each space heating measure.

Table 50: Peak Demand-to-energy Ratios for Space Heating Measures

Measure	Peak Demand-to-energy Ratio (W/kWh)	Reference
Mini-split Heat Pumps (MSHPs)	-	-
Central Air-source Heat Pumps		
Ground-source Heat Pumps		
Wood and Pellet Stoves/Fireplace Inserts		
Wood and Pellet Furnaces/Boilers		
Solar Air Heating	0.000	Assumption
Air Sealing Products	0.283	RES-Elec-Space Heat & Cool, Navigant 2016-2018 DSM Plan
Programmable Thermostats	0.000	Assumption based on literature review findings
Smart Thermostats		
Modelled Space Heating and Building Envelope	0.283	RES-Elec-Space Heat & Cool, Navigant 2016-2018 DSM Plan

2.3.3 Space Heating Measures

(1) Mini-split Heat Pumps

Summary

Table 51 presents a summary of the values used to calculate mini-split heat pump (MSHP) savings. The detailed methodology follows.

Table 51: Mini-split Heat Pump Measure Summary

Parameter	Green Heat		ASFH	HEA	MHEEP	Reference
Measure Description and Identification						
Measure	Mini-split heat pumps for high-efficiency space heating with direct installation (ASFH, HEA, MHEEP) or rebated after purchase (Green Heat)					-
Baseline	Electric resistance space heating					
Application	Fully electrically heated households	Mainly electrically heated households	-			-
General Parameters						
Installation Rate	100%					See details below under Installation Rates
Effective Useful Life [years]	18					See Subsection 3.2
Electrical Savings Parameters						
Unitary Energy Savings [kWh/year]	0.0855 kWh/Btu/h multiplied by the heating capacity of each installed system	0.000 kWh/Btu/h multiplied by the heating capacity of each installed system	Calculation based on specification data for each installed system	Calculated using HOT2000 modelling with an adjustment ratio		See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	N/A					
Unitary Peak Demand Savings [W]	Calculation based on specification data for each installed system				0.138 W/Btu/h multiplied by the average installed heating capacity for each MSHP configuration	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0%					See Subsection 2.3.1
Interactive Effects Factor for Peak Demand Savings	0%					See Subsection 2.3.1

Electrical Unitary Energy Savings

For Green Heat, the electrical unitary energy savings for MSHPs are based on the billing analysis results of the 2024 Green Heat evaluation, which yielded savings per unit of capacity for both homes that were fully electrically heated and homes that were only mainly electrically heated (e.g. that had secondary non-electrical heating systems such as wood stoves. Note that fireplaces are not considered as non-electrical secondary heating systems for the purpose of the billing analyses, and households with such systems still fall in the fully electrically heated category). The billing analysis results yield unitary savings values of 0.0855 kWh/Btu/h for fully electrically heated households and nil savings for mainly electrically heated homes. The appropriate unitary savings value is then multiplied by the heating capacity of the MSHP (found in the tracking sheet) and is used to calculate an energy savings value specific to each MSHP. Further details on the billing analysis methodology and results are found in the appendices of the 2024 DSM Existing Residential Evaluation Report.

For ASFH, the electrical unitary energy savings for MSHPs are calculated for the entire home due to the nature of the program component that offers whole-home energy efficiency upgrades with funding based on the type of space heating fuel. The percentage of electric space heating in the home is then applied to determine the portion of MSHP savings that are electric. It is assumed that the baseline efficiency of the electrical heating system is 100% (electric resistance) and the efficiency of the baseline non-electrical heating system is 84% (a value drawn from 2024-2026 Government-funded Measure Assessment). MSHP savings through ASFH are calculated using the variables defined and listed in the equation and Table 52 below.

$$Energy\ Savings_{kWh} = \%electric_{heat} \times HC \times \left[\frac{1}{COP_{base} \times 3.412} - \frac{1}{HSPF2_{ee}} \right] \times EFLH$$

$$COP_{base} = \%electric_{heat} \times 100\% + (1 - \%electric_{heat}) \times 84\%$$

Table 52: Electrical Energy Savings Values for Mini-split Heat Pumps in ASFH

Parameter	Symbol	Value	Reference
Rated Heating Capacity of the MSHP [BTU/h]	HC	Specification data for each installed system	AHRI certified value
Percentage of Electric Space Heating of the Home at D Assessment	$\%electric_{heat}$	Calculated based on D Assessment consumption data	Use information in tracking sheet
Efficiency of the Baseline Non-electric Space Heating Equipment [kW/kW]	-	0.84	See 2024-2026 GF MA
Efficiency of the Baseline Electric Space Heating Equipment [kW/kW]	-	1.00	Electric Resistance Efficiency
Heating Seasonal Performance Factor of the New Heat Pump [BTU/W·h]	$HSPF2_{ee}$	Specification data for each installed system	AHRI certified value
Equivalent Full Heating Load Hours [h/year]	$EFLH$	501	MSHP billing analysis from the 2024 Green Heat evaluation. See 2024-2026 GF MA for more detail
Conversion Factor [BTU/W·h]	3.412	3.412	Convention
Conversion Factor [GJ/kWh]	0.0036	0.0036	Convention
Conversion Factor [W/kW]	1,000	1,000	Convention

For HEA and MHEEP, the electrical energy savings are based on HOT2000 simulation outputs that are multiplied by adjustment ratios obtained through a billing analysis conducted for the 2024 DSM evaluation of HEA, as listed in Table 53 below. These adjustment ratios apply to all HOT2000 modelled savings (i.e. including savings from measures other than heat pumps).

Table 53: Adjustment Ratios for HEA and MHEEP Modelled Savings

Scenario	Adjustment Ratio
A participant who registered with a heat pump	1.24
A participant who registered without a heat pump and who did not install one	0.58
A participant who registered without a heat pump and then had one installed	0.43

Unitary Peak Demand Savings

For MSHPs, peak demand savings are only claimed for households with a fully electrically heated baseline. They are nil for mainly electrically heated baselines as a Green Heat billing analysis indicated no electrical energy savings for those homes, a scenario that also results in no peak demand savings.

For Green Heat, ASFH, and HEA, the unitary peak demand unitary savings for MSHPs are calculated using the variables defined and listed in the equation and Table 54 below.

$$Peak\ Demand\ Savings_w = \frac{1,000}{3.412} \times HC_{min} \times \left(\frac{1}{COP_{base\_min}} - \frac{1}{COP_{ee\_min}} \right)$$

Table 54: Unitary Peak Demand Savings Values for Mini-split Heat Pumps

Variable	Symbol	Value	Reference
Rated heating capacity of the new heat pump at outdoor air temperature of -15°C [kBtu/h]	HC_{min}	Specification data for each installed system	AHRI certified value
Coefficient of performance of the assumed baseline equipment (electric resistance) at -15°C [kW/kW]	COP_{base_min}	1	Assumed COP for electric resistance
Coefficient of performance of the new heat pump at -15°C [kW/kW]	COP_{ee_min}	Specification data for each installed system	AHRI certified value
Conversion factor [Btu/W·h]	3.412	3.412	Convention
Conversion factor [W/kW]	1,000	1,000	Convention

For some models, the availability of a heating capacity and COP at -15°C is limited. For those models, peak demand savings are considered nil if the specification sheets indicate a cut-off temperature above -15°C, otherwise ratios are applied to the rated COP and heating capacity at 47°F to obtain values considering average performance reductions as per simulation software (DOE-2) performance curves shared by NRCan. The two following equations are used to obtain the adjusted values.

$$COP_{ee\_min} = 53.78\% \times \text{Rated COP at } 47^{\circ}\text{F}$$

$$HC_{min} = 37.46\% \times \text{Rated Capacity at } 47^{\circ}\text{F}$$

For MSHPs installed through MHEEP, unitary peak demand savings are established by multiplying the average unitary peak demand savings per capacity of 0.138 W/Btu/h obtained from the mini-split heat pump measures installed in 2025 under HEA by the average installed capacity for each MSHP configuration in MHEEP.

Installation Rates

Installation rates for MSHPs are estimated at 100% due to their relatively high cost.

(2) Central Air-source Heat Pumps

Summary

Table 55 presents a summary of the values used to calculate central air-source heat pump (CASHP) savings. The detailed methodology follows.

Table 55: Central Air-source Heat Pump Measure Summary

Parameter	Green Heat	HEA	Reference
Measure Description and Identification			
Measure	Central air-source (air-to-air and air-to-water) heat pumps rebated after purchase	-	
Baseline	Electric resistance space heating		
General Parameters			
Installation Rate	100%	See details below under Installation Rates	
Effective Useful Life [years]	18	See Subsection 3.2	
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	0.101 kWh/Btu/h multiplied by the heating capacity of each installed system	Calculated using HOT2000 modelling	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	N/A	0.283	N/A
Unitary Peak Demand Savings [W]	3,989	Calculated by multiplying the energy savings by the peak demand-to-energy ratio	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0%	0%	See Subsection 2.2.1
Interactive Effects Factor for Peak Demand Savings	0%	0%	See Subsection 2.2.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for CASHPs are based on the billing analysis results of the 2017 Green Heat evaluation, which yielded savings per units of capacity of 0.101 kWh/Btu/h. The unitary savings value is then multiplied by the heating capacity of the CASHP (found in the tracking sheet) and is used to calculate an energy savings value specific to each CASHP.

Unitary Peak Demand Savings

For CASHPs installed under Green Heat, rated heating capacity and COP at -15°C are not always available. The Evaluator looked into the specification details of CASHPs installed through Green Heat in 2022 and was able to identify those parameters for up to nine models. The average unitary peak demand savings for CASHPs were then calculated using the variables defined and listed in the equation and Table 56 below.

$$Peak\ Demand\ Savings_w = \frac{HC_{min}}{3.412} \times \left(\frac{1}{COP_{base\_min}} - \frac{1}{COP_{ee\_min}} \right)$$

Table 56: Unitary Peak Demand Savings Values for Central Air-source Heat Pumps

Variable	Symbol	Green Heat	Reference
Rated heating capacity of the new heat pump at outdoor air temperature of -15°C [Btu/h]	HC_{min}	26,261	Average specification data for 7 models in the 2022 Green Heat tracking sheet ⁶⁷
Coefficient of performance of the assumed baseline equipment (electric resistance) at -15°C [kW/kW]	COP_{base_min}	1	Assumed COP for electric resistance
Coefficient of performance of the new heat pump at -15°C [kW/kW]	COP_{ee_min}	2.076	Average specification data for 9 models in the 2022 Green Heat tracking sheet
Conversion factor [Btu/W·h]	3.412	3.412	Convention
Unitary Peak Demand Savings [W]	$Peak\ Demand\ Savings_w$	3,989	Calculation

Installation Rates

Installation rates for CASHPs are estimated at 100% due to their relatively high cost.

(3) Ground-source Heat Pumps

Summary

Table 57 presents a summary of the values used to calculate ground-source heat pump (GSHP) savings. The detailed methodology follows.

⁶⁷ CASHP characteristics were not updated since 2022 due to the low number of CASHPs installed in subsequent years.

Table 57: Ground-source Heat Pump Measure Summary

Parameter	Green Heat	HEA	Reference
Measure Description and Identification			
Measure	Ground-source heat pumps for high-efficiency space rebated after installation (HEA) or rebated after purchase (Green Heat)		-
Baseline	Electric heating resistance, CASHP, or MSHP		
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Effective Useful Life [years]	25		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each installed system	Calculated using HOT2000 modelling	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	N/A	0.283	N/A
Unitary Peak Demand Savings [W]	Calculation based on specification data for each installed system	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0%	0%	See Subsection 2.2.1
Interactive Effects Factor for Peak Demand Savings	0%	0%	See Subsection 2.2.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for GSHPs in Green Heat are calculated using the variables defined and listed in the equation and Table 58 below.

$$\begin{aligned}
 \text{Energy Savings}_{kWh} &= \text{Heating Savings} + \text{Cooling Savings or Penalty} \\
 &= \left(\frac{HC}{1,000} \times \left(\frac{1}{HSPF2_{base}} - \frac{1}{COP_{ee} \times DRF \times 3.412} \right) \times FLH_{heat} \right) \\
 &\quad + \left(\frac{CC}{1,000} \times \left(\frac{1}{EER2_{base}} \times AC - \frac{1}{EER2_{ee} \times DRF \times GSER} \right) \times FLH_{cool} \right)
 \end{aligned}$$

Table 58: Electrical Unitary Savings Values for Ground-source Heat Pumps in Green Heat

Parameter	Symbol	Value	Reference
Rated heating capacity of the new heat pump [Btu/h]	HC	Specification data for each installed system	AHRI certified value
Rated cooling capacity of the new heat pump [Btu/h]	CC	Specification data for each installed system	AHRI certified value
Heating seasonal performance factor of the baseline equipment [HSPF2 in Btu/W·h]	$HSPF2_{base}$	Elec. resistance: 3.412 MSHP and CASHP: 6.0	Assumptions ⁶⁸
Coefficient of performance of the new heat pump [kW/kW]	COP_{ee}	Specification data for each installed system	AHRI certified value
Derating factor of the new heat pump	DRF	0.885	2019 PUC TRM ⁶⁹
Factor used to determine the SEER of a GSHP based on its EER [Btu/W·h]	$GSEER$	1.02	2019 PUC TRM
Energy efficiency ratio of the existing AC system [SEER2 in Btu/W·h]	$SEER2_{base}$	Room AC: 10.9 Central AC: 13.4 MSHP: 14.3 CASHP: 14.3	Assumptions ⁷⁰
Energy efficiency ratio of the new heat pump [Btu/h]	$EER2_{ee}$	Specification data for each installed system	AHRI certified value
Full heating load hours [h/year]	FLH_{heat}	1,603	Estimate based on the number of hours that a GSHP needs to operate to meet a heating load of 16,915 kWh, with a capacity of 3 tonnes based on the 2018 evaluation ⁷¹
Full cooling load hours [h/year]	FLH_{cool}	213	2020 Minnesota TRM ⁷²
Cooling penalty modifier	AC	AC in baseline = 1 No AC in baseline = 0	Assumptions
Conversion factor [Btu/W·h]	3.412	3.412	Convention
Conversion factor [W/kW]	1,000	1,000	Convention

⁶⁸ Assuming a HSPF of 3.412 for electric resistance and an average HSPF2 of 6.0 for Region V, which corresponds to the minimum for “Split system central heat pumps, other than those that are small-duct and high-velocity or space-constrained” as per the NRCAN regulation available at <https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/guide-canadas-energy-efficiency-regulations/split-system-central-air-conditioners-and-heat-pumps/6895>.

⁶⁹ Pennsylvania Public Utility Commission (PUC), *Technical Reference Manual*, August 2019, Subsection 2.2 – HVAC.

⁷⁰ Assumptions based on the average efficiency values cited by NRCAN for room air conditioners (average EER of 10 divided by 0.875 and by 1.05 to convert to SEER 2), <https://www.nrcan.gc.ca/energy/publications/efficiency/residential/air-conditioning/6051> and on SEER 2 for “Split-system central air conditioners, other than those that are space-constrained or small-duct and high-velocity” for central AC, for “Split system central heat pumps, other than those that are small-duct and high-velocity or space-constrained” for heat pumps as per NRCAN regulation <https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/guide-canadas-energy-efficiency-regulations/split-system-central-air-conditioners-and-heat-pumps/6895>.

⁷¹ Based on the average modelled heating energy consumption of HEA participants before and after their home retrofit, including 100% electrically heated participants with no heat pumps and adjusted to take into account HOT2000 overestimation ratios from the 2018 billing analysis. The averages of each year were weighted according to the number of projects.

⁷² Minnesota Department of Commerce Division of Energy Resources, *State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs Version 3.1*, January 2020.

Unitary Peak Demand Savings

The unitary peak demand savings for GSHPs installed under **Green Heat** are established using the equation below. All variables from this equation are defined in Table 58 above. Since standard MSHPs and CASHPs are assumed to operate exclusively on the electric resistance backup in the air handler during peak periods, the value of the COP_{base} variable in the formula below is the electrical baseline value of 1 regardless of the actual baseline equipment.

$$Peak\ Demand\ Savings_W = \left(1,000 \times HC \times \left(\frac{1}{COP_{base}} - \frac{1}{COP_{ee} \times DRF} \right) \right)$$

Installation Rates

Installation rates for GSHPs are estimated at 100% due to their relatively high cost.

(4) Wood and Pellet Stoves/Fireplace Inserts

Summary

Table 59 presents a summary of the values used to calculate wood and pellet stove and fireplace insert savings. The detailed methodology follows.

Table 59: Wood and Pellet Stove and Fireplace Insert Measure Summary

Parameter	Green Heat		HEA	Reference
Measure Description and Identification				
Measure	Wood and pellet stoves and fireplace inserts rebated after installation (HEA) or rebated after purchase (Green Heat)			-
Baseline	Electrical heating or heat pump			
Measure Subcategory	Stove	Fireplace insert	Stove or fireplace insert	
General Parameters				
Installation Rate	100%			See details below under Installation Rates
Effective Useful Life [years]	18			See Subsection 3.2
Electrical Savings Parameters				
Unitary Energy Savings [kWh/year]	1,461	232	1,461	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	-			-
Unitary Peak Demand Savings [W]	828	132	828	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0%			See Subsection 2.3.1
Interactive Effects Factor for Peak Demand Savings	0%			See Subsection 2.3.1

Electrical Unitary Energy Savings

The electrical unitary energy savings values for wood and pellet stoves and fireplace inserts are based on the billing analysis results of the 2024 Green Heat evaluation. The values obtained are valid for homes that have an existing electric resistance system or a heat pump heating system.

Measured savings were significantly lower for fireplace inserts than for stoves in the Green Heat participant population used for the billing analysis. As a result, separate unitary energy savings for Green Heat are provided for stoves and fireplace inserts. For HEA, since the tracking sheet does not allow to make the distinction between stove and fireplace insert installations, unitary energy savings for stoves are used for both stoves and fireplace inserts.

Unitary Peak Demand Savings

Unitary peak demand savings for wood and pellet stoves and fireplace inserts installed under Green Heat and HEA were previously based on program design data.⁷³ It was assumed that, during the peak demand period, existing ASHPs operated exclusively on the electric resistance backup in the air handler. Thus, the peak demand savings for wood and pellet stoves and fireplace inserts with ASHP baselines were identical to the peak demand savings of wood and pellet stoves and fireplace inserts with electric resistance baselines.

In light of the significant reduction in unitary energy savings resulting from the billing analysis, the assumption that the existing ASHP or electric resistance assumed the heating load during peak demand periods no longer seemed valid. The Evaluator also adjusted peak demand savings. Therefore, the peak demand savings were reduced by the ratio of electrical energy savings to the previous electrical energy savings.

For Green Heat, this was done separately for stoves and fireplace inserts. For HEA, the reduction calculated for stoves is applied to both stoves and fireplace inserts since the tracking sheet does not allow to make the distinction between stove and fireplace insert installations. These calculations are presented in the equation and Table 60 below.

$$\text{Peak Demand Savings}_W = \text{Previous Peak Demand Savings}_W \times \frac{\text{Energy Savings}_{kWh}}{\text{Previous Energy Savings}_{kWh}}$$

Table 60: Unitary Peak Demand Savings Values for Wood or Pellet Stoves and Fireplace Inserts

Parameter	Green Heat		HEA	Reference
	Wood or Pellet Stoves	Wood or Pellet Fireplace Inserts	Wood or Pellet Stoves or Fireplace Inserts	
Previous Peak Demand Savings [W]	4,000			2020-2023 DSM MA
Energy Savings [kWh]	1,461	232	1,461	2024 DSM MA
Previous Energy Savings [kWh]*	7,055*			2020-2023 DSM MA
Peak Demand Savings [W]	828	132	828	Calculation
*The values presented correspond to the arithmetic mean of the tracked unitary electrical energy savings for wood or pellet stoves with a heat pump or electric resistance baseline since these measures have all been merged into one.				

Installation Rates

Installation rates for wood and pellet stoves are estimated at 100% due to their relatively high cost.

⁷³ Dunsy Energy Consulting, *Residential Fuel Substitution Pilot Program*, Final Report, December 2010.

(5) Wood and Pellet Boilers and Furnaces

Summary

Table 61 presents a summary of the values used to calculate wood and pellet boiler and furnace savings. The detailed methodology follows.

Table 61: Wood and Pellet Boiler and Furnace Measure Summary

Parameter	Green Heat				HEA				Reference
Measure Description and Identification									
Measure	Wood and pellet boilers and furnaces rebated after installation (HEA) or rebated after purchase (Green Heat)								-
Baseline	Electrical heating or heat pump								
Application	Electrical		Heat pump		Electrical		Heat pump		
Measure Subcategory	Wood	Pellet	Wood	Pellet	Wood	Pellet	Wood	Pellet	
General Parameters									
Installation Rate	100%								See details below under Installation Rates
Effective Useful Life [years]	18								See Subsection 3.2
Electrical Savings Parameters									
Unitary Energy Savings [kWh/year]	13,804	13,765	7,669	7,647	13,804	13,765	$\frac{13,804}{COP_{base\_hp}}$	$\frac{13,765}{COP_{base\_hp}}$	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	-								-
Unitary Peak Demand Savings [W]	7,660	7,750	7,660	7,750	7,660	7,750	7,660	7,750	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0%								See Subsection 2.3.1
Interactive Effects Factor for Peak Demand Savings	0%								See Subsection 2.3.1

Electrical Unitary Energy Savings

The electrical unitary savings values for wood and pellet boilers and furnaces are based on HOT2000 energy models.⁷⁴ The baseline of the models used electric resistance heating as the primary heat source and was calibrated to account for the historical electrical consumption of participants.

For participants who have ASHPs, as their primary heating system instead of electric resistance heating, unitary savings values are calculated using the equation below.

$$Energy\ Savings_{kWh\ (base\_hp)} = Energy\ Savings_{kWh\ (base\_elec)} \times \frac{COP_{base\_elec}}{COP_{base\_hp}}$$

For HEA, the baseline heat pump COP value specified in the tracking sheet is used, while for Green Heat, the COP of a standard mini-split heat pump based on a HSPF2 Region V of 6.0 is used.⁷⁵ The unitary energy savings values are presented in Table 62 below.

⁷⁴ The HOT2000 energy models were developed as part of the 2013 evaluation.

⁷⁵ Assuming an average HSPF2 of 6.0 for Region V, which corresponds to the minimum for “Split system central heat pumps, other than those that are small-duct and high-velocity or space-constrained” as per the NRCan regulation available at <https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/guide-canadas-energy-efficiency-regulations/split-system-central-air-conditioners-and-heat-pumps/6895>.

Table 62: Electrical Unitary Energy Savings Values for Wood and Pellet Boilers and Furnaces

Parameter	Symbol	Green Heat		HEA		Reference
		Wood Furnace or Boiler	Pellet Furnace or Boiler	Wood Furnace or Boiler	Pellet Furnace or Boiler	
Coefficient of Performance of the Baseline Electric Resistance [kW/kW]	COP_{base_elec}	1				Convention
Coefficient of Performance of the Baseline Heat Pump [kW/kW]	COP_{base_hp}	1.8		Specification data for each installed system		Green Heat: Assumption HEA: AHRI certified value
Unitary Energy Savings with Electrical Baseline [kWh/year]	<i>Energy Savings_{kWh (base_elec)}</i>	13,804	13,765	13,804	13,765	2013 Evaluation HOT2000 Energy Models
Unitary Energy Savings with Heat Pump Baseline [kWh/year]	<i>Energy Savings_{kWh (base_hp)}</i>	7,669	7,647	$\frac{13,804}{COP_{base\_hp}}$	$\frac{13,765}{COP_{base\_hp}}$	Calculation

Unitary Peak Demand Savings

For Green Heat, unitary peak demand savings are based on program design data.⁷⁶ It is assumed that during the peak demand period, existing ASHPs operate exclusively on the electric resistance backup in the air handler. Thus, the peak demand savings for wood and pellet boiler and furnace measures with an ASHP baseline are identical to the peak demand savings with an electric resistance baseline.

The unitary peak demand savings values are presented in Table 63.

Table 63: Unitary Peak Demand Savings Values for Wood and Pellet Boilers and Furnaces

Parameter	Green Heat			
	Wood Furnace or Boiler with Electrical Baseline	Pellet Furnace or Boiler with Electrical Baseline	Wood Furnace or Boiler with ASHP Baseline	Pellet Furnace or Boiler with ASHP Baseline
Unitary Peak Demand Savings [W]	7,660	7,750	7,660	7,750

Installation Rates

Installation rates for wood and pellet boilers and furnaces are estimated at 100% due to their relatively high cost.

(6) Solar Air Heating

Summary

Table 64 below presents a summary of the values used to calculate solar air heating savings. The detailed methodology follows.

⁷⁶ Dunskey Energy Consulting, *Residential Fuel Substitution Pilot Program*, Final Report, December 2010.

Table 64: Solar Air Heating Measure Summary

Parameter	Green Heat	Reference
Measure Description and Identification		
Measure	Solar air heating systems rebated after installation	-
Baseline	Electric space heating (resistance or heat pump)	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	20	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculated using RETScreen	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.000	See Subsection 2.3.2
Unitary Peak Demand Savings [W]	0	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.2.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.2.1

Electrical Unitary Energy Savings

The unitary savings value for solar air heating systems installed through Green Heat is calculated for each system.

Installation Rates

Installation rates for solar air heating are estimated at 100% due to their relatively high cost.

(7) Air Sealing Products

Summary

Table 65 presents a summary of the values used to calculate air sealing product savings. The detailed methodology follows.

Table 65: Air Sealing Product Measure Summary

Parameter	EPI								Reference
Measure Description and Identification									
Measure	Air sealing products in electrically heated homes with direct installation								-
Baseline	Door and/or windows without added air sealing products								
Measure Subcategory	Electrical resistance heated homes				Heat pump heated homes				
	Foam gasket	Door sweep	Foot of window air sealing	Foot of door weather stripping	Foam gasket	Door sweep	Foot of window air sealing	Foot of door weather stripping	
General Parameters									
Installation Rate	29%	100%	84%	84%	29%	100%	84%	84%	See details below under Installation Rates
Effective Useful Life [years]	15								See Subsection 3.2
Electrical Savings Parameters									
Unitary Energy Savings [kWh/year]	9	173	9.9	11.5	5.00	96.1	5.50	6.39	See details below under Installation Rates
Peak Demand-to-energy Ratio [W/kWh]	0.283								See Subsection 2.3.2
Unitary Peak Demand Savings [W]	2.55	49.0	2.80	3.25	1.42	27.2	1.56	1.81	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%								See Subsection 2.3.1
Interactive Effects Factor for Peak Demand Savings	0%								See Subsection 2.3.1

Electrical Unitary Energy Savings

The electrical unitary energy savings values are based on the results of an evaluation of a residential weatherization program conducted in Connecticut by KEMA in 2010.⁷⁷ Based on post-retrofit blower door tests on sampled homes, which included single-family homes as well as apartments, the KEMA evaluation report provides per-foot unitary savings values for window air sealing and door weather stripping, as well as per-unit unitary savings for foam gaskets and door sweeps. For heat pump heating systems, the savings from electric resistance are divided by 1.8, the COP of a standard mini-split heat pump based on a HSPF2 Region V of 6.0.⁷⁸

Table 66 summarizes the savings for each measure included in air sealing products for electric resistance.

Table 66: Savings Values for Air Sealing Products in Electric Resistance and Heat Pump Heated Homes

Measure	Electric Resistance Heated Homes	Heat Pump Heated Homes	Reference
Annual Energy Savings from Foam Gaskets [kWh/gasket]	9	5.00	<u>Electric Resistance:</u> Connecticut TRM ⁷⁹ <u>Heat Pump:</u> Calculation
Annual Energy Savings from Door Sweeps [kWh/door]	173	96.1	
Annual Energy Savings from Window Air Sealing [kWh/foot]	9.9	5.50	
Annual Energy Savings from Door Weather Stripping [kWh/foot]	11.5	6.39	

Installation Rates

Table 67 lists the installation rate for EPI air sealing products.

Table 67: EPI Air Sealing Product Installation Rate

Measure Description	Installation Rate	Margin of Error	Reference
Foam Gasket	29%	-	2024 EPI evaluation
Door Sweep	100%	-	Assumption
Window Air Sealing	84%	11.2%	2021 EPI evaluation (on-site visits)
Door Weather Stripping	84%	11.2%	2021 EPI evaluation (on-site visits)

⁷⁷ United Illuminating Company and Connecticut Light & Power Company, *Connecticut Program Savings Document, 15th Edition for 2019 Program Year*, March 2019.

⁷⁸ Assuming an average HSPF2 of 6.0 for Region V, which corresponds to the minimum for “Split system central heat pumps, other than those that are small-duct and high-velocity or space-constrained” as per the NRCAN regulation available at <https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/guide-canadas-energy-efficiency-regulations/split-system-central-air-conditioners-and-heat-pumps/6895>.

⁷⁹ Ibid.

(8) Window Film Kits

Summary

Table 68 presents a summary of the values used to calculate window film kit savings. The detailed methodology follows.

Table 68: Window Film Kit Measure Summary

Parameter	EPI		Reference
Measure Description and Identification			
Measure	Window film kits installed by the participant (left behind by the delivery agent), in electrically heated homes		-
Baseline	Windows without film kits		
Measure Subcategory	Electrical Resistance Heated Homes	Heat Pump Heated Homes	
General Parameters			
Installation Rate	57%		2024 Illinois TRM ⁸⁰
Effective Useful Life [years]	1		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	334	185	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.283		See Subsection 2.3.2
Unitary Peak Demand Savings [W]	94.5	52.4	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%		See Subsection 2.3.1
Interactive Effects Factor for Peak Demand Savings	0%		See Subsection 2.3.1

Electrical Unitary Energy Savings

The electrical unitary energy savings values of the window kit measure are calculated using the equations below.

$$\begin{aligned}
 \text{Energy Savings (kWh)} &= ES_{\text{sealing}} + ES_{\text{insulation}} \\
 ES_{\text{sealing}} &= \frac{n_{\text{window}} \times p_{\text{window}} \times ESPF_{\text{tape}}}{COP} \times \frac{HDD_{NS}}{HDD_{CT}} \\
 ES_{\text{insulation}} &= \frac{HDD_{NS} \times n_{\text{window}} \times A_{\text{window}} \times 24 \times ADJ}{COP \times 3,413} \times \left(\frac{1}{R_{\text{window}}} - \frac{1}{R_{\text{window}} + R_{\text{air}}} \right)
 \end{aligned}$$

⁸⁰ Illinois Commerce Commission, *Illinois Statewide Technical Reference Manual for Energy Efficiency Version 12.0, Volume 3*, September 22, 2023, p. 384.

Total energy savings for this measure were calculated by combining savings from insulation and sealing; for the number of units, it was assumed that each kit could be used to cover two two-foot by three-foot windows.

The energy savings per foot of tape (ESPF) used in the second equation for sealing was taken from Connecticut's 2021 Program Savings Document;⁸¹ the value was adjusted to the Nova Scotia context by using a heating degree days (HDD) ratio between Connecticut and Nova Scotia.

For the savings generated by insulation, the resistance values of the window and the added air layer due to film shrinkage ($R_{\text{window}} + R_{\text{air}}$) were based on specific values provided by the 2022 Iowa Energy Efficiency Statewide Technical Reference Manual.⁸² That TRM also provides an adjustment factor of 0.63 for wall insulation, used to account for overclaiming savings due to prescriptive engineering algorithms.

Table 69 presents the parameters used to calculate unitary energy savings for window film kits installed through EPI.

Table 69: Electrical Unitary Savings Calculations for Window Film Kits

Parameter	Symbol	Value for Electrical Resistance Heated Homes	Value for Heat Pump Heated Homes	Reference
Number of Windows Insulated	n_{window}	2		Assumption that one window kit can typically cover two 2'x3' windows
Perimeter of Insulated Window [ft]	p_{window}	10		
Net Area of Insulated Window [ft ²]	A_{window}	6		
Average Annual Heating Degree Days in Connecticut [°F·day]	HDD _{CT}	5,885		2021 Connecticut Program Savings Document, 18th Edition, p. 242
Average Annual Heating Degree Days in Nova Scotia [°F·day]	HDD _{NS}	6,765		Environment Canada, Halifax Stanfield International Airport, using an 18 °C heating balance point
Coefficient of Performance	COP	1	1.8	
Energy Savings per Foot of Tape [kWh/ft]	ESPF _{tape}	9.9		2021 Connecticut Program Savings Document, 18th Edition, p. 248
R-value of Existing Window [ft ² ·°F·h/Btu]	R_{window}	2		2022 Iowa TRM, Volume 2, p. 307
R-value of existing window [ft ² ·°F·h/Btu]	R_{air}	2.85		
Adjustment to Account for Overclaiming of Savings [%]	ADJ	63%		
Energy Savings from Air Sealing Provided by the Tape [kWh]	ES _{sealing}	228	126	Calculation
Energy Savings from Insulation Provided by the Film [kWh]	ES _{insulation}	106	58.7	
Unitary Energy Savings [kWh/year]	Energy Savings_{kWh}	334	185	Calculation

⁸¹ Energize Connecticut. *Connecticut's 2021 Program Savings Document*, March 1.

⁸² Iowa Utilities Board, *Iowa Energy Efficiency Statewide Technical Reference Manual*, July 23, 2021. Available at: https://iub.iowa.gov/sites/default/files/documents/2021/09/iowa_trm_v6_vol_1_overview_and_user_guide_2069155_210820-161936.pdf.

Installation Rates

The installation rate of 57% was drawn from the 2024 Illinois TRM⁸³ value for window kits.

(9) Programmable Thermostats

Summary

Table 70 presents a summary of the values used to calculate programmable thermostat savings. The detailed methodology follows.

Table 70: Programmable Thermostat Measure Summary

Parameter	Instant Savings	MHEEP	Reference
Measure Description and Identification			
Measure	Programmable thermostats rebated in store for controlling electric baseboards	Programmable thermostats with direct installation for controlling electric baseboards	-
Baseline	Non-programmable electronic thermostats (50% analog and 50% electronic)	Existing analog thermostats	
General Parameters			
Installation Rate	100%	100%	See details below under Installation Rates
Effective Useful Life [years]	10	10	See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	164	221	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0	0	See Subsection 2.3.2
Unitary Peak Demand Savings [W]	0	0	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	0%	See Subsection 2.3.1
Interactive Effects Factor for Peak Demand Savings	0%	0%	See Subsection 2.3.1

⁸³ Illinois Commerce Commission, *Illinois Statewide Technical Reference Manual for Energy Efficiency Version 12.0, Volume 3*, September 22, 2023, p. 384.

Electrical Unitary Energy Savings

For programmable thermostats, the electrical unitary energy savings are based on the results from a Hydro-Québec 2009 program evaluation of electronic thermostats in residential new construction.⁸⁴ In this evaluation, savings values include energy savings generated by the thermostat's accuracy and temperature setback and are established for three types of dwellings: single-family homes, duplex/triplex/townhouses, and apartments. For MHEEP, the savings values were determined only for single-family homes since that corresponds to most of its participants, and the savings values include energy savings generated by the thermostat's accuracy and temperature setback since MHEEP only replaces analog thermostats. As for Instant Savings, savings values were determined for all three types of dwelling and the baseline was set at 50% analog thermostats and 50% electronic thermostats. As defined by the equation below, the unitary savings values are calculated through a weighted average based on the proportion of each dwelling type in Nova Scotia's residential market, as defined in the 2021 Census Profile of Statistics Canada.⁸⁵

$$Energy\ Savings_{kWh} = \sum (Dwelling\ Proportion \times Total\ Savings)$$

Table 71 below presents the parameters used to calculate unitary energy savings for programmable thermostats installed through Instant Savings.

Table 71: Electrical Unitary Savings Calculations for Programmable Thermostats

Parameters	Symbol	Instant Savings			MHEEP	Reference
		Single-family	Duplex/Triplex/ Townhouse	Apartment	Single-family	
Proportion of Each Dwelling Type	<i>Dwelling Proportion</i>	67%	8%	25%	100%	Statistics Canada 2021 Census ⁸⁶
Gross Energy Savings per Thermostat						
Unitary Savings for Electronic Thermostat Accuracy [kWh]	<i>Thermostat Savings</i>	60.3	47.0	30.3	121	2009 Econoler ⁸⁷
Unitary Savings for Temperature Setback [kWh]	<i>Temp. Setback Savings</i>	100	201	118	100	2009 Econoler ⁸⁸
Total Savings per Dwelling Type [kWh]	<i>Total Savings</i>	160	248	148	221	Calculation
Average Weighted Unitary Energy Savings [kWh]	Energy Savings_{kWh}	164			221	Calculation

Installation Rates

For Instant Savings, the installation rate is assumed to be 100%.

⁸⁴ Econoler, *Évaluation du programme thermostats électroniques – Volet nouvelle construction au marché résidentiel*, Final Report presented to Hydro-Québec, February 9, 2009.

⁸⁵ Statistics Canada. (2021). Census Profile, 2021 Census, <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/Page.cfm?Lang=E&Geo1=PR&Code1=12&Geo2=PR&Code2=01&SearchText=Nova%20Scotia&SearchType=Begin&SearchPR=01&B1=All&GeoLevel=PR&GeoCode=12&type=0> (last accessed September 18, 2024).

⁸⁶ Ibid.

⁸⁷ Econoler, *Évaluation du programme thermostats électroniques – Volet nouvelle construction au marché résidentiel*, Final Report presented to Hydro-Québec, February 9, 2009.

⁸⁸ Ibid.

(10) Non-learning Smart Thermostats for Electrical Heating Systems

Summary

Table 72 presents a summary of the values used to calculate non-learning smart thermostat savings. The detailed methodology follows.

Table 72: Non-learning Smart Thermostat for Electrical Heating System Measure Summary

Parameter	ASFH, Instant Savings		EPI						Reference	
Measure Description and Identification										
Measure	Non-learning smart thermostats with programmable schedules through smart devices and additional sensor-based features (such as geofencing) that control electric baseboards, MSHPs, or electric in-floor heating for single-family homes and apartments as well as for central heating systems, namely central heat pumps or electric furnaces, for single-family homes								-	
Baseline	Non-programmable thermostat									
Measure Subcategory	-		Single-family homes				Apartments		-	
	Electric Baseboard or Electric In-floor Heating	MSHP	Electric Baseboard or Electric In-floor Heating	Electric Furnace	Central Heat Pump	MSHP	Electric Baseboard or Electric In-floor Heating	MSHP		
General Parameters										
Installation Rate	100%		100%			84%	100%	84%	See details below under Installation Rates	
Effective Useful Life [years]	10								See Subsection 3.2	
Electrical Savings Parameters										
Unitary Energy Savings [kWh/year]	265	479	265	1,725	959	479	205	455	See details below under Electrical Unitary Energy Savings	
Peak Demand-to-energy Ratio [W/kWh]	0								See Subsection 2.3.2	
Unitary Peak Demand Savings [W]	0								Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio	
Interactive Effects Factor for Energy Savings	0%								See Subsection 2.3.1	
Interactive Effects Factor for Peak Demand Savings										

Electrical Unitary Energy Savings

Some models of smart thermostats are compatible with electrical heating systems. They operate by connecting to a single baseboard, MSHP, or in-floor heating system as opposed to a central heating system. The equation below is used to calculate the unitary savings value for smart thermostats compatible with electrical heating systems and installed through ASFH, EPI, or Instant Savings.

$$Energy\ Savings_{kWh} = \frac{Heating\ Energy \times \%Savings}{FMT \times COP}$$

Since no studies specific to smart thermostats connected to electric baseboards, MSHPs, or electric in-floor heating systems were identified, the percentage of the heating load saved by thermostats is based on available studies for smart thermostats compatible with central heating systems, which have essentially the same features.

When searching for an appropriate value to assign as the heating consumption savings percentage, the Evaluator noticed that thermostats labeled as smart offer many different features that may impact the amount of savings generated by the measure. When combing through various TRMs and studies, the Evaluator identified three main categories of thermostats: Programmable thermostats, non-learning smart thermostats, and advanced learning thermostats. In summary, a programmable thermostat allows the user to program a schedule, the non-learning smart includes the programmable thermostat offer while enabling control through a smart device and additional features such as geofencing, and the advanced learning thermostat includes the non-learning smart thermostat offer and has use pattern learning capabilities. The value of 10.2% used for heating consumption savings is drawn from the 2025 Illinois TRM⁸⁹ because the Evaluator concluded that the efficient thermostat, as it was described in the corresponding algorithm, most resembled the non-learning smart thermostats installed or incented by E1.

As previously mentioned, electric baseboards, MSHPs, and electric in-floor heating systems are individually paired to a unique compatible smart thermostat. Therefore, the savings are divided by the average number of electrical heating systems within a dwelling and assuming there is one baseboard per room, one MSHP per floor, and one electric in-floor heating system per room.

⁸⁹ Illinois Commerce Commission, *Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 13.0 – Volume 3: Residential Measures*, September 20, 2024, p. 220.

Table 73 below presents the variables used for the unitary savings calculation and the resulting value.

Table 73: Electrical Unitary Energy Savings Calculation for Non-learning Smart Thermostats for Electrical Heating Systems

Parameter	Symbol	ASFH, EPI, Instant Savings				EPI		Reference
		Single-family homes				Apartments		
		Value for Electric Baseboard or Electric In-floor Heating	Value for Electric Furnace	Value for Central Heat Pump	Value for MSHP	Value for Electric Baseboard or Electric In-floor Heating	Value for MSHP	
Average heating energy consumption of a home [kWh/year]	Heating Energy	16,915				8,025		Single-family homes: 2021, 2022, and 2023 HEA tracking sheets Apartments: 2021, 2022, and 2023 HEA tracking sheets and NRCan 2021 ^{90,91}
Percentage of heating load saved by smart thermostats	%Savings	10.2%						2025 Illinois TRM ⁹²
Factor to account for multiple thermostats installed in the same home	FMT	6.5	1	1	2	4	1	Single-family homes: Assumption ⁹³ Apartments: Assumption ⁹⁴
Heating system coefficient of performance	COP	1		1.8		1	1.8	Assumption ⁹⁵
Unitary Savings [kWh/year]	-	265	1,725	959	479	205	455	Calculation

⁹⁰ Based on the average modelled heating energy consumption of HEA participants. As for single-family homes, multiplied by the ratio of household energy intensity of Nova Scotia apartments (48.2 GJ/household) to household energy intensity of Nova Scotia single-detached homes (101.6 GJ/household). Values from *Table 34: Single Detached Secondary Energy Use and GHG Emissions by Energy Source* and *Table 38: Apartments Secondary Energy Use and GHG Emissions by Energy Source* for Nova Scotia's residential sector in Natural Resources Canada's 2021 Comprehensive Energy Use Database. Natural Resources Canada, 2021 Comprehensive Energy Use Database, https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/comprehensive/trends_res_ns.cfm.

⁹¹ Based on the average modelled heating energy consumption of HEA participants before and after their home retrofit, including 100% electrically heated participants with no heat pumps and adjusted to take into account HOT2000 overestimation ratios from the 2018 billing analysis. The averages of each year were weighted according to the number of projects.

Installation Rates

For Instant Savings, the installation rates are assumed to be 100%. For EPI, an installation rate of 84% was measured during the 2024 EPI on-site visits for smart thermostats for MSHPs. For smart thermostats controlling electric baseboards and electric in-floor heating delivered through EPI, the 100% installation rate assumption is maintained since installation rates for these types of smart thermostats were not measured during the on-site visits.

Table 74 lists the installation rate for EPI smart thermostats for MSHPs.

Table 74: EPI Non-learning Smart Thermostat for MSHP Installation Rate

Measure Description	Installation Rate	Margin of Error	Reference
Smart Thermostats for MSHPs	84%	12.3%	2024 EPI evaluation (on-site visits)

⁹² Illinois Commerce Commission, *Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 13.0 – Volume 3: Residential Measures*, September 20, 2024, p. 220.

⁹³ Assuming 1 thermostat per room for electric baseboards and in-floor heating and 6.5 rooms on average based on Statistics Canada 2016 Census. Assuming 1 thermostat controlling the central heat pump or electric furnace as they are central heating systems. For MSHP, Assuming 1 thermostat per indoor unit and 2 indoor units per home.

Statistics Canada, Census Profile, 2016 Census, <https://www12.statcan.gc.ca/census-recensement/2016/dp-prof/details/Page.cfm?Lang=E&Geo1=PR&Code1=12&Geo2=&Code2=&Data=Count&SearchType=Begin&SearchPR=01&B1=All> (last accessed December 3, 2019).

⁹⁴ Assuming 1 thermostat per room for electric baseboards and in-floor heating and 4 rooms on average derived from Statistics Canada 2021 Census given the current distribution of occupied private dwellings and number of rooms. For MSHPs, assuming 1 thermostat for the entire apartment. Statistics Canada, Census Profile, 2021 Census, <https://www12.statcan.gc.ca/census-recensement/2021/dp-prof/details/page.cfm?Lang=E&GUIDlist=2021A000212&GENDERlist=1&STATISTIClist=1&HEADERlist=0&form=MG0AV3>.

⁹⁵ Assuming a COP of 1 for electric resistance (including baseboard and in-floor) and a COP of 1.8 for heat assuming an average HSPF2 of 6.0 for Region V, which corresponds to the minimum for “Split system central heat pumps, other than those that are small-duct and high-velocity or space-constrained” as per the NRCan regulation available at <https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/guide-canadas-energy-efficiency-regulations/split-system-central-air-conditioners-and-heat-pumps/6895>.

(11) Advanced Learning Thermostat for Central Heating Systems

Summary

Table 75 presents a summary of the values used to calculate advanced learning thermostat for central heating system savings. The detailed methodology follows.

Table 75: Advanced Learning Thermostat for Central Heating System Measure Summary

Parameter		EPI	Reference
Measure Description and Identification			
Measure	Wi-Fi enabled advanced thermostats with 7-day or learning-based scheduling and remote access for homes with central electric heating. Thermostats must have built in occupancy sensors or plug-in occupancy sensors packaged with the wall unit as well as heat pump auxiliary heat control and optimization capabilities		-
Baseline	Analog or digital non-programmable thermostat		-
Measure Subcategory	Central Heat Pump	Electric Furnace	
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Effective Useful Life [years]	10		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	1,128	2,030	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0		See Subsection 2.3.2
Unitary Peak Demand Savings [W]	0		Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%		See Subsection 2.3.1
Interactive Effects Factor for Peak Demand Savings			

Electrical Unitary Energy Savings

The equation below is used to calculate the unitary savings value for learning thermostats compatible with central electrical heating systems and installed through EPI.

$$Energy\ Savings_{kWh} = \frac{Heating\ Energy \times \%Savings}{COP}$$

Table 76 below presents the results of two billing analyses conducted for Nest learning thermostats installed on central electrical heating systems (rather than natural gas or oil heating systems). Both analyses served to assess the savings from learning thermostats installed to replace both programmable and non-programmable thermostats, which is a reasonable baseline. In both studies, heating consumption savings of 12% were evaluated for central air-source heat pumps, which is the closest heating system to electric baseboards, MSHPs, and electric in-floor heating systems among Nest-compatible systems.

Table 76: Billing Analysis Savings Results for Advanced Learning Thermostats for Central Heating Systems

Jurisdiction	Measure	Sample Size	Heating Consumption Savings
Oregon ⁹⁶	Nest learning thermostats	185	12% (for ASHPs)
Bonneville Power Administration ⁹⁷	Nest learning thermostats	176	12% (for ASHPs)

Table 77 presents the variables used for the unitary savings calculation and the resulting value.

Table 77: Electrical Unitary Energy Savings Calculation for Advanced Learning Thermostats for Central Heating Systems

Parameter	Symbol	Value for Central Heat Pump	Value for Electric Furnace	Reference
Average Heating Energy Consumption of a Home [kWh/year]	<i>Heating Energy</i>	16,915		2021, 2022, and 2023 HEA tracking sheets ⁹⁸
Percentage of Heating Load Saved by Advanced Learning Thermostats	<i>%Savings</i>	12%		Literature review of billing analyses, see Table 76
Heating System Coefficient of Performance	<i>COP</i>	1.8	1	Assumption ⁹⁹
Unitary Energy Savings [kWh/year]	-	1,128	2,030	Calculation

⁹⁶ Apex Analytics LLC, *Energy Trust of Oregon Nest Thermostat Heat Pump Control Pilot Evaluation*, October 10, 2014, p. 123.

⁹⁷ Bonneville Power Administration, *Nest Learning Thermostat Pilot Program Savings Assessment Bonneville Power Administration & Franklin Public Utility District*, November 16, 2016.

⁹⁸ Based on the average modelled heating energy consumption of HEA participants before and after their home retrofit, including 100% electrically heated participants with no heat pumps and adjusted to take into account HOT2000 overestimation ratios from the 2018 billing analysis. The averages of each year were weighted according to the number of projects.

⁹⁹ Assuming a COP of 1 for electric resistance (electric furnace) and a COP of 1.8 for heat pumps assuming an average HSPF2 of 6.0 for Region V, which corresponds to the minimum for "Split system central heat pumps, other than those that are small-duct and high-velocity or space-constrained" as per the NRCAN regulation available at <https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/guide-canadas-energy-efficiency-regulations/split-system-central-air-conditioners-and-heat-pumps/6895>.



Installation Rates

For EPI the installation rate is assumed to be 100%.

2.4 Appliances

2.4.1 Interactive Effects

Retiring old appliances causes an increase in the heating load in the winter and a decrease in the cooling load in the summer since compressors on old appliances release significantly more waste heat than newer, more efficient models. If an inefficient appliance is retired without being replaced, interactive effects are greater.

The heating load period in Nova Scotia lasts about eight months, while the cooling load period is relatively short, lasting approximately two months. The annual total interactive effects due to the retirement or replacement of old appliances are therefore expected to be negative, pushing the savings generated by such retirements or replacements downward.

Several other factors can also affect the interactive effects of E1 appliance measures:

- › Close to all appliance measures are accounted for in E1 DSM savings and thus the focus is on electricity savings for appliances. In Nova Scotia, 25% of households use electricity as their primary heating source.¹⁰⁰ Therefore, the negative interactive effects on the heating load only affect approximately one-third of participating households.
- › A significant number of appliances targeted through E1 programs, such as refrigerators and freezers, are built into or leaned against an exterior wall. Rather than contributing to building heat loads, this results in more heat loss through the building envelope and through the appliance back wall, thereby reducing interactive effects.
- › In Nova Scotia, over one third of households (38%)¹⁰¹ use air conditioning. For these households, positive interactive effects occur during the cooling period, which cancel a portion of the negative interactive effects.
- › Most jurisdictions that offer refrigerator and freezer programs do not consider interactive effects for those appliances.¹⁰²

Considering all these factors, the interactive effects for appliances are negligible and, therefore, the interactive effects factors for energy and peak demand savings are 0%.

Table 78 below summarizes the interactive effectors factors established for appliances.

¹⁰⁰ Statistics Canada, *Residential Sector, Nova Scotia, Table 14: Total Households by Building Type and Energy Source*, <https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CP&sector=res&juris=ns&year=2020&m=14&page=0>, (last accessed September 25, 2024).

¹⁰¹ Statistics Canada, *Table 38-10-0019-01 – Air conditioners*, <https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=3810001901> (last accessed September 2024).

¹⁰² The TRMs for California Municipal Utilities, Connecticut, Illinois, Maine, Massachusetts, Minnesota, Mid-Atlantic, New York, Northwest Power and Conservation Council, Ohio, Pennsylvania, Vermont, and Wisconsin were consulted. Only Northwest Power and Conservation Council and New York apply interactive effects factors for freezers and refrigerators (although only for new rebated appliances and not for recycled appliances).

Table 78: Interactive Effects Factors for Appliances

Measure	Interactive Effects Factor for Energy Savings	Interactive Effects Factor for Peak Demand Savings	Reference
Clotheslines and Outdoor Drying Racks	0%	0%	Assumption (see text above this table)
Refrigerator Retirements/Replacements			
Freezer Retirements/Replacements			
Room Air Conditioner Retirements			
Dehumidifier Replacements or Retirements/ENERGY STAR® Certified Dehumidifiers			
Clothes Dryer Replacements/ENERGY STAR® Certified Clothes Dryers			
Efficient Clothes Washers			
ENERGY STAR® Certified Room Air Purifiers			
ENERGY STAR® Certified Dishwashers			
ENERGY STAR® Certified Bathroom Exhaust Fans			
Humidity Sensors for Bathroom Exhaust Fans			

2.4.2 Peak Demand Savings Factors

For most appliances, peak demand savings are calculated using the peak demand-to-energy ratios developed by Navigant in the 2016-2018 DSM Plan. These ratios were established for various product categories based on modelled system-coincident peak demand savings and electrical energy savings for a projected deployment of products. Navigant used local data to establish the ratios applicable for the 2016-2018 period. The Evaluator recommends using the same ratios during the 2020-2023 DSM cycle.

The Evaluator assumes a peak demand-to-energy ratio of zero for clotheslines, outdoor drying racks, and retired air room conditioners since these products are not likely used on cold winter days when peak conditions occur.

Table 79 below summarizes the peak demand-to-energy ratios established for appliances.

Table 79: Peak Demand-to-energy Ratios for Appliances

Measure	Peak Demand-to-energy Ratio (W/kWh)	Reference
Clothesline and Outdoor Drying Racks	0.000	Calculated by the Evaluator
Refrigerator Retirements/Replacements	0.138	RES-Appliance-Fridge, Navigant 2016-2018 DSM Plan
Freezer Retirements/Replacements	0.138	RES-Appliance-Fridge, Navigant 2016-2018 DSM Plan
Room Air Conditioner Retirements	0.000	Calculated by the Evaluator
Dehumidifier Replacements or Retirements/ ENERGY STAR Certified Dehumidifiers	0.335	RES-Appliance-Dehumidifier, Navigant 2016-2018 DSM Plan
Clothes Dryer Replacements/ENERGY STAR Certified Clothes Dryers	0.138	RES-Appliance-CW, Navigant 2016-2018 DSM Plan
Efficient Clothes Washers	0.138	RES-Appliance-CW, Navigant 2016-2018 DSM Plan
ENERGY STAR Certified Room Air Purifiers	0.171	Calculated by the Evaluator, assuming even distribution of 5840 hours of operation throughout the year
ENERGY STAR Certified Dishwashers	0.341	Calculated using NREL ResStock end-use load profile ¹⁰³ for Maine and “dishwasher” end use and E1’s definition of winter peak period
ENERGY STAR Certified Bathroom Exhaust Fans	-	-
Humidity Sensors for Bathroom Exhaust Fans	0.1	Calculated by Evaluator

¹⁰³ National Renewable Energy Laboratory, *ResStock End-use Load Profiles Data Sets 2022.1 Release*, <https://resstock.nrel.gov/datasets> (last accessed November 6, 2023).

2.4.3 Appliance Measures

(1) Clotheslines and Outdoor Drying Racks

Summary

Table 80 presents a summary of the values used to calculate clothesline and outdoor drying rack savings. The detailed methodology follows.

Table 80: Clothesline and Outdoor Drying Rack Measure Summary

Parameter	Instant Savings	Reference
Measure Description and Identification		
Measure Description	Clotheslines and outdoor drying racks rebated in store	-
Baseline	Clothes being dried with a clothes dryer	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	10	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	70.6	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.000	See Subsection 2.4.2
Unitary Peak Demand Savings [W]	0	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.4.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.4.1

Electrical Unitary Energy Savings

The savings from this measure are due to avoided clothes dryer loads. The following equation is used to establish the unitary savings associated with clotheslines and outdoor drying racks.

$$\begin{aligned}
 \text{Energy Savings} \left[\frac{kWh}{year} \right] &= \text{Annual Laundry Loads} \left[\frac{load}{year} \right] \\
 &\times \text{Proportion of Loads Dried on Clotheslines or Outdoor Drying Racks} [\%] \\
 &\times \text{Energy Consumption per Load} \left[\frac{kWh}{load} \right]
 \end{aligned}$$

Table 81 below lists the parameters and corresponding values applied in the equation above for clotheslines and outdoor drying racks installed and the resulting unitary savings values.

Table 81: Electrical Unitary Savings Values for Clotheslines and Outdoor Drying Racks

Parameter	Value	Reference
Number of Laundry Loads per Year [loads/year]	197	Research to update this value showed that it hardly changed, so the one established in 2015 NRCan ¹⁰⁴ was maintained
Proportion of Loads Dried on Clotheslines [%]	16.3%	2011 OPA Prescriptive Measures and Assumptions List ¹⁰⁵
Energy Consumption per Load [kWh/load]	2.2	2011 OPA Prescriptive Measures and Assumptions List ¹⁰⁶
Unitary Energy Savings [kWh/year]	70.6	Calculation

Installation Rates

For Instant Savings, the installation rate is assumed to be 100% since participants have to purchase the product.

¹⁰⁴ NRCan, *2015 Survey of Household Energy Use*, Table 10.6. Calculated average annual dried loads for Atlantic, assuming 100 days of summer and 265 days of winter. Available at: <https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=SH&sector=aaa&juris=ca&year=2015&rn=38&page=1>, (last accessed July 12, 2024).

¹⁰⁵ Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

¹⁰⁶ Ibid.

(2) Refrigerator Retirements

Summary

Table 82 presents a summary of the values used to calculate refrigerator retirement savings. The detailed methodology follows.

Table 82: Refrigerator Retirement Measure Summary

Parameter		ARet		Reference
Measure Description and Identification				
Measure	Retirement and recycling of old refrigerators		-	
Baseline	Continued usage of old refrigerators			
Measure Subcategory	Full-sized refrigerators – 10 ft.3 and more	Small refrigerators – less than 10 ft.3		
General Parameters				
Installation Rate	-		See details below under Installation Rates	
Effective Useful Life [years]	4		See Subsection 3.2	
Electrical Savings Parameters				
Unitary Energy Savings [kWh/year]	660	164	See details below under Electrical Unitary Energy Savings	
Peak Demand-to-energy Ratio [W/kWh]	0.138		See Subsection 2.4.2	
Unitary Peak Demand Savings [W]	91.1	22.6	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio	
Interactive Effects Factor for Energy Savings	0%		See Subsection 2.4.1	
Interactive Effects Factor for Peak Demand Savings	0%		See Subsection 2.4.1	



Electrical Unitary Energy Savings

The following equations are used to determine the electrical unitary energy savings value of retired and replaced refrigerators.

$$\text{Energy Savings}_{kWh} = \text{AvgConsumptionPerSize} \times \text{AvgSize} \times \text{OAR} \times \text{PuF} - \text{NewConsumption}$$

$$\text{AvgConsumptionPerSize} = \sum (\text{ConsumptionPerSize} \times \% \text{ManufactureSplit})$$

Average annual per-cubic-foot energy consumption is calculated using 2017 metering activity results¹⁰⁷ for appliances manufactured before 2002 and the results of NRCAN data analyses for appliances manufactured in or after 2002.

Since most retired units in the category “manufactured in or after 2002” are now more recent than the most recent units used in the 2017 metering activity, unitary savings values for refrigerators manufactured in 2002 or later were established using data extracted from NRCAN EnerGuide appliance directories from 2001 to 2012.¹⁰⁸ Model numbers in the 2022 and 2023 tracking sheets were matched with EnerGuide data to extract energy consumption values.¹⁰⁹ Given retired appliances manufactured in 2002 or later are on average 15 years old, the Evaluator increased the EnerGuide energy consumption level by 27% to account for the efficiency loss due to aging based on findings from a recently published metering study.¹¹⁰

Average annual consumption values by manufacture-year class^{111,112,113} were established and a weighted average was calculated based on 2024 tracking sheet proportion of units per manufacture-year class. The occupant adjustment factor is based on the metering protocol of the New York Department of Public Service¹¹⁴ and the part-use factor is calculated based on 2022 participant survey data.¹¹⁵

¹⁰⁷ Econoler, *Residential Efficient Product Rebates Program – 2017 DSM Evaluation*, Final Report presented to Efficiency Nova Scotia, March 15, 2018.

¹⁰⁸ Natural Resources Canada, *EnerGuide appliance directory*, <https://publications.gc.ca/site/eng/9.500453/publication.html>. (last accessed October 10, 2024).

¹⁰⁹ Only two years of data were used since the exercise of matching NRCAN data began in 2022, yet three years of data will be used in the next update of the Measure Assessment.

¹¹⁰ Paul A. et al., *Impact of aging on the energy efficiency of household refrigerating appliances*, *Applied Thermal Engineering*, Volume 205(117992), 25 March 2022. <https://doi.org/10.1016/j.applthermaleng.2021.117992> (last accessed November 30, 2022).

¹¹¹ U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, *Energy Conservation Standards for Refrigerators, Refrigerator-Freezers and Freezers*, 10 CFR Part 430, April 28, 1997.

¹¹² Natural Resources Canada, *Refrigerators, Refrigerator-Freezers and Wine Chillers - Energy Efficiency Regulations*, <http://www.nrcan.gc.ca/energy/regulations-codes-standards/products/6877> (last accessed January 17, 2019).

¹¹³ Natural Resources Canada, *Registration and Publication of Regulations Amending Canada's Energy Efficiency Regulations*, <https://www.nrcan.gc.ca/energy-efficiency/energy-efficiency-regulations/regulatory-announcements/amendment-13/18419> (last accessed October 1, 2020).

¹¹⁴ New York Department of Public Service, *New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs - Residential, Multi-Family, and Commercial/Industrial Measures*, April 15, 2019, p. 29.

¹¹⁵ Econoler, *Residential Efficient Product Rebates Program – 2022 DSM Evaluation*, Final Report presented to Efficiency Nova Scotia, March 2023.

Table 83 presents the parameters of the above equations as well as the unitary savings calculations for the refrigerator retirement measures.

Table 83: Electrical Unitary Savings Values for Refrigerator Retirements

Parameter	Symbol	Manufacture-year Class	ARet		Reference
			Full-sized Refrigerators (≥ 10 ft. ³)	Small Refrigerators (< 10 ft. ³)	
Annual Consumption per Size [kWh/ft ³]	<i>Consumption PerSize</i>	2002 and later	34.8		NRCan data analysis (see text before the table for more details)
		1995-2001	41.1		2017 metering activities, 1997 USDE, NRCan EE Regulations
		1994 and earlier	58.9		
Proportion of Refrigerators	% <i>ManufactureSplit</i>	2002 and later	81%		2024 ARet tracking sheet
		1995-2001	11%		
		1994 and earlier	8%		
Average Annual Consumption per Size [kWh/ft ³]	<i>AvgConsumption PerSize</i>	-	37.4		Calculation
Average Refrigerator Size [ft ³]	<i>AvgSize</i>	-	18.5	10.4	2024 ARet tracking sheet
Occupant Adjustment Ratio	<i>OAR</i>	-	1.11		2019 NYPDS
Part-use Factor	<i>PuF</i>	-	0.86	0.38	2022 ARet participant survey data
Consumption of the New Refrigerator [kWh]	<i>NewConsumption</i>	-	N/A		-
Unitary Energy Savings [kWh/year]	<i>Energy Savings_{kWh}</i>	-	660	164	Calculation

Installation Rates

The installation rates are assumed to be 100%.

(3) Freezer Retirements

Summary

Table 84 presents a summary of the values used to calculate freezer retirement savings. The detailed methodology follows.

Table 84: Freezer Retirement Measure Summary

Parameter	ARet		Reference
Measure Description and Identification			
Measure	Retirement and recycling of old freezers		-
Baseline	Continued usage of old freezers		
Measure Subcategory	Full-sized freezers – 7 ft. ³ and more	Small freezers – less than 7 ft. ³	
General Parameters			
Installation Rate	-		See details below under Installation Rates
Effective Useful Life [years]	4		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	726	230	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.138		See Subsection 2.4.2
Unitary Peak Demand Savings [W]	100	31.7	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%		See Subsection 2.4.1
Interactive Effects Factor for Peak Demand Savings	0%		See Subsection 2.4.1



Electrical Unitary Energy Savings

To determine the electrical unitary energy savings value of retired freezers, the following equations are used.

$$\text{Energy Savings}_{kWh} = \text{AvgConsumptionPerSize} \times \text{AvgSize} \times \text{OAR} \times \text{PuF} - \text{NewConsumption}$$
$$\text{AvgConsumptionPerSize} = \sum(\text{ConsumptionPerSize} \times \% \text{ManufactureSplit})$$

Average annual per-cubic-foot energy consumption is calculated using 2017 metering activity results¹¹⁶ for appliances manufactured before 2002 and the results of NRCan data analyses for appliances manufactured in or after 2022.

Since most retired units in the category “manufactured in or after 2002” are now more recent than the most recent units used in the 2017 metering activity, unitary savings values for refrigerators manufactured in 2002 or later were established using data extracted from NRCan EnerGuide appliance directories from 2001 to 2012.¹¹⁷ Model numbers in the 2022 and 2023 tracking sheets were matched with EnerGuide data to extract energy consumption values.¹¹⁸ Given retired appliances manufactured in 2002 or later are on average 15 years old, the Evaluator increased the EnerGuide energy consumption level by 27% to account for the efficiency loss due to aging based on findings from a recently published metering study.¹¹⁹

Average annual consumption values by manufacture-year class^{120,121,122} were established and a weighted average was calculated based on 2024 tracking sheet proportion of units per manufacture-year class. The occupant adjustment factor is based on the metering protocol of the New York Department of Public Service¹²³ and the part-use factor is calculated based on 2022 participant survey data.¹²⁴

¹¹⁶ Econoler, *Residential Efficient Product Rebates Program – 2017 DSM Evaluation*, Final Report presented to Efficiency Nova Scotia, March 15, 2018.

¹¹⁷ Natural Resources Canada, *EnerGuide appliance directory*, <https://publications.gc.ca/site/eng/9.500453/publication.html> (last accessed October 10, 2024).

¹¹⁸ Only two years of data were used since the exercise of matching NRCan data began in 2022, yet three years of data will be used in the next update of the Measure Assessment.

¹¹⁹ Paul A. et al., *Impact of aging on the energy efficiency of household refrigerating appliances*, *Applied Thermal Engineering*, Volume 205(117992), 25 March 2022. <https://doi.org/10.1016/j.applthermaleng.2021.117992> (last accessed November 30, 2022).

¹²⁰ U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, *Energy Conservation: Program for Consumer Products: Energy Conservation Standards for Refrigerators, Refrigerator-Freezers and Freezers*, 10 CFR Part 430, April 28, 1997.

¹²¹ Natural Resources Canada, *Refrigerators, Refrigerator-Freezers and Wine Chillers - Energy Efficiency Regulations*, <http://www.nrcan.gc.ca/energy/regulations-codes-standards/products/6877> (last accessed January 17, 2019).

¹²² Natural Resources Canada, *Registration and Publication of Regulations Amending Canada's Energy Efficiency Regulations*, <https://www.nrcan.gc.ca/energy-efficiency/energy-efficiency-regulations/regulatory-announcements/amendment-13/18419> (last accessed October 1, 2020).

¹²³ New York Department of Public Service, *New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs - Residential, Multi-Family, and Commercial/Industrial Measures*, April 15, 2019, p. 29.

¹²⁴ Econoler, *Residential Efficient Product Rebates Program – 2022 DSM Evaluation*, Final Report presented to Efficiency Nova Scotia, March 2023.

Table 85 presents the parameters of the above equations as well as the unitary savings calculations for the freezer retirement measures.

Table 85: Electrical Unitary Savings Values for Freezer Retirements

Parameter	Symbol	Manufacture-year Class	ARet		Reference
			Full-sized Freezers (≥ 7 ft. ³)	Small Freezers (< 10 ft. ³)	
Annual Consumption per Size [kWh/ft ³]	<i>Consumption PerSize</i>	2002 and later	33.3		NRCan data analysis (see text before the table for more details)
		1995-2001	56.2		2017 metering activities, 1997 USDE, NRCan EE Regulations
		1994 and earlier	118		
Proportion of Freezers	% <i>ManufactureSplit</i>	2002 and later	69%	61%	2024 ARet tracking sheet
		1995-2001	12%	21%	
		1994 and earlier	19%	18%	
Average Annual Consumption per Size [kWh/ft ³]	<i>AvgConsumption PerSize</i>	-	52.1	53.4	Calculation
Average Freezer Size [ft ³]	<i>AvgSize</i>	-	14.1	10.2	2024 ARet tracking sheet
Occupant Adjustment Ratio	<i>OAR</i>	-	1.11		2019 NYPDS
Part-use Factor	<i>PuF</i>	-	0.89	0.38	2022 ARet participant survey data
Consumption of the New Freezer [kWh]	<i>NewConsumption</i>	-	N/A		-
Unitary Energy Savings [kWh/year]	<i>Energy Savings_{kWh}</i>	-	726	230	Calculation

Installation Rates

The installation rates are assumed to be 100%.

(4) Room Air Conditioner Retirements

Summary

Table 86 presents a summary of the values used to calculate room air conditioner retirement savings. The detailed methodology follows.

Table 86: Room Air Conditioner Retirement Measure Summary

Parameter	ARet	Reference
Measure Description and Identification		
Measure Description	Retirement and recycling of old room air conditioners	-
Baseline	Continued usage of old room air conditioners	
General Parameters		
Installation Rate	-	-
Effective Useful Life [years]	3	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	184	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.000	See Subsection 2.4.2
Unitary Peak Demand Savings [W]	0	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.4.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.4.1

Electrical Unitary Energy Savings

The electrical unitary energy savings of retired room air conditioners are calculated using the equations below.

$$Energy\ Savings_{kWh} = \frac{Q \times HOU}{SEER \times 1,000}$$
$$SEER = EER \times RACER$$

The retired unit average capacity variable is calculated using tracking sheet data from 2021 through 2023.

The hours of operation variable is based on NRCan's EnerGuide Room Air Conditioner Directory,¹²⁵ which provides local data for four cities in Nova Scotia, namely Halifax, Yarmouth, Sydney, and Greenwood, and is calculated by taking into account the proportion of those participants who retired a room air conditioner in each of the regions of these four cities in 2022. The participants' postal codes recorded in the ARet tracking sheet were used to determine their locations. The following formula was used to calculate the weighted average hours of operation across the province.

$$\begin{aligned} \text{Annual Hours of Operation} \left[\frac{\text{hr}}{\text{yr}} \right] &= (\%_{\text{people}} \times \text{HOU})_{\text{Halifax}} + (\%_{\text{people}} \times \text{HOU})_{\text{Yarmouth}} + (\%_{\text{people}} \times \text{HOU})_{\text{Sydney}} \\ &+ (\%_{\text{people}} \times \text{HOU})_{\text{Greenwood}} \end{aligned}$$

It is assumed that most air conditioners retired through ARet meet the energy efficiency ratio (EER) of 9.5 as per Natural Resources Canada values for stock room air conditioning units in 2006¹²⁶ since 54% of the air conditioning units retired through ARet between 2021 and 2023 were manufactured from 2003 through 2009. To account for seasonal temperature changes, the EER of 10.5 should be multiplied by a factor of 1.11 in accordance with the Ecox Technical Information Bulletin on SEER.¹²⁷

Table 87 presents the parameters of the above equations as well as the unitary savings calculations for the room air conditioner retirement measure.

Table 87: Electrical Unitary Savings Values for Room Air Conditioner Retirement

Parameter	Symbol	ARet	Reference
Average Capacity of the Retired Equipment [Btu/h]	Q	6,310	Average of 2021, 2022 and 2023 ARet tracking sheets
Annual Hours of Use [h/year]	HOU	306	Calculated
Energy Efficiency Ratio of the Retired Equipment [Btu/W*h]	EER	9.5	2006 NRCan ¹²⁸
Factor Used to Determine the SEER of a Room Air Conditioner Based on its EER	$RACER$	1.11	Ecox Bulletin No. E-004-EN ¹²⁹
Seasonal Energy Efficiency Ratio of the Retired Equipment [Btu/W*h]	$SEER$	10.5	Calculated
Conversion Factor [W/kW]	1,000	1,000	Convention
Unitary Energy Savings [kWh/year]	$Energy Savings_{kWh}$	184	Calculation

¹²⁵ NRCan's Office of Energy Efficiency, *EnerGuide Room Air Conditioner Directory* 2012, May 2012, p. 88.

¹²⁶ Natural Resources Canada, *National Energy Use Database, Residential Sector, Nova Scotia, Table 27: Cooling System Stock by Type, New Unit Efficiencies, Stock Efficiencies and Unit Capacity Ratio, 2007-2012*
<https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CP&sector=res&juris=ns&rn=27&page=2> (last accessed September 19, 2024).

No conversion from SEER to SEER2 was made for this measure since it does not apply to room air-conditioning.

¹²⁷ Ecox, *Technical Information Bulletin No. E-004-EN: SEER*, www.ecoxline.com (last accessed March 3, 2016).

¹²⁸ Natural Resources Canada, *National Energy Use Database, Residential Sector, Nova Scotia, Table 27: Cooling System Stock by Type, New Unit Efficiencies, Stock Efficiencies and Unit Capacity Ratio, 2007-2012*
<https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CP&sector=res&juris=ns&rn=27&page=2> (last accessed September 19, 2024).

¹²⁹ Ecox, *Technical Information Bulletin No. E-004-EN: SEER*, www.ecoxline.com (last accessed March 3, 2016).

(5) Dehumidifier Replacements or Retirements

Summary

Table 88 presents a summary of the values used to calculate dehumidifier replacement or retirement and ENERGY STAR certified dehumidifier savings. The detailed methodology follows.

**Table 88: Dehumidifier Replacement or Retirement /
ENERGY STAR Certified Dehumidifier Measure Summary**

Parameter	ARet, ASFH ¹³⁰	Reference
Measure Description and Identification		
Measure	Replacement or retirement of old dehumidifiers	-
Baseline	Continued usage of existing dehumidifier	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	5	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	616	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.335	See Subsection 2.4.2
Unitary Peak Demand Savings [W]	206	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.4.1
Interactive Effects Factor for Peak Demand Savings		See Subsection 2.4.1

Electrical Unitary Energy Savings

For ARet, dehumidifier electrical unitary energy savings are calculated using the equation below.

$$\text{Energy Savings}_{kWh} = AWRC \times AOD \times \left(\frac{1}{EF_{base}} - \frac{1}{EF_{new}} \right)$$

For ARet, the baseline energy factor is based on the 2011 Ontario Power Authority (OPA) Prescriptive Measures and Assumptions report.¹³¹ The new energy factor is calculated using ARet tracking sheet data from 2021 through 2023. While ARet drop-off events offer an opportunity to retire a dehumidifier without necessarily replacing it, the Evaluator assumed that participants replaced their unit since it is unlikely that a home stopped needing dehumidification.

For both program components, the average water removal capacity and the average operating days are based on the 2011 OPA Prescriptive Measures and Assumptions report.

Table 89 presents the parameters of the above equations as well as the unitary savings calculations for the dehumidifier replacement measure.

¹³⁰ While dehumidifier replacements are offered and reported under ASFH, this measure is administered by ARet.

¹³¹ Ontario Power Authority (OPA). 2011 Prescriptive Measures and Assumptions, Released Version 1, March 2011.

Table 89: Electrical Unitary Savings Values for Dehumidifier Replacements or Retirements

Parameter/	Symbol	ARet, ASFH	Reference
Average Water Removal Capacity [L/day]	$AWRC$	3.87	2011 OPA
Average Operating Days [days/year]	AO		2011 OPA
Energy Factor of the Baseline Dehumidifier [L/kWh]	EF_{base}	0.66	2011 OPA
Energy Factor of the New ENERGY STAR Certified Dehumidifier [L/kWh]	EF_{new}	1.76	Average of 2021, 2022 and 2023 ARet tracking sheets
Unitary Energy Savings [kWh/year]	$Energy\ Savings_{kWh}$	616	Calculation

Installation Rates

The installation rates are assumed to be 100%.

(6) ENERGY STAR Certified Clothes Dryers

Summary

Table 90 presents a summary of the values used to calculate ENERGY STAR certified clothes dryer savings. The detailed methodology follows.

Table 90: ENERGY STAR Certified Clothes Dryer Measure Summary

Parameter	Instant Savings	Reference
Measure Description and Identification		
Measure	ENERGY STAR certified clothes dryers rebated in store	-
Baseline	New non-ENERGY STAR certified dryers	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	12	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	25.0	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.138	See Subsection 2.4.2
Unitary Peak Demand Savings [W]	3.45	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.4.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.4.1

Electrical Unitary Energy Savings

The electrical unitary energy savings of the ENERGY STAR certified clothes dryer measure are calculated using the equations below.

$$Energy\ Savings_{kWh} = ADL \times ALW \times \left(\frac{1}{CEF_{base}} - \frac{1}{CEF_{new}} \right)$$

The average number of dried loads (ADL) was calculated from the NRCAN 2015 Survey of Household Energy Use that contained data on the number of loads per province or region such as the Atlantic region.

The combined energy factor (CEF) of the new units is based on the weighted average CEF of the 10 most installed models in 2024.

The CEF of the base unit replaced through Instant Savings corresponds to the average CEF of the non-ENERGY STAR models available in Canada listed by NRCAN.¹³²

¹³² Natural Resources Canada, Search: Clothes dryers| Energy Efficiency Ratings. Available at: <https://oee.nrcan.gc.ca/pml-imp/index.cfm?action=app.search-recherche&appliance=CLOTHESDRYERS> (last accessed September 25, 2024).

Table 91 presents the parameters of the above equations as well as the unitary savings calculations for the ENERGY STAR Certified clothes dryer measure.

Table 91: Electrical Unitary Savings Values for ENERGY STAR Certified Clothes Dryer

Parameter	Symbol	Instant Savings	Reference
Average Dried Loads per Year [load/year]	ADL	197	2015 NRCan ¹³³
Average Load Weight [lbs/load]	ALW	8.45	2019 PUC TRM ¹³⁴
Combined Energy Factor of New Unit [lbs/kWh]	CEF_{new}	3.94	2024 IS tracking sheet
Combined Energy Factor of Baseline Unit [lbs/kWh]	CEF_{base}	3.72	Average of non-ENERGY STAR models available in Canada, NRCan
Unitary Energy Savings [kWh/year]	$Energy\ Savings_{kW}$	25.0	Calculation

Installation Rates

The installation rates are assumed to be 100%.

(7) Efficient Clothes Washers

Summary

Table 92 presents a summary of the values used to calculate efficient clothes washer savings. The detailed methodology follows.

Table 92: Efficient Clothes Washer Measure Summary

Parameter	Instant Savings	Reference
Measure Description and Identification		
Measure	ENERGY STAR clothes washers, rebated in store	-
Baseline	New non-ENERGY STAR clothes washer	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	11	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	138	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.138	See Subsection 2.4.2
Unitary Peak Demand Savings [W]	19.0	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.4.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.4.1

¹³³ NRCan, 2015 Survey of Household Energy Use, Table 10.6. Calculated average annual dried loads for Atlantic, assuming 100 days of summer and 265 days of winter.

¹³⁴ Pennsylvania Public Utility Commission (PUC), *Technical Reference Manual*, August 2019, Subsection 2.4 – Appliances.

Electrical Unitary Energy Savings

For efficient clothes washers, the electrical unitary savings value is determined by comparing baseline and efficient clothes washer annual energy consumption values, adjusted to consider the proportion of electrically heated hot water used by the appliance.

Energy Consumption Calculation

First, the energy consumption values of both baseline and efficient clothes washers are determined using the following equation.

$$\text{Clothes Washer Energy Consumption [kWh]} = \frac{\text{Number of Loads} \left[\frac{\text{Loads}}{\text{Year}} \right] * \text{Capacity [L]}}{\text{IMEF} \left[\frac{\text{L}}{\text{kWh}} \right]}$$

Table 93 below lists the parameters and corresponding values applied in the equations above for baseline and efficient clothes washers and their resulting energy consumption.

Table 93: Clothes Washer Energy Consumption

Parameter	Symbol	Value for Baseline Clothes Washer	Value for Efficient Clothes Washer	Reference
Number of Loads [Loads/Year]	<i>Number of Loads</i>	218		2015 NRCan ¹³⁵
Capacity [L]	<i>Capacity</i>	127		Weighted average capacity based on 10 most rebated models in 2024 and ENERGY STAR Certified Clothes Washers database ¹³⁶
Integrated Modified Energy Factor (IMEF) [L/kWh/cycle]	<i>IMEF</i>	56.4	82.8	Baseline: Average of non-ENERGY STAR models available in Canada, NRCan ¹³⁷ Efficient: Weighted average capacity based on 10 most rebated models in 2024 and ENERGY STAR Certified Clothes Washers database
Clothes Washer Energy Consumption [kWh/year]	<i>Clothes Washer Energy Consumption</i>	492	335	Calculation

¹³⁵ NRCan, 2015 Survey of Household Energy Use, Table 10.6. Calculated average annual washed loads for Atlantic, assuming 100 days of summer and 265 days of winter. Available at:

<https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=SH&sector=aaa&juris=ca&year=2015&rn=38&page=1> (last accessed September 13, 2024).

¹³⁶ ENERGY STAR, *ENERGY STAR Certified Residential Clothes Washers*, <https://www.energystar.gov/productfinder/product/certified-clothes-washers/> (last accessed December 21, 2018).

¹³⁷ Natural Resources Canada, *Search: Clothes Washers | Energy Efficiency Ratings*, <http://oee.nrcan.gc.ca/pml-imp/index.cfm?action=app.search-recherche&appliance=CLOTHESWASHERS> (last accessed September 13, 2024).

Water Heating Adjustment

Both energy consumption values do not take into account the proportion of hot water for clothes washers produced with electricity in Nova Scotia, nor the use of cold water for washing. Therefore, the energy consumption of both baseline and efficient clothes washers is broken down for each stage of the washing process, as presented in Table 94, to apply correction factors separately at each stage.

Table 94: Energy Consumption Breakdown for Baseline and Efficient Clothes Washers

Energy Consumption Breakdown for Clothes Washers	Proportion of Overall Consumption ¹³⁸	Baseline Clothes Washer Electricity Consumption (kWh/year)	Efficient Clothes Washer Electricity Consumption (kWh/year)
Water Heating System	24.8%	122	83
Clothes Dryer	68.1%	335	228
Clothes Washer Drum	7.1%	35	24
Total	100.0%	492	335

To estimate the savings attributable to water heating system energy consumption, the percentage of electrically heated water is calculated, as presented in Table 95 below. The proportion of electrical DHW tanks in Nova Scotia is used to calculate the overall proportion of electrically heated water for both baseline and efficient clothes washers. The proportion of electrical DHW tanks in Nova Scotia is based on participant data collected in the 2022 and 2023 EPI tracking sheets.^{139,140}

Table 95: Water Heating Sources for Clothes Washers

DHW Tank Type	Proportion
Electrical	76%
Non-electrical	24%

For water heating consumption, an adjustment factor for cold water washing is applied. Thus, to account for the usage of cold water for washing, the water heating energy consumption value is multiplied by a factor of 0.67, which is based on a survey conducted by Hydro-Québec that found that 67% of washes are done in heated water.¹⁴¹

Adjusted Energy Consumption

Table 96 and Table 97 below present the calculations of total electricity consumption for baseline and efficient clothes washers respectively.

¹³⁸ Ad Hoc Recherche, *Rapport d'évaluation, Programme : Produits Mieux Consommer – Électroménagers Energy Star (Années 2008 et 2009)*, p. 18.

¹³⁹ The proportions of electric water heating published by NRCAN are not consistent and significantly lower than the value obtained from EPI participants. Therefore, the proportion of electrical water heating is based on EPI tracking sheet data.

¹⁴⁰ Given the change in the EPI program in 2021, the data for the proportion of electric water heating didn't reflect what was previously observed. Therefore, data from only the 2022 and 2023 EPI tracking sheets were used.

¹⁴¹ Ad Hoc Recherche, *Rapport d'évaluation, Programme : Produits Mieux Consommer – Électroménagers Energy Star (Années 2008 et 2009)*, p. 19.

Table 96: Electricity Consumption for Baseline Clothes Washers

Energy Consumption Component	Energy Consumption (kWh/year)	Adjustment Factor for Electrical Water Heating	Adjustment Factor for Cold Water Usage	Adjusted Energy Consumption (kWh/year)
Water Heating System	122	0.76	0.67	62
Internal Clothes Dryer	335	-	-	335
Washing Machine Drum	35	-	-	35
Total	492	-	-	432

Table 97: Electricity Consumption for Efficient Clothes Washers

Energy Consumption Component	Energy Consumption (kWh/year)	Adjustment Factor for Electrical Water Heating	Adjustment Factor for Cold Water Usage	Adjusted Electricity Consumption (kWh/year)
Water Heating System	83	0.76	0.67	42
Internal Clothes Dryer	228	-	-	228
Washing Machine Drum	24	-	-	24
Total	335	-	-	294

Therefore, the unitary energy savings value is established using the energy consumption between baseline and efficient clothes washers, as presented in Table 98 below.

Table 98: Electrical Unitary Savings Value for Clothes Washer

Parameters	Value
Adjusted Energy Consumption of Baseline Clothes Washer [kWh/year]	432
Adjusted Energy Consumption of Efficient Clothes Washer [kWh/year]	294
Unitary Energy Savings [kWh/year]	138

Installation Rates

The installation rate is assumed to be 100%.

(8) Efficient Washer-Dryer Combination Units

Summary

Table 99 presents a summary of the values used to calculate efficient washer-dryer combination unit savings. The detailed methodology follows.

Table 99: Efficient Washer-Dryer Combination Units

Parameter	Instant Savings	Reference
Measure Description and Identification		
Measure	ENERGY STAR washer-dryer combination units rebated in store	-
Baseline	New non-ENERGY STAR washer-dryer combination units	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	11	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	144	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.138	See Subsection 2.4.2
Unitary Peak Demand Savings [W]	19.9	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.4.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.4.1

Electrical Unitary Energy Savings

For efficient washer-dryer combination units, the current models available through the program consist of a dryer and a washer with separate drums that operate separately. Therefore, the energy savings are calculated by summing the savings obtained using the same methodology as for efficient dryers (see Subsection 1.1.1(6)) and clothes washers (see Subsection 1.1.1(7)).

The electrical unitary energy savings of efficient clothes dryers are calculated using the equations below.

$$Energy\ Savings_{kWh} = ADL \times ALW \times (1/CEF_{base} - 1/(CEF_{new}))$$

The average number of dried loads (ADL) was calculated from the NRCan 2015 Survey of Household Energy Use that contained data on the number of loads per province or region such as the Atlantic region. The combined energy factor (CEF) of the new units is based on the weighted average CEF of the 10 most installed models in 2024. The CEF of the base unit replaced through Instant Savings corresponds to the average CEF of the non-ENERGY STAR models available in Canada listed by NRCan.

Table 100 below presents the parameters of the above equations as well as the unitary savings calculations for the clothes dryer replacement measure.

Table 100: Electrical Unitary Savings Values for the Efficient Clothes Dryer Component of Efficient Washer-Dryer Combination Units

Parameter	Symbol	Instant Savings	Reference
Average Dried Loads per Year [load/year]	ADL	197	2015 NRCan ¹⁴²
Average Load Weight [lbs/load]	ALW	8.45	2019 PUC TRM ¹⁴³
Combined Energy Factor of New Unit [lbs/kWh]	CEF_{new}	3.92	2024 tracking sheet
Combined Energy Factor of Baseline Unit [lbs/kWh]	CEF_{base}	3.72	Average of non-ENERGY STAR models available in Canada, NRCan ¹⁴⁴
Unitary Energy Savings [kWh/year]	$Energy\ Savings_{kWh}$	22.8	Calculation

For efficient clothes washers, the electrical unitary savings value is determined by comparing baseline and efficient clothes washer annual energy consumption values adjusted to consider the proportion of electrically heated hot water used by the appliance.

First, the energy consumption values of both baseline and efficient clothes washers are determined using the following equation.

$$Clothes\ Washer\ Energy\ Consumption\ [kWh] = \frac{Number\ of\ Loads\ \left[\frac{Loads}{Year} \right] * Capacity[L]}{IMEF\ \left[\frac{L}{kWh} \right]}$$

Table 101 lists the parameters and corresponding values applied in the equations above for baseline and efficient clothes washers and their resulting energy consumption.

Table 101: Clothes Washer Energy Consumption

Parameter	Value for Baseline Clothes Washer	Value for Efficient Clothes Washer	Reference
Number of Loads [Loads/Year]	218		2015 NRCan ¹⁴⁵
Capacity [L]	127		Weighted average capacity based on rebated models in 2024 and ENERGY STAR Certified Clothes Washers database ¹⁴⁶
Integrated Modified Energy Factor (IMEF) [L/kWh/cycle]	58.6	82.4	Baseline: NRCan ¹⁴⁷ Efficient: Weighted average capacity based on rebated models in 2024 and ENERGY STAR Certified Clothes Washers database
Clothes Washer Energy Consumption [kWh/year]	473	336	Calculation

¹⁴² NRCan, 2015 Survey of Household Energy Use, Table 10.6. Calculated average annual dried loads for Atlantic, assuming 100 days of summer and 265 days of winter. Available at: <https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=SH&sector=aaa&juris=ca&year=2015&m=38&page=1> (last accessed September 13, 2024).

¹⁴³ Pennsylvania Public Utility Commission (PUC), *Technical Reference Manual*, August 2019, Subsection 2.4 – Appliances.

¹⁴⁴ Natural Resources Canada, *Search: Clothes dryers | Energy Efficiency Ratings*. Available at: <https://oee.nrcan.gc.ca/pml-imp/index.cfm?action=app.search-recherche&appliance=CLOTHESDRYERS> (last accessed September 25, 2024).

¹⁴⁵ NRCan, 2015 Survey of Household Energy Use, Table 10.6. Calculated average annual washed loads for Atlantic, assuming 100 days of summer and 265 days of winter. Available at: <https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=SH&sector=aaa&juris=ca&year=2015&m=38&page=1> (last accessed September 13, 2024).

¹⁴⁶ ENERGY STAR, *ENERGY STAR Certified Residential Clothes Washers*, <https://www.energystar.gov/productfinder/product/certified-clothes-washers/> (last accessed December 21, 2018).

¹⁴⁷ Natural Resources Canada, *Search: Clothes Washers | Energy Efficiency Ratings*, <http://oee.nrcan.gc.ca/pml-imp/index.cfm?action=app.search-recherche&appliance=CLOTHESWASHERS> (last accessed September 13, 2024).

Both energy consumption values do not consider the proportion of hot water for clothes washers produced with electricity in Nova Scotia or the use of cold water for washing. Therefore, the energy consumption of both baseline and efficient clothes washers is broken down for each stage of the washing process, as presented in Table 102, to apply correction factors separately at each stage.

Table 102: Energy Consumption Breakdown for Baseline and Efficient Clothes Washers

Energy Consumption Breakdown for Clothes Washers	Proportion of Overall Consumption ¹⁴⁸	Baseline Clothes Washer Electricity Consumption (kWh/year)	Efficient Clothes Washer Electricity Consumption (kWh/year)
Water Heating System	24.8%	117	83
Clothes Dryer	68.1%	322	229
Clothes Washer Drum	7.1%	34	24
Total	100.0%	473	336

To estimate the savings attributable to water heating system energy consumption, the percentage of electrically heated water is calculated as presented in Table 103 below. The proportion of electrical DHW tanks in Nova Scotia is used to calculate the overall proportion of electrically heated water for both baseline and efficient clothes washers. The proportion of electrical DHW tanks in Nova Scotia is based on participant data collected in the 2022 and 2023 EPI tracking sheets.^{149,150}

Table 103: Water Heating Sources for Clothes Washers

DHW Tank Type	Proportion
Electrical	76%
Non-electrical	24%

For water heating consumption, an adjustment factor for cold water washing is applied. Thus, to account for the usage of cold water for washing, the water heating energy consumption value is multiplied by a factor of 0.67, which is based on a survey conducted by Hydro-Québec that found that 67% of washes are done using heated water.¹⁵¹ Table 104 and Table 105 below present the calculations of total electricity consumption for baseline and efficient clothes washers respectively.

¹⁴⁸ Ad Hoc Recherche, *Rapport d'évaluation, Programme : Produits Mieux Consommer – Électroménagers Energy Star (Années 2008 et 2009)*, p. 18.

¹⁴⁹ The proportions of electric water heating published by NRCAN are not consistent and significantly lower than the value obtained from EPI participants. Therefore, the proportion of electrical water heating is based on EPI tracking sheet data.

¹⁵⁰ Given the change in the EPI program in 2021, the data for the proportion of electric water heating didn't reflect what was previously observed. Therefore, data from only the 2022 and 2023 EPI tracking sheets were used.

¹⁵¹ Ad Hoc Recherche, *Rapport d'évaluation, Programme : Produits Mieux Consommer – Électroménagers Energy Star (Années 2008 et 2009)*, p. 19.

Table 104: Electricity Consumption for Baseline Clothes Washers

Energy Consumption Component	Energy Consumption (kWh/year)	Adjustment Factor for Electrical Water Heating	Adjustment Factor for Cold Water Usage	Adjusted Energy Consumption (kWh/year)
Water Heating System	117	0.76	0.67	60
Internal Clothes Dryer	322	-	-	322
Washing Machine Drum	34	-	-	34
Total	473	-	-	416

Table 105: Electricity Consumption for Efficient Clothes Washers

Energy Consumption Component	Energy Consumption (kWh/year)	Adjustment Factor for Electrical Water Heating	Adjustment Factor for Cold Water Usage	Adjusted Electricity Consumption (kWh/year)
Water Heating System	83	0.76	0.67	42
Internal Clothes Dryer	229	-	-	229
Washing Machine Drum	24	-	-	24
Total	336	-	-	295

The unitary energy savings value is established using the difference between the energy consumption of baseline and efficient clothes washers as presented in Table 106.

Table 106: Electrical Unitary Savings Value for the Clothes Washer Component of Efficient Washer-Dryer Combination Units

Parameters	Value
Adjusted Energy Consumption of Baseline Clothes Washer [kWh/year]	416
Adjusted Energy Consumption of Efficient Clothes Washer [kWh/year]	295
Unitary Energy Savings [kWh/year]	121

Summing the unitary energy savings of 22.8 kWh and 121 kWh for efficient clothes dryers and washers respectively resulted in unitary energy savings of 144 kWh for efficient washer-dryer combination units.

Installation Rates

The installation rate is assumed to be 100%.

(9) ENERGY STAR Certified Room Air Purifiers

Summary

Table 107 presents a summary of the values used to calculate ENERGY STAR certified room air purifier savings. The detailed methodology follows.

Table 107: ENERGY STAR Certified Room Air Purifier Measure Summary

Parameter	Instant Savings	Reference
Measure Description and Identification		
Measure	ENERGY STAR certified room air purifiers rebated in store	-
Baseline	New Non-ENERGY STAR certified room air purifier	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	9	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	768	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.171	See Subsection 2.4.2
Unitary Peak Demand Savings [W]	131	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.4.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.4.1

Electrical Unitary Energy Savings

The electrical unitary energy savings value is determined by using the following equation for ENERGY STAR certified room air purifiers.

$$\begin{aligned}
 \text{Energy Savings} \left[\frac{kWh}{year} \right] &= \left[CADR[cfm] \times \left(\frac{1}{EF_{base}} - \frac{1}{EF_{eff}} \right) \left[\frac{W}{cfm} \right] \times HOU \left[\frac{hours}{year} \right] \right. \\
 &\quad \left. + (SBP_{base} - SBP_{eff})[W] \times (8,760 - HOU) \left[\frac{hours}{year} \right] \right] \times \frac{1 kW}{1,000 W}
 \end{aligned}$$

Table 108 below lists the parameters and corresponding values applied in the equation above and the resulting unitary savings values. Most values are based on the 10 most sold models under Instant Savings in 2024, which represent 57% of air purifier sales under the program component. Other values are based on the Savings Calculator for ENERGY STAR Qualified Appliances since the Canadian government currently has no minimum requirements for room air purifiers.

Table 108: Electrical Unitary Savings Values for ENERGY STAR Certified Room Air Purifiers

Parameter	Symbol	Instant Savings	Reference
Clean Air Delivery Rate [cfm]	$CADR$	172	Weighted average of the 10 most sold models in the 2024 tracking sheet
Efficiency for Baseline Unit [cfm/W]	EF_{base}	1.00	Savings Calculator for ENERGY STAR Qualified Appliances ¹⁵²
Efficiency for Efficient Unit [cfm/W]	EF_{eff}	4.24	Weighted average of the 10 most sold models in the 2024 tracking sheet
Annual Operating Hours [hours/year]	HOU	5,840	Savings Calculator for ENERGY STAR Qualified Appliances
Standby Power for Baseline Unit [W]	SBP_{base}	1	Savings Calculator for ENERGY STAR Qualified Appliances
Standby Power for Efficient Unit [W]	SBP_{eff}	0.73	Weighted average of the 10 most sold models in the 2024 tracking sheet
Unitary Energy Savings [kWh/year]	$Energy\ Savings_{kWh}$	768	Calculation

Installation Rates

The installation rate is assumed to be 100%.

¹⁵² ENERGY STAR, Savings Calculator for ENERGY STAR Qualified Appliances, <https://dnr.mo.gov/sites/dnr/files/media/file/2021/01/energy-star-appliance-calculator.xlsx>, (last accessed December 1, 2019).

(10) ENERGY STAR Certified Dishwashers

Summary

Table 109 presents a summary of the values used to calculate ENERGY STAR certified dishwasher savings. The detailed methodology follows.

Table 109: ENERGY STAR Certified Dishwasher Measure Summary

Parameter	Instant Savings	Reference
Measure Description and Identification		
Measure	ENERGY STAR certified dishwashers that use less than 250 kWh, rebated in store	-
Baseline	New non-ENERGY Star certified dishwashers	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	11	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	15.2	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.0915	See Subsection 2.4.2
Unitary Peak Demand Savings [W]	1.39	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.4.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.4.1

Electrical Unitary Energy Savings

The electrical unitary energy savings value is determined by using the following equation for ENERGY STAR certified dishwashers.

$$\begin{aligned}
 \text{Energy Savings} \left[\frac{\text{kWh}}{\text{year}} \right] &= \left(\text{Consumption}_{\text{base}} - \text{Consumption}_{\text{eff}} \right) \times \left((\% \text{Operation} + (\% \text{Water Heating} \times \% \text{Electric})) \right) \\
 &\times \frac{\text{Nb Loads}}{\text{Nb Loads Standard}}
 \end{aligned}$$

Table 110 below lists the parameters and corresponding values applied in the equation above and the resulting unitary savings values. The baseline corresponds to all non-ENERGY STAR certified models available in Canada.

Table 110: Electrical Unitary Savings Values for ENERGY STAR Certified Dishwashers

Parameter	Symbol	Instant Savings	Reference
Baseline Consumption [kWh]	Consumption _{base}	260	Average of non-ES models in Natural Resources Canada, Searchable product list for dishwashers, retrieved January 22, 2024 ¹⁵³
Efficient Unit Consumption [kWh]	Consumption _{eff}	239	2024 Instant Savings Database (average of all models for which at least 10 units were sold)
Percentage of Dishwasher Energy Consumption Used for Unit Operation [%]	%Operation	44%	Illinois TRM 2022 ¹⁵⁴
Percentage of Dishwasher Energy Consumption Used for Water Heating [%]	%Water Heating	56%	Illinois TRM 2022 ¹⁵⁵
Percentage of DHW Savings that Are Electric [%]	%Electric	76%	The proportion of electrical DHW tanks in Nova Scotia is based on participant data collected in the 2022 and 2023 EPI tracking sheets
Average Annual Number of Loads in Atlantic Region [loads]	Nb Loads	180	NRCAN, 2015 Survey of Household Energy Use ¹⁵⁶
Average Annual Number of Loads Assumed in EnerGuide Rating [loads]	Nb Loads Standard	215	NRCAN, 2013 “Choosing and Using Appliances with EnerGuide” ¹⁵⁷
Unitary Energy Savings [kWh/year]	Energy Savings [kWh/year]	15.2	Calculation

Installation Rates

The installation rate is assumed to be 100%.

¹⁵³ NRCAN, Search: Dishwasher | Energy Efficiency Ratings | Natural Resources Canada, <https://oee.nrcan.gc.ca/pml-imp/index.cfm?action=app.search-recherche&appliance=DISHWASHERS> (last accessed January 22, 2024).

¹⁵⁴ Illinois Energy Efficiency Stakeholder Advisory Group, 2022 *Illinois Statewide Technical Reference Manual for Energy Efficiency Version 10.0, Volume 2*, September 24, 2021, p. 21.

¹⁵⁵ Ibid.

¹⁵⁶ NRCAN, 2015 *Survey of Household Energy Use*, Table 10.4. Calculated average annual loads for Atlantic region. Available at: <https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=SH&sector=aaa&juris=ca&year=2015&m=36&page=1>, (last accessed September 13, 2024).

¹⁵⁷ NRCAN, Choosing and Using Appliances with EnerGuide, available at <https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/pdf/energystar/EnerGuideappliances.pdf>, 2013, p.23.

(11) ENERGY STAR Certified Bathroom Exhaust Fans

Summary

Table 111 presents a summary of the values used to calculate humidity sensor for bathroom exhaust fan savings. The detailed methodology follows.

Table 111: ENERGY STAR Certified Bathroom Exhaust Fan Summary

Parameter	Instant Savings	Reference
Measure Description and Identification		
Measure	ENERGY STAR certified bathroom exhaust fans without lighting included and with a minimum efficacy of 5.5 CFM/W	-
Baseline	Existing fans with no controls	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates.
Effective Useful Life [years]	19	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	42.2	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	N/A	-
Unitary Peak Demand Savings [W]	4.96	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.4.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.4.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for bathroom exhaust fans are calculated using the variables defined and listed in the equation and Table 112 below.

$$Energy\ Savings_{kWh} = \frac{CFM \times HOU}{1,000} \times \left(\frac{1}{\eta_{base}} - \frac{1}{\eta_{eff}} \right)$$

Table 112: Electrical Savings Values for Bathroom Exhaust Fans

Parameter	Symbol	Instant Savings	Reference
Fan Exhaust Rate [CFM]	CFM	99.1	Weighted average from ENERGY STAR compliant model list and 2021 Instant Savings tracking sheet
Annual Fan Operating Hours [hours/year]	<i>HOU</i>	850	Vermont TRM, 2023 ¹⁵⁸
Conversion Factor [W/kWh]	-	1,000	Convention
Base Fan Efficacy [CFM/W]	η_{base}	1.398	Calculated based on the claim that ENERGY STAR certified bathroom fans use 70% less energy than standard fans
Efficient Fan Efficacy [CFM/W]	η_{eff}	4.66	Weighted average from ENERGY STAR compliant model list and 2021 Instant Savings tracking sheet
Energy Savings [kWh/year]	<i>Energy Savings_{kWh}</i>	42.2	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for bathroom exhaust fans are calculated using the variables defined and listed in the equation and below.

$$Peak\ Demand\ Savings_w = CFM \times \left(\frac{1}{\eta_{base}} - \frac{1}{\eta_{eff}} \right) \times PCF$$

Table 113: Unitary Peak Demand Savings Values for Bathroom Exhaust Fans

Parameter	Symbol	Instant Savings	Reference
Fan Exhaust Rate [CFM]	CFM	99.1	Weighted average from ENERGY STAR compliant model list and 2021 Instant Savings tracking sheet
Base Fan Efficacy [CFM/W]	η_{base}	1.398	Calculated based on the claim that ENERGY STAR certified bathroom fans use 70% less energy than standard fans
Efficient Fan Efficacy [CFM/W]	η_{eff}	4.66	Weighted average from ENERGY STAR compliant model list and 2021 Instant Savings tracking sheet
Peak Coincidence Factor	<i>PCF</i>	10%	Assumption (E1 2017 Instant Savings evaluation)
Peak Demand Savings [W]	<i>Peak Demand Savings_w</i>	4.96	Calculation

Installation Rates

The installation rate is assumed to be 100%.

¹⁵⁸ Efficiency Vermont *Technical Reference Manual*, Program Year 2023, pp. 225-226.

(12) Humidity Sensors for Bathroom Exhaust Fans

Summary

Table 114 presents a summary of the values used to calculate humidity sensor for bathroom exhaust fan savings. The detailed methodology follows.

Table 114: Humidity Sensor for Bathroom Exhaust Fan Summary

Parameter	EPI	Reference
Measure Description and Identification		
Measure	Added humidity sensors on existing bathroom exhaust fans with direct installation	-
Baseline	Existing fans with no controls	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates.
Effective Useful Life [years]	9.5	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	143	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.1	See Subsection 2.4.2
Unitary Peak Demand Savings [W]	14.3	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.4.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.4.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for humidity sensor for bathroom exhaust fan are calculated using the variables defined and listed in the equation and Table 115 below.

$$\begin{aligned}
 \text{Energy Savings}_{fan} \left[\frac{kWh}{year} \right] &= \% \text{ Savings} \times \left(HOU_{fan} \times CFM \left[\frac{ft^3}{min} \right] \times \frac{1}{\eta_{fan}} \right) \\
 \text{Energy Savings}_{heating} &= \\
 &= CFM \times \left(\left[0.028317 \frac{m^3}{ft^3} \right] \times \rho \times C_p \times \left[\frac{1 W \cdot sec}{1 J} \right] \times \left[\frac{1 min}{60 sec} \right] \times \left[\frac{1 kW}{1,000 W} \right] \right) \times HOU_{heating} \times \Delta T \times \% \text{ Savings}
 \end{aligned}$$

The fan energy savings are shown in Table 115. These are the savings from the lowered fan usage due to the humidity sensor.

Table 115: Electrical Savings Values for Humidity Sensors for Bathroom Exhaust Fans

Parameter	Symbol	EPI	Reference
Fan Efficiency [CFM/W]	η_{fan}	3.5	ENERGY STAR min standard, 2024 ¹⁵⁹
Savings Percentage	% Savings	50%	Demand-controlled ventilation A case study for existing Swedish multifamily buildings, 2004 ¹⁶⁰
Fan Exhaust Rate [CFM]	CFM	99.1	Weighted average from ENERGY STAR compliant model list and 2021 tracking sheet using the ENERGY STAR bathroom fan measure available in Instant Savings at the time. This was used as a proxy for the size of fan that consumers purchased
Annual Fan Operating Hours [hours/year]	HOU_{fan}	850	Vermont TRM, 2023 ¹⁶¹
Fan Energy Savings [kWh/year]	Energy Savings [kWh/year]	12.0	Calculation

The energy savings per energy source is shown in Table 116 below, and the unitary energy savings are shown in Table 117 below. These are the savings on the electric heating system due to lower air infiltration. Excluded from the tables is the percentage of homes heated with non-electrical heating systems, since those would not generate electrical savings.

Table 116: Electrical Heating per Heating Source Savings Values for Humidity Sensors for Bathroom Exhaust Fans

Parameter	Symbol	EPI	Reference
Density of Air [kg/m ³]	ρ	1.293	Convention
Heat Capacity of Air [J/kg/°C]	C_p	1005	Convention
Fan Operating Hours During Heating Season [hours/year]	$HOU_{heating}$	703	Operation hours corrected for days that drop below an 18°C average temperature during a 15-year average in Halifax
Average Yearly Temperature Difference Between Indoor and Outdoor Air [°C]	ΔT	13.4	Difference between 15-year average of outdoor temperature in Halifax during the heating days and an assumed indoor temperature of 21°C
COP for Electric Resistance	$COP_{HeatingSource}$	1	Assumption ¹⁶²
COP for Heat Pumps	$COP_{HeatingSource}$	1.8	Assumption ¹⁶³
Energy Savings for Electric Resistance [kWh/year]	Energy Savings [kWh/year]	347	Calculation
Energy Savings for Heat Pumps [kWh/year]	Energy Savings [kWh/year]	193	Calculation

¹⁵⁹ ENERGY STAR, *ENERGY STAR Ventilation Fans Key Product Criteria*, https://www.energystar.gov/products/ventilation_fans/key_product_criteria#:~:text=All%20certifying%20bathroom%20and%20utility,measure%20by%20industry%20standard%20testing (last accessed October 1, 2024).

¹⁶⁰ Vitalijus Pavlovas, *Demand controlled ventilation, A case study for existing Swedish multifamily buildings*. 2004.

¹⁶¹ Efficiency Vermont *Technical Reference Manual*, Program Year 2023, pp. 225-226.

¹⁶² Assuming a COP of 1 for electric resistance (including baseboard and in-floor) and a COP of 1.8 for heat assuming an average HSPF2 of 6.0 for Region V, which corresponds to the minimum for "Split system central heat pumps, other than those that are small-duct and high-velocity or space-constrained" as per the NRCan regulation available at <https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/guide-canadas-energy-efficiency-regulations/split-system-central-air-conditioners-and-heat-pumps/6895>.

¹⁶³ Assuming a COP of 1 for electric resistance (including baseboard and in-floor) and a COP of 1.8 for heat assuming an average HSPF2 of 6.0 for Region V, which corresponds to the minimum for "Split system central heat pumps, other than those that are small-duct and high-velocity or space-constrained" as per the NRCan regulation available at <https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/guide-canadas-energy-efficiency-regulations/split-system-central-air-conditioners-and-heat-pumps/6895>.

Table 117: Electrical Savings Values for Humidity sensor for Bathroom Exhaust Fan

Parameter	Percentage of Heating Source	Energy Savings per Heating Source	Unitary Energy Savings	Reference
Energy Savings for Electric Resistance [kWh/year]	26%	347	90.2	Statistics Canada ¹⁶⁴
Energy Savings for Heat Pumps [kWh/year]	21%	193	40.5	
Fan Energy Savings [kWh/year]	-	-	12.0	-
Energy Savings [kWh/year]	-	-	143	Calculation

Installation Rates

Installation rates for humidity sensors for bathroom exhaust fan are estimated at 100%.

2.5 Plug Load Controls

2.5.1 Interactive Effects

No interactive effects factors are calculated for power bars and outdoor devices because they are assumed to be negligible.

Table 118 summarizes the interactive effects factors for plug load control measures.

Table 118: Interactive Effects Factors for Plug Load Control Measures

Measure	Interactive Effects Factor for Energy Savings	Interactive Effects Factor for Peak Demand Savings	Reference
Smart Power Controller for Audiovisual Equipment	0%	0%	Assumption
Power Bar with Integrated Timer			
Heavy-duty Outdoor Timer			
ENERGY STAR Certified Pool Pump			

2.5.2 Peak Demand Savings Factors

For most plug load control measures, peak demand savings are calculated using the peak demand-to-energy ratios developed by Navigant in the 2016-2018 DSM Plan. These ratios were established for various product categories based on modelled system-coincident peak demand savings and electrical energy savings for a projected deployment of products. Navigant used local data to establish the ratios applicable for the 2016-2018 period. The Evaluator recommends using the same ratios during the 2020-2023 DSM cycle.

As for ENERGY STAR certified variable speed pool pumps, the Evaluator assumes a peak demand-to-energy ratio of zero since these products are not likely used on cold winter days when peak conditions occur.

Table 119 summarizes the peak demand-to-energy ratios established for each plug load control measure.

¹⁶⁴ Statistics Canada, *Table 38-10-0286-01 (formerly CANSIM 153-0145) Primary heating systems and type of energy*, 2021, December 12, 2022.
<https://www150.statcan.gc.ca/t1/tbl1/en/cv/recreate.action?pid=3810028601&selectedNodeIds=1D4&checkedLevels=1D1&refPeriods=20170101,20210101&dimensionLayouts=layout3,layout3,layout2&vectorDisplay=false> (last accessed September 13, 2024).

Table 119: Peak Demand-to-energy Ratios for Plug Load Control Measures

Measure	Peak Demand-to-energy Ratio (W/kWh)	Reference
Smart Power Controller for Audiovisual Equipment	0.000	RES-Plug Load Controls, Navigant 2016-2018 DSM Plan
Power Bar with Integrated Timer		
Heavy-duty Outdoor Timer		
ENERGY STAR Certified Pool Pump	0.000	Assumed by the Evaluator

2.5.3 Plug Load Control Measures

(1) Smart Power Controllers for Audiovisual Equipment

Summary

Table 120 presents a summary of the values used to calculate smart power controller for audiovisual equipment savings. The detailed methodology follows.

Table 120: Smart Power Controllers for Audiovisual Equipment Measure Summary

Parameter	Instant Savings	Reference
Measure Description and Identification		
Measure	Smart power controllers for audiovisual equipment rebated in store	-
Baseline	Non-smart power controllers	
Measure Subcategory	Tier 1 power strip	
General Parameters		
Installation Rate	86%	See details below under Installation Rates
Effective Useful Life [years]	4	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	105	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.000	See Subsection 2.5.2
Unitary Peak Demand Savings [W]	0.00	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.5.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.5.1

Electrical Unitary Energy Savings

Smart power bars rebated under Instant Savings are classified as Tier 1. Tier 1 smart power bars have a master outlet that switches off other outlets when the master device is turned off.

The electrical unitary savings energy value associated with the use of Tier 1 smart power controllers for audiovisual equipment is based on a metering study, published in 2019, of 133 households across Massachusetts.¹⁶⁵ This study represents the most up-to-date research using treatment and control sites with a significantly large sample size.

Table 121 presents the annual unitary savings values for EPI and for Instant Savings and the source of those values.

Table 121: Electrical Unitary Savings Values for Smart Power Controller Audiovisual Equipment

Parameter	Instant Savings	Reference
Unitary Energy Savings [kWh/year]	105	NMR Group, 2019 ¹⁶⁶

Installation Rates

For Instant Savings, the installation rate is 86% is based on the impact evaluation¹⁶⁷ done in parallel to the 2019 Massachusetts metering study.

¹⁶⁵ NMR Group Inc., *RLPNC 17-3: Advanced Power Strip Metering Study*, March 18, 2019.

¹⁶⁶ Ibid.

¹⁶⁷ NMR Group Inc., *RLPNC 17-4 and 17-5: Products Impact Evaluation of In-service and Short-Term Retention Rates Study*, October 5, 2018.

(2) Power Bars with Integrated Timers

Summary

Table 122 presents a summary of the values used to calculate power bar with integrated timer savings. The detailed methodology follows.

Table 122: Power Bar with Integrated Timer Measure Summary

Parameter	Instant Savings	Reference
Measure Description and Identification		
Measure Description	Power bars with integrated timer rebated in store	-
Baseline	Power bars without an integrated timer, controlling a variety of end uses	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	4	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	47.9	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.000	See Subsection 2.5.2
Unitary Peak Demand Savings [W]	0.00	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.5.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.5.1

Electrical Unitary Energy Savings

Table 123 below presents the parameters used in equation below to calculate the electrical unitary savings resulting from the installation of power bars with integrated timers. The methodology and parameters used were drawn from the 2011 OPA Prescriptive Measures and Assumptions List,¹⁶⁸ with a minor adjustment to the number of days used per year; notably, the total 12-month period was set at 365 days instead of 12 times 30 days (360 days).

$$\begin{aligned}
 \text{Energy Savings} \left[\frac{\text{kWh}}{\text{year}} \right] &= \text{Average Standby Wattage [W]} \times \frac{\text{kW}}{1,000 \text{ W}} \times (\text{Old Operating Time} - \text{New Operating Time}) \left[\frac{\text{hrs}}{\text{day}} \right] \\
 &\times \text{Number of Days}
 \end{aligned}$$

¹⁶⁸ Ontario Power Authority (OPA), 2011 Prescriptive Measures and Assumptions Version 1, March 2011.

Table 123: Electrical Unitary Savings Value for Power Bars with Integrated Timers

Parameter	Entertainment Centre	Computer System	Lighting	Other
Proportion	40.3%	15.7%	19.4%	24.6%
Average Standby Wattage	38.1 W	28 W	21.6 W ¹⁶⁹	28 W
Old Operating Time	9 hrs/day	14 hrs/day	6 hrs/day	11 hrs/day
New Operating Time – with Timer	5 hrs/day	8 hrs/day	3 hrs/day	4 hrs/day
Number of Days	365	365	259	262
Calculated Unitary Energy Savings [kWh/year]	55.6	61.3	16.8	51.4
Weighted Unitary Energy Savings [kWh/year]	47.9			

Installation Rates

The installation rate is assumed to be 100%.

(3) Heavy-duty Outdoor Timers

Summary

Table 124 presents a summary of the values used to calculate heavy-duty outdoor timer savings. The detailed methodology follows.

Table 124: Heavy-duty Outdoor Timer Measure Summary

Parameter	Instant Savings	Reference
Measure Description and Identification		
Measure Description	Heavy-duty outdoor timers rebated in store	-
Baseline	Outdoor outlets without timers	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	10	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	122	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.000	See Subsection 2.5.2
Unitary Peak Demand Savings [W]	0.00	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.5.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.5.1

¹⁶⁹ Weighted average wattage per installed lamp of different lighting technologies observed in residences by the United States Department of Energy: U.S. Department of Energy. *2020 U.S. Lighting Market Characterization*, April 2024, p. 37.

Electrical Unitary Energy Savings

For heavy-duty outdoor timers, the electrical unitary energy savings value of 122 kWh is based on the results of the OPA 2012 Consumer Program Evaluation.¹⁷⁰ The survey conducted for that evaluation states that heavy-duty outdoor timers sold through the OPA biannual coupon program are used for outdoor lighting, pool pumps, and car block heaters, all of which correspond to possible usages for heavy-duty outdoor timers sold through Instant Savings. Table 125 presents the annual unitary savings value for Instant Savings.

Table 125: Electrical Unitary Savings Values of Heavy-duty Outdoor Timers

Parameter	Value	Reference
Unitary Energy Savings [kWh/year]	122	OPA, 2012 ¹⁷¹

Installation Rates

The installation rate is assumed to be 100%.

(4) ENERGY STAR Certified Pool Pumps

Summary

Table 126 presents a summary of the values used to calculate ENERGY STAR certified pool pump savings. The detailed methodology follows.

Table 126: ENERGY STAR Certified Pool Pump Measure Summary

Parameter	Instant Savings	Reference
Measure Description and Identification		
Measure Description	ENERGY STAR certified pool pumps rebated in store	-
Baseline	Standard efficiency electric pool pump	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	10	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	530	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.000	See Subsection 2.5.2
Unitary Peak Demand Savings [W]	0.00	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.5.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.5.1

¹⁷⁰ Research into Action, *Final Report: 2012 Consumer Program Evaluation*, Report presented to OPA, October 11, 2013, p. 154.

¹⁷¹ Ibid.

Electrical Unitary Energy Savings

The electrical unitary energy savings values of ENERGY STAR certified pool pumps are calculated using the equations below.

$$\text{Energy Savings} \left[\frac{kWh}{yr} \right] = \text{Base Consumption} - \text{Reduced Consumption}$$

$$\text{Base Consumption} \left[\frac{kWh}{yr} \right] = \text{Average Power} [kW] \times \text{Old HOU} \left[\frac{h}{day} \right] \times \text{Pool Season} \left[\frac{days}{yr} \right]$$

$$\text{Reduced Consumption} \left[\frac{kWh}{yr} \right] = \text{Average Power} [kW] \times \text{RSF} [-] \times \text{New HOU} \left[\frac{h}{day} \right] \times \text{Pool Season} \left[\frac{days}{yr} \right]$$

The unitary savings value of 530 kWh comes from the 2020 NEEP TRM¹⁷² and the Pool Pump Demand Response Potential Report.¹⁷³ The value is based on the difference in consumption between an average pool pump operating 5.18 hours per day during a 100-day pool season and a two-speed pool pump with the same power consumption but operating at its lower speed (half speed) for twice the operation time, which is 10.4 hours in this case. The savings are generated through pump affinity laws, which dictate that pump power is proportional to the cube of pump speed. Therefore, if a pump is operating at half speed, its power demand is at one-eighth its usual amount, and since it is operating for twice the usual time, the same amount of water is moved.

Table 127 presents the annual unitary savings value for Instant Savings.

Table 127: Unitary Savings Values of ENERGY STAR Certified Pool Pumps

Parameter	Value	Reference
Average Power [kW]	1.36	Pool Pump Demand Response Potential Report, 2008 ¹⁷⁴
Old Operating Time [h/day]	5.18	Pool Pump Demand Response Potential Report, 2008 ¹⁷⁵
Pool Season [days/year]	100	2020 NEEP TRM ¹⁷⁶
New Operating Time [h/day]	10.4	Assumption
Reduced Speed Factor (RSF) [-]	0.125	Pump affinity law convention
Unitary Energy Savings [kWh/year]	530	Calculation

Installation Rates

The installation rate is assumed to be 100%.

¹⁷² Northeast Energy Efficiency Partnership (NEEP), *Mid-Atlantic Technical Reference Manual Version 10*, May 2020, p. 195.

¹⁷³ Southern California Edison, *Pool Pump Demand Response Potential*, June 2008.

¹⁷⁴ Southern California Edison, *Pool Pump Demand Response Potential*, June 2008, p. 13.

¹⁷⁵ Southern California Edison, *Pool Pump Demand Response Potential*, June 2008, p. 19.

¹⁷⁶ Northeast Energy Efficiency Partnership (NEEP), *Mid-Atlantic Technical Reference Manual Version 10*, May 2020, p. 195.

2.6 Demand Reduction

For one category of demand reduction measures, namely demand response measures, the peak demand savings are replaced by the available DR capacity that differs from peak demand savings because the available DR capacity considers the potential load reduction that was made available instead of the actual load reduction that coincided with the actual utility peak.

2.6.1 Interactive Effects

For demand reduction measures, interactive effects are assumed to be nil.

2.6.2 Peak Demand Savings Factors

For demand reduction measures, peak demand savings are not determined using a peak demand-to-energy ratio since they do not generate energy savings. For more details, refer to Subsection 2.6.3.

2.6.3 Demand Reduction Measures

(1) Domestic Water Heater Timers

Summary

Table 128 presents a summary of the values used to calculate domestic water heater timer (DWHT) savings. The detailed methodology follows.

Table 128: Domestic Water Heater Timer Measure Summary

Parameter	Green Heat	Reference
Measure Description and Identification		
Measure Description	Domestic water heater timers rebated after purchase	-
Baseline	Electric water heaters without timers	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	15	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	-	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	-	N/A
Unitary Peak Demand Savings [W]	500	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	N/A	See Subsection 2.6.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.6.1



Electrical Unitary Energy Savings

No energy savings are expected from this measure.

Unitary Peak Demand Savings

Since no information could be found in the literature, the peak demand savings of DWHTs were based on Nova Scotia Power estimates in their 2019 Load Forecast Report.¹⁷⁷

In that report, the average peak contribution is estimated at 0.57 kW per tank. Therefore, shutting down the hot water system results in 0.57 kW in peak demand savings. This value is based on internal research on metered hot water tanks for which no details are available, except that the average tank power is approximately 3 kW and the coincident system peak of water heaters indicates that approximately one in five water heaters is on.

To account for uncertainties around this value, the peak demand savings were rounded down to 500 W. This value was deemed acceptable and conservative since it is lower than the baseline peak demand in the Hydro-Québec study for three-element water heaters.

Installation Rates

Installation rates for DWHTs are estimated at 100% since they are installed and programmed by certified installers. In addition, the programming is locked after installation, meaning that participants need to contact the installer or Nova Scotia Power to prevent their interruption, leaving little room for savings to end prematurely.

(2) Electric Thermal Storage

Summary

Table 129 presents a summary of the values used to calculate electric thermal storage savings. The detailed methodology follows.

¹⁷⁷ Nova Scotia Power. *2019 Load Forecast Report - Redacted*, April 30, 2019, p. 28.

Table 129: Electric Thermal Storage Measure Summary

Parameter	Green Heat	Reference
Measure Description and Identification		
Measure Description	Electric thermal storage systems rebated after purchase	-
Baseline	Heating systems without electric thermal storage systems	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	18	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	-	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	-	-
Unitary Peak Demand Savings [W]	Maximum storage capacity in eight hours divided by 16 hours	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	N/A	See Subsection 2.6.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 2.6.1

Electrical Unitary Energy Savings

No energy savings are expected from this measure.

Unitary Peak Demand Savings

For electric thermal storage, an eight-hour charging period is assumed based on the residential off-peak period in Nova Scotia Power's time of day rate. It is also assumed that the stored heat is provided equally throughout the remaining 16 hours of the day.

Therefore, the unitary peak demand unitary savings for electric thermal storage are calculated using the equation below where the maximum storage capacity is drawn from manufacturer specification sheets and is the lowest value between either the maximum system storage capacity or the maximum amount of energy the system can store in eight hours.

$$Peak\ Demand\ Savings_W = Maximum\ Storage\ Capacity\ in\ 8h/16h$$

Installation Rates

Installation rates for electric thermal storage systems are estimated at 100% due to their relatively high cost.

(3) Domestic Water Heater Load Control

Summary

Table 130 presents a summary of the values used to calculate domestic water heater load control savings.

The detailed methodology follows.

Table 130: Domestic Water Heater Load Control Measure Summary

Parameter		Demand Response	Reference
Measure Description and Identification			
Measure		Direct load control for domestic water heaters with direct installation	-
Baseline		Domestic water heaters without direct load control	
General Parameters			
In-service Rate	Portion of Season with Enrolment	53.5%	See details below under In-service Rates
	Participation Rate	22.5%	
Effective Useful Life [years]		7	Applicable to new available DR capacity See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]		-	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]		-	-
Available DR Capacity [W]		385 ± 3%	See details below under Available DR Capacity
Interactive Effects Factor for Energy Savings		N/A	See Subsection 2.6.1
Interactive Effects Factor for Available DR Capacity		0%	See Subsection 2.6.1

Electrical Unitary Energy Savings

No energy savings are expected from this measure.

Available DR Capacity

The unitary available DR capacity for domestic water heater load controls is based on the metering data analysis results from the 2023 Residential Demand Response evaluation. During the 2021-2022 and 2022-2023 heating seasons, E1 collected data for all participating units and all events. Using the metering data, it was established that each unit reduced demand by an average of 385 W during the two first hours when events were called.

In-service Rates

The in-service rate was separated into two components: The portion of the DR season during which devices were enrolled and the participation rate of those enrolled devices during DR events. While all controllers remained installed, connectivity issues resulted in not all controllers generating savings when events were called, the impact of which was included through the participation rate as listed in Table 131. The portion of the DR season with enrolled devices accounts for new participants who continued to register throughout the DR season. Although the unitary available DR capacity value was not updated through the 2025 evaluation, the participation rate and portion of the DR season with enrolled devices were updated since they significantly changed.

Table 131: Domestic Water Heater Load Control Measure Parameters Included in the In-service Rate

Parameter	Value	Margin of Error	Reference
Portion of Season with Enrolment	53.5%	-	Residential DR 2025 evaluation
Participation Rate	22.5%	1.7%	Residential DR 2025 evaluation

(4) Smart Thermostat Load Control

Summary

Table 132 presents a summary of the values used to calculate smart thermostat load control savings. The detailed methodology follows.

Table 132: Smart Thermostat Load Control Measure Summary

Parameter	Demand Response				Reference
Measure Description and Identification					
Measure	Direct load control for smart thermostats				-
Baseline	Smart thermostats without direct load control				
Measure Subcategory	Electric Baseboard Only	MSHP Only	Electric Baseboard and MSHP	Others	
General Parameters					
In-service Rate (Portion of Season with Enrolment)	62.2%	61.1%	66.9%	54.7%	See details below under In-service Rates
Effective Useful Life [years]	1				See Subsection 3.2
Electrical Energy Savings Parameters					
Electrical Unitary Energy Savings [kWh/year]	-				See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	-				-
Available DR Capacity [W]	112	119	69.1	92.6	See details below under Available DR Capacity
Interactive Effects Factor for Electrical Energy Savings	N/A				See Subsection 2.6.1
Interactive Effects Factor for Available DR Capacity	0%				See Subsection 2.6.1

Electrical Unitary Energy Savings

No electrical energy savings are expected from this measure.

Available DR Capacity

The unitary available DR capacity for smart thermostat load control is based on the metering data analysis results from the 2025 Residential Demand Response evaluation. During the 2024-2025 heating season, E1 collected data on 2,595 participants that had at least one smart thermostat enrolled in Residential DR. After electric utility account number matching and data cleaning, 1,222 participants were retained for regression analysis. There were communication issues that occurred for several smart thermostats in one event and another event that was considered an outlier due to baseline and actual consumption levels not matching daily consumption. Despite these, all four smart thermostat load control categories had sufficient metering data from at least six events. The established available DR capacity per thermostat type is presented in Table 133.

Table 133: Available DR Capacity per Smart Thermostat Type

	Electric Baseboard Only	MSHP Only	Electric Baseboard and MSHP Only	Others	Source
Average Available DR Capacity Per Participant, Excluding Outliers (W/Participant)	581 ± 8%	226 ± 20%	518 ± 13%	426 ± 7%	Residential DR 2025 evaluation
Average Number of Smart Thermostats per Participant	5.2	1.9	7.5	4.6	
Unitary Available DR Capacity per Thermostat (W/Thermostat)	112	119	69.1	92.6	

In-service Rates

For smart thermostat load control, participants were not removed from the whole-home data analysis if they opted out of an event or had connectivity issues, meaning that the participation rate is already included in the unitary available DR capacity values. Therefore, the in-service rate for smart thermostat load control corresponds directly to the portion of the season with enrolment, as presented in Table 134.

Table 134: Smart Thermostat Control Measure Parameters Included in the In-service Rate

Parameter	Electric Baseboard Only	MSHP Only	Electric Baseboard and MSHP Only	Others	Reference
Portion of Season with Enrolment	61.9%	59.6%	65.9%	54.7%	Residential DR 2025 evaluation

(5) Battery Control

Summary

Table 135 below presents a summary of the values used to calculate battery control savings. The detailed methodology follows.

Table 135: Battery Control Measure Summary

Parameter	Demand Response	Reference
Measure Description and Identification		
Measure	Direct load control for batteries	-
Baseline	Battery consumption of participating homes on non-event days	
General Parameters		
In-service Rate (Participation Rate)	58.0%	See details below under In-service Rates
Effective Useful Life [years]	1	See Subsection 3.2
Electrical Energy Savings Parameters		
Electrical Unitary Energy Savings [kWh/year]	-	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	-	-
Available DR Capacity [W]	763 W/kW of enrolled capacity	See details below under Available DR Capacity
Interactive Effects Factor for Electrical Energy Savings	N/A	See Subsection 2.6.1
Interactive Effects Factor for Available DR Capacity	0%	See Subsection 2.6.1

Electrical Unitary Energy Savings

No electrical energy savings are expected from this measure.

Available DR Capacity

The unitary available DR capacity for battery control is based on the metering data analysis results from the 2025 Residential Demand Response evaluation. During the 2024-2025 heating season, E1 collected data on all participating units and all events. Using the metering data, it was established that each unit reduced demand by an average of 763 W per enrolled kW of capacity.

In-service Rates

For battery control, the portion of the season with enrolment was encompassed in the participation rate that was measured by looking at the percentage of participating enrolled capacity compared to the total enrolled capacity for each event. Therefore, the in-service rate directly corresponds to the participation rate, as outlined in Table 136.

Table 136: Battery Control Measure Parameters Included in the In-service Rate

Parameter	Value	Reference
Participation Rate	58.0%	Residential DR 2025 evaluation

(6) EV Telematic and Charger Control

Summary

Table 137 presents a summary of the values used to calculate EV telematic and charger control savings. The detailed methodology follows.

Table 137: EV Telematic and Charger Control Measure Summary

Parameter	Demand Response	Reference
Measure Description and Identification		
Measure	Direct load control for EV telematics and chargers	-
Baseline	EV telematics and chargers without direct load control	
General Parameters		
In-service Rate (Participation Rate)	2.9%	See details below under In-service Rates
Effective Useful Life [years]	1	See Subsection 3.2
Electrical Energy Savings Parameters		
Electrical Unitary Energy Savings [kWh/year]	-	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	-	-
Available DR Capacity [W]	4,015	See details below under Available DR Capacity
Interactive Effects Factor for Electrical Energy Savings	N/A	See Subsection 2.6.1
Interactive Effects Factor for Available DR Capacity	0%	See Subsection 2.6.1

Electrical Unitary Energy Savings

No energy savings are expected from this measure.

Available DR Capacity

The unitary available DR capacity for EV telematic and charger control is based on the metering data analysis results from the 2025 Residential Demand Response evaluation. During the 2024-2025 heating season, E1 collected data on all participating units and all events. Using the metering data, it was established that each unit reduced demand by an average of 4,015 W with a margin of error of 11%.

In-service Rates

For EV telematic and charger control, the portion of the season with enrolment was encompassed in the participation rate, which was measured by looking at the percentage of participating devices. Therefore, the in-service rate directly corresponds to the participation rate, as outlined in Table 138 below.

**Table 138: EV Telematic and Charger Control Measure
Parameters Included in the In-service Rate**

Parameter	Value	Reference
Participation Rate	2.9%	Residential DR 2025 evaluation

2.7 Renewables

2.7.1 Interactive Effects

Interactive effects are assumed to be nil for solar photovoltaic (PV) projects since the equipment involved in such systems is typically installed outdoors.

2.7.2 Peak Demand Savings Factors

For solar PV projects, peak demand savings are nil since the solar PV energy production from those systems coinciding with the peak period is negligible.

2.7.3 Renewable Measures

(1) Solar Photovoltaic Systems

Summary

Table 139 presents a summary of the values used to calculate savings for solar photovoltaic (PV) projects. The detailed methodology follows.

Table 139: Solar Photovoltaic System Measure Summary

Parameter	HEA	Reference
Measure Description and Identification		
Measure	Solar PV systems of a maximum of 100 kW, rebated after installation	-
Baseline	No solar PV systems	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	30	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on data for each installed system	See details below under Electrical Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0	See Subsection 2.7.2
Unitary Peak Demand Savings [W]	0	Calculation
Interactive Effects Factor for Energy Savings	0%	See Subsection 2.7.1
Interactive Effects Factor for Peak Demand Savings	0%	Ibid

Electrical Unitary Energy Savings

The electrical unitary energy savings for solar PV under HEA come from the average savings of projects rebated by SolarHomes (government funded). The SolarHomes project savings were calculated using the variables defined and listed in the equations and tables below. For each solar PV project, modelled energy production should be obtained either with PV Watts should include 14% of miscellaneous losses as pre-defined in the modelling tool, as well as a snow loss factor.

$$\text{Energy Savings per Project [kWh]} = \text{Modelled Energy Production [kWh]} \times \text{Adj. Ratio}$$

Table 140: Electrical Savings Values for SolarHomes

Parameter	Symbol	Value	Reference
Modelled Energy Production [kWh]	-	Varies per project	Project documentation, using PV Watts
Snow Loss Factor [%]	-	For panel tilt angles $\geq 25^\circ$: 1%	Northern Alberta Institute of Technology ¹⁷⁸
		For panel tilt angles $< 25^\circ$: 4%	
Adjustment Ratio	Adj. Ratio	Projects modelled with PV Watts: 1.009	Calibration study done as part of SolarHomes 2022/2023 Evaluation
Unitary Energy Savings [kWh/year]	-	Calculated based on data for each installed system	Calculation

For HEA, savings are calculated by multiplying the system capacity in kW by a factor of 1,086 kWh/kW, which was obtained by averaging the calibrated savings (i.e. including the 1.009 adjustment factor) for all 2021/2022 and 2022/23 projects in SolarHomes.

Installation Rates

The installation rate is assumed to be 100% given the verification of the measure that is done through HEA's E assessment and the fact that the calibration study for SolarHomes would have captured any discrepancies in installed systems.

¹⁷⁸ Northern Alberta Institute of Technology, *Solar Photovoltaic Reference Array Report*, March 31, 2016.

3 Effective Useful Life

This section outlines the EUL values used to calculate lifetime energy savings. This section also presents EUL values for demand reduction measures; these values are not used to calculate lifetime energy savings since those measures do not save energy. For demand response measures, the EUL represents the number of years for which the demand reduction is expected to persist. The EUL values should be used when calculating cost-effectiveness ratios for measures, in order to account for lifetime benefits.

3.1 LED Lamps and Fixtures

To establish lifetime energy savings for LED lamps and fixtures, the equipment life is determined using rated lifetimes identified in product specification sheets and annual HOU, as described in the equation below.

$$\text{Equipment Life [Years]} = \frac{\text{Rated Lifetime [Hours]}}{\text{Annual HOU [Hours]}}$$

Since regulatory changes will cause the baseline to shift gradually to LED over the lifetime of LEDs and thus decrease annual savings over the lifetime of the product, an equivalent EUL is necessary to determine lifetime savings. The equivalent EUL is multiplied by first-year savings to obtain lifetime energy savings. Since the equivalent EUL is based on upcoming regulatory changes, it must be updated annually to take into account the changing duration of each baseline. The detailed assumptions and calculations to obtain equivalent EUL values are presented in Appendix III.

Table 141 summarizes the equivalent EUL values for residential LED lamps and fixtures.

Table 141: EUL Values for Residential LED Lamps and Fixtures

Measure	Program Component	2025 Equivalent EUL (years)
LED A19 Lamps		
9 W Replacing 25 W	EPI	1.0
9 W Replacing 29 W		1.0
9 W Replacing 40 W		1.0
9 W Replacing 43 W		1.0
9 W Replacing 60 W		1.0
9 W Replacing 72 W		1.0
9 W Replacing 100 W		1.0
9 W Replacing 150 W		1.0
9.5 W Replacing 25 W		1.0
9.5 W Replacing 29 W		1.0
9.5 W Replacing 40 W		1.0
9.5 W Replacing 43 W		1.0
9.5 W Replacing 60 W		1.0
9.5 W Replacing 72 W		1.0
9.5 W Replacing 100 W		1.0
9.5 W Replacing 150 W		1.0
18 W Replacing 75 W		1.0
18 W Replacing 100 W		1.0
7 W Black-out Bulbs Replacing 60 W		1.0
LED Reflector Lamps		
PAR20 7 W Replacing 50 W	EPI	1.0
PAR30 8 W Replacing 53 W		1.0
PAR30 8 W Replacing 75 W		1.0
PAR38 15 W Replacing 90 W		1.0
PAR38 15 W Replacing 120 W		1.0
PAR38 15 W Replacing 150 W		1.0
GU10 7 W Replacing 35 W		1.0
GU10 7 W Replacing 50 W		1.0
LED Decorative Lamps		
4.5 W G25	EPI	1.0
5 W Chandelier E12		
Other LED Lighting		
LED Nightlights	EPI	1.0
LED Fixtures		
ENERGY STAR Certified LED Fixtures with Motion Sensors	Instant Savings	10
Solar Fixtures	EPI, Instant Savings	<u>Instant Savings</u> : 10 EPI: 2.5

3.2 Other Measures

The EUL values for non-LED lighting measures were established by conducting a literature review of the most recent sources, notably technical reference manuals (TRMs) and studies, used in other jurisdictions.

Table 142 below summarizes the EUL values and their source for residential measures.

Table 142: EUL Values and Sources for Non-LED Lighting Residential Measures

Measure Name	Program Component	EUL Value	Reference
Appliances			
Clotheslines and Outdoor Drying Racks	Instant Savings	10	IESO Prescriptive Measures and Assumptions (PMA) List, 2019 (Value for indoor clothes drying racks, retractable clotheslines or drying racks)
Indoor Drying Racks	EPI	10	IESO, PMA List, 2019 (Value for indoor clothes drying racks, retractable clotheslines or drying racks)
Refrigerator Retirements	ARet	4	ENERGY STAR Calculator, Appliance Magazine Market Research Report, 2011 Calculation based on the assumption that the EUL of the retired appliance (4 years) corresponds to one third of the EUL of a new appliance (12 years). An equivalent EUL is calculated to account for the baseline increase occurring over the lifetime of the measure
Freezer Retirements	ARet	4	ENERGY STAR Calculator, Appliance Magazine Market Research Report, 2011 Calculation based on the assumption that the EUL of the retired appliance (4 years) corresponds to one third of the EUL of a new appliance (12 years). An equivalent EUL is calculated to account for the baseline increase occurring over the lifetime of the measure
Room Air-conditioner Retirements	ARet	3	DEER, 2014 (Value for room air conditioner recycling)
Dehumidifier Replacements	ARet	5	ENERGY STAR Calculator, Appliance Magazine Market Research Report, 2011 Calculation based on the assumption that the EUL of the retired appliance (4 years) corresponds to one third of the EUL of a new appliance (12 years). An equivalent EUL is calculated to account for the baseline increase occurring over the lifetime of the measure
ENERGY STAR Certified Clothes Dryers	Instant Savings	12	ENERGY STAR Calculator, 2016 (Value for clothes dryers)

Measure Name	Program Component	EUL Value	Reference
Efficient Clothes Washers	Instant Savings	11	ENERGY STAR Calculator, 2016 (Value for clothes washers) DOE, Building Energy Data Book, 2011, Table 5.7.15 (Value for clothes washers) DEER, 2014 (Value for high efficiency clothes washers)
Efficient Washer-Dryer Combination Units	Instant Savings	11	Minimum between clothes washer and dryer EUL values
ENERGY STAR Certified Room Air Purifiers	Instant Savings	9	ENERGY STAR Calculator, 2016 (Value for air purifiers)
ENERGY STAR Certified Dishwashers	Instant Savings	11	DEER, 2014 ¹⁷⁹ (Value for high efficiency dishwashers)
ENERGY STAR Certified Bathroom Exhaust Fans	Instant Savings	19	Illinois TRM, 2025
Humidity Sensor for Bathroom Exhaust Fans	EPI	9.5	Illinois TRM, 2024 (Half the value of High Efficiency Bathroom Exhaust Fan to account for remaining useful life of existing fan)
Appliance Upgrade	AMH	11	Values for appliance upgrades typically vary between 10 and 12 years, so a value of 11 years was assumed
Lighting Controls			
Dimmer Switches	EPI, Instant Savings	10	IESO PMA List, 2019 (Value for dimmer switches)
Motion Sensors	EPI, Instant Savings	10	IESO PMA List, 2019 (Value for motion sensors)
Water Heating			
Drain Water Heat Recovery	HEA, MHEEP	20	Minnesota TRM, 2020 (Value for residential hot water – drainpipe heat exchangers)
Solar Domestic Hot Water	Green Heat, HEA	20	ENERGY STAR Residential Water Heaters: Draft Criteria Analysis ¹⁸⁰ (Table 1, value for solar water heaters)
Heat Pump Water Heaters	HEA, Instant Savings	15	Connecticut Energy Efficiency Board, 2022 ¹⁸¹ (Value for heat pump water heaters)
Low-flow Showerheads	EPI, Instant Savings	10	DEER, 2014 (Value for low-flow showerheads)
Faucet Aerators	EPI	10	DEER, 2014 (value for faucet aerators)

¹⁷⁹ California Public Utilities Commission. DEER 2014. *EUL table* update, Excel spreadsheet (version 2014) downloadable via READI <http://www.deeresources.com/index.php/23-deer-versions/27-deer-2014> (last accessed June 16, 2020).

¹⁸⁰ Retrieved from https://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/water_heaters/WaterHeaterDraftCriteriaAnalysis.pdf.

¹⁸¹ MichaelsEnergy. *X2001: Connecticut Measure Life/EUL Update Study – Residential & Commercial*, May 11, 2023, p. 17.

Measure Name	Program Component	EUL Value	Reference
Thermostatic Shower Valves	EPI	10	Efficiency Maine TRM, 2019 New York TRM, 2019: UPC certification under the International Association of Plumbing and Mechanical Officials Standard IGC 244-2007a. A standard that includes a lifecycle test consisting of 10,000 cycles without fail. 10,000 cycles are the equivalent of three users showering daily for more than nine years
Pipe Insulation	EPI	13	DEER, 2014 (Value for pipe insulation – electric water heater)
Hot Water Tank Wraps	EPI	7	DEER, 2014 (Value for water heater tank wraps)
Water Heating	AMH	10	DEER, 2014 (Value for heat pump water heaters)
Space Heating			
Mini-split Heat Pumps	AMH, ASFH, Green Heat, HEA, MHEEP	18	GDS, 2007 (Table 1 – Residential Measures, value for AC/heat pumps)
Central Air-source Heat Pumps	Green Heat, HEA	18	GDS, 2007 (Table 1, value for AC/heat pumps)
Ground-source Heat Pumps	Green Heat, HEA	25	Life expectancy estimated by the U.S. Department of Energy ¹⁸² (up to 24 years for the inside component and more than 50 years for the ground loop) and by Natural Resources Canada ¹⁸³ (about 20 to 25 years)
Wood Stoves/Fireplace Inserts	Green Heat, HEA	18	GDS, 2007 (Table 1 – Residential Measures, value for replacement/retrofit of heating and cooling systems)
Pellet Stoves/Fireplace Inserts	Green Heat, HEA	18	GDS, 2007 (Table 1 – Residential Measures, value for replacement/retrofit of heating and cooling systems)
Wood Furnaces/Boilers	Green Heat, HEA	18	GDS, 2007 (Table 1 – Residential Measures, value for replacement/retrofit of heating and cooling systems)
Pellet Furnaces/Boilers	Green Heat, HEA	18	GDS, 2007 (Table 1 – Residential Measures, value for replacement/retrofit of heating and cooling systems)
Solar Air Heating	Green Heat	20	ENERGY STAR Residential Water Heaters: Draft Criteria Analysis ¹⁸⁴ (Table 1, value for solar water heaters) No information specific to solar air heating was available in the literature. The EUL of solar air heating systems is at least equivalent to that of solar DHW systems because solar air heating has very few mobile mechanical components
Air Sealing Products	EPI	15	GDS, 2007 (Table 1 – Residential Measures, value for air sealing)
Window Film Kits	EPI	1	Assumption based on the unlikelihood that the same film would be removed and reapplied every year without it being damaged and replaced over time

¹⁸² Retrieved from <https://energy.gov/energysaver/heat-and-cool/heat-pump-systems/geothermal-heat-pumps#306534-tab-1>.

¹⁸³ Retrieved from <https://www.nrcan.gc.ca/energy-efficiency/energy-star-canada/about-energy-star-canada/energy-star-announcements/publications/heating-cooling-heat-pump/ground-source-heat-pumps-earth-energy-systems/6833>.

¹⁸⁴ Retrieved from https://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/water_heaters/WaterHeaterDraftCriteriaAnalysis.pdf.

Measure Name	Program Component	EUL Value	Reference
Programmable Thermostats	ASFH, Instant Savings, MHEEP	10	GDS, 2007 (Table 1 – Residential Measures; value for residential programmable thermostats)
Smart Thermostats for Electrical Heating Systems	ASFH, EPI, Instant Savings	10	Various EUL values are used among jurisdictions. The common practice is to use the same EUL value as for programmable thermostats
Advanced Learning Thermostat for Central Heating Systems	EPI	10	Various EUL values are used among jurisdictions. The common practice is to use the same EUL value as for programmable thermostats
Plug Load Controls			
Smart Power Controllers for Audiovisual Equipment/Load Sensing Power Bars (Smart Strips)	EPI, Instant Savings	4	David Rogers, PowerSmart Engineering “Smart Strip Electrical Savings Usability.” October 2008, p. 22
Power Bars with Integrated Timer	Instant Savings	4	David Rogers, PowerSmart Engineering “Smart Strip Electrical Savings Usability.” October 2008, p. 22
Heavy-duty Outdoor Timers	Instant Savings	10	IESO PMA List, 2019 (Value for heavy duty plug-in timers)
ENERGY STAR Certified Pool Pumps	Instant Savings	10	ENERGY STAR Calculator, 2016 (Value for pool pumps)
Demand Reduction			
Three-element Water Heaters	Green Heat	12	Hydro-Québec, 2011 ¹⁸⁵
Domestic Water Heater Timers	Green Heat	15	GDS, 2007 (Appendix C – Additional Documentation on Targeted Measures and Preliminary Measure Life Value Data for Other Residential and C&I End-Use Equipment, Value for Water Heater Controls)
Electric Thermal Storage	Green Heat	18	The EUL is expected to be comparable to other heating systems. The EUL therefore corresponds to the value used for stoves, furnaces/boilers, and air-source heat pumps
Domestic Water Heater Load Control	Demand Response	1	For Residential DR, an EUL value of 1 year is used since the available DR capacity of a participant is counted each year and does not need to be extrapolated over its lifetime
Smart Thermostat Load Control	Demand Response	1	For Residential DR, an EUL value of 1 year is used since the available DR capacity of a participant is counted each year and does not need to be extrapolated over its lifetime

¹⁸⁵ Hydro-Québec. *Essais terrain 2007-2008 d'un nouveau concept de chauffe-eau électrique à 3 éléments*, provided by Hydro-Québec - Not publicly available, March 15, 2011.

Measure Name	Program Component	EUL Value	Reference
Battery Control	Demand Response	1	For Residential DR, an EUL value of 1 year is used since the available DR capacity of a participant is counted each year and does not need to be extrapolated over its lifetime
EV Telematic and Charger Control	Demand Response	1	For Residential DR, an EUL value of 1 year is used since the available DR capacity of a participant is counted each year and does not need to be extrapolated over its lifetime
Renewables			
Solar PV	HEA	30	NREL, 2020. ¹⁸⁶ Nearly 90% of respondents to this study gave an EUL of at least 30 years, making this a conservative estimate
Other			
Modelled Space Heating Equipment and Building Envelope Measures	HEA, MHEEP	20.5	The EUL value of 20.5 years for building envelope measures and space heating equipment modelled in HOT2000 was established by calculating the weighted average of EUL values associated with building envelope and heat pump measures installed under HEA in 2024
Building Envelope	AMH	30	California Public Utilities Commission, 2023 ¹⁸⁷

¹⁸⁶ NREL. *Benchmarking Utility-Scale PV Operational Expenses and Project Lifetimes*, June 2020, p.3.

¹⁸⁷ DNV. *Residential Insulation Measure Effective Useful Life Study Final Report*, December 22, 2023, p.16.

4 Commercial Measure Assessment Change Log

Table 143: Commercial Measure Assessment Change Log

Change Type	Section	Description	Date
Update	1.1.1(2) Advanced RTU Controls	Update savings calculation methodology	2023-03-09
Update	3.1 EUL - LED Lamps and Fixtures Appendix III	Update EUL values and rationale for using an equivalent EUL to account for LED lamps becoming the baseline in 2025	2023-03-09
New Measure	1.1.1(6) Compressed Air Leak Repairs	Added compressed air leak repairs since a standard approach was developed for these Custom projects	2023-03-09
New Measure	3.6 (1) Variable Frequency Drives for non-HVAC Applications	Added variable frequency drives for non-HVAC fans and pumps applications since this measure was added to the BER Application Rebates offering	2023-03-09
Update	6.1.1 Interactive Effects 6.1.4 Lighting Measures	Update interactive effects factors for commercial lighting measures	2023-03-09
Removal	Booster Pump (for BER Instant Rebates only)	No longer offered	2024-03-12
Format	All sections	Creation of separate documents for Residential and Commercial Measure Assessment Reports	2025-03-19
New Measure	1.1.1(8) LED Roadway Lighting		2025-03-19
New Measure	(3) Smart Thermostats for Electric Heating	Added smart thermostats for electric baseboards to the BER Application Rebates offering. Unitary savings developed based on the residential measure	2025-03-19
New Measure	6.8 Solar	Added a section for the solar DHW system and solar space heating system measures for BER Application Rebates and SBES, adapted from the residential entries. Also added the photovoltaic system measure to the BER Application Rebates and SBES offerings. EUL updated	2025-03-19
New Measure	6.7 Pool Pumps	Added a section for the pool pump measures for BER Application Rebates and SBES	2025-03-19
Update	3.2 EUL – Other Measures	Update the EUL the commercial Small ASHP	2025-03-19
New Measure	6.3.4 HVAC Measures (6) Heat Pump Water Heaters 6.5.4 Compressed Air Measures 6.9 Refrigeration 6.10 Agriculture 6.11 Commercial Kitchen 6.12 Commercial Laundry Equipment 6.13 Commercial IT and	Added measures that were previously only described in the BER CIRx Screening Tool v1.6	2025-03-19
Update	1.1.1(1) LED Lamps	PCF was corrected from 59% to 54%	2025-03-19

Change Type	Section	Description	Date
Update	6.1.4 Lighting Measures	For LED Linear Fixtures, LED Linear Lamps, LED Outdoor Fixtures, and LED Directional and Architectural Fixtures, the HOU for BER-IR updated based on 2021-2023 BER-AR and SBES. Savings algorithms were added for BER-AR and SBES	2025-03-19
Update	(6) Occupancy/Motion Sensors	Update average wattage with BER-AR-SBES 2020-2023	2025-03-19
Update	(7) LED Nightlights	EUL corrected to 1.0 to align with all other general-use lamp baseline change in 2025	2025-03-19
New Measure	(9) Horticultural Lighting	Added horticultural lighting to BER-IR and BER-AR offerings	2025-03-19
Update	(4) Air-source Heat Pumps Less Than 65,000 Btu/h (excluding air-to-water)	Updated the baseline default Seasonal energy efficiency ratio (SEER) value	2025-03-19
Update	6.4.1 Interactive Effects	Modification of HP COP to 1.8	2025-03-19
Update	6.4.4(1) Low-flow Showerheads	Updated electric water heating efficiency	2025-03-19
Update	6.4.4(2) Faucet Aerators	Updated electric water heating efficiency	2025-03-19
Update	6.4.4(3) Thermostatic Shower Valve	Updated electric water heating efficiency	2025-03-19
Update	6.4.4(5) Hot Water Tank Wraps	Updated electric water heating efficiency	2025-03-19
Update	(7) Efficient Refrigeration Compressors (Scroll Refrigeration Compressor)	Discus compressors are no longer in other TRMs and were also not rebated in recent years. We removed the discus compressors and simplified the algorithm to match Iowa's algorithm	2025-03-19
Update	(9) Brushless DC Motors	Updated the algorithm including the load factor and rated motor outputs	2025-03-19
Update	(6) Dairy Scroll Compressors	The milk weight and base EER were updated, along with the change in milk temperature	2025-03-19
Update	5 Commercial Measure Assessment Scope	Updated to represent most recent program component offerings	2026-02-27
Update	6.1.1 Interactive Effects	Updated lighting interactive effects section following methodology change proposed in 2024; for BER-IR and SBES CDI Pilot, updated average interactive effects factors	2026-02-27
Update	6.1.3 Adjustment Ratios, 6.2.3 Adjustment Ratios, 6.3.3 Adjustment Ratios, 6.6.3 Adjustment Ratios, 6.8.3 Adjustment Ratios, 6.9.3 Adjustment Ratios, 6.10.3 Adjustment Ratios, 6.11.3 Adjustment Ratios	Updated adjustment ratio sections for lighting measures, pump measures, HVAC measures, VFD measures, solar measures, refrigeration measures, agriculture measures and commercial kitchen measures with most recent adjustment ratios and to show adjustment ratios only when necessary	2026-02-27
Update	6.1.4 Lighting Measures	Updated EUL values for lighting measures mentioned in the 2025 Commercial Lighting Market Study	2026-02-27
Update	6.1.4(1) LED Lamps	Added text to mention availability of LED lamps through regular SBES path; updated adjustment ratios and interactive effects factors to differentiate between SBES and SBES CDI Pilot paths	2026-02-27
Update	6.1.4(7) LED Nightlights	Corrected peak coincidence factor	2026-02-27

Change Type	Section	Description	Date
Update	6.2.4(1) Circulator Pumps	Updated references to 2023 Vermont TRM and updated parameter values	2026-02-27
Update	6.2.4(2) Booster Pumps	Updated references to 2024 Hawaii TRM	2026-02-27
Update	6.3.4(2) Advanced Rooftop Unit Controls	Updated default COP value for rooftop units with heat pumps. Updated references to 2025 Massachusetts TRM	2026-02-27
Update	6.3.4(3) Smart Thermostats for Electric Heating	Updated algorithm to remove rounding issues with the factor to account for multiple thermostats (FMT)	2026-02-27
Update	6.3.4(4) Air-source Heat Pumps Less Than 65,000 Btu/h (excluding air-to-water)	Updated the minimum efficient COP default value (CO _{Pe} _min) default value; updated HSPF2base value and updated peak demand savings formula to take heat-pump-to-heat-pump installations into account; removed one-time adjustment ratio for prescriptive AMH heat pumps; and updated AMH heat pump full-load hours	2026-02-27
Update	6.3.4(5) Air-source Heat Pumps Greater Than or Equal to 65,000 Btu/hr; Ground-source Heat Pumps; Water Source Heat Pumps; Air-to-water Heat Pumps; and Packaged Terminal Heat Pumps (PTHPs)	Updated peak demand savings formula to correct unit discrepancy	2026-02-27
Update	6.3.4(6) Dual Enthalpy Economizer Controls	Updated the savings factor (SF) parameter (boundary value of number of tonnes of cooling equipment to distinguish between both savings factors)	2026-02-27
Update	6.3.4(7) HVAC Hotel Occupancy Sensors	Updated references to 2025 Massachusetts TRM	2026-02-27
Update	6.3.4(8) High Volume Low Speed Fans	Moved algorithm to HVAC section and removed any mention of agriculture	2026-02-27
Update	6.4.2 Peak Demand Savings Factors	Updated calculation to remove rounding issues with the number of weekdays in a full week	2026-02-27
Update	6.4.4(6) Heat Pump Water Heaters	Reverted to an updated version of the algorithm as detailed in the last version of the CIRx Tool; updated peak demand-to-energy ratio	2026-02-27
Update	6.8 Solar	Updated section on adjustment ratios for solar measures; updated adjustment ratios in individual measure algorithms	2026-02-27
Update	6.9.4(3) Door Heater Controls	Updated references to 2023 Vermont TRM and updated parameter values	2026-02-27
Update	6.9.4(4) Evaporator Fan Motor Controls	Updated algorithm to match 2023 Vermont TRM	2026-02-27
Update	6.9.4(7) Efficient Refrigeration Compressors (Scroll Refrigeration Compressor)	Updated parameter name (energy efficiency ratio at “Standard Rating Conditions” for base case and efficient case); updated algorithm to match 2023 Vermont TRM	2026-02-27
Update	6.9.4(10) Refrigerated Vending Machine Controllers	Updated default values for SAVE parameter. Updated reference	2026-02-27
Update	6.10.4(1) Energy Efficient Ventilation and Circulation Fans	Updated algorithm to include actual fan size when known	2026-02-27

Change Type	Section	Description	Date
Update	6.10.4(5) Tractor Engine Block Heater Timers	Updated reference for default value for number of days per year	2026-02-27
Update	6.10.4(6) Dairy Scroll Compressors	Updated energy savings equation (removal of HOU parameter); updated default values to be used for EER parameters	2026-02-27
Update	6.10.4(8) Milk Pre-coolers	Updated default values for cooled milk temperatures	2026-02-27
Update	6.11.4 Commercial Kitchen Equipment	Updated name of kitchen equipment savings calculator	2026-02-27
Update	6.12.4(1) Commercial Washing Machines	Updated peak demand savings formula; updated algorithm to include actual MEF values when known; updated values for number of heating loads	2026-02-27
Update	6.12.4(2) Commercial Heat Pump Clothes Dryers	Updated number of dried loads	2026-02-27
Update	6.13.4(2) Server Virtualization and Decommissioning	Updated energy savings formula (removal of division of number of virtualized servers)	2026-02-27
Update	3.1 LED Lamps and Fixtures	Updated EUL values for lighting measures mentioned in the 2025 Commercial Lighting Market Study	2026-02-27
Update	All sections	Added mentions of program components when missing in measure algorithms	2026-02-27
Format	All sections	Fixed any equation discrepancies and formatting issues	2026-02-27

5 Commercial Measure Assessment Scope

Table 144 below lists the commercial measures and associated programs included in the 2025 DSM MA. The MA includes all necessary parameters and calculations to obtain gross energy and peak demand savings for all portfolio prescriptive measures, as well as SBES and BER semi-prescriptive measures. The SBES and BER Application Rebate semi-prescriptive measures are added to the MA for the first time in 2024. In addition, effective useful life values are included for all prescriptive, semi-prescriptive, and custom measures.

For reference, savings calculations for prescriptive measures use fixed assumptions for all participants. The savings are identical for all qualifying units installed and represent the average savings for all qualifying units. Conversely, savings calculations for custom measures use inputs that are specific to each unit installed and thus represent the actual savings for each unit. Semi-prescriptive measures use a mix of two previous approaches by using unit-specific inputs as well as certain non-specific inputs to determine savings.

Table 144: Included Commercial Measures

Eligible Measures	Program Components
Lighting	
LED Lamps	SBES
LED Linear Fixtures	BER-IR, BER-AR, SBES
LED Linear Lamps	BER-IR, BER-AR, SBES
LED Outdoor Fixtures	BER-IR, BER-AR, SBES
LED Directional and Architectural Fixtures	BER-IR, BER-AR, SBES
Occupancy Sensors	BER-IR, BER-AR, SBES
LED Nightlights	SBES
LED Roadway Lighting	BER-AR, SBES
Horticultural Lighting	BER-AR, SBES
Pumps	
Circulator Pumps	BER-IR, BER-AR, SBES
Booster Pumps	BER-AR, SBES
Space Heating	
Electric Thermal Storage	BER-AR, SBES
Advanced Rooftop Unit Controls	BER-AR
HVAC	
Electric Thermal Storage	BER-AR, SBES
Advanced Rooftop Unit Controls	BER-AR
Smart Thermostats for Electric Heating	BER-AR
Air-source Heat Pumps Less Than 65,000 Btu/h (excluding air-to-water)	BER-AR, SBES
Air-source Heat Pumps Greater Than or Equal to 65,000 Btu/hr; Ground-source Heat Pumps; Water Source Heat Pumps; Air-to-water Heat Pumps; and Packaged Terminal Heat Pumps (PTHPs)	BER-AR, SBES
Dual Enthalpy Economizer Controls	BER-AR, SBES
HVAC Hotel Occupancy Sensors	BER-AR, SBES

Eligible Measures	Program Components
Water Heating	
Low-flow Showerheads	SBES
Faucet Aerators	SBES
Thermostatic Shower Valves	SBES
Pipe Insulation	SBES
Hot Water Tank Wraps	SBES
Heat Pump Water Heaters	BER-AR, SBES
Compressed Air	
Compressed Air Leak Repairs	Custom
Cycling Refrigerated Air Dryers	BER-AR, SBES
Air-entraining Air Nozzles	BER-AR, SBES
No-loss Drains	BER-AR, SBES
Variable Frequency Drives (VFDs)	
VFD for non-HVAC Applications	BER-AR, SBES
Pool Pump	
ENERGY STAR® Pool Pumps	BER-AR, SBES
Solar	
Solar Photovoltaic Systems	BER-AR, Custom Retrofit
Solar Domestic Hot Water (DHW)	BER-AR, SBES
Solar Air Heating	BER-AR, SBES
Refrigeration	
Cooler Night Covers/Display Strip Curtains	BER-AR, SBES
Zero-energy Doors	BER-AR, SBES
Door Heater Controls	BER-AR, SBES
Evaporator Fan Motor Controls	BER-AR, SBES
Intelligent Freezer Defrost Controls	BER-AR, SBES
Vertical Refrigeration Open-to-closed Cooler Conversions	BER-AR, SBES
Efficient Refrigeration Compressors (Scroll Refrigeration Compressor)	BER-AR, SBES
Refrigeration Economizers	BER-AR, SBES
Brushless DC Motors	BER-AR, SBES
Refrigerated Vending Machine Controllers	BER-AR, SBES

Eligible Measures	Program Components
Agriculture	
High Volume Low Speed Fans	BER-AR, SBES
Energy Efficient Ventilation Fans and Circulation Fans	BER-AR, SBES
Dual and Natural Ventilation	BER-AR, SBES
Zero-energy and Low-energy Livestock Waterers	BER-AR, SBES
Agriculture Heat Pads	BER-AR, SBES
Tractor Engine Block Heater Timers	BER-AR, SBES
Dairy Scroll Compressors	BER-AR, SBES
Heat Reclaimer Units	BER-AR, SBES
Milk Pre-coolers	BER-AR, SBES
VFD for Milk Vacuum Pumps	BER-AR, SBES
VFD for Milk Transfer Pumps	BER-AR, SBES
Commercial Kitchen Equipment	
Dishwashers	BER-AR, SBES
Freezers/Refrigerators	BER-AR, SBES
Fryers	BER-AR, SBES
Griddles	BER-AR, SBES
Hot Food Holding Cabinets	BER-AR, SBES
Ice Machines	BER-AR, SBES
Steam Cookers	BER-AR, SBES
Ovens	BER-AR, SBES
Kitchen Exhaust Demand Controlled Ventilation (DCV)	BER-AR, SBES
Commercial IT and Datacentres	
Server Virtualization and Decommissioning	BER-AR, SBES
Server-based Power Management Software	BER-AR, SBES
Uninterruptible Power Supply (UPS)	BER-AR, SBES
Commercial Laundry Equipment	
Commercial Washing Machines	BER-AR, SBES
Commercial Clothes Dryers - Heat Pumps	BER-AR, SBES

6 BNI Measure Gross Savings Parameters

The following sections outline all necessary parameters to calculate gross electrical energy savings for BER-AR, BER-IR, SBES, and Custom Retrofit semi-prescriptive measures. Note that, while unitary peak demand savings are presented in W in all summary tables at the beginning of each measure subsection, these may not match the units in the calculations and supporting tables.

6.1 Lighting

6.1.1 Interactive Effects

Pursuant to a literature review of methodologies used by other jurisdictions and of a Uniform Methods Project recommendation, the interactive effects calculation methodology for lighting measures is based on an engineering calculation approach in which the fraction of lighting hours during which the heating generated impacts the heating/cooling system is adjusted according to the COP of the heating/cooling system in question. These factors are further differentiated based on whether the lighting is recessed or non-recessed. For recessed fixtures, the interactive effects factors are multiplied by 57% to consider the limited interaction with heating and cooling systems;¹⁸⁸ this factor applies to lighting measure categories that include recessed fixtures, namely LED linear fixtures and LED linear lamps.

For BER-AR and SBES (excluding the SBES CDI Pilot), the interactive effects factors are based on the building type as well as the space heating and cooling type specific to each project, per the following two tables.

¹⁸⁸ Chantrasrisalai and Fisher, *Lighting heat gain parameters: Experimental results in HVAC&R Research*, 12(2), pp. 305-324.

Table 145: BER-AR and SBES Interactive Effects (IE) Factors for Non-recessed Indoor Lighting

Building Type	IE Energy					IE Demand		
	Heat Pump	Electric Resistance		Non-electric or No Heating		Heat Pump	Electric Resistance	Non-electric or No Heating
	Heating and Cooling	Heating Only	Heating and Cooling	Heating Only	Heating and Cooling	Heat Pump	Electric Resistance	Non-electric or No Heating
Agriculture	-20.1%	-52.6%	-43.5%	0.0%	9.1%	-55.6%	-100.0%	0.0%
Banking / Financial	-20.1%	-52.6%	-43.5%	0.0%	9.1%	-55.6%	-100.0%	0.0%
Education	-20.1%	-52.6%	-43.5%	0.0%	9.1%	-55.6%	-100.0%	0.0%
Entertainment / Public Assembly	-20.1%	-52.6%	-43.5%	0.0%	9.1%	-55.6%	-100.0%	0.0%
Healthcare	-24.5%	-54.4%	-48.7%	0.0%	5.7%	-55.6%	-100.0%	0.0%
Hospitality	-24.5%	-54.4%	-48.7%	0.0%	5.7%	-55.6%	-100.0%	0.0%
Manufacturing / Industrial	-20.0%	-52.5%	-43.3%	0.0%	9.2%	-55.6%	-100.0%	0.0%
Office / Commercial	-20.1%	-52.6%	-43.5%	0.0%	9.1%	-55.6%	-100.0%	0.0%
Public Service	-20.1%	-52.6%	-43.5%	0.0%	9.1%	-55.6%	-100.0%	0.0%
Residential	-24.5%	-54.4%	-48.7%	0.0%	5.7%	-55.6%	-100.0%	0.0%
Restaurant / Bar	-20.0%	-52.5%	-43.3%	0.0%	9.2%	-55.6%	-100.0%	0.0%
Retail	-20.0%	-52.5%	-43.3%	0.0%	9.2%	-55.6%	-100.0%	0.0%
Technology / Science	-20.1%	-52.6%	-43.5%	0.0%	9.1%	-55.6%	-100.0%	0.0%
Warehouse / Storage	-24.5%	-54.4%	-48.7%	0.0%	5.7%	-55.6%	-100.0%	0.0%

Table 146: BER-AR and SBES Interactive Effects (IE) Factors for Recessed Indoor Lighting

Building Type	IE Energy					IE Demand		
	Heat Pump	Electric Resistance		Non-electric or No Heating		Heat Pump	Electric Resistance	Non-electric or No Heating
	Heating and Cooling	Heating Only	Heating and Cooling	Heating Only	Heating and Cooling	Heat Pump	Electric Resistance	Non-electric or No Heating
Agriculture	-11.5%	-30.0%	-24.8%	0.0%	5.2%	-31.7%	-57.0%	0.0%
Banking / Financial	-11.5%	-30.0%	-24.8%	0.0%	5.2%	-31.7%	-57.0%	0.0%
Education	-11.5%	-30.0%	-24.8%	0.0%	5.2%	-31.7%	-57.0%	0.0%
Entertainment / Public Assembly	-11.5%	-30.0%	-24.8%	0.0%	5.2%	-31.7%	-57.0%	0.0%
Healthcare	-14.0%	-31.0%	-27.8%	0.0%	3.2%	-31.7%	-57.0%	0.0%
Hospitality	-14.0%	-31.0%	-27.8%	0.0%	3.2%	-31.7%	-57.0%	0.0%
Manufacturing / Industrial	-11.4%	-29.9%	-24.7%	0.0%	5.2%	-31.7%	-57.0%	0.0%
Office / Commercial	-11.5%	-30.0%	-24.8%	0.0%	5.2%	-31.7%	-57.0%	0.0%
Public Service	-11.5%	-30.0%	-24.8%	0.0%	5.2%	-31.7%	-57.0%	0.0%
Residential	-14.0%	-31.0%	-27.8%	0.0%	3.2%	-31.7%	-57.0%	0.0%
Restaurant / Bar	-11.4%	-29.9%	-24.7%	0.0%	5.2%	-31.7%	-57.0%	0.0%
Retail	-11.4%	-29.9%	-24.7%	0.0%	5.2%	-31.7%	-57.0%	0.0%
Technology / Science	-11.5%	-30.0%	-24.8%	0.0%	5.2%	-31.7%	-57.0%	0.0%
Warehouse / Storage	-14.0%	-31.0%	-27.8%	0.0%	3.2%	-31.7%	-57.0%	0.0%

For indoor lighting measures offered through BER-IR, the interactive effects factors used for electrical energy and peak demand savings are based on the average values of indoor lighting products installed through BER-AR and SBES in 2025 since no customer-specific information is available for BER-IR.

For indoor lighting measures offered through the CDI Pilot, the interactive effects factors used for energy and peak demand savings are based on the average values of indoor lighting products installed through SBES in 2025.

Table 147 below summarizes the interactive effects factors established for each lighting measure offered through BER-IR and the SBES CDI Pilot.

Table 147: BER-IR and SBES CDI Pilot Interactive Effects (IE) Factors for Lighting Measures

Measure		IE Factor for Electrical Energy Savings	IE Factor for Peak Demand Savings
BER-IR			
Linear LED Fixtures and Lamps	Recessed	-7.8%	-25.0%
	Non-recessed	-3.6%	-15.1%
	Unknown	-4.2%	-16.6%
Outdoor LED Fixtures		0%	0%
Directional and Architectural LED Fixtures		9.1%	0.0%
Indoor Occupancy/Motion Sensors		3.6%	0.0%
Outdoor Motion Sensors		0%	0%
SBES CDI Pilot			
LED Lamps		-4.6%	-9.2%
LED Nightlights		-4.6%	-9.2%

For outdoor lighting measures, interactive effects are considered nil. For high bay fixtures, the Evaluator assumes that the heat that they generate remains largely at heights where the temperature is not controlled and therefore do not generate significant interactive effects. Table 148 outlines the interactive effects factors for these lighting measures.

Table 148: IE Factors for Outdoor Lighting and High-bay Fixtures

Measure	IE Factor for Electrical Energy Savings	IE Factor for Peak Demand Savings
Outdoor Lighting	0.0%	0.0%
High-bay Fixtures	0.0%	0.0%

Finally, the above factors do not account for lighting installed in refrigerators and freezers. Table 149 below outlines the interactive effects factors to be used for these types of lighting measures for all program components and all building types.

Table 149: IE Factors for Lighting Installed in Refrigerators and Freezers

Measure	IE Factor for Electrical Energy Savings	IE Factor for Peak Demand Savings
Lighting Installed in Refrigerators	29%	29%
Lighting Installed in Freezers	50%	50%

6.1.2 Peak Demand Savings Factors

Lighting measures use peak coincidence factor (PCF) for calculating peak demand savings. For indoor lighting measures offered through BER-IR, the PCF is based on the weighted average PCF value of all indoor lighting products installed through BER-AR and SBES in 2022 since no customer-specific information is available for BER-IR. The average PCF is 60%.

For indoor lighting measures offered through SBES CDI Pilot, the PCF is based on the average PCF value of indoor lighting products installed through SBES in 2022. The average PCF is 54%.

For outdoor lighting measures, since lighting is typically turned on between 5 p.m. and 7 p.m. throughout December, January, and February, a PCF of 100% is applied.

Unitary Peak Demand Savings Calculations

Peak demand savings are calculated by multiplying the unitary demand savings value by the peak coincidence factor as detailed in the equation below.

$$\text{Unitary Peak Demand Savings (W)} = \text{Unitary Demand Savings (W)} \times \text{Peak Coincidence Factor (\%)}$$

The unitary demand savings value corresponds to the unitary energy savings divided by the hours of use (HOU), as presented in the equation below.

$$\text{Unitary Demand Savings (W)} = \frac{\text{Unitary Energy Savings (kWh)} \times 1,000}{\text{HOU (h)}}$$

6.1.3 Adjustment Ratios

The adjustment ratios in Table 150 were established through the latest comprehensive impact evaluation for each program. They should be applied for all lighting measures in SBES and BER-AR, except for LED roadway lighting measures.

Table 150: Lighting Gross Savings Adjustments Ratios

Program Component	Source Evaluation Report	Energy Savings		Peak Demand Savings	
		Adjustment Ratio	Margin of Error	Adjustment Ratio	Margin of Error
BER-AR Lighting Measures (except LED Roadway Lighting and Horticultural Lighting)	2025	1.117	8.3%	1.031	10.4%
SBES Lighting Measures (Audit Path)	2023	1.070	5.3%	0.917	8.9%
SBES Lighting Measures (DIY Path)	2023	1.070	4.4%	0.932	8.6%
SBES CDI Pilot – A-type LED Lamps	2019 (EPI)	0.960	5%	0.960	5%

6.1.4 Lighting Measures

(1) LED Lamps

Summary

Table 151 presents a summary of the values used to calculate A-type, reflector, and decorative LED lamp savings. These measures are only offered through SBES and the SBES Commercial Direct Install (CDI) Pilot. The detailed methodology follows.

Table 151: LED Lamp Measure Summary

Parameter	SBES	SBES CDI Pilot	Reference
Measure Description and Identification			
Measure Description	LED lamps installed with direct installation		-
Baseline	Existing lighting being replaced		
Measure Subcategory	A-type, reflector, and decorative LED lamps		
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Energy Savings Adjustment Ratio	1.070	0.960	See Subsection 6.1.3
Peak Demand Savings Adjustment Ratio	Audit Path: 0.917 DIY Path: 0.932	0.960	
Effective Useful Life [years]	Varies depending on replaced and installed wattages as well as lamp type		See Subsection 3.1
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Vary depending on replaced and installed wattages. See Table 152 below		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	60%	54%	See Subsection 6.1.2
Unitary Peak Demand Savings [W]	Vary depending on replaced and installed wattages. See Table 153 below		Calculated by multiplying the demand savings value by the peak coincidence factor
Interactive Effects Factor for Energy Savings	Calculation based on facility characteristics	-4.6%	See Subsection 6.1.1
Interactive Effects Factor for Peak Demand Savings		-9.2%	

Electrical Unitary Energy Savings

The equation below is used to determine the unitary savings values of LED lamps for each pairing of old and new wattages. Table 152 below lists the parameters and corresponding values used in the equation and the resulting unitary savings values. It should be noted that operating hours in SBES are tracked, while values are assumed in the SBES CDI Pilot.

$$\text{Energy Savings} \left[\frac{kWh}{yr} \right] = \frac{(\text{Old Wattage} - \text{New Wattage})[W] \times \text{Operating Hours} \left[\frac{h}{yr} \right]}{1,000 \left[\frac{W}{kW} \right]}$$

Table 152: Electrical Unitary Savings Values for SBES CDI Pilot LED Lamps

Type of LED	Old Wattage (W)	New Wattage (W)	Displaced Wattage (W)	Operating Hours (hrs/year)	Unitary Savings Value (kWh/year)
9 W Replacing 25 W	25	9	16	3,600	57.6
9 W Replacing 29 W	29	9	20		72.0
9 W Replacing 40 W	40	9	31		112
9 W Replacing 43 W	43	9	34		122
9 W Replacing 60 W	60	9	51		184
9 W Replacing 72 W	72	9	63		227
9 W Replacing 100 W	100	9	91		328
9 W Replacing 150 W	150	9	141		508
9.5 W Replacing 25 W	25	9.5	15.5		55.8
9.5 W Replacing 29 W	29	9.5	19.5		70.2
9.5 W Replacing 40 W	40	9.5	30.5		110
9.5 W Replacing 43 W	43	9.5	33.5		121
9.5 W Replacing 60 W	60	9.5	50.5		182
9.5 W Replacing 72 W	72	9.5	62.5		225
9.5 W Replacing 100 W	100	9.5	90.5		326
9.5 W Replacing 150 W	150	9.5	140.5		506
18 W Replacing 75 W	75	18	57		205
18 W Replacing 100 W	100	18	82		295
7 W Black-out Bulbs Replacing 60 W	60	7	53		191
PAR20 7 W Replacing 50 W	50	7	43		155
PAR30 8 W Replacing 53 W	53	8	45		162
PAR30 8 W Replacing 75 W	75	8	67		241
PAR38 15 W Replacing 90 W	90	15	75		270
PAR38 15 W Replacing 120 W	120	15	105		378
PAR38 15 W Replacing 150 W	150	15	135		486
7 W GU10 Replacing 35 W	35	7	28		101
7 W GU10 Replacing 50 W	50	7	43		155
7 W G25 Replacing 40 W	40	7	33		119
5 W Chandelier E12 Replacing 40 W	40	5	35		126

Previous evaluations confirmed that installed LED lamps had a light output wattage equivalent to that of the replaced lamps for almost all replacements. In other cases, the savings calculations are still based on the difference in real wattage values. The equivalent incandescent and halogen wattage values were assumed to be the same as those for the residential sector.

Average hours of operation of 3,600 hours were used for SBES CDI Pilot indoor lighting products. These hours of operation are based on the average values of indoor lighting products installed through SBES in 2019.

Unitary Peak Demand Savings

Unitary peak demand savings are calculated as described in Subsection 6.1.2.

Table 153: Electrical Unitary Peak Demand Savings Values for LED Lamps

Type of LED	Displaced Wattage (W)	Peak Coincidence Factor (%)	Unitary Peak Demand Savings Value (W)
9 W Replacing 25 W	16	54%	8.6
9 W Replacing 29 W	20		10.8
9 W Replacing 40 W	31		16.7
9 W Replacing 43 W	34		18.4
9 W Replacing 60 W	51		27.5
9 W Replacing 72 W	63		34.0
9 W Replacing 100 W	91		49.1
9 W Replacing 150 W	141		76.1
9.5 W Replacing 25 W	15.5		8.4
9.5 W Replacing 29 W	19.5		10.5
9.5 W Replacing 40 W	30.5		16.5
9.5 W Replacing 43 W	33.5		18.1
9.5 W Replacing 60 W	50.5		27.3
9.5 W Replacing 72 W	62.5		33.8
9.5 W Replacing 100 W	90.5		48.9
9.5 W Replacing 150 W	140.5		75.9
18 W Replacing 75 W	57		30.8
18 W Replacing 100 W	82		44.3
7 W Black-out Bulbs Replacing 60 W	53		28.6
PAR20 7 W Replacing 50 W	43		23.2
PAR30 8 W Replacing 53 W	45		24.3
PAR30 8 W Replacing 75 W	67		36.2
PAR38 15 W Replacing 90 W	75		40.5
PAR38 15 W Replacing 120 W	105		56.7
PAR38 15 W Replacing 150 W	135		72.9
7 W GU10 Replacing 35 W	28		15.1
7 W GU10 Replacing 50 W	43		23.2
7 W G25 Replacing 40 W	33		17.8
5 W Chandelier E12 Replacing 40 W	35		18.9

Installation Rate

For LED lamps in SBES, an installation rate of 100% was assumed.

(2) Linear LED Fixtures

Summary

Table 154 presents a summary of the values used to calculate linear LED fixture savings, followed by the detailed methodology.

Table 154: Linear LED Fixture Measure Summary

Parameter		BER-IR	BER-AR	SBES	Reference
Measure Description and Identification					
Measure		Linear LED fixtures (Luminaires, Retrofit Kits, Linear Ambient and Low-bay Luminaires), rebated in store	Linear LED fixtures rebated after installation		See Table 274 for BER-IR baseline
Baseline		T8 fluorescent fixtures	Existing fixtures		
General Parameters					
In-service Rate		100%	None, included in the adjustment ratios below.		See details below under In-service Rate
Energy Savings Adjustment Ratio		-	1.117	1.070	See Subsection 6.1.3
Peak Demand Savings Adjustment Ratio		-	1.031	<u>Audit Path:</u> 0.917 <u>DIY Path:</u> 0.932	
Effective Useful Life [years]		Effective useful life based on type of Linear LED Fixture			See Subsection 3.1
Electrical Savings Parameters					
Unitary Energy Savings [kWh/year]		Calculation based on specification data for each rebated unit			See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor		60%	Actual or 0.86		See Subsection 6.1.2
Unitary Peak Demand Savings [W]		Calculation based on specification data for each rebated unit			Calculated by multiplying the demand savings value by the peak coincidence factor
Interactive Effects Factor for Energy Savings	Recessed	-7.8%	Calculation based on facility characteristic		See Subsection 6.1.1
	Non-recessed	-3.6%			
	Unknown	-4.2%			
Interactive Effects Factor for Peak Demand Savings	Recessed	-25.0%			
	Non-recessed	-15.1%			
	Unknown	-16.6%			

Electrical Unitary Energy Savings

Table 155 lists the parameters and corresponding values used in the equation below to calculate unitary energy savings for LED linear fixtures.

$$\begin{aligned} \text{Energy Savings [kWh/yr]} \\ &= ((\text{Baseline Wattage} \\ &\quad - \text{New Wattage})[\text{W}] \times \text{HOU}[\text{h/day}] \times 365[\text{day/yr}]) / 1,000[\text{W/kW}] \end{aligned}$$

Table 155: Electrical Unitary Energy Savings Values for Linear LED Fixtures

Parameter	Symbol	Value for BER-IR	Value for BER-AR and SBES	Reference
Baseline Wattage [W]	<i>Baseline Wattage</i>	Fixed baseline based on fixture type and lumen output	Actual	See Table 156 below for BER-IR
New Wattage [W]	<i>New Wattage</i>	Based on wattage listed in tracking sheet for each rebated unit	Actual	Use information in TS
Hours of Operation [hrs/day]	<i>HOU</i>	4,209	Actual	<u>BER-IR</u> : Average HOU for indoor lighting products installed through BER-AR and SBES in 2021-2023 <u>BER-AR and SBES</u> : Based on specification data for each rebated unit
Unitary Energy Savings [kWh/year]	<i>Energy Savings</i>	Calculation based on specification data for each rebated unit		Calculated

The linear LED fixtures category contains four subcategories of products eligible under Instant Rebates. Table 156 presents the baseline wattage used to calculate the energy savings for each of these subcategories based on lumens output. These wattages correspond to T8 fluorescent luminaires.

Table 156: Linear LED Fixture Baseline Wattages for BER-IR

Subcategory	Lumens Output (lm)	Baseline Wattage (W)
1 x 4 Luminaires	1,500 – 3,500	61.0
	≥ 3,500	83.3
2 x 2 Luminaires & Retrofit Kits	1,500 – 4,500	61.0
	≥ 4,500	84.0
2 x 4 Luminaires & Retrofit Kits	3,000 – 6,500	88.0
	≥ 6,500	129
Linear Ambient and Low-bay Luminaires	< 2,500	29.5
	2,500 – 5,000	58.0
	5,000 – 10,000	112
	≥ 10,000	200

In-service Rate

The in-service rate for linear LED fixtures is estimated at 100% since it is unlikely that participants would purchase fixtures for stocking purposes.

(3) Linear LED Lamps

Summary

Table 157 presents a summary of the values used to calculate linear LED lamp savings. The detailed methodology follows.

Table 157: Linear LED Lamp Measure Summary

Parameter		BER-IR	BER-AR		SBES	Reference
Measure Description and Identification						
Measure		Linear LED lamps, rebated in store	Linear LED lamps, rebated after installation		See Table 274 for BER-IR baseline	
Baseline		T8 fluorescent lamps	Existing lamps			
General Parameters						
In-service Rate		85%	None, included in the adjustment ratios below.		See details below under In-service Rate	
Energy Savings Adjustment Ratio		-	1.117	1.070	See Subsection 6.1.3	
Peak Demand Savings Adjustment Ratio		-	1.031	Audit Path: 0.917 DIY Path: 0.932		
Effective Useful Life [years]		4.8	Effective useful life based on type of LED Lamp		See Subsection 3.1	
Electrical Savings Parameters						
Unitary Energy Savings [kWh/year]		Calculation based on specification data for each rebated unit			See details below under Electrical Unitary Energy Savings	
Peak Coincidence Factor		60%	Actual, or default 0.86		See Subsection 6.1.2	
Unitary Peak Demand Savings [W]		Calculation based on specification data for each rebated unit			Calculated by multiplying the demand savings value by the peak coincidence factor	
Interactive Effects Factor for Energy Savings	Recessed	-7.8%	Calculation based on facility characteristic			See Subsection 6.1.1
	Non-recessed	-3.6%				
	Unknown	-4.2%				
Interactive Effects Factor for Peak Demand Savings	Recessed	-25.0%				
	Non-recessed	-15.1%				
	Unknown	-16.6%				

Electrical Unitary Energy Savings

Table 158 lists the parameters and corresponding values used in the equation below to calculate unitary energy savings for LED linear lamps.

$$\text{Energy Savings} \left[\frac{kWh}{yr} \right] = \frac{(\text{Baseline Wattage} [W] \times \text{Ballast Factor} \times \text{Baseline Quantity} - \text{New Wattage} [W] \times \text{New Quantity}) \times HOU \left[\frac{h}{day} \right] \times 365 \left[\frac{day}{yr} \right]}{1,000 \left[\frac{W}{kW} \right]}$$

Table 158: Electrical Unitary Energy Savings Values for Linear LED Lamps

Parameter	Symbol	Value for BER-IR	Value for BER-AR and SBES	Reference
Baseline Wattage [W]	<i>Baseline Wattage</i>	Based on fixture type and lumen output	Actual	Based on specification data for each rebated unit. See Table 159 below
Ballast Factor	<i>Ballast Factor</i>	0.88	Actual or default 0.88	Assumption for normal ballast factor
Baseline Quantity	<i>Baseline Quantity</i>	Actual	Actual	Based on quantity listed in tracking sheet for each rebated unit
New Wattage [W]	<i>New Wattage</i>	Actual	Actual	Based on wattage listed in tracking sheet for each rebated unit
New Quantity	<i>New Quantity</i>	Actual	Actual	Based on quantity listed in tracking sheet for each rebated unit
Hours of Operation [hrs/day]	<i>HOU</i>	4,209	Actual	<u>BER-IR</u> : Average HOU for indoor lighting products installed through BER-AR and SBES in 2021-2023 <u>BER-AR and SBES</u> : Based on specification data for each rebated unit
Unitary Energy Savings [kWh/year]	<i>Energy Savings</i>	Calculation based on specification data for each rebated unit	Calculated	

The linear LED lamp category contains six subcategories of products eligible under Instant Rebates. Table 159 presents the baseline wattage used to calculate the energy savings based on the Duke Energy Fixture Wattage Table.¹⁸⁹ These wattages correspond to T8 fluorescent luminaires.

Table 159: Linear LED Lamp Baseline Wattage for BER-IR

Subcategory	Baseline Wattage (W)
2-foot Replacement Lamps	17
3-foot Replacement Lamps	25
4-foot Replacement Lamps	32
8-foot Replacement Lamps	59
U-bend Replacement Lamps	31
4-foot High Output Replacement Lamps	49

¹⁸⁹ Duke Energy Progress. Fixture Wattage Table. <http://www.ahutton.com/LED/Progress%20wattages.pdf>, (last accessed November 21, 2018).

In-service Rate

Based on a study conducted by DNV-GL for the Massachusetts Energy Efficiency Program Administrators,¹⁹⁰ an in-service rate (ISR) of 85% is applied to LED lamps as part of BER-IR, which corresponds to the proportion of in-service fluorescent and LED lighting technologies installed three years after their purchase through an instant rebates program.

(4) Outdoor LED Fixtures

Summary

Table 160 presents a summary of the values used to calculate outdoor LED fixture savings. The detailed methodology follows.

Table 160: Outdoor LED Fixture Measure Summary

Parameter	BER-IR	BER-AR	SBES	Reference
Measure Description and Identification				
Measure	Outdoor LED fixtures, rebated in store	Outdoor LED fixtures, rebated after installation		See Table 162 and Table 163 for BER-IR baseline
Baseline	Mix of metal halide (MH) and high pressure sodium (HPS) fixtures	Existing lamps		
General Parameters				
In-service Rate	100%	None, included in the adjustment ratios below.		See details below under In-service Rate
Energy Savings Adjustment Ratio	-	1.117	1.070	See Subsection 6.1.3
Peak Demand Savings Adjustment Ratio	-	1.031	<u>Audit Path:</u> 0.917 <u>DIY Path:</u> 0.932	
Effective Useful Life [years]	Effective useful life based on type of outdoor LED fixture			See Subsection 3.1
Electrical Savings Parameters				
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit			See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	100%	Actual		See Subsection 6.1.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit			Calculated by multiplying the demand savings value by the peak coincidence factor
Interactive Effects Factor for Energy Savings	0%			See Subsection 6.1.1
Interactive Effects Factor for Peak Demand Savings	0%			See Subsection 6.1.1

¹⁹⁰ DNV-GL, *Massachusetts Commercial and Industrial Upstream Lighting Program: "In Storage" Lamps Follow-up Study*, March 2015.

Electrical Unitary Energy Savings

Table 161 lists the parameters and corresponding values used in the equation below to calculate unitary energy savings for outdoor LED fixtures.

$$\text{Energy Savings} \left[\frac{kWh}{yr} \right] = \frac{(\text{Baseline Wattage} - \text{New Wattage})[W] \times HOU \left[\frac{h}{day} \right] \times 365 \left[\frac{day}{yr} \right]}{1,000 \left[\frac{W}{kW} \right]}$$

Table 161: Electrical Unitary Energy Savings Values for Outdoor LED Fixtures

Parameter	Symbol	Value for BER-IR	Value for BER-AR and SBES	Reference
Baseline Wattage [W]	<i>Baseline Wattage</i>	Based on fixture type and lumen output	Actual	<u>IR</u> : See Table 162 for wall-mounted area luminaires and Table 163 for architectural and flood spot luminaires <u>AR</u> : Based on specification data for each rebated unit.
New Wattage [W]	<i>New Wattage</i>	Actual	Actual	Based on wattage listed in tracking sheet for each rebated unit
Hours of Operation [hrs/day]	<i>HOU</i>	4,317	Actual	<u>BER-IR</u> : Average HOU for indoor lighting products installed through BER-AR and SBES in 2021-2023 <u>BER-AR and SBES</u> : Based on specification data for each rebated unit
Unitary Energy Savings [kWh/year]	<i>Energy Savings</i>	Calculation based on specification data for each rebated unit		Calculated

The outdoor LED fixture category contains outdoor wall-mounted area luminaires as well as the architectural flood and spot luminaire subcategories.

Both subcategories are divided into groups by lumens output to assign the correct baseline wattages, and the baseline technology used for each subcategory differs. Weighted averages of 50% MH and 50% HPS fixture system wattages are used to determine the baseline wattage values for outdoor full-cut-off, semi-cut-off, and non-cut-off wall-mounted area luminaires, as presented in Table 162.

Table 162: Wattages per Lumens Output for Outdoor Wall-mounted Area Luminaires for BER-IR

Lumens Range	MH Baseline Fixture Wattage (W)	HPS Baseline Fixture Wattage (W)	Weighted Average Baseline Wattage (W)
≥ 300 and < 2,000	43	46	44.5
≥ 2,000 and < 5,000	95	95	95.0
≥ 5,000 and < 15,000	295	250	272.5
≥ 15,000 and < 25,000	458	465	461.5
≥ 25,000	850	930	890

The architectural flood and spot luminaire subcategory is divided into six ranges according to the baseline lamp technology. The typical lumens output of these fixtures is grouped into ranges to be able to select the appropriate efficient LED fixture depending on the required light output. A summary of the savings calculation parameters is provided in Table 163 below. The baseline technologies were derived from the Duke Energy Fixture Wattage Table.¹⁹¹

Table 163: Wattages per Lumens Output for Architectural Flood and Spot Luminaires for BER-IR

Lumens Range of Efficient Luminaires	Baseline Fixture	Baseline Wattage (W)
≥ 250 and < 1,000	Halogen	37
≥ 1,000 and < 5,000	MH (70 W)	95
≥ 5,000 and < 15,000	MH (250 W)	295
≥ 15,000 and < 30,000	MH (250 W x 2)	590
≥ 30,000 and < 50,000	MH (1,000 W)	1,080
≥ 50,000	MH (1,500 W)	1,610

In-service Rate

The in-service rate for outdoor LED fixtures is estimated at 100% since it is unlikely that participants would purchase fixtures for stocking purposes.

¹⁹¹ Duke Energy, *Fixture Wattage Table*, <http://www.ahutton.com/LED/Progress%20wattages.pdf> (last accessed January 10, 2018).

(5) Directional and Architectural LED Fixtures

Summary

Table 164 presents a summary of the values used to calculate directional and architectural LED fixture savings. The detailed methodology follows.

Table 164: Directional and Architectural LED Fixture Measure Summary

Parameter	BER-IR	BER-AR	SBES	Reference
Measure Description and Identification				
Measure	Directional and architectural LED fixtures, rebated in store	Directional and architectural LED fixtures, rebated after installation		See Table 166 for BER-IR baseline
Baseline	Halogen fixtures	Existing lamps		
General Parameters				
In-service Rate	100%	None, included in the adjustment ratios below.		See details below under In-service Rate
Energy Savings Adjustment Ratio	-	1.117	1.070	See Subsection 6.1.3
Peak Demand Savings Adjustment Ratio	-	1.031	<u>Audit Path:</u> 0.917 <u>DIY Path:</u> 0.932	
Effective Useful Life [years]	1.0	Effective useful life based on type of LED fixture		See Subsection 3.1
Electrical Savings Parameters				
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit			See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	60%	Actual		See Subsection 6.1.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit			Calculated by multiplying the demand savings value by the peak coincidence factor
Interactive Effects Factor for Energy Savings	9.1%	Calculation based on facility characteristic		See Subsection 6.1.1
Interactive Effects Factor for Peak Demand Savings	0.0%			See Subsection 6.1.1

Electrical Unitary Energy Savings

Table 165 lists the parameters and corresponding values used in the equation below to calculate unitary energy savings for directional and architectural LED fixtures.

$$Energy\ Savings\ \left[\frac{kWh}{yr}\right] = \frac{(Baseline\ Wattage - New\ Wattage)[W] \times HOU\ \left[\frac{h}{day}\right] \times 365\ \left[\frac{day}{yr}\right]}{1,000\ \left[\frac{W}{kW}\right]}$$

**Table 165: Electrical Unitary Energy Savings Values
for Directional and Architectural LED Fixtures**

Parameter	Symbol	Value for BER-IR	Value for BER-AR and SBES	Reference
Baseline Wattage [W]	<i>Baseline Wattage</i>	Based on fixture type and lumen output	Actual	<u>BER-IR</u> : See Table 166 below <u>BER-AR and SBES</u> : Based on specification data for each rebated unit
New Wattage [W]	<i>New Wattage</i>	Actual	Actual	Use information in TS
Hours of Operation [hrs/day]	<i>HOU</i>	4,209	Actual	BER-IR: Average HOU for indoor lighting products installed through BER-AR and SBES in 2021-2023 BER-AR and SBES: Based on specification data for each rebated unit
Unitary Energy Savings [kWh/year]	<i>Energy Savings</i>	Calculation based on specification data for each rebated unit		Calculated

The directional and architectural LED fixture category contains track or mono-point directional luminaires. The baseline technology is halogen lamps generating 17 lumens/W. Table 166 presents the baseline wattage used to calculate the energy savings based on lumens output.

Table 166: Directional and Architectural LED Fixture Baseline Wattages for BER-IR

Category	Lumens	Baseline Wattage (W)
Track or Mono-point Directional Luminaires	≥ 250	60.4
Wall-wash Luminaires	517 - 1199	50.0
	≥ 1,200	100

In-service Rate

The in-service rate for directional and architectural LED fixtures is estimated at 100% since it is unlikely that participants would purchase fixtures for stocking purposes.

(6) Occupancy/Motion Sensors

Summary

Table 167 presents a summary of the values used to calculate occupancy/motion sensor savings. The detailed methodology follows.

Table 167: Occupancy/Motion Sensor Measure Summary

Parameter	BER-IR		BER-AR	SBES	Reference
Measure Description and Identification					
Measure	Occupancy/Motion sensors, rebated in store		Occupancy/Motion sensors, rebated after installation		-
Baseline	No sensor				
Measure Subcategory	Interior	Exterior	-		
General Parameters					
In-service Rate	100%		None, included in the adjustment ratios below.		See details below under In-service Rate
Energy Savings Adjustment Ratio	-		1.117	1.070	See Subsection 6.1.3
Peak Demand Savings Adjustment Ratio	-		1.031	Audit Path: 0.917 DIY Path: 0.932	
Effective Useful Life [years]	10				See Subsection 3.1
Electrical Savings Parameters					
Unitary Energy Savings [kWh/year]	100	134	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	60%	100%	Actual		See Subsection 6.1.2
Unitary Peak Demand Savings [W]	26.3	35.3	Calculation based on specification data for each rebated unit		Calculated by multiplying the demand savings value by the peak coincidence factor
Interactive Effects Factor for Energy Savings	3.6%	0%	Calculation based on facility characteristic		See Subsection 6.1.1
Interactive Effects Factor for Peak Demand Savings	0.0%	0%			See Subsection 6.1.1

Electrical Unitary Energy Savings

Table 168 lists the parameters and corresponding values used in the equation below for occupancy and motion sensors and the resulting unitary values.

$$Energy\ Savings\ \left[\frac{kWh}{yr}\right] = Connected\ Wattage\ (W) \times Savings\ Factor\ (\%) \times OTF \times HOU / 1,000$$

Table 168: Electrical Unitary Energy Savings Values for Occupancy/Motion Sensors

Parameter	Type of Occupancy Sensor	Value for BER-IR	Value for BER-AR and SBES	Reference
Connected Wattage (W)	Interior	110	Actual	Average connected wattage for occupancy/motion sensors installed through BER-AR and SBES from 2021 to 2023
	Exterior	86		2023 Efficiency Vermont TRM ¹⁹²
Savings Factor (%)	Ceiling or Wall Remote-Mounted	24%	See Table 169 below	
	Fixture Mounted			
	Wall Switch			
	Exterior	41%		
Operational Testing Factor (OTF)	-	1		
Hours of Operation (HOU) [hrs/yr]	-	3,799	Actual	2023 Efficiency Vermont TRM
Unitary Energy Savings [kWh/year]	Interior	100	Calculation based on specification data for each rebated unit	Calculated
	Exterior	134		

The connected wattage for occupancy/motion sensors is mostly based on the average connected wattage for units installed through BER-AR and SBES from January 2021 to July 2023. The only exception is for exterior motion sensors since only three were installed under these programs during that period. The connected wattage for exterior motion sensors is based on the value presented in the 2023 Efficiency Vermont TRM. The energy savings factors and the HOU are also based on the metering study referenced in the 2023 Efficiency Vermont TRM and are listed below.

Table 169: Savings Factor per Control Type

Control Type	Savings Factor %
Wall Occupancy Sensors	24%
Fixture Mounted Occupancy	24%
Remote Mounted Occupancy	24%
Refrigerator Case Controls	40%
Freezer Case Controls	40%
Exterior Occupancy	41%
Fixture Mounted Daylight	28%
Remote Mounted Daylight	28%

In-service Rate

The in-service rate for occupancy/motion sensors is assumed to be 100%.

¹⁹² Efficiency Vermont, *Technical Reference Manual (TRM): Program Year 2023, 2023*.

(7) LED Nightlights

Summary

Table 170 presents a summary of the values used to calculate savings for LED nightlights. The detailed methodology follows.

Table 170: LED Nightlight Measure Summary

Parameter	SBES CDI Pilot	Reference
Measure Description and Identification		
Measure	LED nightlights through direct installation	N/A
Baseline	Existing nightlight being replaced, which must be incandescent	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	1.0	See Subsection 3.1
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	29.3	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	54%	See Subsection 6.1.2
Unitary Peak Demand Savings [W]	3.95	Calculated by multiplying the demand savings value by the peak coincidence factor
Interactive Effects Factor for Energy Savings	-4.6%	See Subsection 6.1.1
Interactive Effects Factor for Peak Demand Savings	-9.2%	

Electrical Unitary Energy Savings

Table 171 lists the parameters and corresponding values used in the equation below for LED nightlights and the resulting unitary values. The values for displaced wattages and hours of operation are consistent with the values used by other jurisdictions such as the State of Pennsylvania.¹⁹³

$$Energy\ Savings\ \left[\frac{kWh}{yr}\right] = \frac{(Old\ Wattage - New\ Wattage)[W] \times HOU\ \left[\frac{h}{day}\right] \times 365\ \left[\frac{day}{yr}\right]}{1,000\ \left[\frac{W}{kW}\right]}$$

¹⁹³ Pennsylvania Public Utility Commission, *Technical Reference Manual – State of Pennsylvania*, August 2019, p. 7.

Table 171: Electrical Unitary Energy Savings Values for LED Nightlights

Parameter	Value	Reference
Old Wattage [W]	7.0	Assumption based on the typical wattage value of an incandescent nightlight
New Wattage [W]	0.3	Wattage value of the LED nightlight installed through SBES (E1)
Average Displaced Wattage [W]	6.7	Calculation
Hours of Operation [hrs/day]	12	Assumption based on the average length of night
Unitary Energy Savings [kWh/year]	29.3	Calculation

Unitary Peak Demand Savings

Unitary peak demand savings are calculated as described in Subsection 6.1.2.

Installation Rates

An in-service rate of 100% was assumed since SBES LED nightlights are currently only offered through a direct install service; such services typically have installation rates close to 100% for lighting products.

(8) LED Roadway Lighting

Summary

Table 172 presents a summary of the values used to calculate savings for LED roadway lighting. The detailed methodology follows.

Table 172: LED Roadway Lighting Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	LED, DLC Premium qualified roadways lighting with a minimum efficacy of 150 lm/W, with advanced dimming based on real-time data, rebated after installation	-
Baseline	Existing LED roadway fixtures	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	2.7	See Subsection 3.1
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	100%	See Subsection 6.1.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	Calculated by multiplying the demand savings value by the peak coincidence factor
Interactive Effects Factor for Energy Savings	0%	See Subsection 6.1.1
Interactive Effects Factor for Peak Demand Savings	0%	

Electrical Unitary Energy Savings

Table 173 lists the parameters and corresponding values used in the equation below for LED roadway lighting and the resulting unitary values.

$$Energy\ Savings\ \left[\frac{kWh}{yr}\right] = \frac{(Old\ Wattage - New\ Wattage)[W] \times HOU\ \left[\frac{h}{yr}\right]}{1,000\ \left[\frac{W}{kW}\right]}$$

Table 173: Electrical Unitary Energy Savings Values for LED Roadway Lighting

Parameter	Value	Reference
Old Wattage [W]	Actual	Use information in TS
New Wattage [W]	Actual	Use information in TS
Hours of Operation [hrs/year]	Actual or 4662	Calculated based on sunset and sunrise times for Nova Scotia
Unitary Energy Savings [kWh/year]	<i>Energy Savings</i>	Calculation based on specification data for each rebated unit

Unitary Peak Demand Savings

Unitary peak demand savings are calculated as described in Subsection 6.1.2.

Installation Rates

An installation rate of 100% was assumed in the absence of measured data, since roadway lighting

(9) Horticultural Lighting

Summary

Table 174 presents a summary of the values used to calculate savings for horticultural lighting. The detailed methodology follows.

Table 174: Horticultural Lighting Measure Summary

Parameter	BER-AR	SBES		Reference
	Retrofit	Retrofit	New Construction	
Measure Description and Identification				
Measure Description	Horticultural lighting rebated after installation			-
Baseline	Existing lighting		Metal halide HID fixtures	
General Parameters				
Installation Rate	100%			See details below under Installation Rates
Effective Useful Life [years]	3.3			See Subsection 3.1
Electrical Savings Parameters				
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit			See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	Actual			-
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit			See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	Actual			-
Interactive Effects Factor for Peak Demand Savings	Actual			

Electrical Unitary Energy Savings

Table 175 lists the parameters and corresponding values used in the equation below for horticultural lighting and the resulting unitary values.

$$\text{Unitary Energy Savings} \left[\frac{kWh}{yr} \right] = \frac{(W_b[W] \times Qty_b[-] - W_e[W] \times Qty_e[-]) \times HOU \left[\frac{h}{yr} \right] \times IE}{1,000}$$

Table 175: Electrical Unitary Energy Savings Values for Horticultural Lighting

Parameter	Symbol	BER-AR	SBES		Reference
		Retrofit	Retrofit	New Construction	
Baseline Wattage [W]	W_b	Actual	Actual	1,000	<u>Retrofit:</u> Use information in TS <u>New Construction:</u> 2020 Iowa TRM ¹⁹⁴ Remillard & Collins 2017 ¹⁹⁵
Baseline Quantity [-]	Qty_b	Actual	Actual	Same as Qty_e	<u>Retrofit:</u> Use information in TS <u>New Construction:</u> Assumption
New Wattage [W]	W_e	Actual	Actual		Use information in TS
New Quantity [-]	Qty_e	Actual	Actual		Use information in TS
Hours of Operation [hours/year]	HOU	Actual	Actual		Use information in TS
Energy Savings Interactive Effects Factor [-]	IE	Actual	Actual		Use information in TS
Conversion Factor [W/kW]	-	1,000	1,000		Convention
Unitary Energy Savings [kWh/year]	<i>Unitary Energy Savings</i>	Calculation based on project data	Calculation based on project data		Calculation

Unitary Peak Demand Savings

Table 176 lists the parameters and corresponding values used in the equation below for horticultural lighting and the resulting unitary peak demand savings values.

$$\text{Unitary Peak Demand Savings [kW]} = \frac{(W_b[W] \times Qty_b[-] - W_e[W] \times Qty_e[-]) \times PCF \times IE_{PD}}{1,000}$$

¹⁹⁴ Iowa Utilities Commission. *Iowa Energy Efficiency Statewide Technical Reference Manual Version 5.0, Volume 3: Nonresidential Measures*, July 22, 2020, pp. 43-47.

¹⁹⁵ Jesse Remillard and Nick Collins, *Trends and Observations of Energy Use in the Cannabis Industry*, 2017 ACEEE Summer Study on Energy Efficiency in Industry.

Table 176: Unitary Peak Demand Savings Values for Horticultural Lighting

Parameter	Symbol	BER-AR	SBES		Reference
		Retrofit	Retrofit	New Construction	
Peak Coincidence Factor [-]	PCF	Actual	Actual		Use information in TS
Energy Savings Interactive Effects Factor [-]	IE _{PD}	Actual	Actual		Use information in TS
Conversion Factor [W/kW]	-	1,000	1,000		Convention
Unitary Energy Savings [kW]	<i>Unitary Peak Demand Savings</i>	Calculation based on project data	Calculation based on project data		Calculation

Installation Rates

Installation rates for horticultural lighting products are estimated at 100%.

6.2 Pumps

6.2.1 Interactive Effects

For pumps, interactive effects are assumed to be nil because pumps are typically installed in non-conditioned spaces.

6.2.2 Peak Demand Savings Factors

For pumps, the methodology used to determine peak demand savings is detailed in the measure-specific sections below.

6.2.3 Adjustment Ratios

The adjustment ratios in Table 177 were established as part of the 2025 BER-AR evaluation. They should be applied for all pump measures in BER-AR. No adjustment ratios were calculated for SBES.

Table 177: Pump Gross Savings Adjustment Ratios

Program Component	Source Evaluation Report	Energy Savings		Peak Demand Savings	
		Adjustment Ratio	Margin of Error	Adjustment Ratio	Margin of Error
BER-AR	2025	0.951	5.8%	0.514	21.9%

6.2.4 Pump Measures

(1) Circulator Pumps

Summary

Table 178 presents a summary of the values used to calculate circulator pump savings. The detailed methodology follows.

Table 178: Circulator Pump Measure Summary

Parameter	BER-IR, BER-AR, SBES			Reference
Measure Description and Identification				
Measure	Variable speed electronically commutated motor (ECM) circulator pumps, rebated in store			-
Baseline	Single-speed circulator pump			
Measure Subcategory	Max input power < 144 W	Max input power ≥ 144 W and < 575 W	Max input power ≥ 575 W and < 2,500 W	
General Parameters				
Installation Rate	100%			See details below under Installation Rates
Energy Savings Adjustment Ratio	<u>BER-AR</u> : 0.951 <u>BER-IR and SBES</u> : -			See Subsection 6.2.3
Peak Demand Savings Adjustment Ratio	<u>BER-AR</u> : 0.514 <u>BER-IR and SBES</u> : -			
Effective Useful Life [years]	15			See Subsection 3.2
Electrical Savings Parameters				
Unitary Energy Savings [kWh/year]	420	816	2,014	See details below under Electrical Energy Unitary Savings
Peak Coincidence Factor	100%			See details below under Peak Coincidence Factor
Unitary Peak Demand Savings [W]	67.5	95.3	127	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0%			See Subsection 6.2.1
Interactive Effects Factor for Peak Demand Savings	0%			See Subsection 6.2.1

Electrical Energy Unitary Savings

The electrical energy unitary savings for circulator pumps are calculated using the equation below and savings data from Vermont adapted to Nova Scotia using each jurisdiction's average operating hours. Although the max input power tiers defined in the Vermont TRM and those defined by E1 differ, the difference is considered minimal, thus E1's tiers have been used in the savings assumptions for this measure. Table 179 below lists the parameters used for the calculation of electrical energy unitary savings.

$$\text{Unitary Energy Savings} \left[\frac{kWh}{yr} \right] = UES_{VT} \left[\frac{kWh}{yr} \right] \times \frac{HOU_{NS} \left[\frac{hours}{yr} \right]}{HOU_{VT} \left[\frac{hours}{yr} \right]}$$

Table 179: Electrical Unitary Energy Savings Values for Circulator Pumps

Parameters	Symbol	BER-IR			Reference
		Max Input Power < 144 W	Max Input Power ≥ 144 W and < 575 W	Max Input Power ≥ 575 W and < 2,500 W	
Vermont Average Unitary Energy Savings [kWh/year]	UES_{VT}	401	780	1,924	2023 Vermont TRM ¹⁹⁶
Vermont Average Operating Hours [hours/year]	HOU_{VT}	4,592			
Nova Scotia Average Operating Hours [hours/year]	HOU_{NS}	4,805			Assumption ¹⁹⁷
Unitary Energy Savings [kWh/year]	<i>Unitary Energy Savings</i>	420	816	2,014	Calculation

Unitary Peak Demand Savings

The unitary demand savings value corresponds to the unitary energy savings divided by the HOU, as presented in the equation below.

$$\text{Unitary Demand Savings} [W] = \frac{\text{Unitary Energy Savings} [kWh]}{HOU [h] \times 1,000} \times \text{Peak Coincidence Factor} [(%)]$$

Since circulator pumps are typically used as part of residential and commercial hydronic heating system applications, it is assumed that they operate continuously during the coldest days of winter. Thus, a PCF of 100% is applied to this measure category.

The unitary peak demand unitary savings for circulator pumps are calculated using the parameters listed in Table 180.

¹⁹⁶ Efficiency Vermont, *Technical Reference Manual (TRM)*, Program Year 2023, pp. 149-151.

¹⁹⁷ Assuming operation between October 1 and April 30 when outside air temperature is below 55 °F (12.8 °C).

Table 180: Unitary Peak Demand Savings Values for Circulator Pumps

Parameters	BER-IR			Reference
	Max Input Power < 144 W	Max Input Power ≥ 144 W and < 575 W	Max Input Power ≥ 575 W and < 2,500 W	
Average Demand Savings [kW]	0.0675	0.0953	0.1270	2023 Vermont TRM ¹⁹⁸
Peak Coincidence Factor	1.000			Assumption
Unitary Peak Demand Savings [W]	67.5	95.3	127	Calculation

Installation Rates

Installation rates for circulator pumps are estimated at 100%.

(2) Booster Pumps

Summary

Table 181 presents a summary of the values used to calculate booster pump savings. The detailed methodology follows.

Table 181: Booster Pump Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	High efficiency booster pumps rebated after installation		-
Baseline	Existing booster pumps		
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.2.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	15		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each installed system		See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	N/A		-
Unitary Peak Demand Savings [W]	Calculation based on specification data for each installed system		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0%		See Subsection 6.2.1
Interactive Effects Factor for Peak Demand Savings	0%		See Subsection 6.2.1

¹⁹⁸ Efficiency Vermont, *Technical Reference Manual (TRM)*, Program Year 2023, pp. 149-151.

Electrical Unitary Energy Savings

The electrical unitary energy savings for booster pumps are calculated using the variables defined and listed in the equation and Table 182 below.

$$\text{Energy Savings}_{kWh} = 891.20 \times HP_{ee} + 3,523.08 \times \Delta HP_{sys}$$

Table 182: Electrical Unitary Energy Savings Values for Booster Pumps

Parameter	Symbol	BER-AR, SBES	Reference
Rated Horsepower of the New Booster Pump or Pumping System [HP]	HP_{ee}	Specification data for each system	Tracking sheet
Reduction in the Total Rated Horsepower of the System [HP]	ΔHP_{sys}	Specification data for each system	Tracking sheet
Annual Unitary Energy Savings per Rated Horsepower from the Use of a VFD Booster Pump [kWh/HP]	-	891.20	2024 Hawaii TRM ¹⁹⁹
Annual Unitary Energy Savings per Rated Horsepower Reduced [kWh/HP]	-	3,523.08	
Unitary Energy Savings [kWh/year]	$\text{Energy Savings}_{kWh}$	Calculation based on specification data for each installed system	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for booster pumps are calculated using the variables defined and listed in the equation and Table 183 below, as well as variables from Table 182 above.

$$\text{Peak Demand Savings}_W = (172 \times HP_{ee} + 671 \times \Delta HP_{sys}) \times PCF$$

Table 183: Unitary Peak Demand Savings Values for Booster Pumps

Parameter	Symbol	BER-AR, SBES	Reference
Annual Unitary Demand Savings per Rated Horsepower from the Use of a VFD Booster Pump [W/HP]	-	172	2024 Hawaii TRM ²⁰⁰
Annual Unitary Demand Savings per Rated Horsepower Reduced [W/HP]	-	671	
Peak Coincidence Factor	PCF	0.7	Average value established in the 2021 BER-AR evaluation calculated using project data from eight Custom Retrofit booster pump projects
Unitary Peak Demand Savings [W]	$\text{Peak Demand Savings}_W$	Calculation based on specification data for each installed system	Calculation

¹⁹⁹ Hawai'i Energy, *Hawai'i Energy Efficiency Program Technical Reference Manual (TRM)*, PY2024 V1.2, November 8, 2024.

²⁰⁰ Ibid.

Installation Rates

Installation rates for booster pumps are estimated at 100%.

6.3 HVAC

6.3.1 Interactive Effects

For HVAC measures, interactive effects are assumed to be nil.

6.3.2 Peak Demand Savings Factors

For all HVAC measures, the methodology used to determine peak demand savings is detailed in the measure-specific sections below.

6.3.3 Adjustment Ratios

The adjustment ratios in Table 184 were established through the latest comprehensive impact evaluation for each program. They should be applied for all HVAC measures in SBES and BER-AR.

Table 184: HVAC Gross Savings Adjustment Ratios

Program Component	Source Evaluation Report	Energy Savings		Peak Demand Savings	
		Adjustment Ratio	Margin of Error	Adjustment Ratio	Margin of Error
BER-AR	2025	1.006	3.3%	1.027	8.5%
SBES	2023	0.980	4.4%	1.009	8.6%

6.3.4 HVAC Measures

(1) Electric Thermal Storage

Summary

Table 185 presents a summary of the values used to calculate electric thermal storage savings. The detailed methodology follows.

Table 185: Electric Thermal Storage Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	Electric thermal storage systems to reduce peak demand space heating load, rebated after installation	-	
Baseline	No thermal storage		
General Parameters			
Installation Rate	None, included in the adjustment ratios below		
Energy Savings Adjustment Ratio	-	-	See Subsection 6.3.3
Peak Demand Savings Adjustment Ratio	1.027	1.009	
Effective Useful Life [years]	18		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	-		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	-		-
Unitary Peak Demand Savings [W]	Calculation based on specification data for each installed system		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0%		See Subsection 6.3.1
Interactive Effects Factor for Peak Demand Savings	0%		See Subsection 6.3.1

Electrical Unitary Energy Savings

No energy savings are expected from this measure.

Unitary Peak Demand Savings

For electric thermal storage, an eight-hour charging period is assumed based on the residential off-peak period in Nova Scotia Power's time of day rate. It is also assumed that the stored heat will be provided equally throughout the remaining 16 hours of the day.

Therefore, the unitary peak demand unitary savings for electric thermal storage are calculated using the equation below where the maximum storage capacity is drawn from manufacturer specification sheets and is either the maximum system storage capacity or the maximum amount of energy the system can store in eight hours.

$$Peak\ Demand\ Savings_W = \text{Maximum Storage Capacity in 8h/16h}$$

(2) Advanced Rooftop Unit Controls

Summary

Table 186 presents a summary of the values used to calculate advanced rooftop unit (RTU) control savings. The detailed methodology follows.

Table 186: Advanced RTU Control Measure Summary

Parameter	BER-AR	Reference
Measure Description and Identification		
Measure	Advanced RTU controls that include demand-controlled ventilation (DCV) and an optional variable frequency drive (VFD), rebated after installation	-
Baseline	Control without DCV or VFD	
General Parameters		
Installation Rate	None, included in the adjustment ratios below	-
Energy Savings Adjustment Ratio	1.006	See Subsection 6.3.3
Peak Demand Savings Adjustment Ratio	1.027	
Effective Useful Life [years]	10	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each installed system	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	1.0	-
Unitary Peak Demand Savings [W]	Calculation based on specification data for each installed system	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0%	See Subsection 6.3.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 6.3.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for advanced RTU controls are calculated using the variables defined and listed in the equation below as well as in Table 187 and Table 188 further below.

$$\begin{aligned}
 \text{Energy Savings}_{kWh} &= \frac{1}{12,000} \times \left(\text{Capacity}_{cool} \times (AC \times CESF_{DCV} + VFD \times FESF_{VFD}) \right. \\
 &\quad \left. + \text{ElecHeat} \times \frac{\text{Capacity}_{heat} \times HESF_{DCV}}{COP_{heat}} \right)
 \end{aligned}$$

Table 187: Electrical Unitary Energy Savings Values for Advanced RTU Controls

Parameter	Symbol	BER-AR	Reference
Indicator of Cooling in the RTU	AC	RTU with AC: 1 RTU without AC: 0	-
Indicator of Electrical Heating in the RTU	$ElecHeat$	RTU with electrical heating: 1 RTU without electrical heating: 0	-
Indicator of a Supply Fan VFD Added with Advanced RTU Controls	VFD	Advanced RTU controls with supply fan VFD: 1 Advanced RTU controls without supply fan VFD: 0	-
Coefficient of Performance (COP) of the Heating Equipment [kW/kW]	COP_{heat}	RTU with electrical resistance: 1 RTU with heat pump: Specification data (if unknown, assume 1.8)	AHRI certified value or assumption ²⁰¹
Rated Cooling Capacity of the Cooling Equipment [Btu/h]	$Capacity_{cool}$	Specification data for each system	-
Rated Heating Capacity of the Heating Equipment [Btu/h]	$Capacity_{heat}$	Specification data for each system	
Cooling Energy Savings Factor for DCV [kWh/tonne]	$CESF_{DCV}$	Values from Table 188	2021 Illinois TRM, ²⁰² Government of Canada, ²⁰³ 2016 EPR Evaluation ²⁰⁴
Heating Energy Savings Factor for DCV [kWh/tonne]	$HESF_{DCV}$		
Supply Fan Energy Savings Factor from VFD [kWh/tonne]	$FESF_{VFD}$		
Conversion Factor [Btu/tonne·h]	12,000	12,000	Convention
Unitary Energy Savings [kWh/year]	$Energy Savings_{kWh}$	Calculation based on specification data for each rebated unit	Calculated

²⁰¹ Assuming a COP of 1 for electric resistance and an average COP of 1.8 for heat pumps based on a HSPF2 value of 6.0 for Region V, which corresponds to the minimum for “Split system central heat pumps, other than those that are small-duct and high-velocity or space-constrained” as per the NRCan regulation available at <https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/guide-canadas-energy-efficiency-regulations/split-system-central-air-conditioners-and-heat-pumps/6895>.

²⁰² Illinois Energy Efficiency Stakeholder Advisory Group, 2021 *Illinois Statewide Technical Reference Manual for Energy Efficiency Version 9.0*, Volume 2, September 2020, p. 393.

²⁰³ Government of Canada, Historical Climate Data. Retrieved from https://climate.weather.gc.ca/historical_data/search_historic_data_e.html.

²⁰⁴ Econoler, *Efficient Product Rebates 2016 DSM Evaluation*, March 8, 2017.

Table 188: Advanced RTU Control Energy Savings Factors

Facility Type	Supply Fan Energy Savings Factors from VFD ²⁰⁵ [kWh/tonne]	Cooling Energy Savings Factors for DCV ²⁰⁶ [kWh/tonne]	Heating Energy Savings Factors for DCV ²⁰⁷ [kWh/tonne]
Convenience Store	927	9	1,826
Education - Community College/University	388	9	2,675
Education - Primary ²⁰⁸	388	4	3,248
Education - Secondary ²⁰⁸	388	7	3,474
Health/Medical – Clinic ²⁰⁹	597	2	331
Health/Medical - Hospital ²⁰⁸	597	2	372
Lodging ²⁰⁹	597	2	331
Manufacturing	798	2	166
Multi-family ²⁰⁸	597	1	320
Office - Low Rise	1,115	3	1,035
Office - Mid Rise ²⁰⁸	1,115	4	1,152
Office - High Rise ²⁰⁸	1,115	8	1,131
Restaurant	596	3	1,035
Retail - Large Dept. Store	715	6	952
Retail - Strip Mall	738	6	870
Warehouse	401	1	934
Other/Miscellaneous ²¹⁰	692	4	1,241

²⁰⁵ Supply fan energy savings factors were calculated based on the difference between the normalized energy savings per cooling capacity values for the Chicago DCV and VFD w/3-speed fan control and DCV scenarios of the Advanced Rooftop Controls measure in the 2021 Illinois TRM.

²⁰⁶ Cooling energy savings factors for DCV were calculated based on the normalized energy savings per cooling capacity values for the Chicago DCV scenario of the Advanced Rooftop Controls measure in the 2021 Illinois TRM as well as the cooling degree days from Chicago (1,865°C·day, 2021 Illinois TRM) and Halifax (325°C·day, Government of Canada).

²⁰⁷ Heating energy savings factors for DCV were calculated based on the normalized energy savings per heating capacity values for the Chicago DCV scenario of the Advanced Rooftop Controls measure in the 2021 Illinois TRM as well as the heating degree days from Chicago (2,238°C·day, 2021 Illinois TRM) and Halifax (3,378°C·day, Government of Canada). Heating energy savings factors per capacity were multiplied by the COP assumption of 2.3 (2021 Illinois TRM) to obtain heating energy savings factors per capacity and COP.

²⁰⁸ For primary and secondary education facilities, supply fan energy savings factors were assumed to be the same as for community college/university facilities, and cooling and heating energy savings factors were calculated based on the ratio of their full load heating and cooling hours and those of community college/university facilities (from the 2016 EPR Evaluation Report). Similarly, the savings factors for hospitals were based on the values for clinics, those for multi-family facilities were based on the values for lodging facilities, and those for mid-rise and high-rise offices were based on the values for low-rise offices.

²⁰⁹ Energy savings factors for assisted living facilities were used for clinics and lodging facilities as they were assumed to be similar.

²¹⁰ Energy savings factors for the Other/Miscellaneous category were estimated to be the average values of all other categories.

Unitary Peak Demand Savings

The unitary peak demand savings for advanced RTU controls that include a supply fan VFD are calculated using the variables defined and listed in the equation as well as in Table 189 below. For the DCV portion of advanced RTU controls, no unitary peak demand savings that could be adapted to the Nova Scotia load shape were found in the literature. To claim DCV peak demand savings, metering or simulation data would have to be collected.

$$\text{Peak Demand Savings}_W = VFD \times HP \times 1,000 \times DSVG \times PCF$$

Table 189: Unitary Peak Demand Savings Values for Advanced RTU Controls

Parameter	Symbol	BER-AR	Reference
Demand Savings Factor [kW/hp]	<i>DSVG</i>	0.252	2025 Massachusetts TRM ²¹¹
Peak Coincidence Factor [-]	<i>PCF</i>	1.0	
Conversion Factor [W/kW]	-	1,000	Convention
Unitary Peak Demand Savings [W]	<i>Peak Demand Savings_W</i>	Calculation based on specification data for each rebated unit	Calculated

²¹¹ Mass Save, *Massachusetts Technical Reference User Manual (TRM) for Estimating Savings from Energy Efficiency Measures*, 2025-2027 Three-Year Plan Version, October 31, 2024, p. 582.

(3) Smart Thermostats for Electric Heating

Summary

Table 190 presents a summary of the values used to calculate smart thermostat for electric heating savings. The detailed methodology follows.

Table 190: Smart Thermostat for Electric Heating Measure Summary

Parameter	BER-AR, BER-IR, SBES				Reference
Measure Description and Identification					
Measure	Smart thermostats for electric baseboards, in floor radiant heating, and heat pumps, rebated after installation				-
Baseline	Manual or programmable thermostats				-
Measure Sub-category	Electric baseboards	MSHP	In-floor heating	Central heat pump	
General Parameters					
Installation Rate	None, included in the adjustment ratios below				-
Energy Savings Adjustment Ratio	1.006				See Subsection 6.3.3
Peak Demand Savings Adjustment Ratio	1.027				
Effective Useful Life [years]	9				See Subsection 3.2
Electrical Savings Parameters					
Unitary Energy Savings [kWh/year]	312	564	312	1,128	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	0%				See details below under Unitary Peak Demand Savings
Unitary Peak Demand Savings [W]	0				See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0				See Subsection 6.3.1
Interactive Effects Factor for Peak Demand Savings	0				See Subsection 6.3.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for smart thermostats for electric baseboards for commercial applications are assumed to be equal to the savings for a residential application because the heating power of controlled thermostats is expected to be similar. The residential savings were calculated according to the equation and methodology below.

$$Energy\ Savings_{kWh} = \frac{Heating\ Energy \times \%Savings}{FMT \times COP}$$

Since no studies specific to smart thermostats connected to electric baseboards, mini-split heat pump (MSHPs), or electric in-floor heating systems were identified, the percentage of the heating load saved by thermostats is based on available studies for smart thermostats compatible with central heating systems, which have essentially the same features. Table 191 presents two billing analyses conducted for Nest smart thermostats installed on central electrical heating systems (rather than natural gas or oil heating systems). Both analyses served to assess the savings for smart thermostats installed to replace both programmable and non-programmable thermostats, which is a reasonable baseline. In both studies, heating consumption savings of 12% were evaluated for central air-source heat pumps, which is the closest heating system to electric baseboards.

Table 191: Billing Analysis Savings Results for Smart Thermostats for Electrical Heating Systems

Jurisdiction	Measure	Sample Size	Heating Consumption Savings
Oregon ²¹²	Nest thermostats	185	12% (for ASHPs)
Bonneville Power Administration ²¹³	Nest thermostats	176	12% (for ASHPs)

The savings are divided by the average number of electric heating systems within a dwelling and assuming there is one heating system and one thermostat controlling the system in each room.

Table 192 below presents the variables used for the unitary savings calculation and the resulting value per thermostat.

²¹² Apex Analytics LLC, *Energy Trust of Oregon Nest Thermostat Heat Pump Control Pilot Evaluation*, October 10, 2014, 123 p

²¹³ Bonneville Power Administration, *Nest Learning Thermostat Pilot Program Savings Assessment Bonneville Power Administration & Franklin Public Utility District*, November 16, 2016.

Table 192: Electrical Unitary Energy Savings Calculation for Smart Thermostats for Electric Heating

Parameter	Symbol	Value for Electric Baseboard	Value for MSHP	Value for Electric In-floor Heating	Value for Central Heat Pumps	Reference
Average Heating Energy Consumption of a Home [kWh/year]	Heating Energy	16,915				2021, 2022, and 2023 HEA tracking sheets ²¹⁴
Percentage of Heating Load Saved by Smart Thermostats	%Savings	0.12				Literature review of billing analyses, see
Factor to Account for Multiple Thermostats Installed in the Same Home	FMT	6.5	2	6.5	1	Assumption ²¹⁵
Heating System Coefficient of Performance	COP	1	1.8	1	1.8	Assumption ²¹⁶
Unitary Energy Savings per Thermostat [kWh/year]	<i>Energy Savings_u</i>	312	564	312	1,128	Calculation

Unitary Peak Demand Savings

Smart thermostats are assumed to generate no peak demand savings because temperature setback periods, which are usually at night, are typically not aligned with peak demand hours. For there to be peak demand savings, smart thermostats would need to be enrolled in a demand reduction program and, in this case, the peak demand savings would be claimed through that program.

²¹⁴ Based on the average modelled heating energy consumption of HEA participants before and after their home retrofit, including 100% electrically heated participants with no heat pumps and adjusted to take into account HOT2000 overestimation ratios from the 2018 billing analysis. The averages of each year were weighted according to the number of projects.

²¹⁵ Assuming 1 thermostat per room for electric baseboards and in-floor heating and 6.5 rooms on average based on Statistics Canada 2016 Census. For MSHP, Assuming 1 thermostat per indoor unit and 2 indoor units per home. Statistics Canada, Census Profile, 2016 Census, <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/Page.cfm?Lang=E&Geo1=PR&Code1=12&Geo2=&Code2=&Data=Count&SearchType=Begin&SearchPR=01&B1=All> (last accessed December 3, 2019).

²¹⁶ Assuming a COP of 1 for electric resistance (including baseboard and in-floor), a COP of 1.8 for heat pumps and an average HSPF2 of 6.0 for Region V, which corresponds to the minimum for "Split system central heat pumps, other than those that are small-duct and high-velocity or space-constrained" as per the NRCan regulation available at <https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/guide-canadas-energy-efficiency-regulations/split-system-central-air-conditioners-and-heat-pumps/6895>.

(4) Air-source Heat Pumps Less Than 65,000 Btu/h (excluding air-to-water)

Summary

Table 193 presents a summary of the values used to calculate the savings for air-source heat pumps (ASHPs) of less than 65,000 Btu/h (excluding air-to-water). The detailed methodology follows.

Table 193: Air-source Heat Pumps Less Than 65,000 Btu/h, Measure Summary

Parameter	BER-AR	SBES	AMH (prescriptive)	AMH (comprehensive)	Reference
Measure Description and Identification					
Measure	Air-source heat pump less than 65,000 Btu/h used over the heating season which must be an AHRI certified matched system, rebated after installation				-
Baseline	Existing electric resistance heating				-
General Parameters					
Installation Rate	None, included in the adjustment ratios below		100%		-
Energy Savings Adjustment Ratio	1.006	0.980	1.000	-	See Subsection 6.3.3
Peak Demand Savings Adjustment Ratio	1.027	1.009	1.000	-	
Effective Useful Life [years]	18				See Subsection 3.2
Electrical Savings Parameters					
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit			Calculated using RETScreen or HOT2000	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	100%				See details below under Unitary Peak Demand Savings
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit			Calculated using RETScreen or HOT2000	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0				See Subsection 6.3.1
Interactive Effects Factor for Peak Demand Savings	0				See Subsection 6.3.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for ASHPs of less than 65,000 Btu/h (excluding air-to-water) are calculated using the variables defined and listed in the equation²¹⁷ and Table 194 below.

$$\Delta kWh = \left(HC \times \left[\frac{1}{HSPF2_{base}} - \frac{1}{HSPF2_{ee}} \right] \times FLH_h + CC \times \left[\frac{1}{SEER2_{base}} \times AC - \frac{1}{SEER2_{ee}} \right] \times FLH_c \right)$$

Table 194: Electrical Unitary Energy Savings Values for Air-source Heat Pumps Less Than 65,000 Btu/h

Parameter	Symbol	BER-AR, SBES, AMH (prescriptive)	Reference
Heat Pump Rated Heating Capacity [kBtu/h]	HC	Actual	Use information in TS
Heating Seasonal Performance Factor of the Baseline Heat Pump Equipment for Region 5 [Btu/W·h]	$HSPF2_{base}$	Actual or 3.412	Use information in TS <u>Default:</u> Convention for electric resistance
Heating Seasonal Performance Factor of the Energy Efficient Heat Pump Equipment for Region 5 [Btu/W·h]	$HSPF2_{ee}$	Actual	Use information in TS
Heat Pump Heating Full Load Hours per Year [h]	FLH_h	Based on building type	See Table 195
Cooling Full Load Hours per Year [h]	FLH_c	Based on building type	See Table 195
Heat Pump Rated Cooling Capacity [kBtu/h]	CC	Actual	Use information in TS
Cooling Seasonal Energy Efficiency Ratio of the Baseline Cooling Equipment [Btu/W·h]	$SEER2_{base}$	Actual If unknown, it can be estimated as follows: SEER = EER*1.1 or 14	Use information in TS Optional baseline from Vermont TRM, 2023 ²¹⁸
Cooling Seasonal Energy Efficiency Ratio of the Energy Efficient Cooling Equipment [Btu/W·h]	$SEER2_{ee}$	Actual If unknown, it can be estimated as follows: SEER = EER*1.1	Use information in TS
Air Conditioning	AC	baseline = 1; no air-conditioning in baseline = 0	Use information in TS
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculated

The FLH for heating and cooling come from the Minnesota TRM,²¹⁹ which were calculated for Duluth Minnesota. It is in the 4b climate zone with an average HDD of 6,956.

²¹⁷ Efficiency Vermont, *Technical Reference Manual (TRM) Program Year 2023*, p.90.

²¹⁸ Efficiency Vermont, *Technical Reference Manual (TRM) Program Year 2023*, p.91.

²¹⁹ Minnesota Commerce Department, *State of Minnesota Technical Reference Manual, Version 4.1*, January 31, 2024, p.340.

Table 195: Full Load Heating and Cooling Hours for BER-AR and SBES

Facility Type	FLHh	FLHc
Convenience Store	1,887	647
Education - Community College/University	1,972	682
Education - Primary	2,394	289
Education - Secondary	2,561	484
Health/Medical - Clinic	2,234	558
Health/Medical - Hospital	2,508	663
Lodging	2,361	401
Manufacturing	1,397	347
Multi-Family	2,280	228
Office - Low Rise	1,966	257
Office - Mid Rise	2,189	373
Office - High Rise	2,149	669
Restaurant	1,868	347
Residential ²²⁰	501	-
Retail - Large Department Store	1,763	462
Retail - Strip Mall	1,701	307
Warehouse	1,872	164
Other/Miscellaneous	2,123	443

For AMH, most heat pumps are installed in dwelling where people live and used in a residential fashion. Therefore, it was decided to use a residential FLH value derived from the 2024 Green Heat billing analysis, unless people do not actually live in the dwellings, like when they only sleep there. For example, the residential FLH value should not be used for shelters and community centers.

Unitary Peak Demand Savings

The unitary peak demand savings for ASHPs of less than 65,000 Btu/h (excluding air-to-water) are calculated using the variables defined and listed in the equation and Table 196 below, as well as variables from Table 194 above. The equation is from the Vermont 2023 TRM²²¹ with the performance taken at -15°C, which is the estimated temperature during the Nova Scotia peak demand period. If the heat pump is not operational at -15°C, there are no peak demand savings.

$$\Delta kW = HC_{min} \times \left[\frac{1}{HSPF2_{base}} - \frac{1}{COP_{ee\_min} \times 3.412} \right] \times PCF$$

²²⁰ These full-load hour values are used for MSHPs installed through AMH and for in-unit residential MSHPs installed through BER-AR and SBES.

²²¹ Efficiency Vermont, *Technical Reference Manual (TRM) Program Year 2023*, p.90.

Table 196: Unitary Peak Demand Savings Values for Air-source Heat Pumps Less Than 65,000 Btu/h

Parameter	Symbol	BER-AR, SBES, AMH (prescriptive)	Reference
Heat Pump Rated Heating Capacity at -15°C (estimated temperature during NS peak demand) [kBtu/h]	HC_{min}	Actual If unknown HCmin = 37.46% * Rated HC at 47°F	Use information in TS Estimation based on average performance reductions as per simulation software (DOE- 2) performance curves shared by NRCan
Coefficient of Performance for Efficient Heat Pump Technology at -15°C [-]	COP_{ee_min}	Actual If unknown COPee_min = 53.78% * Rated COP at 47°F	Use information in TS Estimation based on average performance reductions as per simulation software (DOE- 2) performance curves shared by Natural Resources Canada (NRCan)
Peak Coincidence Factor [-]	PCF	100%	Assumption that ASHPs operate continuously under peak demand conditions
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculated

(5) Air-source Heat Pumps Greater Than or Equal to 65,000 Btu/hr; Ground-source Heat Pumps; Water Source Heat Pumps; Air-to-water Heat Pumps; and Packaged Terminal Heat Pumps (PTHPs)

Summary

Table 197 presents a summary of the values used to calculate the savings for ASHPs greater than or equal to 65,000 Btu/h. The same methodology is used for ground-source heat pumps, water-source heat pumps, air-to-water heat pumps, and packaged terminal heat pumps. The detailed methodology follows.

Table 197: Air-source Heat Pumps Greater Than 65,000 Btu/h, Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	Air-source heat pump greater than 65,000 Btu/h, ground-source heat pump, water source heat pump, air-to-water heat pump, or a PTHP used over the heating season which must be an AHRI certified matched system, rebated after installation		-
Baseline	Existing electric resistance heating		-
General Parameters			
Installation Rate	None, included in the adjustment ratios below		-
Energy Savings Adjustment Ratio	1.006	0.980	See Subsection 6.3.3
Peak Demand Savings Adjustment Ratio	1.027	1.009	
Effective Useful Life [years]	Dependent on equipment type		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	100%		See details below under Unitary Peak Demand Savings
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.3.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.3.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for ASHPs greater than 65,000 Btu/h calculated using the variables defined and listed in the equation²²² and Table 198 below.

$$\Delta kWh = \left(HC \times \left[\frac{1}{HEF_{base}} - \frac{1}{HEF_{ee}} \right] \times FLH_h + CC \times \left[\frac{1}{CEF_{base}} \times AC - \frac{1}{CEF_{ee}} \right] \times FLH_c \right)$$

²²² Efficiency Vermont, *Technical Reference Manual (TRM) Program Year 2023*, p.90.

Table 198: Electrical Unitary Energy Savings Values for Air-source Heat Pumps Greater Than 65,000 Btu/h

Parameter	Symbol	BER-AR, SBES	Reference
Heat Pump Rated Heating Capacity [kBtu/hr]	HC	Actual	Use information in TS
Heating Efficiency Factor [Btu/W·h]	HEF_{base}	Actual or 3.412	Convention for electric resistance
Heating Efficiency Factor of the Energy Efficient Heat Pump Equipment [Btu/W·h]	HEF_{ee}	Actual	Use information in TS
Heat Pump Heating Full Load Hours [hours/year]	FLH_h	Based on building type	See Table 199
Cooling Full Load Hours [hours/year]	FLH_c	Based on building type	See Table 199
Heat Pump Rated Cooling Capacity (kBtu/hr)	CC	Actual	Use information in TS
Cooling Efficiency Factor [Btu/W·h]	CEF_{base}	Actual	Use information in TS
Cooling Efficiency Factor of the Energy Efficient Cooling Equipment [Btu/W·h]	CEF_{ee}	Actual	Use information in TS
Air Conditioning	AC	Baseline = 1; no air-conditioning in baseline = 0	Use information in TS
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculated

The FLH for heating and cooling come from the Minnesota TRM,²²³ which were calculated for Duluth Minnesota. It is in the 4b climate zone with an average HDD of 6,956.

Table 199: Full Load Hours for Heating and Cooling for BER-AR and SBES

Facility Type	FLHh	FLHc
Convenience Store	1,887	647
Education - Community College/University	1,972	682
Education - Primary	2,394	289
Education - Secondary	2,561	484
Health/Medical - Clinic	2,234	558
Health/Medical - Hospital	2,508	663
Lodging	2,361	401
Manufacturing	1,397	347
Multi-Family	2,280	228
Office - Low Rise	1,966	257
Office - Mid Rise	2,189	373
Office - High Rise	2,149	669
Restaurant	1,868	347
Retail - Large Department Store	1,763	462
Retail - Strip Mall	1,701	307
Warehouse	1,872	164
Other/Miscellaneous	2,123	443

²²³ Minnesota Commerce Department, *State of Minnesota Technical Reference Manual, Version 4.1*, January 31, 2024, p.340.

Unitary Peak Demand Savings

The unitary peak demand savings for ASHP greater than 65,000 Btu/h are calculated using the variables defined and listed in the equation and Table 200 below, as well as variables from Table 198 above. The equation is from the Vermont 2023 TRM²²⁴ with the performance taken at -15°C, which is the estimated temperature during Nova Scotia Peak Demand. If the heat pump is not operational at -15°C, there are no peak demand savings.

$$\Delta kW = HC_{min} \times \left[\frac{1}{HEF_{base}} - \frac{1}{HEF_{ee\_min}} \right] \times PCF$$

Table 200: Unitary Peak Demand Savings Values for Air-source Heat Pumps Greater Than 65,000 Btu/h

Parameter	Symbol	BER-AR, SBES	Reference
Heat Pump Rated Heating Capacity at -15°C (estimated temperature during NS peak demand) [kBtu/h]	HC_{min}	Actual	Use information in TS
Heating Efficiency Factor for Efficient Heat Pump Technology at -15°C	HEF_{ee_min}	Actual	Use information in TS
Peak Coincidence Factor [-]	PCF	100%	Assumption that ASHPs operate continuously under peak demand conditions
Unitary Peak Demand Savings [W]	ΔkW	Calculation based on specification data for each rebated unit	Calculated

²²⁴ Efficiency Vermont, *Technical Reference Manual (TRM) Program Year 2023*, p.90.

(6) Dual Enthalpy Economizer Controls

Summary

Table 201 presents a summary of the values used to calculate dual enthalpy economizer control savings. The detailed methodology follows.

Table 201: Dual Enthalpy Economizer Control Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	Dual enthalpy economizer controls which must be installed on new equipment that is also eligible for rebates, rebated after installation	-	
Baseline	-		
General Parameters			
Installation Rate	None, included in the adjustment ratios below		-
Energy Savings Adjustment Ratio	1.006	0.980	See Subsection 6.3.3
Peak Demand Savings Adjustment Ratio	1.027	1.009	
Effective Useful Life [years]	10		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	-		See details below under Unitary Peak Demand Savings
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.3.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.3.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for dual enthalpy economizer controls are calculated using the variables defined and listed in the equation²²⁵ and Table 202 below.

$$\Delta kWh = SF \times Tonnes \times \frac{OTF}{EER} \times Quantity$$

²²⁵ Efficiency Vermont, *Technical Reference User Manual Measure Savings Algorithms and Cost Assumptions*, March 2015.

Table 202: Electrical Unitary Savings Values for Dual Enthalpy Economizer Controls

Parameter	Symbol	BER-AR, SBES	Reference
Savings Factor [kBtu/tonne]	SF	SF (<4.5 tonnes) = 4,576 SF (>4.5 tonnes) = 3,318	Vermont TRM, 2015 ²²⁶ Annual kWh savings per tonne of cooling equipment at an EER of 1.0. Based on simulation modelling for Burlington, VT. For units less than 4.5 tonnes: SF = 4,576 (assume fixed damper baseline). For units of 4.5 tonnes or more: SF = 3,318
Tonnage of Cooling Equipment [tonnes]	Tonnes	Actual	Use information in TS
Operational Testing Factor	OTF	OTF (non-comm) = 0.8 OTF (comm) = 1	(When the project undergoes operational testing of commissioning services)
Energy Efficiency Ratio [Btu/Wh]	EER	Actual or 10.3	Use information in TS <u>Default:</u> 2015 Vermont TRM
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculated

Unitary Peak Demand Savings

The unitary peak demand savings for dual enthalpy economizer controls are assumed to be nil, because air conditioning loads are likely to be nil under peak conditions at -15°C.

Installation Rates

Installation rates for dual enthalpy economizer controls are estimated at 100%.

²²⁶ Efficiency Vermont, *Technical reference User Manual*, March 16, 2015.

(7) HVAC Hotel Occupancy Sensors

Summary

Table 203 presents a summary of the values used to calculate HVAC hotel occupancy sensor savings. The detailed methodology follows.

Table 203: HVAC Hotel Occupancy Sensor Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	Year-round HVAC hotel occupancy sensor which controls electric heating and which sets back temperature when space is not occupied, rebated after installation		-
Baseline	No occupancy sensor		-
General Parameters			
Installation Rate	None, included in the adjustment ratios below		-
Energy Savings Adjustment Ratio	1.006	0.980	See Subsection 6.3.3
Peak Demand Savings Adjustment Ratio	1.027	1.009	
Effective Useful Life [years]	8		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	-		Peak demand savings are taken from a secondary source and do not consider PCF
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.3.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.3.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for HVAC hotel occupancy sensors are defined in Table 204 below.

Table 204: Electrical Unitary Energy Savings Values for HVAC Hotel Occupancy Sensors

Parameter	Symbol	BER-AR, SBES	Reference
Unitary Energy Savings [kWh/year]	-	438	2025 Massachusetts TRM ²²⁷

²²⁷ Mass Save, *Massachusetts Technical Reference User Manual (TRM) for Estimating Savings from Energy Efficiency Measures*, 2025-2027 Three-Year Plan Version, October 31, 2024, p. 479.

Unitary Peak Demand Savings

The unitary peak demand savings for HVAC hotel occupancy sensors are provided in Table 205 below, as well as variables from Table 204 above.

Table 205: Unitary Peak Demand Savings Values for HVAC Hotel Occupancy Sensors

Parameter	Symbol	BER-AR, SBES	Reference
Unitary Peak Demand Savings [kW]	-	0.09	2025 Massachusetts TRM

Installation Rates

Installation rates for HVAC hotel occupancy sensors are estimated at 100%.

(8) High Volume Low Speed Fans

Summary

Table 206 presents a summary of the values used to calculate high volume low speed fan savings. The detailed methodology follows.

Table 206: High Volume Low Speed Fan Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	CSA / cUL rated high volume low speed (HVLS) fans rebated after installation		-
Baseline	Must replace existing circulation fans (unless building is new construction)		-
General Parameters			
Installation Rate	None, included in the adjustment ratios below	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	1.006	-	See Subsection 6.10.3
Peak Demand Savings Adjustment Ratio	1.027	-	
Effective Useful Life [years]	15		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	84%		See Subsection 6.10.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.10.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.10.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for high volume low speed fans are calculated using the variables defined and listed in the equation²²⁸ and Table 207 below.

$$\Delta kWh = (P_b \times QTY_b - P_e \times QTY_e) \times HOU / 1,000$$

Table 207: Electrical Unitary Energy Savings Values for High Volume Low Speed Fans

Parameter	Symbol	BER-AR, SBES	Reference
Power of Baseline Fans [W]	P _b	Actual or based on fan size (ft) >= 16 and <18 = 4,497 >= 18 and <20 = 5,026 >= 20 and <24 = 5,555 >= 24 = 6,613	Use information in TS Default values from Pennsylvania TRM, 2019 ²²⁹
Quantity of Baseline Fans	QTY _b	Actual or if not using actual fan power, assume QTY _b is equal to QTY _e	Use information in TS
HVLS Power Consumption, [W]	P _e	Actual or based on fan size (ft) >= 16 and <18 = 761 >= 18 and <20 = 850 >= 20 and <24 = 940 >= 24 = 1,119	Use information in TS Default values from Pennsylvania TRM, 2019
Total Quantity of New HVLS Fans	QTY _e	Actual or, if not using actual fan power, assume QTY _b is equal to QTY _e	Use information in TS
Hours of Use [h/year]	HOU	Actual or 2,928	Use information in TS
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for high volume low speed fans are calculated using the variables defined and listed in the equation and Table 208 below as well as variables from Table 207 above.

$$\Delta kW = (P_b \times QTY_b - P_e \times QTY_e) \times PCF / 1000$$

Table 208: Unitary Peak Demand Savings Values for High Volume Low Speed Fans

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	0.84	As per Subsection 6.10.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for high volume low speed fans in SBES are estimated at 100%.

²²⁸ Pennsylvania PUC, *Technical Reference Manual (TRM) Volume 3*, August 2019.

²²⁹ Pennsylvania Public Utility Commission, *Technical Reference Manual Volume 3: Commercial and Industrial Measures*, April 2019, p. 308.

6.4 Water Heating

6.4.1 Interactive Effects

Interactive effects are assumed to be nil for all water heating measures except for hot water insulation measures and heat pump water heaters.

Hot Water Insulation Measures

For hot water insulation measures, namely pipe insulation and hot water tank wraps, the interactive effects factors are based on engineering calculations to account for the duration of the heating and cooling seasons, cooling and heating system efficiency, and percentage of heat generated inside the heated portion of the building envelope.

For SBES, since no information is currently available on the proportion of water heating systems that are located inside the heated portion of the building for small businesses, the Evaluator assumed that it is similar to those of single-family homes. As presented in the Residential Subsection 2.2.1, based on site visit results from the 2015 evaluation²³⁰ and accounting for the proportion of DHW insulation measures installed in conditioned spaces, the average number of months during which heating interactive effects occur in a single-family home is 3.8 months. It is assumed that the impact of DHW on cooling loads is negligible since most measures are installed in a location that might be heated but not likely air-conditioned. Similar to lighting measures, it is assumed that 10% of the heat released by the pipes and DHW is lost through exterior walls and ceilings and does not contribute to the interactive effects, meaning 90% of heating contributes to interactive effects.

For buildings with heat pump heating, since the interactive effects factors are based on a heating system efficiency of 100%, some adjustments are necessary for buildings that use a heat pump as a primary heating system because the efficiency of such systems is superior to 100%. To do so, the interactive effects factor for heating (-28.5%) is divided by 1.8, the COP of a standard mini-split heat pump based on an HSPF2 Region V of 6.0, which is the value for a standard split heat pump as defined by the Federal Energy Efficiency Regulations.²³¹

Peak Demand

As for the impact on peak demand savings, it is assumed that all hot water tanks in a conditioned or semi-conditioned space create interactive effects. Therefore, similar to lighting products, the interactive effects factor for peak demand savings in electrically heated buildings is -90%.

Table 209 summarizes the interactive effects factors for water heating insulation measures.

Table 209: Interactive Effects Factors for Pipe Insulation and Hot Water Tank Wraps

Space Heating	Energy Interactive Effects During Heating Period	Energy Interactive Effects During Cooling Period	Total Energy Interactive Effects	Peak Demand Interactive Effects
Heat Pump Heating	$-90\% \times 3.8/12 / 1.8 = -15.8\%$	0.0%	-15.8%	-90%
Electrical Heating	$-90\% \times 3.8/12 = -28.5\%$	0.0%	-28.5%	-90%
No Electrical Heating	0.0%	0.0%	0.0%	0%

²³⁰ Econoler, *Residential Direct Install 2015 Evaluation*, March 3, 2016.

²³¹ Minister of Justice, Canada, *Energy Efficiency Regulations*, 2016, <http://laws-lois.justice.gc.ca/PDF/SOR-2016-311.pdf> (last accessed December 5, 2019).

Heat Pump Water Heaters

For heat pump water heaters, interactive effects are included in the calculation of energy and peak demand savings.

Summary

Table 210 summarizes the interactive effects factors established for each water heating measure.

Table 210: Interactive Effects Factors for Water Heating Measures

Measure	Type of Space Heating	Interactive Effects Factors for Energy Savings	Interactive Effects Factors for Peak Demand Savings	Reference
Low-flow Showerheads	-	0%	0%	Assumption
Faucet Aerators				
Thermostatic Shower Valves				
Pipe Insulation	Heat Pump Heating	-15.8%	-90%	Calculation
Hot Water Tank Wraps	Electrical Heating	-28.5%	-90%	
	No Electrical Heating	0%	0%	
Heat Pump Water Heaters	-	N/A	N/A	IE are included in the energy and peak demand savings

6.4.2 Peak Demand Savings Factors

For hot water tank wraps, energy savings are assumed to occur all the time since the tank always exchanges heat with the space around it. Therefore, peak demand savings for this measure correspond to the average demand savings throughout the year and were established by dividing the energy savings by 8,760 hours, which correspond to a peak demand-to-energy ratio of 0.114 W/kWh.

For other water heating measures, since commercial DHW was not an end use included in the peak demand-to-energy ratios developed by Navigant in the 2016-2018 Demand-side management (DSM) Plan, the Evaluator relied on load shapes from the Illinois TRM to establish a peak demand-to-energy ratio for this end use. Those load shapes rely on simulations to identify what portion of the energy savings is generated during the winter peak, which is defined for Illinois as between 8 a.m. and 11 p.m. on non-holiday weekdays from October to April. While that peak period differs from the one defined in Nova Scotia, those load shapes account for the fact that most water usage happens during the day on weekdays, thus providing a better estimate than spreading savings evenly throughout the year. Therefore, using those load shapes, the Evaluator established a peak demand-to-energy ratio by dividing the energy savings occurring during the peak period by the length of the peak period, as presented in the equations below.

$$\text{Peak Demand-to-energy Ratio} = \frac{\%kWh_{WP} \times 1,000 \text{ kW/W}}{Hours_{WP}}$$

$$Hours_{WP} = \left(Days_{WP} \times \frac{Weekdays}{Days \text{ in a Week}} - Holidays_{WP} \right) \times \text{Daily Peak Hours}$$

Table 211 lists the parameters and corresponding values applied in the above equations and the resulting peak demand-to-energy ratio.

Table 211: Peak Demand-to-energy Ratio for Water Heating Measures

Parameter	Symbol	Value	Reference
Portion of Energy Savings Occurring During Winter Peak Hours	%kWh _{WP}	40.5%	Illinois TRM ²³²
Number of Days During Winter Peak Season	Days _{WP}	211	Illinois TRM
Number of Weekdays in a Week	Weekdays	5	Convention
Number of Total Days in a Week	Days in a Week	7	Convention
Number of Holidays During Winter Peak Period	Holidays _{WP}	10	Assumption
Number of Peak Hours per Day	Daily Peak Hours	15	Illinois TRM
Number of Winter Peak Hours per Year	Hours _{WP}	2,111	Calculation
Peak Demand-to-energy Ratio	Peak Demand-to-energy Ratio	0.192	Calculation

Table 212 summarizes the peak demand-to-energy ratio for water heating measures.

Table 212: Water Heating Measure Peak Demand-to-energy Ratio Summary

Measure	Peak Demand-to-energy Ratio (W/kWh)
Low-flow Showerheads	0.192
Faucet Aerators	
Thermostatic Shower Valves	
Pipe Insulation	
Hot Water Tank Wraps	0.114

6.4.3 Adjustment Ratios

For water heating measures, no adjustment ratios were calculated.

²³² Illinois Commerce Commission, Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 5.0. February 2016.

6.4.4 Water Heating Measures

(1) Low-flow Showerheads

Summary

Table 213 presents a summary of the values used to calculate low-flow showerhead savings. The detailed methodology follows.

Table 213: Low-flow Showerhead Measure Summary

Parameter	SBES			Reference
Measure Description and Identification				
Measure	Low-flow showerheads of 1.5 GPM, with direct installation			-
Baseline	Standard flow showerhead			-
Measure Subcategory	Flow rate reduction of 0.5 gpm	Flow rate reduction of 0.75 gpm	Flow rate reduction of 1 gpm	-
General Parameters				
Installation Rate	100%			Assumption
Effective Useful Life [years]	10			See Subsection 3.2
Electrical Savings Parameters				
Unitary Energy Savings [kWh/year]	212	319	425	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.192			See Subsection 6.4.2
Unitary Peak Demand Savings [W]	40.7	61.2	81.6	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%			See Subsection 6.4.1
Interactive Effects Factor for Peak Demand Savings	0%			See Subsection 6.4.1

Electrical Unitary Energy Savings

The equations below are used to determine the annual unitary savings values for low-flow showerheads. The reduction in hot water consumption is established by the difference between the base and efficient hot water consumption levels, as presented in the second equation.

$$Energy\ Savings\ \left[\frac{kWh}{year}\right] = \%ElectricDHW \times \Delta Gallons\ \left[\frac{gal}{year}\right] \times EPG_{electric}\ \left[\frac{kWh}{gal}\right]$$

$$\Delta Gallons\ \left[\frac{gal}{year}\right] = (GPM_{base} - GPM_{low})\ \left[\frac{gal}{min}\right] \times SH_{time}\ \left[\frac{min}{year}\right] \times \%_{DHW}$$

$$EPG_{Electric}\ \left[\frac{kWh}{gal}\right] = (\rho_{H2O}\ \left[\frac{lb}{ft^3}\right] \times Cp_{H2O}\ \left[\frac{BTU}{lb^{\circ}F}\right] \times \Delta T_{H2O}\ [^{\circ}F] \times UC1\ \left[\frac{kWh}{BTU}\right] \times UC2\ \left[\frac{ft^3}{gal}\right]) / \eta$$

Table 214 below lists the parameters and corresponding values applied in the above equations for low-flow showerheads and the resulting unitary savings values.

Table 214: Electrical Unitary Energy Savings Values for Low-flow Showerheads

Parameter	Symbol	Value			Reference
Proportion of Water Heating Supplied by Electric Resistance Heating	%ElectricDHW	100%			Electrical energy savings will only be claimed for participants with electrical water heating
Baseline Flow Rate [gpm]	GPM _{base}	2	2.25	2.5	SBES tracking sheet
Low-flow Rate [gpm]	GPM _{low}	1.5			EPI Program Manual
Annual Minutes per Showerhead [min/year]	SH _{time}	3,419			See Table 215 below
Percentage of Hot Water Used in Showers	%DHW	63%			DeOreo et al. ²³³
Energy per Gallon of Hot Water Supplied by Electricity for Resistance Units [kWh/gal]	EPG _{Electric}	0.19924			Calculation
Electric Water Heater Efficiency	η	98%			Pennsylvania Public Utility Commission TRM ²³⁴
Temperature Rise in Electric Water Heater [°F]	ΔT _{H2O}	79			2011 OPA ²³⁵
Specific Heat of Water [Btu/lb°F]	Cp _{H2O}	1			Convention
Density of Water [lb/ft ³]	ρ _{H2O}	62.43			Convention
Unit Conversion #1 [kWh/Btu]	UC1	0.00029308			Convention
Unit Conversion #2 [ft ³ /gal]	UC2	0.1337			Convention
Unitary Energy Savings [kWh/year]	Energy Savings $\left[\frac{kWh}{year}\right]$	212	319	425	Calculation

Table 215 presents the annual minutes per showerhead by building type, the weight of each building type, and the resulting average annual minutes per showerhead for SBES.

Table 215: Average Showerhead Usage

Building Type	Annual Minutes per Showerhead (SH _{time})	Weight	Reference
Hospitality	3,509	86%	Annual minutes per showerhead: Iowa Energy Efficiency TRM – 2021 ²³⁶
Health	2,528	0%	
Education	2,057	0%	
Commercial - Employee Shower	1,894	2%	Weight: SBES 2021 tracking sheet
Other Commercial Except Fitness Center	3,029	12%	
Fitness Center	56,893	0%	
Weighted Average [Min/year]	3,419	-	Calculation

²³³ DeOreo et al. (2016). *Residential End Uses of Water*, Version 2: Executive Report, published by Water Research Foundation, <http://www.waterrf.org/PublicReportLibrary/4309A.pdf> (March 16, 2017), pp. 5-8.

²³⁴ Pennsylvania Public Utility Commission, *Technical Reference Manual Volume 2: Residential Measures*, September 2024, p. 82.

²³⁵ Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

²³⁶ Iowa Energy Efficiency, *Iowa Energy Efficiency Statewide Technical Reference Manual Version 6.0*, July 23, 2021.

Installation Rates

For SBES low-flow showerheads, an installation rate of 100% is assumed.

(2) Faucet Aerators

Summary

Table 216 presents a summary of the values used to calculate faucet aerator savings. The detailed methodology follows.

Table 216: Faucet Aerator Measure Summary

Parameter	SBES	Reference
Measure Description and Identification		
Measure	Faucet aerators, with direct installation	-
Baseline	No faucet aerator on standard flow-rate faucets	
General Parameters		
Installation Rate	95%	See details below under Installation Rates
Effective Useful Life [years]	10	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	266	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.192	See Subsection 6.4.2
Unitary Peak Demand Savings [W]	51.1	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	0%	See Subsection 6.4.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 6.4.1

Electrical Unitary Energy Savings

The equations below are used to calculate the annual unitary savings value for faucet aerators.

$$DHW\ Savings\ \left[\frac{L}{year}\right] = DHW_{base}\ \left[\frac{gal}{year}\right] \times \frac{(q_{base} - q_{low})}{q_{base}} \times UC1\ \left[\frac{L}{gal}\right]$$

$$Unitary\ Savings\ \left[\frac{kWh}{year}\right] = \frac{DHW\ Savings[L] \times Cp\ \left[\frac{lb}{ft^3}\right] \times \rho\ \left[\frac{btu}{lb^{\circ}F}\right] \times \Delta T[^{\circ}F] \times UC2\ \left[\frac{kWh}{btu} \times \frac{ft^3}{L}\right]}{\eta}$$

Table 217 below lists the parameters and values applied in the two above equations for faucet aerators and the resulting unitary savings values.

Table 217: Electrical Unitary Energy Savings Values for Faucet Aerators

Parameter	Symbol	Value	Reference
Baseline Flow Rate [gpm]	Q_{base}	1.39	DeOreo et al. in <i>Residential End Uses of Water Study Update</i> , as cited in Illinois 2021 TRM ²³⁷
Low-flow Rate [gpm]	Q_{low}	0.94	
Baseline Hot Water Consumption [US gallons/year]	DHW _{base}	4,163	See Table 218 below
Specific Heat of Water [Btu/lb°F]	C_{pH_2O}	1	Convention
Density of Water [lb/ft ³]	ρ_{H_2O}	62.43	Convention
Temperature Rise in Electrical Water Heater [°F]	ΔT_{H_2O}	79	2011 OPA ²³⁸
Electrical Water Heater Efficiency	η	98%	Pennsylvania Public Utility Commission TRM ²³⁹
Unit Conversion #1 [L/US gallon]	UC1	3.79	Convention
Unit Conversion #2 [(kWh/Btu)x(ft ³ /L)]	UC2	0.00001035	Convention
Unitary Energy Savings [kWh/year]	<i>Unitary Savings</i> $\left[\frac{kWh}{year} \right]$	266	Calculation

Table 218 presents the average hot water usage per faucet by building type, the weight of each building type, and the resulting average annual hot water usage per faucet for SBES.

Table 218: Average Hot Water Usage per Faucet

Building Type	DHW Consumption per Faucet (Gallons)	Weight	Reference
Small Office	2,500	12%	Consumption: 2021 Illinois Statewide TRM ²⁴⁰ Weight: SBES 2021 tracking sheet
Restaurant	15,768	6%	
Retail	3,650	3%	
Lodging	1,825	36%	
Other	5,000	43%	
Weighted Average [Min/year]	4,163	-	Calculation

Installation Rates

For SBES faucet aerators, an installation rate of 95% is used based on the value in the 2021 Illinois Statewide TRM.

²³⁷ Illinois Energy Efficiency Stakeholder Advisory Group. *2021 Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 9.0 – Volume 2: Commercial and Industrial Measures*, p. 131.

²³⁸ Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

²³⁹ Pennsylvania Public Utility Commission, *Technical Reference Manual Volume 2: Residential Measures*, September 2024, p. 82..

²⁴⁰ Illinois Energy Efficiency, *2021 Illinois Statewide Technical Reference Manual for Energy Efficiency Version 9.0*, September 25, 2020.

(3) Thermostatic Shower Valve

Summary

Table 219 presents a summary of the values used to calculate thermostatic shower valve savings. The detailed methodology follows.

Table 219: Thermostatic Shower Valve Measure Summary

Parameter		SBES				Reference
Measure Description and Identification						
Measure	Thermostatic shower valves cutting off water after the target temperature has been reached, with direct installation				-	
Baseline	No thermostatic shower valve				-	
Measure Subcategory	1.5 gpm showerhead	2.0 gpm showerhead	2.25 gpm showerhead	2.5 gpm showerhead	-	
General Parameters						
Installation Rate	100%				See details below under Installation Rates	
Effective Useful Life [years]	10				See Subsection 3.2	
Electrical Savings Parameters						
Unitary Energy Savings [kWh/year]	80.1	107	120	133	See details below under Electrical Unitary Energy Savings	
Peak Demand-to-energy Ratio [W/kWh]	0.192				See Subsection 6.4.2	
Unitary Peak Demand Savings [W]	15.4	20.5	23.5	25.5	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio	
Interactive Effects Factor for Energy Savings	0%				See Subsection 6.4.1	
Interactive Effects Factor for Peak Demand Savings	0%				See Subsection 6.4.1	

Electrical Unitary Energy Savings

The equations below are used to determine the annual unitary savings values for thermostatic shower valves. Energy savings are established by calculating the reduction in hot water usage, as presented in the second equation below.

$$Energy\ Savings\ \left[\frac{kWh}{year}\right] = DHW\ Reduction\ \left[\frac{gal}{year}\right] \times EPG_{electric}\ \left[\frac{kWh}{gal}\right]$$

$$DHW\ Reduction\ \left[\frac{gal}{year}\right] = q\ \left[\frac{gal}{min}\right] \times \%_{DHW} \times t_w\ \left[\frac{min}{shower}\right] \times \frac{SH_{time}\ \left[\frac{min}{year}\right]}{t_{shower}\ \left[\frac{min}{shower}\right]}$$

$$EPG_{Electric}\ \left[\frac{kWh}{gal}\right] = (\rho_{H2O}\ \left[\frac{lb}{ft^3}\right] \times Cp_{H2O}\ \left[\frac{BTU}{lb^{\circ}F}\right] \times \Delta T_{H2O}\ [^{\circ}F] \times UC1\ \left[\frac{kWh}{BTU}\right] \times UC2\ \left[\frac{ft^3}{gal}\right]) / \eta$$

Table 220 lists the parameters and corresponding values applied to the two above equations and the resulting unitary savings values for thermostatic shower valves.

Table 220: Electrical Unitary Energy Savings Values for Thermostatic Shower Valves

Parameter	Symbol	SBES	Reference
Flow Rate [gpm]	q	Variable (1.5 gpm for low-flow showerhead, otherwise: 2.0 gpm, 2.25 gpm, or 2.5 gpm)	SBES tracking sheet
Annual Minutes per Showerhead [min/year]	SH _{time}	3,419	Value drawn from the low-flow showerhead measure; see Subsection 6.4.4 (1)
Average Shower Time per Person [min/shower]	t _{shower}	7.8	DeOreo et al. ²⁴¹
Behavioural Waste Time [min/shower]	t _w	0.98	Pennsylvania Public Utility Commission TRM ²⁴²
Percentage of Hot Water Used in Showers	% _{DHW}	63%	DeOreo et al.
Specific Heat of Water [Btu/lb°F]	Cp _{H2O}	1	Convention
Density of Water [lb/ft³]	ρ _{H2O}	62.43	Convention
Temperature Rise in Electric Water Heater [°F]	ΔT _{H2O}	79	2011 OPA ²⁴³
Unit Conversion #1 [kWh/Btu]	UC1	0.000293083	Convention
Unit Conversion #2 [ft³/gal]	UC2	0.1337	Convention
Electric Water Heater Efficiency	η	98%	Pennsylvania Public Utility Commission TRM ²⁴⁴
Unitary Energy Savings [kWh/year]	Flow rate of 1.5 gpm	80.1	Calculation
	Flow rate of 2.0 gpm	107	Calculation
	Flow rate of 2.25 gpm	120	Calculation
	Flow rate of 2.5 gpm	133	Calculation

²⁴¹ DeOreo et al. (2016). *Residential End Uses of Water*, Version 2: Executive Report, published by Water Research Foundation, <http://www.waterrf.org/PublicReportLibrary/4309A.pdf> (March 16, 2017), pp. 5-8.

²⁴² Pennsylvania Public Utility Commission, *Technical Reference Manual*, State of Pennsylvania, June 2013, p. 174.

²⁴³ Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

²⁴⁴ Pennsylvania Public Utility Commission, *Technical Reference Manual Volume 2: Residential Measures*, September 2024, p. 82

Installation Rates

For SBES thermostatic shower valves, an installation rate of 100% is assumed.

(4) Pipe Insulation

Summary

Table 221 presents a summary of the values used to calculate pipe insulation savings. The detailed methodology follows.

Table 221: Pipe Insulation Measure Summary

Parameter	SBES	Reference
Measure Description and Identification		
Measure	Added pipe insulation to hot water copper pipes, with direct installation	-
Baseline	No pipe insulation	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	13	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings (per ft) [kWh/year]	12.7	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.192	See Subsection 6.4.2
Unitary Peak Demand Savings [W]	2.44	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	Calculation based on building heating systems for each installed unit	See Subsection 6.4.1
Interactive Effects Factor for Peak Demand Savings		

Electrical Unitary Energy Savings

As presented in Table 222, the annual unitary savings value for pipe insulation was identified through Ontario Power Authority (OPA) 2011²⁴⁵ values and was established at 12.7 kWh per linear foot. While this value is for residential usage, it was assumed that water heating systems in small businesses would be used for a similar amount of time as a home.

Table 222: Unitary Energy Savings Value for Pipe Insulation

Parameter	SBES
Unitary Energy Savings (per ft) [kWh/year]	12.7

²⁴⁵ Ontario Power Authority (OPA), *OPA Prescriptive Measures and Assumptions List*, December 2010.

Installation Rates

The installation rate for SBES pipe insulation is assumed at 100%.

(5) Hot Water Tank Wraps

Summary

Table 223 presents a summary of the values used to calculate hot water tank wrap savings. The detailed methodology follows.

Table 223: Hot Water Tank Wrap Measure Summary

Parameter	SBES	Reference
Measure Description and Identification		
Measure	Hot water tank wrap, with direct installation	-
Baseline	No tank wrap	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	7	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	157	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	0.114	See Subsection 6.4.2
Unitary Peak Demand Savings [W]	17.9	Calculated by multiplying the unitary savings value by the peak demand-to-energy ratio
Interactive Effects Factor for Energy Savings	Calculation based on building heating systems for each installed unit	See Subsection 6.4.1
Interactive Effects Factor for Peak Demand Savings		

Electrical Unitary Energy Savings

The following equations are used to determine the annual unitary savings associated with hot water tank wraps. The energy savings are equal to the difference in heat losses associated with tank circumference (Q_{tank}) before and after adding the tank wrap ($Q_{\text{tank+RSI 1.21}}$). The heat losses are calculated using the following formulas of heat transfer in an insulated cylinder.

$$R_{\text{layer}} = \frac{\ln(r_e/r_i)}{2\pi k}$$

$$R_{\text{cyl}} = R_{\text{layer1}} + R_{\text{layer2}}$$

$$Q_{\text{cyl}} = \frac{T_i - T_e}{R_{\text{cyl}}} L$$

$$Q_{\text{top}} = \frac{A_{\text{top}} \times (T_i - T_e)}{R_{\text{top}}}$$

$$Q_{\text{total}} = Q_{\text{cyl}} + Q_{\text{top}}$$

$$\text{Energy Savings}_{\text{kWh}} = \frac{(Q_{\text{total}}) \cdot \text{HOU}}{\eta_{\text{heater}}}$$

It is assumed that small businesses use similar hot water tanks as single-family homes. Thus, the calculation considers a typical residential tank with a capacity of 60 imperial gallons and hot water tank wrap with a thermal resistance of 1.21 m²·°C/W.

Table 224 below lists the values applied in the above equations to obtain the unitary savings for tank wraps.

Table 224: Electrical Unitary Energy Savings Values for Hot Water Tank Wraps

Parameter	Symbol	Value	Reference
Layer 1: Interior Insulation of Tank			
External Radius of the Layer [m]	r_e	0.300	Giant ²⁴⁶
Internal Radius of the Layer [m]	r_i	0.249	Ibid
Thermal Conductivity of the Layer [W/m·°C]	k	0.024	Ibid
Thermal Resistance of the Layer of Material in the Cylinder (e.g. insulation inside the tank and tank wrap) [m·°C/W]	R_{layer}	1.228	Calculation
Thermal Resistance of the Top of the Tank [m·°C/W]	R_{Top}	2.113	Giant ²⁴⁷
Layer 2: Tank Wrap			
External Radius of the Layer [m]	r_e	0.351	Estimated from Frost King Insulation Blanket Specifications ²⁴⁸
Internal Radius of the Layer [m]	r_i	0.300	Giant ²⁴⁹
Thermal Conductivity of the Layer [W/m·°C]	k	0.042	Estimated from Frost King Insulation Blanket Specifications
Thermal Resistance of the Layer of Material Inside the Cylinder (e.g. insulation inside the tank and tank wrap) [m·°C/W]	R_{layer}	1.821	Calculation
Thermal Resistance of the Top of the Tank [m·°C/W]	R_{Top}	3.323	Sum of R-values of the insulation inside the tank and tank wrap
Heat Transfer			
Length of the Cylinder [m]	L	1.52	Giant ²⁵⁰
Area of the Top of the Tank [m ²]	A_{top}	0.283	Calculated from Giant tank dimensions
Temperature at the External Radius of the Cylinder [°C]	T_e	21	Assumption for standard ambient indoor temperature
Temperature at the Internal Radius of the Cylinder [°C]	T_i	60	OPA Prescriptive Measures and Assumptions 2011 ²⁵¹
Hours of Use [h/year]	HOU	8,760	Assumption
Thermal Efficiency of Heating Element	η_{heater}	98%	Pennsylvania Public Utility Commission ²⁵²
Heat Transfer Through the Tank [W]	Q_{total}	53.4	Calculation
Heat Transfer Through the Insulated Tank [W]	Q_{total}	35.8	Calculation
Unitary Energy Savings for Tank Wrap [kWh/year]	-	157	Calculation

²⁴⁶ Giant Inc., *Engineering Submittal Data Sheet 172ETE Models*, <http://www.giantinc.com/tech-data/FT-172E-An.pdf> (last accessed February 18, 2015).

²⁴⁷ Ibid.

²⁴⁸ Frost King Weatherization Products, *Water Heater Insulation Blanket*, <http://www.frostking.com/water-heater-insulation-blanket/> (last accessed January 4, 2014).

²⁴⁹ Giant Inc., *Engineering Submittal Data Sheet 172ETE Models*, 16.

²⁵⁰ Giant Inc., *Engineering Submittal Data Sheet 172ETE Models*, 16.

²⁵¹ Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

²⁵² Pennsylvania Public Utility Commission, *Technical Reference Manual Volume 2: Residential Measures*, September 2024, p. 82.

Installation Rates

The installation rate for SBES hot water tank wraps is assumed at 100%.

(6) Heat Pump Water Heaters

Summary

Table 225 presents a summary of the values used to calculate DHW heat pump water heater savings. The detailed methodology follows.

Table 225: DHW Heat Pump Water Heater Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Heat pump water heater with an Energy factor greater than 2.3, rebated after installation	-
Baseline	Existing electric resistance hot water system	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	10	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Demand-to-energy Ratio [W/kWh]	Calculation based on facility characteristics	See details below under Unitary Peak Demand Savings
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.4.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.4.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for heat pump water heaters are calculated based on the difference between the uniform energy factor of an existing electric resistance hot water system and the uniform energy factor of the efficient measure. The savings are calculated using the variables defined and listed in the equation and Table 226 below.

$$\Delta kWh = \Delta kWh_{DHW} + \Delta kWh_{IE}$$

$$\Delta kWh_{DHW} = WHL \times \left(\frac{1}{UEF_b} - \frac{1}{UEF_e \times F_{adj}} \right)$$

$$\Delta kWh_{IE} = WHL \times \left(1 - \frac{1}{UEF_e} \right) \times \left(AC \times \frac{f_{cool}}{COP_{cool}} - SH \times \frac{f_{heat}}{COP_{heat}} \right)$$

$$WHL = GPD \times DAYS \times c_v \times \Delta T_{H2O} \times \frac{1}{3412}$$

$$GPD \text{ (if unknown)} = Capacity \times \frac{Consumption/Cap}{365}$$

Table 226: Electrical Unitary Energy Savings Values for DHW Heat Pump Water Heaters

Parameter	Symbol	Value	Reference
Commercial Gallons of Hot Water Used per Day per HWHP [gallons/day]	GPD	Actual or based on Table 227	2024 Illinois TRM ²⁵³ adjusted to E1 facility types
Capacity of HPWH [gallons]	$Capacity$	Actual	Use information in TS
Number of Days of Use per Year [days/year]	$DAYS$	Actual or 365	Use information in TS Default: Convention
Heat Capacity of Water [Btu/gal-°F]	c_v	8.33	Convention
Temperature Rise in Electric Water Heater [°F]	ΔT_{H2O}	79	2011 OPA ²⁵⁴
Btu-to-kWh Conversion Factor [kWh/Btu]	-	1/3,412	Convention
Baseline Uniform Energy Factor	UEF_b	Actual or 0.9307 – 0.0002 * Capacity [gallons]	Use information in TS Default: NRCAN, 2022 (assuming medium draw pattern) ²⁵⁵
Efficient Uniform Energy Factor	UEF_e	Actual	Use information in TS
COP Adjustment Factor	F_{adj}	If efficient measure is in a: Unconditioned space: 0.77 Conditioned space: 1.16 Kitchen: 1.45 Unknown: 1.06	2026 Pennsylvania TRM ²⁵⁶
Space Cooling Factor	AC	If presence of: Air conditioning: 1 No air conditioning: 0	Use information in TS
Space Heating Factor	SH	If presence of: Electric space heating: 1 Non-electric or no space heating: 0	Use information in TS
Proportion of Water Heating During Cooling Hours	f_{cool}	Calculation based on facility characteristic	See Table 228
Proportion of Water Heating During Heating Hours	f_{heat}		
Cooling System COP	COP_{cool}	Actual or 2.5	Use information in TS Default: Assumption
Heating System COP	COP_{heat}	Actual or, if unknown: Electric resistance: 1 Heat pump: 1.8	Use information in TS Default: Electric resistance: Convention Heat pump: Region V HSPF2 of 6.0
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Table 227: Consumption/Cap by Facility Type

Facility Type	Consumption/Cap
Agriculture	341
Banking / Financial	511
Education	568
Entertainment / Public Assembly	341
Healthcare	788
Hospitality	715
Manufacturing / Industrial	341
Office / Commercial	511
Public Service	341
Residential	894
Restaurant / Bar	622
Retail	528
Technology / Science	341
Warehouse / Storage	341

Similarly to interactive effects for lighting measures, heat pump water heater interactive effects factors are determined through engineering calculations based on the proportion of operating times of the water heating system to space heating and cooling systems. Assumed water heating operating times are assigned based on the facility type to match those assumed for lighting systems. Space heating and space cooling operating times are based on weather data established using a typical meteorological year with a heating season between October 1 and April 30 and a cooling season for the remainder of the year. Finally, the heating balance point is assumed to be 13 °C and the cooling balance point is assumed to be 18 °C. The proportions (f_{heat} and f_{cool}) are presented in Table 228.

²⁵³ Illinois Commerce Commission, *2024 Illinois Statewide Technical Reference Manual for Energy Efficiency Version 12.0*, Volume 2: Commercial and Industrial Measures, September 22, 2023, p. 214.

²⁵⁴ Ontario Power Authority (OPA), *2011 Prescriptive Measures and Assumptions Version 1*, March 2011.

²⁵⁵ Natural Resources Canada. *Electric water heaters*, July 2022. Retrieved from <https://natural-resources.canada.ca/energy-efficiency/energy-efficiency-regulations/electric-water-heaters> (last accessed October 24, 2025)

²⁵⁶ Pennsylvania Public Utility Commission, *2026 Technical Reference Manual Volume 3: Commercial & Industrial Measures*, September 2024, p. 185.

Table 228: Proportion of Water Heating During Operation of Space Heating and Cooling Systems

Facility Type	Assumed Daily Schedule	f _{heat}	f _{cool}
Agriculture	8 A.M. to 4 P.M.	0.526	0.228
Banking / Financial	8 A.M. to 4 P.M.	0.526	0.228
Education	8 A.M. to 4 P.M.	0.526	0.228
Entertainment / Public Assembly	8 A.M. to 4 P.M.	0.526	0.228
Healthcare	24 hours	0.544	0.143
Hospitality	24 hours	0.544	0.143
Manufacturing / Industrial	8 A.M. to 6 P.M.	0.525	0.230
Office / Commercial	8 A.M. to 4 P.M.	0.526	0.228
Public Service	8 A.M. to 4 P.M.	0.526	0.228
Residential	24 hours	0.544	0.143
Restaurant / Bar	8 A.M. to 6 P.M.	0.525	0.230
Retail	8 A.M. to 6 P.M.	0.525	0.230
Technology / Science	8 A.M. to 4 P.M.	0.526	0.228
Warehouse / Storage	24 hours	0.544	0.143

Unitary Peak Demand Savings

The unitary peak demand savings for DHW heat pump water heaters are calculated using the variables defined and listed in the equation and Table 229 below, as well as variables from Table 228 above.

$$\Delta kW = \Delta kWh \times PDTER$$

Table 229: Unitary Peak Demand Savings Values for DHW Heat Pump Water Heaters

Parameter	Symbol	BER-AR, SBES	Reference
Peak Demand-to-Energy Ratio [kW/kWh]	PDTER	Calculation based on facility characteristics as shown in Table 230	2026 Pennsylvania TRM ²⁵⁷
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

²⁵⁷ Pennsylvania Public Utility Commission, *Technical Reference Manual – Volume 3: Commercial & Industrial Measures*, September 2024, p. 184.

Table 230: Heat Pump Water Heater PDTER by Facility Type

Facility Type	PDTER
Agriculture	0.141
Banking / Financial	0.161
Education	0.116
Entertainment / Public Assembly	0.141
Healthcare	0.131
Hospitality	0.163
Manufacturing / Industrial	0.141
Office / Commercial	0.161
Public Service	0.141
Residential	0.141
Restaurant / Bar	0.146
Retail	0.143
Technology / Science	0.141
Warehouse / Storage	0.082

Installation Rates

Installation rates for DHW heat pump water heaters are estimated at 100%.

6.5 Compressed Air

6.5.1 Interactive Effects

Interactive effects are assumed to be nil for compressed air projects since compressors are usually in non-conditioned spaces.

6.5.2 Peak Demand Savings Factors

For compressed air measures, the peak demand savings factor is assumed to be 77% where it is unknown for the specific project.

6.5.3 Adjustment Ratios

For compressed air measures, no adjustment ratios were calculated.

6.5.4 Compressed Air Measures

(1) Compressed Air Leak Repairs

Summary

Table 231 presents a summary of the values used to calculate compressed air leak repair savings. The detailed methodology follows.

Table 231: Compressed Air Leak Repair Measure Summary

Parameter	BER-AR, Custom	Reference
Measure Description and Identification		
Measure	Repair leaks in compressed air systems	-
Baseline	-	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	2	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on performance data for each system	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	Actual	Use information in TS
Unitary Peak Demand Savings [W]	Calculation based on performance data for each system	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0%	See Subsection 6.5.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 6.5.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for compressed air leak repairs are calculated using the variables defined and listed in the equation and tables below.

$$\text{Unitary Savings [kWh/yr]} = \text{Size of Leak [cfm]} \times \text{Plant Efficiency [kW/(100 cfm)]} \times \text{HOU [h/yr]}$$

Table 232: Electrical Unitary Energy Savings Values for Compressed Air Leak Repairs

Parameter	Symbol	Value	Reference
Size of Leak [cfm]	-	Actual	Project documentation
Plant Efficiency [kW/100 cfm]	-	Actual (If unknown, use 19.7 kW/100 cfm)	Project documentation (UE Systems Calculations)
Hours of Use [h/yr]	HOU	Actual	Project documentation
Unitary Energy Savings [kWh/year]	<i>Unitary Savings</i> [kWh/yr]	Calculated based on specification data for each installed system	Calculation

Unitary Peak Demand Savings

Unitary peak demand savings for compressed air leak repairs are calculated using the equation below and the variables defined and listed in Table 232 above.

$$\text{Unitary Savings [kW]} = \text{Size of Leak [cfm]} \times \text{Plant Efficiency [kW/(100 cfm)]} \times \text{PCF}$$

Table 233: Electrical Unitary Peak Demand Values for Compressed Air Leak Repairs

Parameter	Symbol	Value	Reference
Peak Coincidence Factor	PCF	Actual	Project Documentation
Unitary Peak Demand Savings [kW]	<i>Unitary Savings</i> [kW]	Calculated based on specification data for each installed system	Calculation

Installation Rates

For Custom measures, the installation rate is assumed to be 100%.

(2) Cycling Air Dryers

Summary

Table 234 presents a summary of the values used to calculate cycling air dryer savings. The detailed methodology follows.

Table 234: Cycling Air Dryer Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Cycling refrigerated dryers up to 300 cubic feet per minute (CFM) capacity which automatically turn on and off in response to load, rebated after installation	-
Baseline	Refrigerated dryers that run continuously	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	10	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	Actual or 0.77	As per Subsection 6.5.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.5.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.5.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for cycling air dryers are calculated using the variables defined and listed in the equation²⁵⁸ and Table 235 below.

$$\Delta kWh = 4 \times hp_{comp} \times 0.0087 \times HOU \times (1 - APC) \times RTD$$

Table 235: Electrical Unitary Energy Savings Values for Cycling Air Dryers

Parameter	Symbol	BER-AR, SBES	Reference
Compressor Motor Nominal Horsepower [HP]	hp _{comp}	Actual	Use information in TS
Hours of Use [hours/year]	HOU	Actual or 1-shift (8/5) – 2,080 hours 2-shift (16/5) – 4,160 hours 3-shift (24/5) – 6,240 4-shift (24/7) – 8,320 hours Blended – 3,952 hours	Use information in TS
Average % Capacity; Average Operating Capacity of Compressor	APC	0.65	Vermont TRM (2015) ²⁵⁹
Chilled Coil Response Time Derate	RTD	0.925	Vermont TRM (2015)
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for cycling air dryers are calculated using the variables defined and listed in the equation and Table 236 below, as well as variables from Table 235 above.

$$\Delta kW = \Delta kWh \times PCF / HOU$$

Table 236: Unitary Peak Demand Savings Values for Cycling Air Dryers

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	Actual or 0.77	As per Subsection 6.5.2
Hours of Use [hours/year]	HOU	Actual or 1-shift (8/5) – 2,080 hours 2-shift (16/5) – 4,160 hours 3-shift (24/5) – 6,240 4-shift (24/7) – 8,320 hours Blended – 3,952 hours	Use information in TS
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

²⁵⁸ Efficiency Vermont, *Technical Reference User Manual (TRM) Measure Savings Algorithms and Cost Assumption*, March 2015.

²⁵⁹ Efficiency Vermont, *Technical Reference User Manual (TRM) Measure Savings Algorithms and Cost Assumption*, March 2015.

Installation Rates

Installation rates for cycling air dryers are estimated at 100%.

(3) Air-entraining Air Nozzles

Summary

Table 237 presents a summary of the values used to calculate air-entraining air nozzle savings. The detailed methodology follows.

Table 237: Air-entraining Air Nozzle Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Air-entraining air nozzles under 14 CFM at 100 psi	-
Baseline	Hand-held or fixed air nozzles	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	15	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	Actual or 0.77	As per Subsection 6.5.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.5.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.5.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for air-entraining air nozzles are calculated using the variables defined and listed in the equation²⁶⁰ and Table 238 below.

$$\Delta kWh = (CFM_b - CFM_e) \times COMP \times HRS \times \%USE \times QTY$$

²⁶⁰ Efficiency Vermont, *Technical Reference User Manual (TRM) Measure Savings Algorithms and Cost Assumption*, March 2015.

Table 238: Electrical Unitary Energy Savings Values for Air-entraining Air Nozzles

Parameter	Symbol	BER-AR, SBES	Reference
Compressor kW/CFM	COMP	Modulating w/ BD = 0.32 Load/No Load w/ 1 gal/CFM = 0.32 Load/No Load w/ 3 gal/CFM = 0.30 Load/No Load w/ 5 gal/CFM = 0.28 Variable Speed w/ Unloading = 0.23 Blended = 0.29	Vermont TRM (2015) ²⁶¹
Percent of Compressor Total Operating Hours that the Nozzle Is in Use	%USE	0.05	Vermont TRM (2015) 5% for 3 seconds of use per minute
Baseline Nozzle [CFM]	CFMb	26	Vermont TRM (2015) assumes 1/8" diameter orifice
Efficient Nozzle [CFM]	CFMe	14	Vermont TRM (2015)
Hours of Use [h/year]	HOU	Actual 1-shift (8/5) – 2,080 hours 2-shift (16/5) – 4,160 hours 3-shift (24/5) – 6,240 hours 4-shift (24/7) – 8,320 hours Blended – 3,952 hours	Use information in TS
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for air-entraining air nozzles are calculated using the variables defined and listed in the equation and Table 239 below, as well as variables from Table 238 above.

$$\Delta kW = \Delta kWh \times PCF / HOU$$

Table 239: Unitary Peak Demand Savings Values for Air-entraining Air Nozzles

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	Actual or 0.77	As per Subsection 6.5.2
Hours of Use [hours/year]	HOU	Actual 1-shift (8/5) – 2,080 hours 2-shift (16/5) – 4,160 hours 3-shift (24/5) – 6,240 hours 4-shift (24/7) – 8,320 hours Blended – 3,952 hours	Use information in TS
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for air-entraining air nozzles are estimated at 100%.

²⁶¹ Efficiency Vermont, *Technical Reference User Manual (TRM) Measure Savings Algorithms and Cost Assumption*, March 2015.

(4) No-loss Drains

Summary

Table 240 presents a summary of the values used to calculate no-loss drain savings. The detailed methodology follows.

Table 240: No-loss Drain Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	A no-loss drain opens the valve only when signaled by a condensate-level controller, rebated after installation	-
Baseline	Timed drains which use a timer to set a local lower limit of condensation in the system	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	15	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	Actual or 0.77	As per Subsection 6.5.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.5.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.5.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for no-loss drains are calculated using the variables defined and listed in the equation²⁶² and Table 241 below.

$$\Delta kWh = ALR \times COMP \times OPEN \times AF \times PNC \times QTY$$

²⁶² Efficiency Vermont, *Technical Reference User Manual (TRM) Measure Savings Algorithms and Cost Assumption*, March 2015.

Table 241: Electrical Unitary Energy Savings Values for No-loss Drains

Parameter	Symbol	BER-AR, SBES	Reference
Air Loss Rate [CFM]	ALR	See Table 242	Vermont TRM (2015) ²⁶³
Compressor Efficiency [kW/CFM]	COMP	Modulating w/ BD = 0.32 Load/No Load w/ 1 gal/CFM = 0.32 Load/No Load w/ 3 gal/CFM = 0.30 Load/No Load w/ 5 gal/CFM = 0.28 Variable Speed w/ Unloading = 0.23 Blended = 0.29	Vermont TRM (2015) ²⁶⁴
Hours per Year the Timed Drain Is Open	OPEN	146	Vermont TRM (2015) ²⁶⁵
Adjustment Factor	AF	1-Shift – 2,080 Hours = 0.62 2-Shift – 4,160 Hours = 0.74 3-Shift – 6,240 Hours = 0.86 4-Shift – 8,320 Hours = 0.97 Blended = 0.80	Use information in TS
% Not Condensate	PNC	0.75	Vermont TRM (2015) ²⁶⁶
Hours of Use [h/year]	HOU	Actual 1-Shift (8/5) – 2,080 hours 2-Shift (16/5) – 4,160 hours 3-Shift (24/5) – 6,240 hours 4-Shift (24/7) – 8,320 hours Blended – 3,952 hours	Use information in TS
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Table 242: Average Air Loss Rates (CFM)

P (psig)	Orifice Diameter (inches)					
	1/64	1/32	1/16	1/8	1 / 4	3/8
70	0.29	1.16	4.66	18.62	74.4	167.8
80	0.32	1.26	5.24	20.76	83.1	187.2
90	0.36	1.46	5.72	23.10	92	206.6
95	0.38	1.51	6.02	24.16	96.5	216.8
100	0.40	1.55	6.31	25.22	100.9	227
105	0.42	1.63	6.58	26.31	105.2	236.7
110	0.43	1.71	6.85	27.39	109.4	246.4
115	0.45	1.78	7.12	28.48	113.7	256.1
120	0.46	1.86	7.39	29.56	117.9	265.8
125	0.48	1.94	7.66	30.65	122.2	275.5

²⁶³ Efficiency Vermont, *Technical Reference User Manual (TRM) Measure Savings Algorithms and Cost Assumption*, March 2015.

²⁶⁴ Ibid.

²⁶⁵ Ibid.

²⁶⁶ Ibid.

Unitary Peak Demand Savings

The unitary peak demand savings for no-loss drains are calculated using the variables defined and listed in the equation and Table 243 below, as well as variables from Table 242 above.

$$\Delta kW = \Delta kWh \times PCF / HOU$$

Table 243: Unitary Peak Demand Savings Values for No-loss Drains

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	Actual or 0.77	As per Subsection 6.5.2
Hours of Use [hours/year]	HOU	Actual 1-Shift (8/5) – 2,080 hours 2-Shift (16/5) – 4,160 hours 3-Shift (24/5) – 6,240 hours 4-Shift (24/7) – 8,320 hours Blended – 3,952 hours	Use information in TS
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for no-loss drains are estimated at 100%.

6.6 Variable Frequency Drives

6.6.1 Interactive Effects

Interactive effects are assumed to be nil for variable frequency drive (VFD) projects since this measure is implemented on equipment that is usually in non-conditioned spaces.

6.6.2 Peak Demand Savings Factors

For variable frequency drives measures, the methodology used to determine peak demand savings is detailed in the measure-specific subsections below.

6.6.3 Adjustment Ratios

The adjustment ratios in Table 244 were established as part of the 2025 BER-AR evaluation. They should be applied for all VFD measures in BER-AR. No adjustment ratios were calculated for SBES.

Table 244: VFD Gross Savings Adjustment Ratios

Program Component	Source Evaluation Report	Energy Savings		Peak Demand Savings	
		Adjustment Ratio	Margin of Error	Adjustment Ratio	Margin of Error
BER-AR	2025	0.951	5.8%	0.514	21.9%

6.6.4 Variable Frequency Drive (VFD) Measure

(1) Variable Frequency Drives for non-HVAC Applications

Summary

Table 245 presents a summary of the values used to calculate savings for VFDs installed in non-HVAC applications. The detailed methodology follows.

Table 245: VFD Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Variable frequency drive for non-HVAC applications, installed after installation	-
Baseline	No VFD	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	See Subsection 6.6.3
Peak Demand Savings Adjustment Ratio	0.514	
Effective Useful Life [years]	15	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each installed system	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	Actual	See details below under Unitary Peak Demand Savings
Unitary Peak Demand Savings [W]	Calculation based on specification data for each installed system	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0%	See Subsection 6.6.1
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection 6.6.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for VFD for non-HVAC applications are calculated using the variables defined and listed in the equations and tables below.

$$Unitary\ Savings\left[\frac{kWh}{yr}\right] = \left(0.746\left[\frac{kW}{hp}\right] \times HP[hp] \times \frac{LF[\%]}{Eff[\%]}\right) \times HOU\left[\frac{h}{yr}\right] \times ESF[\%]$$

$$ESF = \sum_{0\%}^{100\%} (DutyCycle \times PLR_{Baseline}) - \sum_{0\%}^{100\%} (DutyCycle \times PLR_{Eff})$$

Table 246: Electrical Unitary Energy Savings Values for VFD Pumps and Fans

Parameter	Symbol	Value	Reference
Rated Horsepower of the Motor [HP]	HP	Varies per project	Project documentation
Motor Load Factor [%]	LF	Varies per project (If unknown, use 75%)	Project documentation, 2022 Minnesota TRM ²⁶⁷
Efficiency of Motor [%]	Eff	Varies per project	Project documentation
Annual Operating Hours [h/yr]	HOU		
Percent of Motor Runtime at Each Flow Rate	DutyCycle	Varies per project (If unknown for each flow rate, use an average flow rate)	Project documentation
Part Load Ratio for the Baseline Control Strategy	PLRBaseline	Based on baseline controls and flow rate profile	See Table 247 below
Part Load Ratio for the VFD	PLREff	Based on VFD controls and flow rate profile	See Table 247 below
Energy Savings Factor	ESF	Calculation based on data from project documentation	Calculation
Conversion Factor [kW/hp]	-	0.746	Convention
Unitary Energy Savings [kWh/year]	<i>Unitary Savings</i> $\left[\frac{kWh}{yr}\right]$	Calculated based on specification data for each installed system	Calculation

²⁶⁷ Minnesota Commerce Department, *State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs*, January 31, 2021.

Table 247: Part Load Ratio for Flow Rate Based on Control Types²⁶⁸

Control Type	Flow Rate (percentage of design flow)									
	0% to 10%	10% to 20%	20% to 30%	30% to 40%	40% to 50%	50% to 60%	60% to 70%	70% to 80%	80% to 90%	90% to 100%
Pump Baseline Values (PLR_{Baseline})										
No Control	1.00									
Bypass Valve	0.90	0.90	0.91	0.91	0.93	0.93	0.95	0.96	0.98	1.00
Throttling Valve	0.80	0.81	0.82	0.83	0.85	0.87	0.90	0.93	0.96	1.00
Unknown Control Type	0.90	0.90	0.91	0.91	0.93	0.93	0.95	0.96	0.98	1.00
Pump VFD Value (PLR_{Eff})										
Pump VFD	0.05	0.06	0.09	0.12	0.18	0.27	0.39	0.55	0.75	1.00
Fan Baseline Values (PLR_{Baseline})										
No Control or Bypass Damper	1.00									
Discharge Dampers	0.46	0.55	0.63	0.70	0.77	0.83	0.88	0.93	0.97	1.00
Outlet Damper, Backward Inclined & Airfoil Fans	0.53	0.53	0.57	0.64	0.72	0.80	0.89	0.96	1.02	1.05
Inlet Damper Box	0.56	0.60	0.62	0.64	0.66	0.69	0.74	0.81	0.92	1.07
Inlet Guide Vane, Backward Inclined & Airfoil Fans	0.53	0.56	0.57	0.59	0.60	0.62	0.67	0.74	0.85	1.00
Inlet Vane Dampers	0.38	0.40	0.42	0.44	0.48	0.53	0.60	0.70	0.83	0.99
Outlet Damper, Forward Curved Fans	0.22	0.26	0.3	0.37	0.45	0.54	0.65	0.77	0.91	1.06
Eddy Current Drives	0.17	0.2	0.25	0.32	0.41	0.51	0.63	0.76	0.90	1.04
Inlet Guide Vane, Forward Curved Fans	0.21	0.22	0.23	0.26	0.31	0.39	0.49	0.63	0.81	1.04
Unknown Control Type	0.45	0.48	0.51	0.55	0.60	0.66	0.73	0.81	0.91	1.03
Fan VFD Value (PLR_{Eff})										
Fan VFD	0.09	0.10	0.11	0.15	0.20	0.29	0.41	0.57	0.76	1.01

²⁶⁸ Minnesota Department of Commerce Division of Energy Resources, *State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs Version 3.1*, January 2020, pp. 691-692.

Example: A process fan with discharge damper controls operates 85% of the time at 75% flow fraction, 5% of the time at 80% flow fraction, and 10% of the time at 95% flow fraction:

$$\sum_{0\%}^{100\%} (DutyCycle \times PLR) = (0.85 \times 0.93) + (0.05 \times 0.97) + (0.10 \times 1.00) = 0.939$$

Unitary Peak Demand Savings

The unitary peak demand savings for VFD for pumps and fans are calculated using the variables defined and listed in the equation and Table 248 as well as variables from Table 247 above.

$$\begin{aligned} \text{Unitary Peak Demand Savings}[kW] \\ = \left(0.746 \left[\frac{kW}{hp} \right] \times HP[hp] \times \frac{LF[\%]}{Eff[\%]} \right) \times (PLR_{Baseline,FFpeak} - PLR_{Eff,FFpeak}) \end{aligned}$$

In situations where the part load ratio during the peak demand period is unknown, unitary peak demand savings are calculated by multiplying the average demand savings by a peak coincidence factor of 0 or 1 based on business hours and using the equation below.

$$\text{Unitary Peak Demand Savings}[kW] = \left(0.746 \left[\frac{kW}{hp} \right] \times HP[hp] \times \frac{LF[\%]}{Eff[\%]} \right) \times ESF[\%] \times PCF$$

Table 248: Electrical Unitary Peak Demand Values for VFDs for non-HVAC Applications

Parameter	Symbol	Value	Reference
Part Load Ratio for the Average Flow Fraction During the Weekday Peak Time Period	$PLR_{Baseline,FFpeak}$	Based on baseline control and flow fraction	Project documentation
Part Load Ratio for the Average Flow Fraction During Peak Time Period	$PLR_{Eff,FFpeak}$	Based on VFD control	Project documentation
Peak Coincidence Factor	PCF	If business is open during peak period: 1 Otherwise: 0	Project documentation
Unitary Peak Demand Savings [kW]	$Unitary\ Peak\ Demand\ Savings[kW]$	Calculated based on specification data for each installed system	Calculation

Installation Rates

Installation rates for VFD for non-HVAC applications are estimated at 100%.

6.7 Pool Pumps

6.7.1 Interactive Effects

Interactive effects are assumed to be nil for pool pumps projects since this measure is usually implemented in non-conditioned spaces.

6.7.2 Peak Demand Savings Factors

For pool pump measures, peak demand savings factors are assumed to be nil since most pumps are installed on outdoor pools that do not operate during the winter peak.

6.7.3 Adjustment Ratios

For pool pump measures, no adjustment ratios were calculated.

6.7.4 Pool Pump Measure

(1) ENERGY STAR Pool Pumps

Summary

Table 249 presents a summary of the values used to calculate pool pump savings. The detailed methodology follows.

Table 249: Pool Pump Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	ENERGY STAR® multi-speed and variable frequency drive (VFD) commercial inground pool pumps, rebated after installation	-
Baseline	Conventional pool pumps, with only one speed	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	10	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	-	-
Unitary Peak Demand Savings [W]	0	Assumption
Interactive Effects Factor for Energy Savings	0	See Subsection 6.7.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.7.1



Electrical Unitary Energy Savings

The electrical unitary energy savings for pool pumps are calculated using the ENERGY STAR Pool Pump Calculator.²⁶⁹

Installation Rates

Installation rates for pool pumps are assumed to be 100%.

6.8 Solar

6.8.1 Interactive Effects

Interactive effects are assumed to be nil for solar projects since the equipment involved in such systems is typically installed outdoors.

6.8.2 Peak Demand Savings Factors

For solar PV projects, peak demand savings are nil since the solar energy production from those systems coinciding with the peak period is negligible.

6.8.3 Adjustment Ratios

For solar measures, no adjustment ratios were calculated.

6.8.4 Solar Measures

(1) Solar Photovoltaic (PV) Systems

Summary

Table 250 presents a summary of the values used to calculate savings for solar PV projects. The detailed methodology follows.

²⁶⁹ ENERGY STAR Pool Pump Calculator,
https://www.energystar.gov/productfinder/downloads/Pool_Pump_Calculator_2020.05.05_FINAL.xlsx.

Table 250: Solar PV Measure Summary

Parameter	Custom Retrofit, BER-AR	Reference
Measure Description and Identification		
Measure	Solar PV systems for commercial, industrial, and agricultural facilities rebated after installation	-
Baseline	Facilities without solar PV systems	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	30	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on data for each installed system	See details below under Electrical Energy Savings
Peak Coincidence Factor	0	See Subsection 6.8.2
Unitary Peak Demand Savings [W]	0	See Subsection 6.8.2
Interactive Effects Factor for Energy Savings	0%	See Subsection (4)
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection (4)

Electrical Unitary Energy Savings

The electrical unitary energy savings for solar PV systems installed in commercial, industrial, and agricultural applications are calculated using the variables defined and listed in the equations and tables below. For each solar PV project, modelled energy production should be obtained either with PV Watts or RETScreen Expert and should include 14% of miscellaneous losses as pre-defined in both modelling tools. Due to inverter capacity, the solar PV systems can only be 100 kW or less.

$$\text{Energy Savings per Project [kWh]} = \text{Modelled Energy Production [kWh]} \times (1 - \text{Snow Loss Factor})$$

Table 251: Electrical Unitary Energy Savings Values for Solar PV Systems

Parameter	Symbol	Value	Reference
Modelled Energy Production [kWh]	-	Actual	Project documentation
Snow Loss Factor [%]	-	For panel tilt angles $\geq 25^\circ$: 1%	Northern Alberta Institute of Technology ²⁷⁰
		For panel tilt angles $< 25^\circ$: 4%	
Unitary Energy Savings [kWh/year]	-	Calculated based on data for each installed system	Calculation

²⁷⁰ Northern Alberta Institute of Technology, *Solar Photovoltaic Array Reference Array Report*, March 31, 2016.

Installation Rates

For solar photovoltaic systems, the installation rate is assumed to be 100%.

(2) Solar Domestic Hot Water

Summary

Table 30 presents a summary of the values used to calculate solar domestic hot water (DHW) savings. The detailed methodology follows.

Table 252: Solar Domestic Hot Water Measure Summary

Parameter	BER-AR, SBES		Reference
Measure Description and Identification			
Measure	CSA approved Solar domestic hot water heating rebated after installation		-
Baseline	Existing conventional electric water heater		
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Energy Savings Adjustment Ratio	0.942	-	See Subsection 6.8.3
Effective Useful Life [years]	20		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculated using RETScreen		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	0		See Subsection 6.8.2
Unitary Peak Demand Savings [W]	0		See Subsection 6.8.2
Interactive Effects Factor for Energy Savings	0%		See Subsection (4)
Interactive Effects Factor for Peak Demand Savings	0%		See Subsection (4)

Electrical Unitary Energy Savings

The unitary savings value for solar DHW systems installed through BER-AR is calculated for each system using a custom RETScreen model.

Unitary Peak Demand Savings

Solar DHW systems provide no peak demand savings because the sun has set during the peak demand period.

Installation Rates

Installation rates for solar DHW systems are estimated at 100%.

(3) Solar Air Heating

Summary

Table 253 presents a summary of the values used to calculate solar air heating savings. The detailed methodology follows.

Table 253: Solar Air Heating Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	CSA approved Solar air heating systems rebated after installation	-
Baseline	Electric space heating (resistance or heat pump)	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	20	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculated using RETScreen	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	0	See Subsection 6.8.2
Unitary Peak Demand Savings [W]	0	See Subsection 6.8.2
Interactive Effects Factor for Energy Savings	0%	See Subsection (4)
Interactive Effects Factor for Peak Demand Savings	0%	See Subsection (4)

Electrical Unitary Energy Savings

The unitary savings value for solar air heating systems installed through BER-AR and SBES is calculated for each system.

Installation Rates

Installation rates for solar air heating are estimated at 100%.

6.9 Refrigeration

6.9.1 Interactive Effects

For refrigeration measures, interactive effects are considered when reduced heat rejection occurs within the refrigerated space, which in turns reduces the electricity consumption of the refrigeration compressor. They are taken into consideration in the unitary electrical energy and peak demand savings equation in the form of a bonus factor, for measures where that applies.

6.9.2 Peak Demand Savings Factor

For refrigeration measures, the peak coincidence factor (PCF) is assumed to be 100%, since all equipment is expected to be running continuously, with minor downtime that is addressed in the duty cycle variables, where applicable.

6.9.3 Adjustment Ratios

The adjustment ratios in Table 254 were established as part of the 2025 BER-AR evaluation. They should be applied for all refrigeration measures in BER-AR. No adjustment ratios were calculated for SBES.

Table 254: Refrigeration Gross Savings Adjustment Ratios

Program Component	Source Evaluation Report	Energy Savings		Peak Demand Savings	
		Adjustment Ratio	Margin of Error	Adjustment Ratio	Margin of Error
BER-AR	2025	0.951	5.8%	0.514	21.9%

6.9.4 Refrigeration Measures

(1) Cooler Night Covers and Display Case Strip Curtains

Summary

Table 255 presents a summary of the values used to calculate electrical cooler night cover and display strip curtain savings. The detailed methodology follows.

Table 255: Cooler Night Cover and Display Strip Curtain Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Night cover or strip curtain for refrigerated cases, rebated after installation	-
Baseline	No night cover or strip curtain	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	See Subsection 6.9.3
Peak Demand Savings Adjustment Ratio	0.514	
Effective Useful Life [years]	4	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	1.0	As per Subsection 6.9.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.9.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.9.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for cooler night covers and display strip curtains are calculated using the variables defined and listed in the equation and Table 256 below.²⁷¹

$$Energy\ Savings_{kWh} = (HG \times EF \times CL \times DF) / (EER \times 1,000) \times Usage \times 365$$

²⁷¹ Under the 2.8 "Refrigeration" section, if not saying otherwise, the equation comes from Efficiency Vermont, *Technical Reference User Manual (TRM) Measure Savings Algorithms and Cost Assumptions*, March 16, 2015.

Table 256: Electrical Unitary Savings Values for Cooler Night Covers and Display Strip Curtains

Parameter	Symbol	BER-AR R, SBES		Reference
		Cooler Night Covers	Display Strip Curtains	
Loss of Cold Air or Heat Gain for Refrigerated Cases with no Cover [Btu/hr-ft opening]	HG	Medium Temp (10 - 40F) = 760 High Temp (45 - 65F) = 610 Average = 685		Vermont TRM, 2015 ²⁷²
Efficiency Factor	EF	0.8	0.65	
Refrigerated Case Length in Feet [ft]	CL	Actual if case length is open length of refrigerated box		Use information in TS
Disabling Factor	DF	100%	80%	Vermont TRM, 2015 ²⁷³
Compressor Efficiency [Btu/hr-watt]	EER	Medium Temp (10 - 40F) = 11.95 High Temp (45 - 65F) = 18.5 Average = 15.225		
Conversion Factor [W/kW]	1,000	1,000		Convention
Average Hours per Day that Case Cover Is in Place [hrs/day]	Usage	8	24	Vermont TRM, 2015 ²⁷⁴
Unitary Energy Savings [kWh/year]	<i>Energy Savings_{kWh}</i>	Calculation based on specification data for each rebated unit		Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for cooler night covers and display strip curtains are calculated using the variables defined and listed in the equation and Table 257 below, as well as variables from Table 256 above.

$$Peak\ Demand\ Savings_{kW} = (HG \times EF \times CL \times DF \times PCF) / (EER \times 1000)$$

Table 257: Unitary Peak Demand Savings Values for Cooler Night Covers and Display Strip Curtains

Parameter	Symbol	BER-AR, SBES		Reference
		Cooler Night Covers	Display Strip Curtains	
Peak Coincidence Factor	PCF	1		As per Subsection 6.9.2
Unitary Peak Demand Savings [kW]	<i>Peak Demand Savings_{kW}</i>	Calculation based on specification data for each rebated unit		Calculation

Installation Rates

Installation rates for cooler night covers and display strip curtains are assumed to be 100%.

²⁷² Efficiency Vermont, *Technical reference User Manual*, March 16, 2015.

²⁷³ Ibid.

²⁷⁴ Ibid.

(2) Zero-energy Doors

Summary

Table 258 presents a summary of the values used to calculate zero-energy door savings. The detailed methodology follows.

Table 258: Zero-energy Door Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Zero-energy doors, without electric resistance heating in the door or frame, for Reach-in Coolers. Reach-in display case doors must be highly insulated, double or triple pane units with low-E glass coatings or low-conductivity filler gas (argon). Rebated after installation	-
Baseline	Standard cooler door	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	See Subsection 6.9.3
Peak Demand Savings Adjustment Ratio	0.514	
Effective Useful Life [years]	12	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	1.0	As per Subsection 6.9.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.9.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.9.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for zero-energy doors are calculated using the variables defined and listed in the equation and Table 259 below.

$$\Delta kWh = kW_{door} \times BF \times HOU$$

Table 259: Electrical Unitary Energy Savings Values for Zero-energy Doors

Parameter	Symbol	BER, SBES	Reference
Connected Load of a Typical Reach-in Cooler Door and Frame with Electric Heaters [kW]	kW _{door}	0.131	Vermont TRM, 2015 ²⁷⁵
Bonus Factor	BF	Medium temp (10 - 40F) = 1.22 High temp (45 - 65F) = 1.15 Average = 1.19	
Hours of Use [h/year]	HOU	8,760	
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for zero-energy doors are calculated using the variables defined and listed in the equation and Table 260 below, as well as variables from Table 259 above.

$$\Delta kW = kW_{door} \times BF \times PCF$$

Table 260: Unitary Peak Demand Savings Values for Zero-energy Doors

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	1	As per Subsection 6.9.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for zero-energy doors are assumed to be 100%.

²⁷⁵ Efficiency Vermont, *Technical reference User Manual*, March 16, 2015.

(3) Door Heater Controls

Summary

Table 261 presents a summary of the values used to calculate electrical door heater control savings. The detailed methodology follows.

Table 261: Door Heater Control Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Humidity or conductivity-based heater controls that limit heater operation to periods of high relative humidity (when condensation is likely to form), rebated after installation	-
Baseline	Standard cooler door with no control	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	See Subsection 6.9.3
Peak Demand Savings Adjustment Ratio	0.514	
Effective Useful Life [years]	12	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	1.0	As per Subsection 6.9.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.9.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.9.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for door heater controls are calculated using the variables defined and listed in the equation and Table 262 below.

$$\Delta kWh = kW_{door} \times N_{door} \times ES \times BF \times HOU$$

Table 262: Electrical Unitary Energy Savings Values for Door Heater Controls

Parameter	Symbol	BER-AR, SBES	Reference
Connected Load of a Typical Reach-in Cooler Door and Frame with Electric Heaters [kW]	kW _{door}	Coolers = 0.066 Freezers = 0.230	2023 Vermont TRM ²⁷⁶
Number of Doors Controlled by Sensor	N _{door}	Actual	Use information in TS
Percent Annual Energy Savings	ES	45.1%	2023 Vermont TRM
Bonus Factor	BF	Coolers = 1.4 Freezers = 1.8	2023 Vermont TRM
Hours of Use [h/year]	HOU	8760	2023 Vermont TRM
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for door heater controls are calculated using the variables defined and listed in the equation and Table 263 below, as well as variables from Table 262 above.

$$\Delta kW = kW_{door} \times N_{door} \times ES \times BF \times PCF$$

Table 263: Unitary Peak Demand Savings Values for Door Heater Controls

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	1	As per Subsection 6.9.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for door heater controls are assumed to be 100%.

²⁷⁶ Efficiency Vermont, *Technical Reference Manual (TRM)*, Program Year 2023, pp. 63-65.

(4) Evaporator Fan Motor Controls

Summary

Table 264 presents a summary of the values used to calculate electrical evaporator fan motor control savings. The detailed methodology follows.

Table 264: Evaporator Fan Motor Control Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	The control system rebated after installation: - Controls a minimum of 300 Watts or four evaporator fans - Reduces evaporator fan air flow by at least 50% when the compressor is not running or when no refrigerant is flowing through the evaporator	-
Baseline	No control	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	See Subsection 6.9.3
Peak Demand Savings Adjustment Ratio	0.514	
Effective Useful Life [years]	10	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	1.0	As per Subsection 6.9.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.9.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.9.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for evaporator fan motor controls are calculated using the variables defined and listed in the equation and Table 265 below.

$$\Delta kWh = kW_{fan} \times n_{fans} \times LRF \times BF \times HOU$$

Table 265: Electrical Unitary Energy Savings Values for Evaporator Fan Motor Controls

Parameter	Symbol	BER-AR, SBES	Reference
Connected Load kW of Each Evaporator Fan [kW]	kW _{fan}	Actual or 0.11	Use information in TS <u>Default:</u> Based on weighted average of 60% shaded pole at 135 Watts, 20% EC motors at 62 Watts and 20% synchronous motors at 58 Watts, all drawn from Vermont's assumptions with some adjustments for NS market
Number of Evaporator Fans	n _{fans}	Actual	Use information in TS
Load Reduction Factor	LRF	0.313	2023 Vermont TRM ²⁷⁷
Bonus Factor	BF	1 + 1/COP if known. Otherwise: 1.4 for coolers, 1.8 for freezers, 1.4 for others	2023 Vermont TRM
Hours of Use [h/year]	HOU	8,760	Assuming continuous operation
Unitary Energy Savings [kWh/year]	$\Delta kW h$	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for evaporator fan motor controls are calculated using the variables defined and listed in the equation and Table 266 below, as well as variables from Table 265 above.

$$\Delta kW = kW_{fan} \times n_{fans} \times LRF \times BF \times PCF$$

Table 266: Unitary Peak Demand Savings Values for Cooler Night Covers and Display Strip Curtains

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	1	As per Subsection 6.9.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for evaporator fan motor controls are estimated at 100%.

²⁷⁷ Efficiency Vermont, *Technical Reference Manual (TRM) Program Year 2023*, pp. 75-77.

(5) Intelligent Freezer Defrost Controls

Summary

Table 267 presents a summary of the values used to calculate electrical intelligent freezer defrost control savings. The detailed methodology follows.

Table 267: Intelligent Freezer Defrost Control Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Control system which contains temperature and pressure sensors to monitor system operation and determine if there is a need to run a defrost cycle, rebated after installation: › Each controller controls the defrost cycle of three or more evaporator fans › Walk-in freezer evaporator coils with electric defrost only (medium and high temperature coolers not eligible)	-
Baseline	No control	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	See Subsection 6.9.3
Peak Demand Savings Adjustment Ratio	0.514	
Effective Useful Life [years]	10	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	1.0	As per Subsection 6.9.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.9.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.9.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for intelligent freezer defrost control are calculated using the variables defined and listed in the equation and Table 268 below.

$$\Delta kWh = n_{fans} \times kW_{DE} \times SVG \times BF \times FLH$$

Table 268: Electrical Unitary Energy Savings Values for Intelligent Freezer Defrost Controls

Parameter	Symbol	BER-AR, SBES	Reference
Number of Evaporator Fans	nfans	Actual	Use information in TS
kW of Defrost Element per Evaporator Fan	kWDE	0.9	Vermont TRM, 2015 ²⁷⁸
Percent of Defrost Cycle Saved by Control	SVG	30%	Vermont TRM, 2015
Bonus Factor	BF	1.5 for low temp	Vermont TRM, 2015
Average Full Load Defrost Hours	FLH	487	Vermont TRM, 2015
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for intelligent freezer defrost control are calculated using the variables defined and listed in the equation and Table 269 below, as well as variables from Table 268 above.

$$\Delta kW = n_{fans} \times kW_{DE} \times SVG \times BF \times PCF$$

Table 269: Unitary Peak Demand Savings Values for Intelligent Freezer Defrost Controls

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	1	See Subsection 6.9.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for intelligent freezer defrost control are estimated at 100%.

²⁷⁸ Efficiency Vermont, *Technical reference User Manual*, March 16, 2015.

(6) Vertical Refrigeration Open-to-closed Cooler Conversion

Summary

Table 270 presents a summary of the values used to calculate vertical refrigeration open-to-closed cooler conversion savings. The detailed methodology follows.

Table 270: Vertical Refrigeration Open-to-closed Cooler Conversion Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Doored vertical refrigeration units, rebated after installation	-
Baseline	Open multi-deck coolers	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	See Subsection 6.9.3
Peak Demand Savings Adjustment Ratio	0.514	
Effective Useful Life [years]	12	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	1.0	As per Subsection 6.9.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.9.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.9.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for vertical refrigeration open to closed cooler conversion are calculated using the variables defined and listed in the equation²⁷⁹ and Table 271 below.

$$\Delta kWh = OCSF \times DAYS \times L_{case}$$

²⁷⁹ Fricke, Brian, Becker, Bryan, "Energy use of doored and open vertical refrigerated display cases". *International Refrigeration and Air Conditioning Conference*. Paper 1154, 2010.

Table 271: Electrical Unitary Energy Savings Values for Vertical Refrigeration Open-to-closed Cooler Conversion

Parameter	Symbol	BER-AR, SBES	Reference
Open-to-closed Case Savings Factor [kWh/(day*feet)]	OCSF	With anti-sweat heaters = 0.5 kWh/(day*ft) Without anti-sweat heaters = 1.5 kWh/(day*ft)	International Refrigeration and Air Conditioning Conference ²⁸⁰
Days Cooler Is Operational per Year [days]	DAYS	Actual	Use information in TS
Length of Refrigerated [feet]	Lcase	Actual	Use information in TS
Unitary Energy Savings [kWh]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for vertical refrigeration open to closed cooler conversion are calculated using the variables defined and listed in the equation and Table 272 below, as well as variables from Table 271 above.

$$\Delta kW = \frac{OCSF \times DAYS \times L_{case} \times PCF}{HOU}$$

Table 272: Unitary Peak Demand Savings Values for Vertical Refrigeration Open-to-closed Cooler Conversion

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	1	See Subsection 6.9.2
Hours of Use [h/year]	HOU	Actual	Use information in TS
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for vertical refrigeration open to closed cooler conversion are estimated at 100%.

²⁸⁰ Fricke, Brian, Becker, Bryan, *Energy use of doored and open vertical refrigerated display cases*, 2010. International Refrigeration and Air Conditioning Conference. Paper 1154.

(7) Efficient Refrigeration Compressors (Scroll Refrigeration Compressor)

Summary

Table 273 presents a summary of the values used to calculate efficient refrigeration compressor savings. The detailed methodology follows.

Table 273: Efficient Refrigeration Compressor Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Efficient scroll compressor, rebated after installation	-
Baseline	Hermetic or semihermetic compressor	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	See Subsection 6.9.3
Peak Demand Savings Adjustment Ratio	0.514	
Effective Useful Life [years]	15	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	1.0	As per Subsection 6.9.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.9.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.9.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for efficient refrigeration compressor are calculated using the variables defined and listed in the equation²⁸¹ and Table 274 below.

$$\Delta kWh = \frac{CAP_{avg,ee} \times \left(\frac{1}{EER_{avg,base}} - \frac{1}{EER_{avg,ee}} \right) \times FLH}{1,000}$$

²⁸¹ Iowa Energy, Iowa Energy Efficiency Statewide Technical Reference Manual, July 31, 2023, pp.405-408.

Table 274: Electrical Unitary Energy Savings Values for Efficient Refrigeration Compressors

Parameter	Symbol	BER-AR, SBES	Reference
Compressor Capacity at Standard Rating Conditions [Btu/h]	$CAP_{avg,ee}$	Actual	Use information in TS
Energy Efficiency Ratio of the Baseline Compressor at Standard Rating Conditions [Btu/Wh]	$EER_{avg,base}$	Actual or use information in Table 275 for low temperature cases and Table 276 for medium temperature cases	Use information in TS <u>Default:</u> 2025 Iowa TRM ²⁸²
Energy Efficiency Ratio of the Efficient Compressor at Standard Rating Conditions [Btu/Wh]	$EER_{avg,ee}$	Actual or use information in Table 275 for low temperature cases and Table 276 for medium temperature cases	Use information in TS <u>Default:</u> 2025 Iowa TRM
Full Load Hours from DPS Commercial Refrigeration Load Shape [h]	FLH	Medium temperature = 3,910 Low temperature = 4,139	2025 Iowa TRM
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Table 275: Low Temperature (Condensing Temp. 90°F, Evaporating Temp. -25°F) Baseline and Efficient EER

Capacity Bins in Btu/h	$EER_{avg,base}$	$EER_{avg,ee}$
0-4,200	3.85	4.39
4,200-8,399	4.83	5.21
8,400-12,599	5.06	5.37
12,600-16,799	5.26	5.59
16,800-20,999	5.36	5.80
21,000-25,199	5.69	6.06
25,200-29,399	5.71	6.15
29,400-33,599	6.14	6.39
33,600-37,800	5.64	6.06
37,800-42,000	5.73	6.06

²⁸² Iowa Utilities Commission, *Iowa Energy Efficiency Statewide Technical Reference Manual Version 10.0*, Volume 3: Non-residential Measures, July 31, 2025, pp.429-432.

**Table 276: Medium Temperature (Condensing Temp. 90°F, Evaporating Temp 20°F)
Baseline and Efficient EER**

Capacity Bins in Btu/h	$EER_{avg,base}$	$EER_{avg,ee}$
0-7,500	8.14	9.03
7,500-14,999	9.28	10.86
15,000-22,499	10.64	11.83
22,500-29,999	11.18	12.15
30,000-37,499	11.12	12.39
37,500-44,999	11.74	12.70
45,000-52,499	11.68	12.52
52,500-59,999	12.54	13.12
60,000-67,499	12.46	13.13
67,500-75,000	11.44	12.37

Unitary Peak Demand Savings

The unitary peak demand savings for efficient refrigerator compressors are calculated using the variables defined and listed in the equation and Table 277 below, as well as variables from Table 274 above.

$$\Delta kW = \Delta kWh \times PCF / FLH$$

Table 277: Unitary Peak Demand Savings Values for Refrigeration Economizers

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	1	See Subsection 6.9.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for refrigeration economizer are estimated at 100%.

(8) Refrigeration Economizers

Summary

Table 278 presents a summary of the values used to calculate refrigeration economizer savings. The detailed methodology follows.

Table 278: Refrigeration Economizer Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Coolers capable of drawing in outdoor air when it is sufficiently cool (temperatures less than 34°F or 1°C), rebated after installation. Outdoor air and exhaust dampers must close automatically for summer isolation	-
Baseline	No economizer	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	See Subsection 6.9.3
Peak Demand Savings Adjustment Ratio	0.514	
Effective Useful Life [years]	15	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	1.0	As per Subsection 6.9.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.9.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.9.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for refrigeration economizer are calculated using the variables defined and listed in the equation and Table 279 below.

With fan control installed

$$\Delta kWh = (HP \times kWh_{cond}) + \left((kW_{evap} \times n_{fans}) - kW_{circ} \right) \times HRS \times DC_{comp} \times BF - (kW_{econ} \times DC_{econ} \times HOU)$$

Without fan control installed

$$\Delta kWh = (HP \times kWh_{cond}) - (kW_{econ} \times DC_{econ} \times HOU)$$

Table 279: Electrical Unitary Energy Savings Values for Refrigeration Economizers

Parameter	Symbol	BER-AR, SBES	Reference
Power of Compressor [HP]	HP	Actual	Use information in TS
Condensing Unit Savings, per hp [kWh]	kWhcond	Hermetic / Semi-hermetic = 1,256 Scroll = 1,108 Discus = 1,051	Vermont TRM, 2015 ²⁸³
Hours of Use [h/year]	HOU	2,996	Number of hours based on 38°F cooler setpoint, Burlington VT weather data, and 5-degree economizer deadband
Duty Cycle of Compressor	DCcomp	0.5	Vermont TRM, 2015 ²⁸⁴
Connected Load of Each Evaporator Fan	kWevap	0.11	Based on weighted average of 60% shaded pole at 132 Watts, and 20% PSC motors at 88 Watts, and 20% EC-motors at 62 Watts. This is based on Vermont's assumptions, with some adjustments for NS market
Connected Load of the Circulating Fan [kW]	kWcirc	0.035	Vermont TRM, 2015 ²⁸⁵
Number of Evaporator Fans	nfans	Actual	Use information in TS
Duty Cycle of the Economizer Fan on Days that Are Cool Enough for the Economizer to Be Working	DCecon	0.63	Vermont TRM, 2015 ²⁸⁶
Bonus Factor for Reduced Cooling Load from Running the Evaporator Fan Less	BF	1.3	
Connected Load of the Circulating Fan [kW]	kWecon	0.227	
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for refrigeration economizer are calculated using the variables defined and listed in the equation and Table 280 below, as well as variables from Table 279 above.

$$\Delta kW = \Delta kWh \times PCF / HOU$$

²⁸³ Efficiency Vermont, *Technical reference User Manual*, March 16, 2015.

²⁸⁴ Ibid.

²⁸⁵ Ibid.

BER-AR, SBES

²⁸⁶ Ibid.

Table 280: Unitary Peak Demand Savings Values for Refrigeration Economizers

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	1	See Subsection 6.9.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for refrigeration economizer are estimated at 100%.

(9) Brushless DC Motors

Summary

Table 281 presents a summary of the values used to calculate brushless DC motor savings for refrigeration applications. The detailed methodology follows.

Table 281: Brushless DC Motor Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Brushless DC motors (or electrically commutated motors – ECM) for cooler of freezer evaporator fan, rebated after installation	-
Baseline	Existing conventional shaded-pole motors	
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	See Subsection 6.9.3
Peak Demand Savings Adjustment Ratio	0.514	
Effective Useful Life [years]	15	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	1.0	As per Subsection 6.9.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0%	See Subsection 6.9.1
Interactive Effects Factor for Peak Demand Savings	0%	

Electrical Unitary Energy Savings

The electrical unitary energy savings for brushless DC motors are calculated using the variables defined and listed in the equation²⁸⁷ and Table 282 below.

$$\Delta kWh = \left(\frac{kW_{output}}{\eta_{base}} - \frac{kW_{output}}{\eta_{ee}} \right) \times HOU \times DC \times LF \times \left(1 + \frac{1}{COP} \right)$$

Table 282: Electrical Unitary Energy Savings Values for Brushless DC Motors

Parameter	Symbol	Value for BER-AR and SBES	Reference
Motor Output [kW]	kW _{output}	0.015 for cases and 0.042 for walk-ins	Iowa TRM, 2023
Baseline Motor Efficiency [-]	η _{base}	Actual or 29%	DOE EERE, 2022 ²⁸⁸
Efficient Motor Efficiency [-]	η _{ee}	Actual or 66%	Iowa TRM, 2023
Hours of Use [hrs/year]	HOU	8,760	Assumption based on continuous operation
Duty Cycle of a Fan Motor [-]	DC	97.8%	The Cadmus Group, 2015 ²⁸⁹
Load Factor [-]	LF	90%	Iowa TRM, 2023
Coefficient of Performance [-]	COP	3.5 for coolers 2.0 for freezers 2.5 for unknown cooler type	Iowa TRM, 2023
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for brushless DC motors are calculated using the variables defined and listed in the equation and Table 283 below, as well as variables from Table 282 above.

$$\Delta kW = \left(\frac{kW_{output}}{\eta_{base}} - \frac{kW_{output}}{\eta_{ee}} \right) \times DC \times LF \times \left(1 + \frac{1}{COP} \right) \times PCF$$

Table 283: Unitary Peak Demand Savings Values for Brushless DC Motors

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	1	As per Subsection 6.9.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

²⁸⁷ Iowa Utilities Board, Iowa Energy Efficiency Statewide Technical Reference Manual Version 8.0, Volume 3, July 2023, p. 388.

²⁸⁸ Department of Energy – Office of Energy Efficiency and Renewable Energy, Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Commercial Refrigeration Equipment, June 2022, pp. 5-16.

²⁸⁹ The Cadmus Group, Commercial Refrigeration Load Shape Project Final Report, Northeast Energy Efficiency Partnerships, Regional Evaluation, Measurement, and Verification Forum, Lexington, MA 2015, page 67, Table 34.

(10) Refrigerated Vending Machine Controllers

Summary

Table 284 presents a summary of the values used to calculate refrigerated vending machine controller savings. The detailed methodology follows.

Table 284: Refrigerated Vending Machine Controller Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Controller uses occupancy sensor based controls to de-energize refrigerated vending machines when the surrounding area is not occupied, rebated after installation	-
Baseline	No occupancy sensor on refrigeration vending machine	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	See Subsection 6.9.3
Peak Demand Savings Adjustment Ratio	0.514	
Effective Useful Life [years]	5	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	1.0	As per Subsection 6.9.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.9.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.9.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for refrigerated vending machine controllers are calculated using the variables defined and listed in the equation²⁹⁰ and Table 285 below.

$$\Delta kWh = kW_{rated} \times HOU \times SAVE \times QTY$$

²⁹⁰ Mass Save, *Technical Reference User Manual (TRM) for Estimating Savings from Energy Efficiency Measures* – 2022 Report Version, June 1, 2023, p. 791.

**Table 285: Electrical Unitary Energy Savings Values
for Refrigerated Vending Machine Controllers**

Parameter	Symbol	BER-AR, SBES	Reference
Rated Power of Connected Equipment [kW]	kW _{rated}	Actual	Use information in TS
Hours of Use [h/year]	HOU	Actual or 8,760	Use information in TS
Percent Savings Factor for the Connected Equipment	SAVE	Refrigerated beverage vending machines = 46% Glass front refrigerated coolers = 30%	Massachusetts TRM, 2022 ²⁹¹
Quantity of Vending Machines	QTY	Actual	Use information in TS
Unitary Energy Savings [kWh/year]	ΔkW_h	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for refrigerated vending machine controllers are calculated using the variables defined and listed in the equation and Table 286 below, as well as variables from Table 285 above.

$$\Delta kW = kW_{rated} \times SAVE \times QTY \times PCF$$

**Table 286: Unitary Peak Demand Savings Values
for Refrigerated Vending Machine Controllers**

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	1	As per Subsection 6.9.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for refrigerated vending machine controllers are estimated at 100%.

6.10 Agriculture

6.10.1 Interactive Effects

Interactive effects are assumed to be nil for agriculture measures since they are usually located in spaces that are not heated or cooled electrically.

6.10.2 Peak Demand Savings Factors

For agriculture measures, peak demand savings are determined by multiplying the wattage by a PCF value of 84%, which was established as part of the 2015 evaluation of BER.²⁹²

²⁹¹ Mass Save, *Technical Reference User Manual (TRM) for Estimating Savings from Energy Efficiency Measures* – 2022 Report Version, June 1, 2023, p. 792.

²⁹² Econoler, Business Energy Rebates 2015 DSM Evaluation, Report presented to Efficiency Nova Scotia, 2016.

6.10.3 Adjustment Ratios

The adjustment ratios in Table 287 were established as part of the 2025 BER-AR evaluation. They should be applied to all agricultural measures in BER-AR. No adjustment ratios were calculated for SBES.

Table 287: Agriculture Gross Savings Adjustments

Path and Measure Category	Energy Savings		Peak Demand Savings	
	Adjustment Ratio	Margin of Error	Adjustment Ratio	Margin of Error
Projects Sampled in Project Reviews				
BER-AR	0.951	5.8%	0.514	21.9%

6.10.4 Agriculture Measures

(1) Energy Efficient Ventilation and Circulation Fans

Summary

Table 288 presents a summary of the values used to calculate energy efficient ventilation and circulation fan savings. The detailed methodology follows.

Table 288: Energy Efficient Ventilation and Circulation Fan Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	Ventilation Fan: BESS or AMCA listed rated High Efficiency Ventilation Fan (Exhaust or Supply Fan), rebated after installation, meeting minimum Efficiency: 14-23 inches = 11 Cfm/Watt 24-35 inches = 13 Cfm/Watt 36-47 inches = 18 Cfm/Watt 48+ inches = 21 Cfm/Watt Circulation Fan: BESS or AMCA listed rated High Efficiency Circulation Fan, rebated after installation, meeting minimum Efficiency: Diameter (Inches) Minimum Efficiency (Cfm/Watt) 18-35 inches = 13 Cfm/Watt 36-47 inches = 19 Cfm/Watt 48+ inches = 23 Cfm/Watt	-	
Baseline	Existing fan	-	
General Parameters			
Installation Rate	None, included in the adjustment ratios below	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.10.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	15		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	84%		See Subsection 6.10.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.10.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.10.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for energy efficient ventilation & circulation fans are calculated using the variables defined and listed in the equation and Table 289 below.

$$\Delta kWh = \left(\frac{AF_b}{ER_b} \times Qty_b - \frac{AF_e}{ER_e} \times Qty_e \right) \times HOU / 1,000$$

Table 289: Electrical Unitary Energy Savings Values for Energy Efficient Ventilation and Circulation Fans

Parameter	Symbol	BER-AR, SBES		Reference
		Ventilation Fan	Circulation Fan	
Airflow Produced by Baseline Fan [CFM]	AF _b	Actual or assume same airflow as efficient measure		-
Airflow Produced by Efficient Fan [CFM]	AF _e	Actual		Use information in TS
Baseline Efficacy Ratio [CFM/W]	ER _b	Actual or based on fan size: 14" = 9.07 16" = 9.26 20" = 9.59 24" = 10.71 36" = 15.05 ≥48" = 18.36	Actual or based on fan size: 18" = 9.08 20" = 10.33 24" = 11.14 30" = 11.75 36" = 16.39 ≥48" = 19.96	Use information in TS <u>Default:</u> 2021 BESS Fan Performance Data ²⁹³
Efficient Efficacy Ratio [CFM/W]	ER _e	Actual or based on fan size: 14" = 11.30 16" = 12.27 20" = 12.43 24" = 15.12 36" = 20.20 ≥48" = 24.44	Actual or based on fan size: 18" = 15.97 20" = 16.14 24" = 14.76 30" = 14.59 36" = 21.58 ≥48" = 25.67	Use information in TS <u>Default:</u> 2021 BESS Fan Performance Data ²⁹⁴
Baseline Quantity	Qty _b	Actual		Use information in TS
Efficient Quantity	Qty _e	Actual		Use information in TS
Hours of Use [h/year]	HOU	12" - 16" = 8760 18" - 30" = 2804 36" - 54" = 2928		IESO Prescriptive Measures and Assumptions 2024 ²⁹⁵
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit		Calculation

²⁹³ Bioenvironmental and Structural Systems Laboratory, Agricultural Ventilation Fans, Performance and Efficiencies data, 2021. Retrieved from: <http://www.bess.illinois.edu/type.asp>

²⁹⁴ Ibid.

²⁹⁵ Independent Electrical System Operator, *IESO Prescriptive Measures and Assumptions List*, February 2024.

Unitary Peak Demand Savings

The unitary peak demand savings for energy efficient ventilation & circulation fans are calculated using the variables defined and listed in the equation and Table 290 below, as well as variables from Table 289 above.

$$\Delta kW = \frac{\left(\frac{AF_b}{ER_b} \times Qty_b - \frac{AF_e}{ER_e} \times Qty_e \right) \times PCF}{1,000}$$

**Table 290: Unitary Peak Demand Savings Values
for Energy Efficient Ventilation and Circulation Fans**

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	0.84	As per Subsection 6.10.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for energy efficient ventilation & circulation fans in SBES are assumed to be 100%.

(2) Dual and Natural Ventilation

Summary

Table 291 presents a summary of the values used to calculate dual and natural ventilation savings. The detailed methodology follows.

Table 291: Dual and Natural Ventilation Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	Both natural and dual ventilation systems that meet the following criteria are eligible, rebated after installation: - Natural Ventilation – No mechanical ventilation present. All ventilation provided by chimneys and sidewall openings (with curtains or panels) - Dual Ventilation – Mechanical ventilation to modulate exhaust in winter months only - Eligible facility types: dairy cows, swine, layers, broilers, turkeys, and sheep	-	
Baseline	No dual or natural ventilation	-	
General Parameters			
Installation Rate	None, included in the adjustment ratios below	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.10.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	15		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	84%		See Subsection 6.10.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.10.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.10.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for dual & natural ventilation are calculated using the variables defined and listed in the equation and The fan energy savings are shown in Table 115. These are the savings from the lowered fan usage due to the humidity sensor.

Table 115

$$\Delta kWh = LC \times ARL \times \frac{1}{ER} \times SF \times HOU \times QTY / 1,000$$

Table 292: Electrical Unitary Energy Savings Values for Dual and Natural Ventilation

Parameter	Symbol	BER-AR, SBES	Reference
Livestock Capacity (number of animals the barn is designed for)	LC	Actual	Use information in TS
Airflow Requirement per Livestock [cfm/livestock]	ARL	Dairy Year Round: 143 Dairy Winter Only: 62 Swine: 30.5 Broilers Layers: 4.275 Broilers Breeders: 5.4 Broilers Turkeys: 7.35 Sheep: 78.75	Reference: Adapted from OPA TRM http://www.extension.purdue.edu/extmedia/ae/AE-96.html
Efficiency Ratio [cfm/W]	ER	14	IESO Prescriptive Measures and Assumptions 2024 ²⁹⁶
Savings Factor	SF	Natural ventilation SF = 1 and w/ Dual ventilation SF = 0.8	
Hours of Use [h/year]	HOU	Dairy Year Round: 8,760 Dairy Winter Only: 4,380 Swine: 8,760 Broilers: 8,760	
Quantity	QTY	Actual	Use information in TS
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for dual & natural ventilation are calculated using the variables defined and listed in the equation and Table 293 below, as well as variables from The fan energy savings are shown in Table 115. These are the savings from the lowered fan usage due to the humidity sensor.

Table 115

$$\Delta kW = LC \times ARL \times \frac{1}{ER} \times SF \times PCF \times QTY / 1,000$$

Table 293: Unitary Peak Demand Savings Values for Dual and Natural Ventilation

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	0.84	As per Subsection 6.10.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for dual & natural ventilation in SBES are assumed to be 100%.

²⁹⁶Independent Electrical System Operator, *IESO Prescriptive Measures and Assumptions List*, February 2024.

(3) Zero-energy and Low-energy Livestock Waterers

Summary

Table 294 presents a summary of the values used to calculate zero-energy and low-energy livestock waterer savings. The detailed methodology follows.

Table 294: Zero-energy and Low-energy Livestock Waterer Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	Must contain a minimum of 2 inches insulation and an adjustable thermostat and be CSA / cUL rated, rebated after installation	-	
Baseline	Existing waterer	-	
General Parameters			
Installation Rate	None, included in the adjustment ratios below	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.10.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	10		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	84%		See Subsection 6.10.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.10.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.10.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for zero-energy & low-energy livestock waterers are calculated using the variables defined and listed in the equation and Table 295 below.

$$\Delta kWh = (P_b - P_e) * Qty * HOU / 1,000$$

Table 295: Electrical Unitary Energy Savings Values for Zero-energy and Low-energy Livestock Waterers

Parameter	Symbol	BER-AR, SBES	Reference
Wattage of the Heater in the Old Waterer	P _b	Actual or 800	Use information in TS Default: IESO Prescriptive Measures and Assumptions 2024 ²⁹⁷
Wattage of the Heater in the New Efficient Waterer	P _e	Actual If no heater = 0	Use information in TS
Quantity	Qty	Actual	Use information in TS
Hours of Use [h/year]	HOU	Actual or 2,000	Use information in TS Default: Conservative estimate for the number of hours where temperature is below 0 °C in Halifax
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for zero-energy & low-energy livestock waterers are calculated using the variables defined and listed in the equation and Table 296 below, as well as variables from Table 295 above.

$$\Delta kW = (P_b - P_e) * Qty * PCF / 1,000$$

Table 296: Unitary Peak Demand Savings Values for Zero-energy and Low-energy Livestock Waterers

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	0.84	As per Subsection 6.10.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for zero-energy and low-energy livestock waterers in SBES are assumed to be 100%.

²⁹⁷Independent Electrical System Operator, *IESO Prescriptive Measures and Assumptions List*, February 2024.

(4) Agriculture Heat Pads

Summary

Table 297 presents a summary of the values used to calculate agriculture heat pad savings. The detailed methodology follows.

Table 297: Agriculture Heat Pad Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	CSA / cUL rated agricultural heat pad, rebated after installation	-	
Baseline	Incandescent heat lamps	-	
General Parameters			
Installation Rate	None, included in the adjustment ratios below	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.10.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	10		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	84%		See Subsection 6.10.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.10.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.10.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for agriculture heat pads are calculated using the variables defined and listed in the equation and Table 298 below.

$$\Delta kWh = (P_b \times Qty_b - P_e \times Qty_e) \times HOU / 1,000$$

Table 298: Electrical Unitary Energy Savings Values for Agriculture Heat Pads

Parameter	Symbol	BER-AR, SBES	Reference
Wattage of Inefficient Heat Lamps	P _b	Actual or 175	Use information in TS <u>Default:</u> IESO Prescriptive Measures and Assumptions 2024 ²⁹⁸
Baseline Quantity	Qty _b	Actual	Use information in TS
Wattage of Efficient Heat Pads	P _e	Actual or approximately 80 W for single heat pad	Use information in TS <u>Default:</u> Assumption based on IESO Prescriptive Measures and Assumptions 2024 ²⁹⁹
Efficient Quantity	Qty _e	Actual	Use information in TS
Hours of Use [h/year]	HOU	Actual or 6,900	Use information in TS <u>Default:</u> IESO Prescriptive Measures and Assumptions 2024 ³⁰⁰
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for agriculture heat pads are calculated using the variables defined and listed in the equation and Table 299 below, as well as variables from Table 298 above.

$$\Delta kW = (P_b \times Qty_b - P_e \times Qty_e) \times PCF / 1,000$$

Table 299: Unitary Peak Demand Savings Values for Agriculture Heat Pads

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	0.84	As per Subsection 6.10.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for agriculture heat pads in SBES are assumed to be 100%.

²⁹⁸Independent Electrical System Operator, *IESO Prescriptive Measures and Assumptions List*, February 2024.

²⁹⁹Ibid.

³⁰⁰Ibid.

(5) Tractor Engine Block Heater Timers

Summary

Table 300 presents a summary of the values used to calculate tractor engine block heater timer savings. The detailed methodology follows.

Table 300: Tractor Engine Block Heater Timer Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	Tractor engine block heater timer that controls an engine block heater of at least 400 W and is CSA / cUL rated, rebated after installation	-	
Baseline	No existing heater timer	-	
General Parameters			
Installation Rate	None, included in the adjustment ratios below	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.10.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	5		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Saving
Peak Coincidence Factor	84%		See Subsection 6.10.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.10.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.10.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for tractor engine block heater timers are calculated using the variables defined and listed in the equation and Table 301 below.

$$\Delta kWh = P_{heater} \times (HOU_b - HOU_e) \times DAYS/1,000$$

Table 301: Electrical Unitary Energy Savings Values for Tractor Engine Block Heater Timers

Parameter	Symbol	BER-AR, SBES	Reference
Power Consumption of Engine Block Heater [W]	P_{heater}	Actual	Use information in TS
Baseline Hours of Use [h/day]	HOU_b	Actual or 10	Use information in TS <u>Default:</u> New York 2024 TRM ³⁰¹
Efficient Hours of Use [h/day]	HOU_e	Actual or 2	Use information in TS <u>Default:</u> New York 2024 TRM ³⁰²
Days per Year that Heater Is Used	DAYS	Actual or 120	Use information in TS <u>Default:</u> Assumption based on four winter months of 30 days
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for tractor engine block heater timer are calculated using the variables defined and listed in the equation and Table 302 below, as well as variables from Table 301 above.

$$\Delta kW = P_{heater} \times PCF / 1,000$$

Table 302: Unitary Peak Demand Savings Values for Tractor Engine Block Heater Timers

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	0.84	As per Subsection 6.10.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for tractor engine block heater timer in SBES are assumed to be 100%.

³⁰¹ New York Department of Public Service, *New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs - Residential, Multi-Family, and Commercial/Industrial Measures*, October 6, 2023, p. 429.

³⁰² New York Department of Public Service, *New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs - Residential, Multi-Family, and Commercial/Industrial Measures*, October 6, 2023, p. 430.

(6) Dairy Scroll Compressors

Summary

Table 303 presents a summary of the values used to calculate dairy scroll compressor unit savings. The detailed methodology follows.

Table 303: Dairy Scroll Compressor Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	Dairy scroll compressor for milk refrigeration, rebated after installation	-	
Baseline	Reciprocating compressor	-	
General Parameters			
Installation Rate	None, included in the adjustment ratios below	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.10.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	15		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	84%		See Subsection 6.10.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.10.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.10.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for dairy scroll compressors are calculated using the variables defined and listed in the equation³⁰³ and Table 304 below.

$$\Delta kWh = \frac{\left(\frac{1}{EER_b} - \frac{1}{EER_e} \right) \times DAYS \times COWS \times lb_{milk} \times c_{p,milk} \times \Delta T}{1,000}$$

³⁰³ Illinois Energy Efficiency, *Illinois Statewide Technical Reference Manual – Volume 2: Commercial and Industrial Measure*, September 22, 2023.

Table 304: Electrical Unitary Energy Savings Values for Dairy Scroll Compressors

Parameter	Symbol	BER-AR, SBES	Reference
Efficiency of Existing Compressor at Medium Temperature (Condensing Temp. 90°F, Evaporating Temp. 20°F) [Btu/Wh]	EER_b	Actual or use information in Table 305	Use information in TS <u>Default:</u> 2025 Iowa TRM ³⁰⁴
Efficiency of Installed Compressor at Medium Temperature (Condensing Temp. 90°F, Evaporating Temp. 20°F) [Btu/Wh]	EER_e	Actual or use information in Table 305	Use information in TS <u>Default:</u> 2025 Iowa TRM
Days per Year	DAYS	Actual	Use information in TS
Average Number of Cows Milked per Day (excluding dry cows)	COWS	Actual	Use information in TS
Milk Weight [lb/cow/day]	lb_{milk}	52.2	Pennsylvania TRM 2021, ³⁰⁵ based on 6 gal per day per cow and a density of 8.7 lb/gal
Specific Heat of Milk [Btu/lb.°F]	$c_{p,milk}$	0.93	Convention
Change in Milk Temperature [°F]	ΔT	59 = system with no pre-cooler 19 = system with a pre-cooler	Iowa 2023 TRM ³⁰⁶
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Table 305: Medium Temperature (Condensing Temp. 90°F, Evaporating Temp. 20°F) Baseline and Efficient EER

Capacity Bins in Btu/h	$EER_{avg,base}$	$EER_{avg,ee}$
0-7,500	8.14	9.03
7,500-14,999	9.28	10.86
15,000-22,499	10.64	11.83
22,500-29,999	11.18	12.15
30,000-37,499	11.12	12.39
37,500-44,999	11.74	12.70
45,000-52,499	11.68	12.52
52,500-59,999	12.54	13.12
60,000-67,499	12.46	13.13
67,500-75,000	11.44	12.37

³⁰⁴ Iowa Utilities Commission, *Iowa Energy Efficiency Statewide Technical Reference Manual Version 10.0*, Volume 3: Non-residential Measures, July 31, 2025, pp. 21-23.

³⁰⁵ Pennsylvania PUC, *Technical Reference Manual Volume 3: Commercial and Industrial Measures*, February 2021.

³⁰⁶ Iowa Energy Efficiency, *Iowa Energy Efficiency Statewide Technical Reference Manual Version 8.0 Volume 3*, July 31, 2023.

Unitary Peak Demand Savings

The unitary peak demand savings for dairy scroll compressors are calculated using the variables defined and listed in the equation and Table 306 below, as well as variables from Table 304 above.

$$\Delta kW = \frac{\Delta kWh \times PCF}{HOU}$$

Table 306: Unitary Peak Demand Savings Values for Dairy Scroll Compressors

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	Actual	As per Subsection 6.10.2
Hours of Use [h/year]	HOU	Actual	Use information in TS
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for dairy scroll compressors for SBES are assumed to be 100%.

(7) Heat Reclaimer Units

Summary

Table 307 presents a summary of the values used to calculate heat reclaimer unit savings. The detailed methodology follows.

Table 307: Heat Reclaimer Unit Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	Heat reclaimer unit that electrically heats water, rebated after installation	-	
Baseline	No heat reclaimer	-	
General Parameters			
Installation Rate	None, included in the adjustment ratios below	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.10.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	15		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	84%		See Subsection 6.10.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.10.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.10.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for heat reclaimer units are calculated using the variables defined and listed in the equation and Table 308 below.

$$\Delta kWh = COWS \times \frac{MILK}{COW} \times (U_{warm} - U_{cold}) \times \frac{1}{3,600} \times \frac{EFF_{hx}}{EFF_{wh}} \times 1.0989$$

Table 308: Electrical Unitary Energy Savings Values for Heat Reclaimer Units

Parameter	Symbol	BER-AR, SBES	Reference
Average Number of Cows Milked per Day	COWS	Actual	Use information in TS
Average Amount of Milk Yielded per Cow Annually [L/cow/year]	MILK/COW	8,030	Agriculture and Agri-Food Canada ³⁰⁷ Massachusetts Farm Energy 2012 ³⁰⁸
Internal Energy of Warm Milk	Uwarm	Actual or No pre-cooler and VSD milk transfer pump: 1,259.21 Pre-cooler but no VSD milk transfer pump: 1,178.53 Pre-cooler and VSD milk transfer pump: 1,150.29	Massachusetts Farm Energy 2012 ³⁰⁸
Internal Energy of Cooled Milk	Ucold	1,118.02	
kWh-to-kJ Conversion Factor (kWh/kJ)	-	1/3,600	Convention
Efficiency of Heat Exchanger	EFFhx	0.4	Massachusetts Farm Energy 2012 ³⁰⁹
Efficiency of Water Heater	EFFwh	Standard electric tank water heater = 0.908 High efficiency electric tank water heater = 0.93 Heat pump water heater = 2.0	
Estimate of Additional Energy Savings Derived from Reduced Load on Refrigeration System	-	1.0989	
Hours of Use [h/year]	HOU	Actual or 2,920	Use information in TS Default: New Jersey 2024 TRM ³¹⁰
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

³⁰⁷ Assuming 8,030 L based on Agriculture and Agri-Food Canada table. Government of Canada. *Average production per cow and breed for selected countries*. Retrieved from: <https://agriculture.canada.ca/en/sector/animal-industry/canadian-dairy-information-centre/statistics-market-information/dairy-animal-genetics/production-breed/per-cow> (last modified June 18, 2024).

³⁰⁸ Massachusetts Farm Energy. *Best Management Practices for Dairy Farms*. (2012). Retrieved from: <https://massfarmenergy.com/wp-content/uploads/2014/03/Dairy%20Farms%20Best%20Practices.pdf>.

³⁰⁹ Ibid.

³¹⁰ New Jersey's Clean Energy Program. *New Jersey 2023 Triennial Technical Reference Manual For 2024 Filings*, May 22, 2023, p. 260.

Unitary Peak Demand Savings

The unitary peak demand savings for heat reclaimer units are calculated using the variables defined and listed in the equation and Table 309 below, as well as variables from Table 308 above.

$$\Delta kW = (\Delta kWh/HOU) \times PCF$$

Table 309: Unitary Peak Demand Savings Values for Heat Reclaimer Units

Parameter	Symbol	BER-AR, SBES	Reference
Hours of Use [h/year]	HOU	Actual or 2,920	Use information in TS
Peak Coincidence Factor	PCF	0.84	As per Subsection 6.10.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for heat reclaimer units in SBES are assumed to be 100%.

(8) Milk Pre-coolers

Summary

Table 310 presents a summary of the values used to calculate milk pre-cooler savings. The detailed methodology follows.

Table 310: Milk Pre-cooler Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	Milk pre-cooler, rebated after installation	-	
Baseline	No existing milk pre-cooler	-	
General Parameters			
Installation Rate	None, included in the adjustment ratios below	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.10.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	15		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	84%		See Subsection 6.10.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.10.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.10.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for milk pre-cooler are calculated using the variables defined and listed in the equation and Table 311 below.

$$\Delta kWh = COWS \times \frac{MILK}{COW} \times (T_{warm} - T_{cold}) \times \frac{1}{3,600} \times c \times \left(\frac{\rho}{COP} \right) \times QTY$$

Table 311: Electrical Unitary Energy Savings Values for Milk Pre-Coolers

Parameter	Symbol	BER-AR, SBES	Reference
Average Number of Cows Milked per Day	COWS	Actual	Use information in TS
Average Amount of Milk Yielded per Cow Annually [L/cow/year]	MILK/COW	Actual or 8,030	Use information in TS <u>Default:</u> Agriculture and Agri-Food Canada ³¹¹
Temperature of Warm Milk [°C]	Twarm	No pre-cooler and VSD milk transfer pump: 39 Pre-cooler but no VSD milk transfer pump: 19 Pre-cooler and VSD milk transfer pump: 12	West et al. ³¹²
Temperature of Cooled Milk [°C]	Tcold	Actual or if unknown: No VSD milk transfer pump: 19 With VSD milk transfer pump: 12	Use information in TS <u>Default:</u> Farm Energy Nova Scotia ³¹³ and Government of Alberta ³¹⁴
kJ-to-kWh Conversion Factor [kWh/kJ]	-	1/3,600	Convention
Specific Heat Capacity of Milk [kJ/kg.K]	c	3.9356	Convention
Density of Milk [kg/L]	p	1.029	Convention ³¹⁵
Coefficient of Performance for Refrigeration System	COP	Actual or 2.17	Use information in TS
Quantity	QTY	Actual	Use information in TS
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

³¹¹ Assuming 8,030 L based on Agriculture and Agri-Food Canada table. Government of Canada. *Average production per cow and breed for selected countries*. Retrieved from: <https://agriculture.canada.ca/en/sector/animal-industry/canadian-dairy-information-centre/statistics-market-information/dairy-animal-genetics/production-breed/per-cow> (last modified June 18, 2024).

³¹² Assuming 39 °C as the start temperature. West, J.W., Mullinix, B.G., Bernard, J.K. (2003). *Effects of Hot, Humid Weather on Milk Temperature, Dry Matter Intake, and Milk Yield of Lactating Dairy Cows*. Retrieved from: <https://www.sciencedirect.com/science/article/pii/S0022030203736029>.

³¹³ Farm Energy Nova Scotia states a 65% drop in temperature when using a pre-cooler and VFD milk transfer pump, assuming a start temperature of 39 °C.

³¹⁴ Government of Alberta states a VFD milk transfer pump further decreases milk temperature by 8 to 11 °C. Government of Alberta. *Energy Efficiency on Dairy Farms*. Retrieved from: <https://open.alberta.ca/dataset/9f69749b-6b62-4474-8dfe-25e78986918a/resource/24dcf621-f817-460b-a7c1-760a0ef16e43/download/af-energy-efficiency-on-dairy-farms.pdf>.

³¹⁵ Based on conditions established in this study: Parmar, P., Lopez-Vallalobos, N., Tobin, J. T., Murphy, E., McDonagh, A., Crowley, S. V., Kelly, A. L., Shalloo, L. *The Effect of Compositional Changes Due to Seasonal Variation on Milk Density and the Determination of Season-Based Density Conversion Factors for Use in the Dairy Industry*. July 27, 2020. Retrieved from: <https://pubmed.ncbi.nlm.nih.gov/32726926/>.

Unitary Peak Demand Savings

The unitary peak demand savings for milk pre-cooler are calculated using the variables defined and listed in the equation and Table 312 below, as well as variables from Table 311 above.

$$\Delta kW = (\Delta kWh/HOU) \times PCF$$

Table 312: Unitary Peak Demand Savings Values for Milk Pre-coolers

Parameter	Symbol	BER-AR, SBES	Reference
Hours of Use [h/year]	HOU	Actual or 2,920	Use information in TS <u>Default:</u> Minnesota 2025 TRM ³¹⁶
Peak Coincidence Factor	PCF	0.84	As per Subsection 6.10.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for milk pre-cooler in SBES are assumed to be 100%.

³¹⁶ Minnesota Department of Commerce Division of Energy Resources, *State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs Version 4.1*, January 31, 2024, p. 659.

(9) VFDs for Milk Vacuum Pumps

Summary

Table 313 presents a summary of the values used to calculate VFD for milk vacuum pump savings. The detailed methodology follows.

Table 313: VFD for Milk Vacuum Pump Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	VFD for milk vacuum pump which must milk at least 50 cows, rebated after installation	-	
Baseline	No existing VFD	-	
General Parameters			
Installation Rate	None, included in the adjustment ratios below	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.10.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	15		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	84%		See Subsection 6.10.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.10.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.10.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for VFD for milk vacuum pump are calculated using the variables defined and listed in the equation and Table 314 below.

$$\Delta kWh = \left(HP \times 0.746 \times \frac{1}{EFF_{motor}} \times LF \right) \times (1 - MSF) \times HOU$$

Table 314: Electrical Unitary Energy Savings Values for Milk Vacuum Pumps

Parameter	Symbol	BER-AR, SBES	Reference
Horsepower of Connected Pump Motor	HP	Actual	Use information in TS
Conversion from hp to kW	-	0.746	Convention
Efficiency of Connected Motor	EFF _{motor}	Actual or 0.91	Use information in TS
Load Factor	LF	1. Rotary vane (LF = 0.88) 2. Blower (LF = 0.92)	No reference
Milking System Factor	MSF	1. Stanchion (MSF = 0.6) 2. Tie stall (MSF = 0.6) 3. Parlor (MSF = 0.45)	No reference
Quantity	QTY	Actual	Use information in TS
Hours of Use [h/year]	HOU	Actual or 3,000	Use information in TS
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for VFD for milk vacuum pump are calculated using the variables defined and listed in the equation and Table 315 below, as well as variables from Table 314 above.

$$\Delta kW = \left(HP \times 0.746 \times \frac{1}{EFF_{motor}} \times LF \right) \times (1 - MSF) \times PCF$$

Table 315: Unitary Peak Demand Savings Values for Milk Vacuum Pumps

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	0.84	As per Subsection 6.10.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for VFD for milk vacuum pumps in SBES are assumed to be 100%.

(10) VFD Milk Transfer Pumps

Summary

Table 316 presents a summary of the values used to calculate VFD milk transfer pump savings. The detailed methodology follows.

Table 316: VFD Milk Transfer Pump Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	VFD for milk transfer pump with pre-cooler installed which must milk at least 75 cows, rebated after installation	-	
Baseline	No existing VFD	-	
General Parameters			
Installation Rate	None, included in the adjustment ratios below	100%	See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.10.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	15		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	84%		See Subsection 6.10.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.10.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.10.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for VFD milk transfer pump are calculated using the variables defined and listed in the equation and Table 317 below.

$$\Delta kWh = EF \times COWS$$

Table 317: Electrical Unitary Energy Savings Values for VFD Milk Transfer Pumps

Parameter	Symbol	BER-AR, SBES	Reference
Energy Factor - Estimate of Energy Offset by Using VFD Milk Transfer Pump per Cow Milked	EF	33.945	Massachusetts Farm Energy Program
Average Number of Cows Milked per Day	COWS	Actual	Use information in TS
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for VFD milk transfer pump are calculated using the variables defined and listed in the equation and Table 318 below, as well as variables from Table 317 above.

$$\Delta kW = \frac{EF \times COWS \times PCF}{HOU}$$

Table 318: Unitary Peak Demand Savings Values for VFD Milk Transfer Pumps

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	0.84	As per Subsection 6.10.2
Hours of Use [h/year]	HOU	Actual or 2,920	Use information in TS Default: Minnesota 2025 TRM ³¹⁷
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for VFD milk transfer pumps in SBES are assumed to be 100%.

6.11 Commercial Kitchen Equipment

6.11.1 Interactive Effects

Interactive effects are assumed to be nil for kitchen measures since they are usually located in spaces that are not heated or cooled electrically.

6.11.2 Peak Demand Savings Factor

For kitchen measures, peak demand savings are determined by multiplying the wattage by a PCF value of 68%, which was established as part of the 2015 evaluation of BER.³¹⁸ Freezers and refrigerators have a PCF of 100%.

³¹⁷ Minnesota Department of Commerce Division of Energy Resources, *State of Minnesota Technical Reference Manual for Energy Conservation Improvement Programs Version 4.1*, January 31, 2024, p. 667.

³¹⁸ Econoler, Business Energy Rebates 2015 DSM Evaluation, Report presented to Efficiency Nova Scotia, 2016.

6.11.3 Adjustment Ratios

The adjustment ratios in Table 319 were established as part of the 2025 BER-AR evaluation. They should be applied for all commercial kitchen measures in BER-AR. No adjustment ratios were calculated for SBES.

Table 319: Commercial Kitchen Gross Savings Adjustment Ratios

Program Component	Source Evaluation Report	Energy Savings		Peak Demand Savings	
		Adjustment Ratio	Margin of Error	Adjustment Ratio	Margin of Error
BER-AR	2025	0.951	5.8%	0.514	21.9%

6.11.4 Commercial Kitchen Measures

(1) Dishwasher

Summary

Table 320 presents a summary of the values used to calculate electrical dishwasher savings. The detailed methodology follows.

Table 320: Dishwasher Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	Low or high temperature ENERGY STAR® rated dishwasher, rebated after installation		-
Baseline	Standard dishwasher		-
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.11.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	Under-counter: 10 Door-type: 15 Conveyor: 20		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	68%		See Subsection 6.11.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.11.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.11.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for dishwashers are calculated using the ENERGY STAR Commercial Food Services Calculator using the parameters in Table 321 below.

Table 321: Electrical Unitary Energy Savings Values for Dishwashers

Parameter	Symbol	BER-AR, SBES	Reference
Annual Days of Operation [days/year]	DAYS	Actual	Measure specific - use information in TS
Average Daily Operation [hours/day]	HOU	Actual	Measure specific - use information in TS
Racks Washed per Day	-	Actual	Measure specific - use information in TS
Idle Energy Rate of Efficient Equipment [kW]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Water Use of Efficient Equipment [gallons/rack]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Typical Total Wash Time in Minutes	-	Actual	Measure specific - use information in TS
Water Heating Energy for Building Water Heater [kWh/gallon]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Water Heating Energy for Booster Water Heater [kWh/gallon]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Energy Savings [kWh]	ES	Calculated using the ENERGY STAR Commercial Food Services Calculator	ENERGY STAR Commercial Food Services Calculator

Unitary Peak Demand Savings

The unitary peak demand savings for dishwashers are calculated using the variables defined and listed in the equation and Table 322 below, as well as variables from Table 321 above.

$$Peak\ Demand\ Savings_{kW} = \frac{ES \times PCF}{HOU \times DAYS}$$

Table 322: Unitary Peak Demand Savings Values for Dishwashers

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	Actual or 0.68	As per Subsection 6.11.2
Unitary Peak Demand Savings [kW]	<i>Peak Demand Savings_{kW}</i>	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for dishwashers are assumed to be 100%.

(2) Freezers/Refrigerators

Summary

Table 323 presents a summary of the values used to calculate electrical freezer/refrigerator savings. The detailed methodology follows.

Table 323: Freezer/Refrigerator Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	ENERGY STAR® rated standalone refrigerator or freezer, rebated after installation		-
Baseline	Standard refrigerator or freezer		-
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.11.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	12		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	100%		See Subsection 6.11.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.11.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.11.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for freezers and refrigerators are calculated using the ENERGY STAR Commercial Food Services Calculator using the parameters in Table 324 below.

Table 324: Electrical Unitary Energy Savings Values for Freezers/Refrigerators

Parameter	Symbol	BER-AR, SBES	Reference
Annual Days of Operation [days/year]	DAYS	Actual	Measure specific - use information in TS
Average Daily Operation [hours/day]	HOU	Actual	Measure specific - use information in TS
Interior Volume [ft3]	-	Actual	Measure specific - use information in TS
Energy Use (or daily energy consumption) for Efficient Equipment [kWh/day]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Energy Savings [kWh]	ES	Calculated using the ENERGY STAR Commercial Food Services Calculator	ENERGY STAR Commercial Food Services Calculator

Unitary Peak Demand Savings

The unitary peak demand savings for freezer/refrigerator are calculated using the variables defined and listed in the equation and Table 325 below, as well as variables from Table 324 above.

$$Peak\ Demand\ Savings_{kW} = \frac{ES \times PCF}{HOU \times DAYS}$$

Table 325: Unitary Peak Demand Savings Values for Freezers/Refrigerators

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	1	As per Subsection 6.11.2
Unitary Peak Demand Savings [kW]	<i>Peak Demand Savings_{kW}</i>	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for freezers/refrigerators are assumed to be 100%.

(3) Fryer

Summary

Table 326 presents a summary of the values used to calculate electrical fryer savings. The detailed methodology follows.

Table 326: Fryer Measure Summary

Parameter	BER-AR, SBES		Reference
Measure Description and Identification			
Measure	ENERGY STAR® rated fryer, rebated after installation		-
Baseline	Standard electric fryer		-
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.11.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	12		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	68%		See Subsection 6.11.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.11.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.11.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for fryers are calculated using the ENERGY STAR Commercial Food Services Calculator using the parameters in Table 327 below.

Table 327: Electrical Unitary Energy Savings Values for Fryers

Parameter	Symbol	BER-AR R, SBES	Reference
Annual Days of Operation [days/year]	DAYS	Actual	Measure specific - use information in TS
Average Daily Operation [hours/day]	HOU	Actual	Measure specific - use information in TS
Size of Fryer	-	Actual (options are standard or large)	Measure specific - use information in TS
Food Cooked per Day [pounds] Pro-rate Based on HRS (if HRS do not equal 16)	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Shortening Capacity [lbs]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Cooking Energy Efficiency of Efficient Fryer [%]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Energy Use (or idle energy rate) of Efficient Fryer [Btu/hr]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Energy Savings [kWh]	ES	Calculated using the ENERGY STAR Commercial Food Services Calculator	ENERGY STAR Commercial Food Services Calculator

Unitary Peak Demand Savings

The unitary peak demand savings for fryers are calculated using the variables defined and listed in the equation and Table 328 below, as well as variables from Table 327 above.

$$Peak\ Demand\ Savings_{kW} = \frac{ES \times PCF}{HOU \times DAYS}$$

Table 328: Unitary Peak Demand Savings Values for Fryers

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	Actual or 0.68	As per Subsection 6.11.2
Unitary Peak Demand Savings [kW]	<i>Peak Demand Savings_{kW}</i>	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for fryers are assumed to be 100%.

(4) Griddles

Summary

Table 329 presents a summary of the values used to calculate electrical griddles savings. The detailed methodology follows.

Table 329: Griddle Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	ENERGY STAR® rated griddle, rebated after installation		-
Baseline	Standard electric griddle		-
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.11.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	12		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	68%		See Subsection 6.11.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.11.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.11.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for griddles are calculated using the ENERGY STAR Commercial Food Services Calculator using the parameters in Table 330 below.

Table 330: Electrical Unitary Energy Savings Values for Griddles

Parameter	Symbol	BER-AR R, SBES	Reference
Annual Days of Operation [days/year]	DAYS	Actual	Measure specific - use information in TS
Average Daily Operation [hours/day]	HOU	Actual	Measure specific - use information in TS
Width of Griddle [ft]	-	Actual	Measure specific - use information in TS
Depth of Griddle [ft]	-	Actual	Measure specific - use information in TS
Food Cooked per Day [pounds] Pro-rate Based on HRS (if HRS do not equal 12)	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Cooking Energy Efficiency of Efficient Griddle [%]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Energy Use (or normalized idle energy) of Efficient Griddle [Btu/hr/sqft]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Energy Savings [kWh]	ES	Calculated using the ENERGY STAR Commercial Food Services Calculator	ENERGY STAR Commercial Food Services Calculator

Unitary Peak Demand Savings

The unitary peak demand savings for griddles are calculated using the variables defined and listed in the equation and Table 331 below, as well as variables from Table 330 above.

$$Peak\ Demand\ Savings_{kW} = \frac{ES \times PCF}{HOU \times DAYS}$$

Table 331: Unitary Peak Demand Savings Values for Griddles

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	Actual or 0.68	As per Subsection 6.11.2
Unitary Peak Demand Savings [kW]	<i>Peak Demand Savings_{kW}</i>	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for griddles are assumed to be 100%.

(5) Hot Food Holding Cabinets

Summary

Table 332 presents a summary of the values used to calculate electrical hot food holding cabinets savings. The detailed methodology follows.

Table 332: Hot Food Holding Cabinet Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	ENERGY STAR® rated hot food holding cabinet, rebated after installation		-
Baseline	Standard hot food holding cabinet		-
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.11.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	12		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	68%		See Subsection 6.11.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.11.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.11.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for hot food holding cabinets are calculated using the ENERGY STAR Commercial Food Services Calculator using the parameters in Table 333 below.

Table 333: Electrical Unitary Energy Savings Values for Hot Food Holding Cabinets

Parameter	Symbol	BER-AR R, SBES	Reference
Annual Days of Operation [days/year]	DAYS	Actual	Measure specific - use information in TS
Average Daily Operation [hours/day]	HOU	Actual	Measure specific - use information in TS
Interior Volume [ft ³]	-	Actual	Measure specific - use information in TS
The Rate of Energy Consumption While it Is Maintaining or Holding at the Control Setpoint Without Using a Humidity-generating Device [W]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Energy Savings [kWh]	ES	Calculated using the ENERGY STAR Commercial Food Services Calculator	ENERGY STAR Commercial Food Services Calculator

Unitary Peak Demand Savings

The unitary peak demand savings for hot food holding cabinets are calculated using the variables defined and listed in the equation and Table 334 below, as well as variables from Table 333 above.

$$Peak\ Demand\ Savings_{kW} = \frac{ES \times PCF}{HOU \times DAYS}$$

Table 334: Unitary Peak Demand Savings Values for Hot Food Holding Cabinets

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	Actual or 0.68	As per Subsection 6.11.2
Unitary Peak Demand Savings [kW]	<i>Peak Demand Savings_{kW}</i>	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for hot food holding cabinets are assumed to be 100%.

(6) Ice Machines

Summary

Table 335 presents a summary of the values used to calculate electrical ice machines savings. The detailed methodology follows.

Table 335: Ice Machine Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	ENERGY STAR® rated ice machine, rebated after installation		-
Baseline	Standard ice machine		-
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.11.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	10		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	68%		See Subsection 6.11.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.11.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.11.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for ice machines are calculated using the ENERGY STAR Commercial Food Services Calculator using the parameters in Table 336 below.

Table 336: Electrical Unitary Energy Savings Values for Ice Machines

Parameter	Symbol	BER-AR, SBES	Reference
Annual Days of Operation [days/year]	DAYS	Actual	Measure specific - use information in TS
Average Daily Operation [hours/day]	HOU	Actual	Measure specific - use information in TS
The Type of Equipment Category the Ice Maker Falls into	-	Actual The three categories are: Ice-making heat (IMH) Remote condensing unit (RCU) Split system unit / self-contained unit (SCU)	Measure specific - use information in TS
The Type of Ice the Ice Maker Produces	-	Actual (Options: batch or continuous)	Measure specific - use information in TS
Harvest Rate - the Gross Weight of Ice Harvested in a 24-hour Period for Efficient Ice Maker [lbs ice/day]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
The Measured Energy Use (or energy consumption rate) for the Efficient Ice Maker [kWh / 100 lbs]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Energy Savings [kWh]	ES	Calculated using the ENERGY STAR Commercial Food Services Calculator	ENERGY STAR Commercial Food Services Calculator

Unitary Peak Demand Savings

The unitary peak demand savings for ice machines are calculated using the variables defined and listed in the equation and Table 337 below, as well as variables from Table 336 above.

$$Peak\ Demand\ Savings_{kW} = \frac{ES \times PCF}{HOU \times DAYS}$$

Table 337: Unitary Peak Demand Savings Values for Ice Machines

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	Actual or 0.68	As per Subsection 6.11.2
Unitary Peak Demand Savings [kW]	<i>Peak Demand Savings_{kW}</i>	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for ice machines are assumed to be 100%.

(7) Ovens

Summary

Table 338 presents a summary of the values used to calculate electrical ovens savings. The detailed methodology follows.

Table 338: Oven Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	ENERGY STAR® rated oven, rebated after installation		-
Baseline	Standard oven		-
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.11.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	12		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	68%		See Subsection 6.11.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.11.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.11.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for ovens are calculated using the ENERGY STAR Commercial Food Services Calculator using the parameters in Table 339 below.

Table 339: Electrical Unitary Energy Savings Values for Ovens

Parameter	Symbol	BER-AR R, SBES	Reference
Annual Days of Operation [days/year]	DAYS	Actual	Measure specific - use information in TS
Average Daily Operation [hours/day]	HOU	Actual	Measure specific - use information in TS
Size	-	Actual (FULL size or HALF size)	Measure specific - use information in TS
The Number of Pans a Combination Oven Can Accommodate	-	Actual or ENERGY STAR default (N/A for convection ovens)	Measure specific - use information in TS
Food Cooked per Day [pounds] Pro-rate Based on HRS (if HRS do not equal 12).	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Cooking Energy Efficiency of Efficient Oven (CEE)	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Production Capacity of Efficient Oven [lbs/hr]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Idle Energy Rate of Efficient Oven [Watts]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Energy Savings [kWh]	ES	Calculated using the ENERGY STAR Commercial Food Services Calculator	ENERGY STAR Commercial Food Services Calculator

Unitary Peak Demand Savings

The unitary peak demand savings for ovens are calculated using the variables defined and listed in the equation and Table 340 below, as well as variables from Table 339 above.

$$Peak\ Demand\ Savings_{kW} = \frac{ES \times PCF}{HOU \times DAYS}$$

Table 340: Unitary Peak Demand Savings Values for Ovens

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	Actual or 0.68	As per Subsection 6.11.2
Unitary Peak Demand Savings [kW]	$Peak\ Demand\ Savings_{kW}$	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for ovens are assumed to be 100%.

(8) Steam Cookers

Summary

Table 341 presents a summary of the values used to calculate electrical steam cooker savings. The detailed methodology follows.

Table 341: Steam Cooker Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	ENERGY STAR® rated steam cooker, rebated after installation		-
Baseline	Standard steam cooker		-
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.11.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	12		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	68%		See Subsection 6.11.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.11.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.11.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for steam cookers are calculated using the ENERGY STAR Commercial Food Services Calculator using the parameters in Table 342 below.

Table 342: Electrical Unitary Savings Values for Steam Cookers

Parameter	Symbol	BER-AR R, SBES	Reference
Annual Days of Operation [days/year]	DAYS	Actual	Measure specific - use information in TS
Average Daily Operation [hours/day]	HOU	Actual	Measure specific - use information in TS
Type of Steam	-	Actual (steam generator, boilerless, boiler based)	Measure specific - use information in TS
The Maximum Number of Full-sized Pans	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Food Cooked per Day [pounds] Pro-rate Based on HRS (if HRS do not equal 12).	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Cooking Energy Efficiency of Efficient Steam Cooker (CEE)	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Idle Energy Rate of Efficient Oven [Watts]	-	Actual or ENERGY STAR default	Measure specific - use information in TS
Energy Savings [kWh]	ES	Calculated using the ENERGY STAR Commercial Food Services Calculator	ENERGY STAR Commercial Food Services Calculator

Unitary Peak Demand Savings

The unitary peak demand savings for steam cookers are calculated using the variables defined and listed in the equation and Table 343 below, as well as variables from Table 342 above.

$$Peak\ Demand\ Savings_{kW} = \frac{ES \times PCF}{HOU \times DAYS}$$

Table 343: Unitary Peak Demand Savings Values for Steam Cookers

Parameter	Symbol	BER-AR, SBES	Reference
Peak Coincidence Factor	PCF	Actual or 0.68	As per Subsection 6.11.2
Unitary Peak Demand Savings [kW]	<i>Peak Demand Savings_{kW}</i>	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for steam cookers are assumed to be 100%.

(9) Demand Controlled Kitchen Exhaust

Summary

Table 344 presents a summary of the values used to calculate electrical demand-controlled kitchen exhaust savings. The detailed methodology follows.

Table 344: Demand Controlled Kitchen Exhaust Measure Summary

Parameter	BER-AR	SBES	Reference
Measure Description and Identification			
Measure	Controlled by temperature and/or optical sensors located in exhaust hood, rebated after installation		-
Baseline	No DCV		-
General Parameters			
Installation Rate	100%		See details below under Installation Rates
Energy Savings Adjustment Ratio	0.951	-	See Subsection 6.11.3
Peak Demand Savings Adjustment Ratio	0.514	-	
Effective Useful Life [years]	15		See Subsection 3.2
Electrical Savings Parameters			
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit		See details below under Electrical Unitary Energy Savings
Interactive Effects Factor for Energy Savings	0		See Subsection 6.11.1
Interactive Effects Factor for Peak Demand Savings	0		See Subsection 6.11.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for demand-controlled kitchen exhaust are calculated using the variables defined and listed in the equation and Table 345 below.

$$Energy\ Savings_{kWh} = ESG \times HP$$

**Table 345: Electrical Unitary Energy Savings Values
for Demand Controlled Kitchen Exhaust**

Parameter	Symbol	BER-AR R, SBES	Reference
Energy Savings Factor [kWh/hp]	ESVG	4,423	2026 Pennsylvania TRM ³¹⁹
Total Horsepower of Motor Controlled (exhaust only)	HP	Actual	2026 Pennsylvania TRM
Unitary Energy Savings [kWh/year]	<i>Energy Savings_{kWh}</i>	Calculated based on specification data for each installed system	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for demand controlled kitchen exhaust are calculated using the variables defined and listed in the equation and Table 346 below, as well as variables from Table 345 above.

$$\text{Peak Demand Savings}_{kW} = \text{DSVG} \times \text{PCF} \times \text{HP}$$

**Table 346: Unitary Peak Demand Savings Values
for Demand Controlled Kitchen Exhaust**

Parameter	Symbol	BER-AR, SBES	Reference
Demand Savings Factor (kW/hp)	DSVG	0.58	2026 Pennsylvania TRM
Peak Coincidence Factor	PCF	0.68	As per Subsection 6.11.2
Unitary Peak Demand Savings [kW]	<i>Peak Demand Savings</i>	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for demand-controlled kitchen exhaust are assumed to be 100%.

6.12 Commercial Laundry Equipment

6.12.1 Interactive Effects

Interactive effects are assumed to be nil for laundry measures since they usually exhaust heat through outdoor vents and drain water.

6.12.2 Peak Demand Savings Factor

For laundry measures, peak demand savings are determined by multiplying the wattage by a PCF value of 34%, which was established as part of the 2015 evaluation of BER.³²⁰

6.12.3 Adjustment Ratios

For laundry measures, no adjustment ratios were calculated.

³¹⁹ Pennsylvania Public Utility Commission, *Technical Reference Manual – Volume 3: Commercial & Industrial Measures*, September 2024, pp. 173-174.

³²⁰ Econoler, Business Energy Rebates 2015 DSM Evaluation, Report presented to Efficiency Nova Scotia, 2016.

6.12.4 Commercial Laundry Measures

(1) Commercial Washing Machines

Summary

Table 347 presents a summary of the values used to calculate commercial washing machine savings. The detailed methodology follows.

Table 347: Commercial Washing Machine Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	ENERGY STAR® rated commercial washing machine used for commercial purposes, rebated after installation • Building must use electrically heated water	-
Baseline	Washing machine meeting Canadian minimum standards	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	11	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	34%	See Subsection 6.12.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.12.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.12.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for commercial washing machine are calculated using the variables defined and listed in the equation and Table 348 below.

$$\Delta kWh = \left(\frac{1}{MEF_b} - \frac{1}{MEF_e} \right) \times CAP \times LOADS \times QTY$$

**Table 348: Electrical Unitary Energy Savings Values
for Commercial Washing Machines**

Parameter	Symbol	BER-AR, SBES	Reference
Modified Energy Factor of Baseline Equipment [ft ³ /kWh/load]	MEFb	Actual or 1.26	Use information in TS <u>Default:</u> Canadian Min. Efficiency per EEA, compliance date - Jan 1, 2007
Modified Energy Factor of Efficient Equipment [ft ³ /kWh/load]	MEFe	Actual or if unknown: CEE Tier MEFe Tier 1 1.8 Tier 2 2.0 Tier 3 2.2	Use information in TS <u>Default:</u> ENERGY STAR Commercial Clothes Washer Savings Calculator
Equipment Capacity [ft ³]	CAP	Actual or 3	Use information in TS <u>Default:</u> Based on manufacturer research
Number of Loads Run per Year [loads/year]	LOADS	Multi-unit Residential 1,241 Laundromats 2,190 Weighted Average 1,431	ENERGY STAR Commercial Clothes Washer Savings Calculator
Quantity of Washing Machines	QTY	Actual	Use information in TS
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for commercial washing machine are calculated using the variables defined and listed in the equation and Table 349 below, as well as variables from Table 348 above.

$$\Delta kW = \frac{\Delta kWh \times PCF}{RUNTIME \times LOADS}$$

Table 349: Unitary Peak Demand Savings Values for Commercial Washing Machines

Parameter	Symbol	BER-AR, SBES	Reference
Length of Average Cycle [h/load]	RUNTIME	Actual or 1	Use information in TS
Peak Coincidence Factor	PCF	0.34	See Subsection 6.12.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for commercial washing machine are assumed to be 100%.

(2) Commercial Heat Pump Clothes Dryers

Summary

Table 350 presents a summary of the values used to calculate commercial heat pump clothes dryers savings. The detailed methodology follows.

Table 350: Commercial Heat Pump Clothes Dryer Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Commercial heat pump clothes dryer meeting a minimum Combined Energy Factor (CEF) of 4.5, rebated after installation - ENERGY STAR® rated - Used for commercial purpose (units installed in individual apartments are not eligible for rebates)	-
Baseline	Standard electric commercial clothes dryer	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	12	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Peak Coincidence Factor	34%	See Subsection 6.12.2
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.12.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.12.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for commercial heat pump clothes dryers are calculated using the variables defined and listed in the equation³²¹ and Table 351 below.

$$\Delta kWh = QTY \times C_{dry} \times Load_{avg} \times \left(\frac{1}{CEF_{base}} - \frac{1}{CEF_{ee}} \right)$$

³²¹ Efficiency Vermont, *Technical Reference User Manual Measure Savings Algorithms and Cost Assumptions*, March 2015.

**Table 351: Electrical Unitary Energy Savings Values
for Commercial Heat Pump Clothes Dryers**

Parameter	Symbol	BER-AR, SBES	Reference
Quantity	QTY	Actual	Use information in TS
Loads per Year [loads/year]	Cdry	Multi-unit Residential 1,083 Laundromats 1,479 Weighted Average 1,162	U.S. Department of Energy, 2021 ³²²
Average Load [lbs/load]	LoadAvg	Standard: 8.45 Compact: 3.0	Vermont TRM, 2015 ³²³
CEF for Baseline [lbs/kWh]	CEFbase	Actual or Standard clothes dryer (≥ 125-litre capacity) 2.51 120V Compact clothes dryer (<125-litre capacity) 2.61 240V Compact clothes dryer (<125-litre capacity) 2.42	Vermont 2015 TRM
CEF for Efficient Equipment [lbs/kWh]	CEFee	Actual	Use information in TS
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for commercial heat pump clothes dryers are calculated using the variables defined and listed in the equation and Table 352 below, as well as variables from Table 351 above.

$$\Delta kW = \frac{Load_{avg} \times \left(\frac{1}{CEF_{base}} - \frac{1}{CEFee} \right)}{time_{cycle}} \times PCF \times QTY$$

**Table 352: Unitary Peak Demand Savings Values
for Commercial Heat Pump Clothes Dryers**

Parameter	Symbol	BER-AR, SBES	Reference
Time Cycle [h]	timecycle	Actual or 1	Use information in TS Default: Vermont 2015 TRM
Peak Coincidence Factor	PCF	Actual or 0.34	See Subsection 6.12.2
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for commercial heat pump clothes dryers are assumed to be 100%.

³²² NOPD analysis for DOE Commercial Clothes Washer standard. U.S. Department of Energy, *Energy Conservation Program: Energy Conservation Standards for Commercial Clothes Washers*, December 20, 2021. Retrieved from: <https://www.federalregister.gov/documents/2021/12/20/2021-27461/energy-conservation-program-energy-conservation-standards-for-commercial-clothes-washers> (last accessed October 29, 2025).

³²³ Efficiency Vermont, *Technical reference User Manual*, March 16, 2015.

6.13 Commercial IT and Datacentres

6.13.1 Interactive Effects

Interactive effects factors are not included in commercial IT and datacentre measures.

6.13.2 Peak Demand Savings Factor

No standard PCF values have been determined for commercial IT and datacentre measures.

6.13.3 Adjustment Ratios

For IT and datacentres measures, no adjustment ratios were calculated.

6.13.4 Commercial IT and Datacentres

(1) Server-based Power Management Software

Summary

Table 353 presents a summary of the values used to calculate server-based power management software savings. The detailed methodology follows.

Table 353: Server-based Power Management Software Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Power management utility must be network-based, rebated after installation • Must enable both monitor shut-down as well as computer sleep mode within 30 minutes of inactivity	-
Baseline	No network-based management system	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	5	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.13.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.13.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for server-based power management software are calculated using the variables defined and listed in the equation³²⁴ and Table 354 below.

$$\Delta kWh = ESF_D \times Q_D + ESF_L \times Q_L$$

Table 354: Electrical Unitary Energy Savings Values for Server-based Power Management Software

Parameter	Symbol	BER-AR, SBES	Reference
Energy Savings Factor for a Desktop Computer [kWh/year]	ESFD	356	Based on ENERGY STAR Computer Power Management Savings Calculator ³²⁵ using the following assumptions: Typical forty-hour work week; Monitor off setting of 5 minutes of inactivity; Computer sleep setting of 15 minutes of inactivity; Computer on wattage of 46 Watts; Computer sleep wattage of 2 Watts; LCD monitor wattage of 25 Watts; LCD monitor sleep wattage of 1 Watt; Default of 36% is the percentage of computers turned off each night is based upon 2004 Lawrence Berkeley National Lab Report entitled "After-hours Power Status of Office Equipment and Inventory of Miscellaneous Plug-Load Equipment"
Quantity of Power Managed Desktop Computers	Qd	Actual	Use information in TS
Energy Savings Factor for a Laptop Computer [kWh/year]	ESFL	69	Based on ENERGY STAR Computer Power Management Savings Calculator using the following assumptions: Typical forty-hour work week; Monitor off setting of 5 minutes of inactivity; Computer sleep setting of 15 minutes of inactivity; Laptop on wattage of 14 Watts; Laptop sleep wattage of 1 Watt; Assumes 50% of laptop power is for computer, while 50% is for monitor; Default of 36% is the percentage of computers turned off each night is based upon 2004 Lawrence Berkeley National Lab Report entitled "After-hours Power Status of Office Equipment and Inventory of Miscellaneous Plug-Load Equipment"
Quantity of Power Managed Laptop Computers	Ql	Actual	Use information in TS
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for server-based power management software are calculated using the variables defined and listed in the equation and Table 355 below, as well as variables from Table 354 above.

$$\Delta W = DSF_D \times Q_D + DSF_L \times Q_L$$

³²⁴ Pennsylvania PUC, *Technical Reference Manual (TRM) Volume 1*, August 2019.

³²⁵ Retrieved from <https://www.energystar.gov/sites/default/files/asset/document/LowCarbonITSavingsCalc.xlsx>.

Table 355: Unitary Peak Demand Savings Values for Server-based Power Management Software

Parameter	Symbol	BER-AR, SBES	Reference
Demand Savings Factor for a Desktop Computer [W]	DSFD	68	Based on ENERGY STAR Computer Power Management Savings Calculator using the following assumptions: Computer on wattage of 46 Watts; Computer sleep wattage of 2 Watts; LCD monitor wattage of 25 Watts; LCD monitor sleep wattage of 1 Watt
Demand Savings Factor for a Laptop Computer [W]	DSFL	13	Demand Savings Factor for a Laptop Computer. Based on ENERGY STAR Computer Power Management Savings Calculator using the following assumptions: Laptop on wattage of 14 Watts; Laptop sleep wattage of 1 Watt; Assumes 50% of laptop power is for computer, while 50% is for monitor
Unitary Peak Demand Savings [W]	ΔW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for server-based power management software are estimated at 100%.

(2) Server Virtualization and Decommissioning

Summary

Table 356 presents a summary of the values used to calculate server virtualization and decommissioning savings. The detailed methodology follows.

Table 356: Server-based Server Virtualization and Decommissioning Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	Removed servers must be properly disposed of and not be reused in any form, rebated after decommissioning	-
Baseline	Removed servers which were functional and in use prior to virtualization	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	4	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Unitary Peak Demand Savings [W]	Calculation based on specification data for each rebated unit	See details below under Unitary Peak Demand Savings
Interactive Effects Factor for Energy Savings	0	See Subsection 6.13.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.13.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for server virtualization and decommissioning are calculated using the variables defined and listed in the equation³²⁶ and Table 357 below.

$$\Delta kWh = (kWh_{BV} - kWh_{AV})$$

$$kWh_{BV} = \frac{8,760}{1,000} \times RS \times (W_{rs,idle} + U_{rs} * (W_{rs,full\ load} - W_{rs,idle}))$$

$$kWh_{AV} = \frac{8,760}{1,000} \times VH \times (W_{vh,idle} + U_{vh} * (W_{vh,full\ load} - W_{vh,idle}))$$

Table 357: Electrical Unitary Energy Savings Values for Server Virtualization and Decommissioning

Parameter	Symbol	BER-AR, SBES	Reference
Servers to Be Retired	RS	Actual (minimum of 8)	Use information in TS
Power Use in Idle [W] of a Server to Be Retired	Wrs_idle	Actual	Use information in TS
Utilization of Server to Be Retired	Urs	0.09	Assumption
Power Use at Full Load [W] of a Server to Be Retired	Wrs_full load	Actual	Use information in TS
Virtual Host Servers	VH	Actual	Use information in TS
Power Use of a Virtual Host Server in Idle [W]	Wvh_idle	Actual	Use information in TS
Virtual Host Server Utilization	Uvh	0.5	Assumption
Power Use of Virtual Host Server at Full Load [W]	Wvh_full load	Actual	Use information in TS
Energy Use Before Virtualization	kWhBV	Calculation based on specification data for each rebated unit	Calculation
Energy Use After Virtualization	kWhAV	Calculation based on specification data for each rebated unit	Calculation
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Unitary Peak Demand Savings

The unitary peak demand savings for server virtualization and decommissioning are calculated using the variables defined and listed in the equation and Table 358 below, as well as variables from Table 357 above.

$$\Delta kW = \Delta kWh /_{HOU}$$

³²⁶ Pennsylvania PUC, *Technical Reference Manual (TRM) Volume 1*, August 2019.

**Table 358: Unitary Peak Demand Savings Values
for Server Virtualization and Decommissioning**

Parameter	Symbol	BER-AR, SBES	Reference
Hours of Use [h/year]	HOU	8760	Assumption
Unitary Peak Demand Savings [kW]	ΔkW	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for server virtualization and decommissioning are estimated at 100%.

(3) Uninterruptible Power Supply (UPS)

Summary

Table 359 presents a summary of the values used to calculate uninterruptible power supply (UPS) savings. The detailed methodology follows.

Table 359: Uninterruptible Power Supply (UPS) Measure Summary

Parameter	BER-AR, SBES	Reference
Measure Description and Identification		
Measure	ENERGY STAR® certified UPS to reduce energy losses, rebated after installation	-
Baseline	No UPS	-
General Parameters		
Installation Rate	100%	See details below under Installation Rates
Effective Useful Life [years]	10	See Subsection 3.2
Electrical Savings Parameters		
Unitary Energy Savings [kWh/year]	Calculation based on specification data for each rebated unit	See details below under Electrical Unitary Energy Savings
Unitary Peak Demand Savings [W]	0	No peak demand reduction
Interactive Effects Factor for Energy Savings	0	See Subsection 6.13.1
Interactive Effects Factor for Peak Demand Savings	0	See Subsection 6.13.1

Electrical Unitary Energy Savings

The electrical unitary energy savings for uninterruptible power supply (UPS) are calculated using the variables defined and listed in the equation³²⁷ and Table 360 below.

$$\Delta kWh = 204 \times kVA$$

**Table 360: Electrical Unitary Energy Savings Values
for Uninterruptible Power Supply (UPS)**

Parameter	Symbol	BER-AR, SBES	Reference
Energy Use per Rated kVA	-	204	CMUA California 2017 TRM
UPS Power [kVA]	kVA	Actual	Use information in TS
Unitary Energy Savings [kWh/year]	ΔkWh	Calculation based on specification data for each rebated unit	Calculation

Installation Rates

Installation rates for uninterruptible power supply (UPS) are estimated at 100%.

³²⁷ California Municipal Utilities Association, *Savings Estimation Technical Reference Manual*, 2017, p.8-15.

7 Effective Useful Life

This section outlines the EUL values used to calculate lifetime energy savings. This section also presents EUL values for demand reduction measures; these values are not used to calculate lifetime energy savings since those measures do not save energy. For demand response measures, the EUL represents the number of years for which the demand reduction is expected to persist. The EUL values should be used when calculating cost-effectiveness ratios for measures, in order to account for lifetime benefits.

7.1 LED Lamps and Fixtures

To establish lifetime energy savings for LED lamps and fixtures, the equipment life is determined using rated lifetimes identified in product specification sheets and annual HOU, as described in the equation below.

$$\text{Equipment Life [Years]} = \frac{\text{Rated Lifetime [Hours]}}{\text{Annual HOU [Hours]}}$$

Since regulatory changes will cause the baseline to gradually shift to LED over the lifetime of LEDs and thus decrease annual savings over the lifetime of the product, an equivalent EUL is necessary to determine lifetime savings. The equivalent EUL is multiplied by first-year savings to obtain lifetime energy savings. Since the equivalent EUL is based on upcoming regulatory changes, it must be updated annually to take into account the changing duration of each baseline. The detailed assumptions and calculations to obtain equivalent EUL values are presented in Appendix I.

Table 361 summarizes the equivalent EUL values for BNI LED lamps and fixtures.

Table 361: EUL Values for BNI LED Lamps and Fixtures

Measure	Program Component	Average Rated Lifetime (hours)	Annual HOU (hours/year)	Equipment Life	2025 Equivalent EUL
LED Linear Fixtures					
1 x 4 Luminaires	BER-IR, BER-AR, SBES	20,000*	4,209	4.8	4.8
2 x 2 Luminaires and Retrofit Kits	BER-IR, BER-AR, SBES	20,000*	4,209	4.8	4.8
2 x 4 Luminaires and Retrofit Kits	BER-IR, BER-AR, SBES	20,000*	4,209	4.8	4.8
Linear Ambient and Low-bay Luminaires	BER-IR, BER-AR, SBES	20,000*	4,209	4.8	4.8
High-bay Luminaires	BER-AR, SBES	20,000*	4,209	4.8	4.8
Troffers	BER-IR, BER-AR, SBES	20,000*	4,209	4.8	4.8
Stairwell and Passageway Luminaire	BER-AR, SBES	20,000*	7,000	2.9	2.9
LED Linear Lamps					
2-foot Replacement Lamps	BER-IR, BER-AR, SBES	20,000*	4,209	4.8	4.8
3-foot Replacement Lamps	BER-IR, BER-AR, SBES	20,000*	4,209	4.8	4.8
4-foot Replacement Lamps	BER-IR, BER-AR, SBES	20,000*	4,209	4.8	4.8
8-foot Replacement Lamps	BER-IR, BER-AR, SBES	20,000*	4,209	4.8	4.8
U-bend	BER-IR, BER-AR, SBES	20,000*	4,209	4.8	4.8

Measure	Program Component	Average Rated Lifetime (hours)	Annual HOU (hours/year)	Equipment Life	2025 Equivalent EUL
LED General-use and Decorative Lamps					
LED Decorative (Chandelier)	SBES	25,000	3,600	6.9	1.0
LED Omnidirectional (A-lamp and Globe)	SBES	25,000	3,600	6.9	1.0
Four Pin-base Replacement Lamps for Compact Fluorescent Lamps (CFLs)	BER-AR, SBES	8,000*	4,209	1.9	1.9
9 W Replacing 25 W	SBES	25,000	3,600	6.9	1.0
9 W Replacing 29 W					1.0
9 W Replacing 40 W					1.0
9 W Replacing 43 W					1.0
9 W Replacing 60 W					1.0
9 W Replacing 72 W					1.0
9 W Replacing 100 W					1.0
9 W Replacing 150 W					1.0
9.5 W Replacing 25 W					1.0
9.5 W Replacing 29 W					1.0
9.5 W Replacing 40 W					1.0
9.5 W Replacing 43 W					1.0
9.5 W Replacing 60 W					1.0
9.5 W Replacing 72 W					1.0
9.5 W Replacing 100 W					1.0
9.5 W Replacing 150 W					1.0
18 W Replacing 75 W					1.0
18 W Replacing 100 W					1.0
7 W Blackout Bulbs Replacing 60 W					1.0
LED Reflector Lamps					
Small LED Reflector Lamps - PAR, MR, MRX 16	SBES	25,000	3,600	6.9	1.0
Small LED Reflector Lamps - PAR, R 20	SBES	25,000	3,600	6.9	1.0
Large LED Reflector Lamps - PAR, BR, R 30/30L	SBES	25,000	3,600	6.9	1.0
Large LED Reflector Lamps - PAR, BR, R 38/40	SBES	25,000	3,600	6.9	1.0
LED Downlight Fixtures					
LED Recessed	SBES	50,000	3,600	13.9	1.0
LED Ceiling Mount, LED Surface Mount, LED Solid State Retrofit, LED Inseparable Solid State Luminaire, LED Wall Sconces, LED Wall Sconce Retrofits	SBES	50,000	3,600	13.9	1.0

Measure	Program Component	Average Rated Lifetime (hours)	Annual HOU (hours/year)	Equipment Life	2025 Equivalent EUL
LED Outdoor Fixtures					
Outdoor Full-cut-off Wall-mounted Area Luminaires	BER-IR, BER-AR, SBES	19,500*	4,317	4.5	4.5
Flood and Spot Luminaires	BER-IR, BER-AR, SBES	19,500*	4,317	4.5	4.5
Fuel Pump Canopy Luminaires	BER-AR, SBES	15,000*	4,317	3.5	3.5
LED Replacements for High-Intensity Discharge Lamps	BER-AR, SBES	19,500*	4,317	4.5	4.5
Non-cut-off and Semi-cut-off Wall-mounted Area Luminaires	BER-IR, BER-AR, SBES	19,500*	4,317	4.5	4.5
Pole/Arm-mounted Area Luminaires	BER-AR, SBES	15,000*	4,317	3.5	3.5
Pole/Arm-mounted Decorative Luminaires	BER-AR, SBES	15,000*	4,317	3.5	3.5
Parking Garage Luminaires	BER-AR, SBES	20,000*	4,317	4.6	4.6
Case Lighting for Sign Retrofit Applications	BER-AR, SBES	20,000*	4,209	4.8	4.8
LED Directional and Architectural Fixtures					
Track or Mono-point Directional Luminaires, LED Wall Wash Luminaires	BER-IR, BER-AR, SBES	4,000*	4,209	1.0	1.0
Other LED Lighting					
Refrigerated Case Luminaires	BER-AR, SBES	20,000*	4,209	4.8	4.8
LED Nightlights	SBES	4,000	4,317	1.0	1.0
LED Roadway Lighting	BER-AR	19,500*	7,300	2.7	2.7
Horticultural Lighting	BER-AR	19,500*	6,000	3.3	3.3
Lighting	AMH	50,000*	8,760	5.7	5.7
* For these measures, the average rated lifetime is that of the current baseline fixture instead of that of the LED replacement. See Appendix I for details.					

7.2 Other Measures

The EUL values for non-LED lighting measures were established by conducting a literature review of technical reference manuals (TRMs) and studies from other similar jurisdictions.

Table 362 summarizes the EUL values and their source for Business, non-profit, and institutional (BNI) measures.

Table 362: EUL Values for Non-LED Lighting BNI Measures

Measure	Program Component	EUL Value	Reference
Lighting Controls			
Occupancy Sensors	BER-IR, BER-AR, SBES	10	GDS, 2007 (Table 2 – Commercial & Industrial Measures, value for occupancy sensors in new constructions)
Agriculture			
Agriculture Heat Pads	BER-AR, SBES	10	IESO PMA List, 2019 (Value for single creep heat pads)
Dairy Scroll Compressors	BER-AR, SBES	15	IESO PMA List, 2019 (Value for milk scroll compressors) KEMA, 2009 ³²⁸ (Value for scroll compressors for dairy refrigeration)
Energy Efficient Ventilation and Circulation Fans	BER-AR, SBES	15	GDS, 2007 (Appendix C) KEMA, 2009 (Value for ventilation fans, high efficiency)
Heat Reclaimer Units	BER-AR, SBES	15	Pennsylvania TRM, 2016 KEMA, 2009 (Value for process heat recovery)
High-volume Low-speed Fans	BER-AR, SBES BER-AR, SBES	15	IESO PMA List, 2019 (Value for high-volume low-speed fans) KEMA, 2009 (Value for high-volume low-speed fans) DEER, 2008 (Value for two-speed fans)
Low-energy and Zero-energy Livestock Waterers	BER-AR, SBES	10	KEMA, 2009 (Value for energy efficient livestock waterers) IESO PMA List, 2019 (Value for low-energy livestock waterers)
Milk Pre-coolers	BER-AR, SBES	15	KEMA, 2009 (Value for well water pre-coolers)
Natural and Dual Ventilation	BER-AR, SBES	15	IESO PMA List, 2019 (Value for dual and natural exhaust ventilation systems)
Tractor Engine-block Heater Timers	BER-AR, SBES	5	Minnesota TRM, 2020 (Value for agriculture – engine block heater timers) IESO PMA List, 2019 (Value for engine block heater timers)
VFD for Milk Vacuum Pumps	BER-AR, SBES	15	KEMA, 2009 (Value for VFD on milk vacuum pumps) DEER, 2008 (Value for milking vacuum pump variable speed drives)
VFD for Milk Transfer Pumps	BER-AR, SBES	15	DEER, 2014 (Value for milking transfer pump variable speed drives)
Compressed Air			
Air-entraining Air Nozzles	BER-AR, SBES	15	KEMA, 2009 (Value for compressed air nozzles)
Cycling Air Dryers	BER-AR, SBES	10	KEMA, 2009 (Value for cycling air dryers)
No-loss Drains	BER-AR, SBES	15	ERS, 2005 ³²⁹ (Table 1-2, value for compressed air)
Compressed Air Leak Repairs	Custom	2	KEMA, 2009 ³³⁰ (Value for compressed air - service)
Air Compressor Replacement	Custom	15	ERS, 2005 (Table 1-2, value for compressed air – new construction)

³²⁸ KEMA. Focus on Energy Evaluation Business Programs: Measure Life Study. Prepared for PA Consulting Group Inc., August 2009.

³²⁹ ERS. Measure Life Study. Prepared for the Massachusetts Joint Utilities. November 2005.

³³⁰ KEMA. Focus on Energy Evaluation Business Programs: Measure Life Study. Prepared for PA Consulting Group Inc., August 2009.

Measure	Program Component	EUL Value	Reference
HVAC			
Air-source Heat Pumps Greater Than or Equal to 65,000 Btu/hr	BER-AR, SBES	20	California Public Utilities Commission, 2024 ³³¹ (Value for HVAC heat pump)
Air-source Heat Pumps Less Than 65,000 Btu/hr (Excluding Air-to-water)	BER-AR, SBES	18	GDS, 2007 (Table 1 – Residential Measures, value for AC/heat pump, assuming air-source heat pumps of smaller capacities, mostly mini-split systems, have operating conditions closer to residential)
Air-to-water Heat Pumps	BER-AR, SBES	15	GDS, 2007 (Table 2 – Commercial & Industrial Measures, value for packaged AC/HP) ERS, 2005 (Table 4-7, value for packaged AC/HP)
Dual-enthalpy Economizer Controls	BER-AR, SBES	10	GDS, 2007 (Table 2 – Commercial & Industrial Measures, value for enthalpy economizers) ERS, 2005 (value for enthalpy economizers)
Ground-source Heat Pumps	BER-AR, SBES	25	Life expectancy estimated by the U.S. Department of Energy ³³² (up to 24 years for the inside component and more than 50 years for the ground loop) and by Natural Resources Canada ³³³ (about 20 to 25 years)
HVAC Hotel Occupancy Sensors	BER-AR, SBES	8	DEER, 2014 (Value for occupancy sensors)
Packaged Terminal Heat Pumps (PTHPs)	BER-AR, SBES	15	GDS, 2007 (Table 2 – Commercial & Industrial Measures, value for packaged AC/HP)
Water-source Heat Pumps	BER-AR, SBES	15	GDS, 2007 (Table 2 – Commercial & Industrial Measures, value for packaged AC/HP) ERS, 2005 (Value for WSHP) DEER 2014 (Value for high-efficiency water-source heat pumps)
Electric Thermal Storage	BER-AR, SBES	18	The EUL is expected to be comparable to other heating systems. The EUL therefore corresponds to the value used for stoves, furnaces/boilers, and air-source heat pumps
Advanced RTU Controls	BER-AR	10	Illinois TRM, 2021 (Value for advanced RTU controls)
Smart Thermostats for Electric Heating	BER-AR, BER-IR	8	Wisconsin TRM, 2024 (Value for Smart Thermostats for Business)
Commercial Kitchen Equipment			
Demand-controlled Kitchen Exhausts	BER-AR, SBES	15	Efficiency Maine TRM, 2019 (Value for demand control kitchen ventilation) DEER, 2014 (Value for variable speed drives controlled by CO2 sensors)
Dishwashers	BER-AR, SBES	Under-counter: 10 Door-type: 15 Conveyor: 20	William Goetzler et al., Energy Savings Potential and RD&D Opportunities for Commercial Building Appliances, U.S. Department of Energy, June 2016 Koeller and Company and H.W. Hoffman & Associates, LLC. 2010. "A Report on Potential Best Management Practices – Commercial Dishwashers," Prepared for the California Urban Water Conservation Council (CUWCC) by Koeller and Company and H.W. Hoffman & Associates, LLC. June 2010

³³¹ California Public Utilities Commission, *Commercial HVAC and Water Heating Measure Effective Useful Life Study Draft Report*, May 2, 2024, p. 21.

³³² Retrieved from <https://energy.gov/energysaver/heat-and-cool/heat-pump-systems/geothermal-heat-pumps#306534-tab-1>.

³³³ Retrieved from <https://www.nrcan.gc.ca/energy-efficiency/energy-star-canada/about-energy-star-canada/energy-star-announcements/publications/heating-cooling-heat-pump/ground-source-heat-pumps-earth-energy-systems/6833>.

Measure	Program Component	EUL Value	Reference
Freezers/Refrigerators	BER-AR, SBES	12	DEER 2014 (Value for commercial reach-in refrigerator/freezers) DOE, 2011 Buildings Energy Data Book, Table 5.7.15 (Value for refrigerators)
Fryers	BER-AR, SBES	12	DEER 2014 (Value for fryers)
Griddles	BER-AR, SBES	12	DEER 2014 (Value for griddles)
Hot Food Holding Cabinets	BER-AR, SBES	12	DEER 2014 (Value for commercial insulated holding cabinets)
Ice Machines	BER-AR, SBES	10	DEER 2014 (Value for ice machines) KEMA, 2009 (Value for ice machines)
Ovens	BER-AR, SBES	12	DEER 2014 (Value for combination ovens or convection ovens)
Steam Cookers	BER-AR, SBES	12	DEER 2014 (Value for steam cookers)
Commercial Laundry Equipment			
Commercial Clothes Dryers (NG Conversion)	BER-AR, SBES	12	Vermont TRM, 2018 (Value for clothes dryers) DOE, 2011 Buildings Energy Data Book, Table 5.7.15 (Value for clothes dryers)
Commercial Heat Pump Clothes Dryers	BER-AR, SBES	12	Vermont TRM, 2018 (Value for clothes dryers) DOE, 2011 Buildings Energy Data Book, Table 5.7.15 (Value for clothes dryers)
Commercial Washing Machines	BER-AR, SBES	11	DEER 2011 (Value for high efficiency clothes washers) William Goetzler et al., Energy Savings Potential and RD&D Opportunities for Commercial Building Appliances, U.S. Department of Energy, June 2016 DOE, 2011 Buildings Energy Data Book, Table 5.7.15 (Value for clothes washers)
Motors and VFDs			
Variable Frequency Drives for non-HVAC Applications	BER-AR	15	DEER, 2008 (Value for VSD supply fan motors) ERS, 2005 (Value for VFDs on fans) Navigant. Incremental Cost Study Phase Two Final Report Burlington, MA, 2013
Pumping			
Circulator Pumps	BER-IR, BER-AR	15	KEMA, 2009 (Value for wells and pumps)
Booster Pumps	BER-AR	15	KEMA, 2009 (Value for wells and pumps)
Refrigeration			
Brushless DC Motors	BER-AR, SBES	15	KEMA, 2009 (Value for NEMA motors) ERS, 2005 (Table 4-7, value for motors) DEER, 2008 (Value for premium-efficiency motors)
Cooler Night Covers/Display Case Strip Curtains	BER-AR, SBES	4	DEER, 2014 (Value for strip curtains for walk-ins)
Door Heater Controls	BER-AR, SBES	12	KEMA, 2009 (Value for anti-sweat heater controls) ERS, 2005 (Table 4-7, value for door heater controls)
Efficient Refrigeration Compressors	BER-AR, SBES	15	DEER, 2014 (Value for refrigeration upgrades, variable speed compressors) ERS, 2005 (Table 4-7, value for commercial refrigeration compressors)

Measure	Program Component	EUL Value	Reference
Evaporator Fan Motor Controls	BER-AR, SBES	10	ERS, 2005 (Value for motor controls)
Intelligent Freezer Defrost Controls	BER-AR, SBES	10	ERS, 2005 (Value for motor controls)
Refrigerated Vending Machine Controllers	BER-AR, SBES	5	DEER, 2008, 2014 (Value for vending machine controllers) ERS, 2005 (Table 1-1, value for vending machine controllers)
Refrigeration Economizers	BER-AR, SBES	15	Illinois TRM, 2019 (Value for refrigeration economizers)
Vertical Refrigeration Open-to-closed Cooler Conversion	BER-AR, SBES	12	DEER, 2008 (Value for reach-in refrigerators/freezers)
Zero-energy Doors	BER-AR, SBES	12	DEER 2014 (Value for zero heat reach-in glass doors) KEMA, 2009 (Value for no-energy doors)
Water Heating			
Heat Pump Water Heaters	BER-AR, SBES	10	DEER, 2008, 2014 (Value for heat pump water heaters)
Low-flow Showerheads	SBES	10	DEER, 2014 (Value for low-flow showerheads)
Faucet Aerators		10	DEER, 2014 (Value for faucet aerators)
Thermostatic Shower Valves		10	Efficiency Maine TRM, 2019
Pipe Insulation		13	DEER, 2014 (Value for pipe insulation – electric water heaters)
Hot Water Tank Wraps		7	DEER, 2014 (Value for water heater tank wraps)
Solar			
Solar Water Heaters	BER-AR, SBES	20	ENERGY STAR, Save Money and More with ENERGY STAR Qualified Solar Water Heaters ³³⁴
Solar Space Heating Systems	BER-AR, SBES	20	ENERGY STAR, Save Money and More with ENERGY STAR Qualified Solar Water Heaters
Solar Photovoltaic Panels	Custom Retrofit, BER-AR	30	NREL, 2020. ³³⁵ Nearly 90% of respondents to this study gave an EUL of at least 30 years, making this a conservative estimate)
Pool			
ENERGY STAR Pool Pumps	BER-AR, SBES	10	DEER, 2014 (Value for high-efficiency pool pumps)
IT & Datacentres			
Server-based Power Management Software	BER-AR, SBES	5	DEER 2014 (Value for power management software)
Server Virtualization and Decommissioning	BER-AR, SBES	4	Pennsylvania TRM, 2019 (Value for server virtualization)
ENERGY STAR Uninterruptible Power Supply	BER-AR, SBES	10	California TRM, 2017 (Value for ENERGY STAR uninterrupted power supply)

³³⁴ Retrieved from: https://www.energystar.gov/products/water_heaters/water_heater_solar/benefits_savings.

³³⁵ National Renewable Energy Laboratory. *Benchmarking Utility-Scale PV Operational Expenses and Project Lifetimes*, June 2020, p.3.

Measure	Program Component	EUL Value	Reference
New Construction (NC)			
<i>For NC projects, since the savings calculation is based on a modelling approach, the EUL values are established by end-use categories found in the simulation software. The EUL values are determined by considering the most reasonable and common measures for each end-use category and, in most cases, correspond to the values used for the other BNI program components (referenced above).</i>			
DHW Measures	Custom NC	10	Based on the EUL value of heat pump water heaters and several other DHW measures such as faucet aerators, low-flow showerheads, and thermostatic shower valves
Solar Thermal DHW	Custom NC	20	Based on the EUL value of solar water heaters
Cooling Measures	Custom NC	18	Based on the EUL value of air-source heat pumps less than 65,000 Btu/hr
Heating Measures	Custom NC		
Ventilation Measures	Custom NC	20	Based on the EUL value of heat recovery ventilators
Motor Equipment	Custom NC	15	Based on the EUL value of energy efficient motors
Other	Custom NC	15	Reasonable average EUL values for any measures outside of the defined categories
Refrigeration	Custom NC	15	Based on the EUL value of efficient refrigeration compressors
Renewable Power Generation (Solar)	Custom NC	25	NREL, Useful Life ³³⁶ (Most conservative value for photovoltaics)
Renewable Power Generation (Wind)	Custom NC	20	NREL, Useful Life ³³⁷ (Value for wind)
Building Optimization (BOpt)			
Changes to Control Parameters	Custom BOpt	3	SBW Consulting, 2010 ³³⁸
Equipment Repairs	Custom BOpt	8	SBW Consulting, 2010 ³³⁹
New Equipment Installations	Custom BOpt	12	SBW Consulting, 2010 ³⁴⁰
Energy Management			
Strategic Energy Management	SEM	N/A	Calculated by project based on implemented measures

³³⁶ NREL. *Useful Life*. Retrieved from <https://www.nrel.gov/analysis/tech-footprint.html>.

³³⁷ NREL. *Useful Life*. Retrieved from <https://www.nrel.gov/analysis/tech-footprint.html>.

³³⁸ Roberts J. and Tso B. (SBW Consulting), *Do Savings from Retrocommissioning Last? Results from an Effective Useful Life Study*, ACEEE Summer Study on Energy Efficiency in Buildings, 2010.

³³⁹ Ibid.

³⁴⁰ Ibid.



APPENDIX I

Detailed Calculations of 2025 Equivalent EUL Values for LED Lamps and Fixtures

This appendix presents how the equivalent effective useful life (EUL) of LED lamps and fixtures were established for applicable measures in the BER and SBES program components. An equivalent EUL corresponds to the number of years by which the first-year savings need to be multiplied to obtain the lifetime savings.

Starting in 2025, the Evaluator considers that the baseline consists of LED for general-use, decorative, and reflector lamps as well as downlight fixtures. Therefore, no savings can be claimed for replacements that would have naturally occurred since LED lamps and fixtures would have been installed regardless of program offerings.

That being said, lamps and fixtures replaced through SBES are considered early replacements since the replaced units are confirmed to be non-LED units. In this scenario, the Evaluator considers it acceptable to assume that these old inefficient lamps and fixtures could have been used for another year and to continue accepting savings with an EUL of one year.

For other types of lamps and fixtures installed through SBES and BER, including linear fixtures and lamps, decorative lamps, outdoor and architectural fixtures as well as other lamps, the Evaluator considers that the baseline will shift to LED by June 30, 2026 for lamps and by January 1, 2028 for fixtures.³⁴¹ This means that lamps and fixtures installed under BER and SBES in 2025, whether they are early replacements or end-of-life replacements, would have been replaced with LED at the end of the next lifecycle. For example, if a linear T8 lamp were to be replaced today with a fluorescent equivalent (current baseline), this lamp would last on average 20,000 hours (rated equipment life) and would burn out in 4.8 years, requiring a replacement in 2029. By that time, the market will have been fully transformed and only LED will be available, meaning that no additional savings can be achieved. Therefore, for 2025, the Evaluator elected to use the baseline equipment average rated lifetime for the EUL calculation to account for the upcoming shift in baseline. This approach will need to be updated as the new baselines come into effect (2026 for lamps and 2028 for fixtures).

³⁴¹ See E1's Efficient Product Rebates Program 2025 DSM Evaluation report, Section 6 – BER Market Evolution.



Rationale for Using an Equivalent EUL

The LED market is evolving rapidly, driven in part by government regulations. LED products installed today are likely to become the baseline before the end of their rated lifetime since LED technologies are developing quickly and prices are falling. Some jurisdictions have already applied a reduced equivalent EUL to their lighting savings by adopting a higher baseline to represent savings in future years. In other words, their baseline increases over the lifetime of the product, which in turn reduces the equivalent EUL applied to first-year savings to obtain lifetime energy savings. The baseline is informed by government regulations as well as LED market information.

In terms of government regulations, as of April 2022, the U.S. Department of Energy restored the extended definition of general service lamps, including decorative and reflector lamps, thereby subjecting those products to the 45 lm/W backstop efficiency standard under the Energy Independence and Security Act (EISA 2007), with full retail enforcement beginning in July 2023.³⁴² In Canada, Natural Resources Canada published Amendment 18 to the Energy Efficiency Regulations in April 2025, which updated efficiency and testing requirements for general service lamps and formally incorporated technical standard documents applicable to those products, effectively aligning Canada's minimum general service lamps efficacy with the U.S. 45 lm/W backstop.³⁴³

While the latest U.S. regulation is set to establish a minimum efficiency level corresponding to a high-efficiency CFL, recent studies³⁴⁴ indicate that the U.S. market is rapidly moving away from CFL lamps toward LED lamps. The recent lighting market study conducted by Econoler for E1³⁴¹ demonstrates similar trends in Nova Scotia. Steady shipment volumes, high LED shipment shares, elevated free-ridership levels, retailers' impressions on market saturation, and the greater availability of LED technologies compared to non-LEDs are all factors leading the Evaluator to believe that the markets for both LED A-type as well as LED non-A-type lamps are close to maturity. With the Canadian general service lamp minimum energy performance now updated, it is expected that it will result in a ban on halogen incandescent lamps once it is applied. Therefore, the Evaluator now considers LED technology as the standard. For other types of lamps and fixtures installed through SBES and BER-AR, the Evaluator considers that the baseline will shift to LED by June 30, 2026 for lamps and by January 1, 2028 for fixtures.

For direct-install programs, from an impact perspective, if a non-LED bulb is replaced, E1 would be able to claim one year of savings. Indeed, if through these programs a functional non-LED bulb is replaced, savings are achieved and persist until that bulb would have burned out – the standard assumption is that savings are achieved for one year. After that one-year period, the bulb would have to be replaced with bulbs available in store, which are assumed to be LED starting in 2025.

³⁴² U.S. Department of Energy, *Energy Conservation Standards for General Service Lamps (EISA 2007 Backstop, 45 lm/W) — Enforcement Timelines*, *National Law Review summary*, May 2, 2022 (retail enforcement July 2023).

³⁴³ Natural Resources Canada, *Regulations Amending the Energy Efficiency Regulations*, 2016 (Amendment 18), Canada Gazette, Part II, April 9, 2025.

³⁴⁴ Illinois Commerce Commission, *Illinois Statewide Technical Reference Manual for Energy Efficiency Version 8.0, Volume 3*, October 17, 2019, p. 258.

APPENDIX II

Verification of Climate Validity for Interactive Effects Calculations

The climate data of Nova Scotia and Quebec for the duration of the heating and cooling seasons were analyzed as part of the 2015 evaluation and found to be comparable, and thus the 1992 ADS study results are applicable for EfficiencyOne (E1) lighting measures. This appendix presents the analysis conducted in 2015.

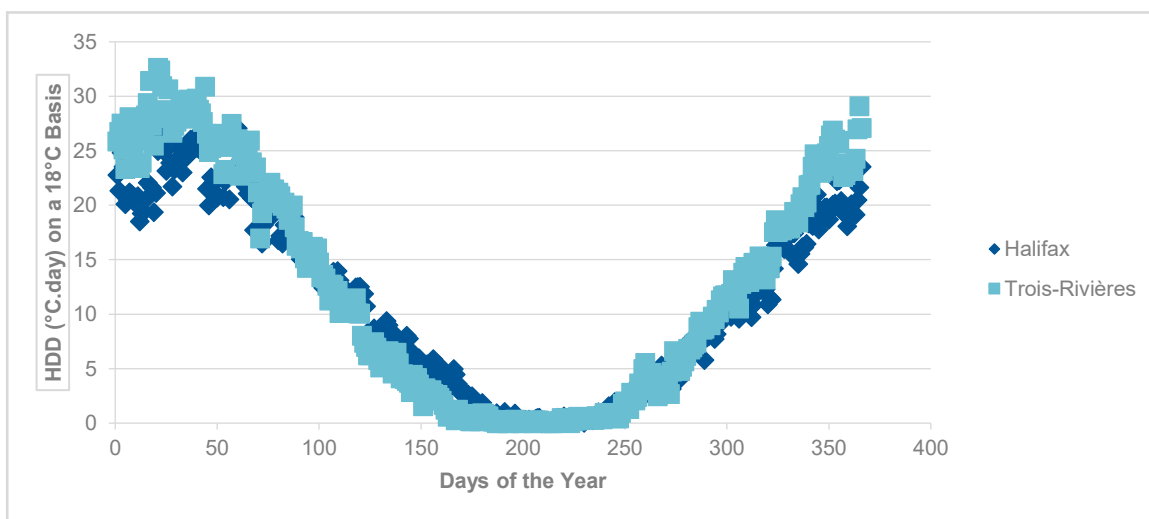
Verification of Climate Data Validity

Considering that the 1992 ADS study remains the only well-documented study for cold climates, it is still used to establish interactive effects. To ensure that the findings of the ADS study are valid and applicable to Nova Scotia, Nova Scotia's climate characteristics were compared with those of Quebec to determine whether it is appropriate to use the weather data used in the ADS study in the impact evaluation of Nova Scotia's programs.

This analysis was conducted based on the assumption that internal gains (from lighting, DHW or any other appliances) reduce the heating load as long as the outdoor temperature is below the balance temperature of the building (and the opposite during the cooling season). This would mean that the most significant variable involved in calculating the interactive effect factors is the duration of the heating and cooling seasons, rather than the total heating and cooling degree days in a given climate.

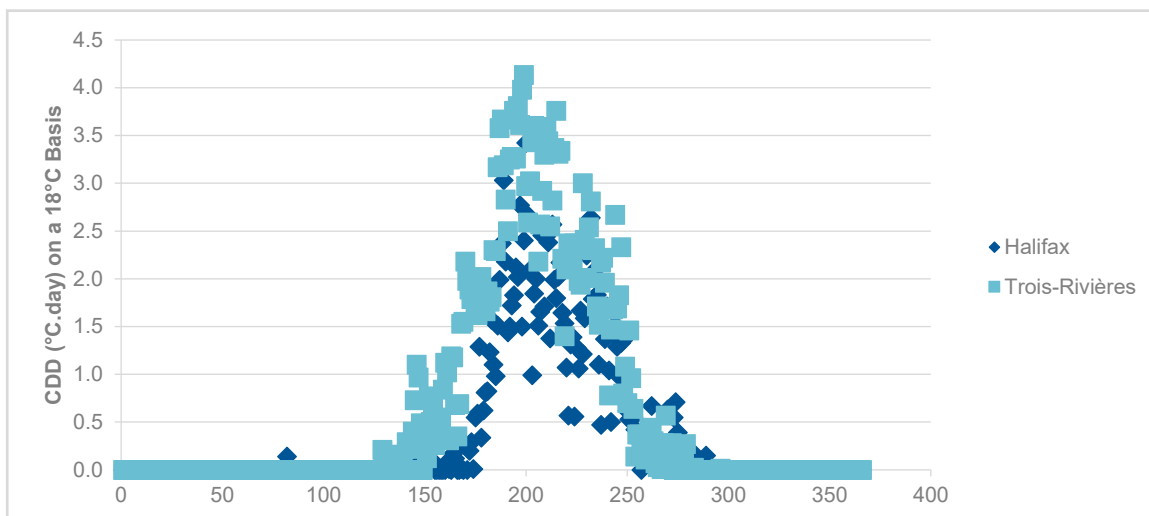
The following two figures show the average heating degree days (HDD) and cooling degree days (CDD) per day over a full year in Trois-Rivières³⁴⁵ and Halifax, respectively.

Figure 1: HDD per Day for Trois-Rivières and Halifax



³⁴⁵ Since this city is located about halfway between Montreal and Quebec City, it is representative of the climate used in the ADS study.

Figure 2: CDD per Day for Trois-Rivières and Halifax



In the case of HDD, Figure 1 shows that Trois-Rivières' heating season ends about 15 days earlier than Halifax (based on the assumption that heating is turned on when there are around 5 HDD per day). Indeed, the heating season ends around May 20 in Trois-Rivières and around June 4 in Halifax. In both cities, the heating season starts around the 270th day of the year, which roughly falls on September 28. As for the cooling season, Figure 2 indicates that it starts around the 160th day and the 180th day in Trois-Rivières and Halifax, respectively, and ends around the 250th day in both cities.

In conclusion, the heating season is about 6% shorter in Trois-Rivières than in Halifax, while the former cooling season is about 22% longer than the latter. This means that the interactive effect factors based on the ADS study slightly underestimate the negative interactive effects occurring during the heating season in Nova Scotia; however, the Evaluator considers this 6% difference not significant. The overestimation of the cooling season also results in a positive impact on the interactive effects; nevertheless, because of the very small impact of cooling on the interactive effects (3.6% according to the ADS study), the overestimation is considered negligible. Therefore, the Evaluator concludes that the findings of the ADS study are still applicable to Nova Scotia.



APPENDIX III

Detailed Calculations of 2025 Equivalent EUL Values for LED Lamps and Fixtures

This appendix presents how the equivalent effective useful life (EUL) of LED lamps and fixtures were calculated for applicable measures in the EPI and Instant Savings program components. An equivalent EUL corresponds to the number of years by which the first-year savings need to be multiplied to obtain the lifetime savings.

Starting in 2025, the Evaluator considers that the baseline consists of LED for general-use, decorative, and reflector lamps as well as for downlight fixtures. Therefore, no savings can be claimed for replacements that would have naturally occurred since LED lamps and fixtures would have been installed regardless of E1 program offerings or influence.

That being said, lamps and fixtures replaced through EPI are considered early replacements since the replacements are confirmed to be non-LED units. In that scenario, the Evaluator considers it acceptable to assume that these old inefficient lamps and fixtures could have been used for one more year and to continue accepting savings with an EUL of one year.

Rationale for Using an Equivalent EUL

The LED market is evolving rapidly, driven in part by government regulations. LED products installed today are likely to become the baseline before the end of their rated lifetime since LED technologies are developing quickly and prices are falling. Some jurisdictions have already applied a reduced equivalent EUL to their lighting savings by adopting a higher baseline to represent savings in future years. In other words, their baseline increases over the lifetime of the product, which in turns reduces the equivalent EUL applied to first-year savings to obtain lifetime energy savings. The baseline is informed by government regulations as well as LED market information.

In terms of government regulations, as of April 2022, the U.S. Department of Energy restored the extended definition of general service lamps, including decorative and reflector lamps, thereby subjecting those products to the 45 lm/W backstop efficiency standard under the Energy Independence and Security Act (EISA 2007), with full retail enforcement beginning in July 2023.³⁴⁶ In Canada, Natural Resources Canada published Amendment 18 to the Energy Efficiency Regulations in April 2025, which updated efficiency and testing requirements for general service lamps and formally incorporated technical standard documents applicable to those products, effectively aligning Canada's minimum general service lamps efficacy with the U.S. 45 lm/W backstop.³⁴⁷

³⁴⁶ U.S. Department of Energy, *Energy Conservation Standards for General Service Lamps (EISA 2007 Backstop, 45 lm/W) — Enforcement Timelines*, *National Law Review summary*, May 2, 2022 (retail enforcement July 2023).

³⁴⁷ Natural Resources Canada, *Regulations Amending the Energy Efficiency Regulations*, 2016 (Amendment 18), Canada Gazette, Part II, April 9, 2025.

While the latest regulations established a minimum efficiency level corresponding to a high-efficiency CFL, recent studies³⁴⁸ indicate that the U.S. market is rapidly moving away from CFL lamps toward LED lamps. The recent lighting market study conducted by Econoler for E1 demonstrates similar trends in Nova Scotia.³⁴⁹ Steady shipment volumes, high LED shipment shares, elevated free-ridership levels, retailers' impressions on market saturation, and the greater availability of LED technologies compared to non-LEDs are all factors leading the Evaluator to believe that the markets for both LED A-type as well as LED non-A-type lamps are close to maturity. With the Canadian general service lamp minimum energy performance now updated, it is expected that it will result in a ban on halogen incandescent lamps once it is applied. Therefore, the Evaluator now considers LED technology as the standard.

For direct-install programs such as EPI, from an impact perspective, if a non-LED bulb is replaced, E1 would be able to claim one year of savings. Indeed, if through these programs a functional non-LED bulb is replaced, savings are achieved and persist until that bulb would have burned out – the standard assumption is that savings are achieved for one year. After that one-year period, the bulb would have to be replaced with bulbs available in store, which are assumed to be LED starting in 2025.

For solar fixtures, a measure life of 10 years was assumed based on the EUL values for motion sensors. For Instant Savings, only savings due to reduced hours of use because of motion sensors are claimed. Thus, an EUL of 10 is used. For EPI, while solar lamps initially remove the full wattage of the baseline lamps from the grid, the baseline wattage is assumed to become LED lamps starting in 2025. Therefore, the wattage of outdoor fixtures with motion sensors was assumed starting in 2025 until the end of the measure life. An equivalent EUL was obtained using the equation and the value presented in Table 1 below, which corresponds to 2.5 years.

$$\text{Equivalent EUL} = (\Delta W_{\text{Initial}} \times 1 \text{ Year} + \Delta W_{\text{LED}} \times 9 \text{ Years}) / \Delta W_{\text{Initial}}$$

Table 1: Equivalent EUL Calculation for Solar Fixtures

Average Replaced Lamp (W)	Average Wattage of Efficient Lamp (W)	Halogen Incandescent Baseline – Replaced Fixture Baseline 1 Year		LED Equivalent Baseline 9 Years	
		Baseline Wattage	Displaced Wattage	Baseline Wattage	Displaced Wattage
92.6	0 (not connected to grid)	92.6	92.6	15.0	15.0

³⁴⁸ Illinois Commerce Commission, *Illinois Statewide Technical Reference Manual for Energy Efficiency Version 8.0, Volume 3*, October 17, 2019, p. 258.

³⁴⁹ See EfficiencyOne's "Efficient Product Rebates Program 2025 DSM Evaluation", Section 6 – BER Market Evolution



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