EfficiencyOne

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

- and -

IN THE MATTER OF An Application pursuant to Subsection 79J(3) of the *Public Utilities Act* for Approval of the 2016-2018 Supply Agreement for Electricity Efficiency and Conservation Activities.

Incentive Setting Methodology: CLEAResult Report & EfficiencyOne Implementation Plan

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1. INTRODUCTION

The purpose of this Implementation Plan (the "Plan") is to provide EfficiencyOne's response to the three main recommendations contained within CLEAResult's Incentive Setting Methodology Report (the "Report", attached as Appendix A) and to provide EfficiencyOne's proposed integration of the Report's recommendations into its business practises.[1] As the implementation process will guide and inform detailed changes to business practises, this Plan focuses on high level requirements for implementation.

The following pages provide:

i) a brief background of the genesis of the Report and the stakeholder consultation process followed throughout the project's scoping, procurement and review stages;
ii) a summary of the Report's three main recommendations;
iii) EfficiencyOne's Implementation Plan; and
iv) EfficiencyOne's commitment to provide ongoing updates on its implementation of the Report's recommendations.

EfficiencyOne concludes that this Report provides the tools and methodology to complement and enhance the process for setting incentives, and asks the Nova Scotia Utility and Review Board ("UARB" or "Board") to accept the Report and EfficiencyOne's Implementation Plan.

1.1 Background

During the 2016-2018 DSM Resource Plan regulatory process, Intervenor discussion emerged on the appropriateness of EfficiencyOne's incentive levels for Efficiency Nova Scotia electricity efficiency programs. As a consequence, the Board's Order stated:

[1] The Report presents several ancillary and program-specific recommendations. EfficiencyOne is in the process of considering these recommendations through discussions with program management, the Executive Leadership Team, and other internal stakeholders.

> The Board directs E1 to undertake research and make recommendations on a more rigorous program for determining incentives, which is to be filed by June 30, 2016, provided that any revisions can be implemented shortly thereafter and any long-term contracts with embedded incentives preserve the right to vary such incentives.[2]

In accordance with the Board's Order, EfficiencyOne developed a Scope of Work for the project in November, 2015. This Scope of Work was shared with the DSM Advisory Group (DSMAG) for comments and revised to reflect the Group's feedback. A request for proposals (RFP) procurement process was initiated in late November 2015. Final RFP submissions were received on December 18, 2015, and CLEAResult was selected as the successful proponent on January 8th, 2016.

CLEAResult's approach was consistent with EfficiencyOne's Scope of Work, and included the following major activities:

1. A jurisdictional review of incentive setting methodologies across North American jurisdictions, including staff interviews.
2. A characterisation of Nova Scotia's electricity market, and the regulatory environment in which DSM operates in Nova Scotia.
3. Interviews with EfficiencyOne employees to better understand EfficiencyOne's current incentive setting practices.
4. Application of CLEAResult's findings, in a detailed quantitative manner, to two Efficiency Nova Scotia programs: Custom Retrofit and Instant Savings.

[2] M06733, NSUARB Order, *The Public Utilities Act and An Application for Approval of a Supply Agreement for electricity efficiency and conservation activities between EfficiencyOne and Nova Scotia Power Incorporated, the establishment of a final agreement between the parties, and approval of a 2016-2018 Demand Side Management Resource Plan* (7 Oct 2015), at p 2, item 9.

EfficiencyOne shared a preliminary draft report with the DSMAG on April 11, 2016. This draft report provided CLEAResult's detailed research methodology, but did not provide recommendations for EfficiencyOne. Very limited DSMAG feedback was obtained during this comment period and stakeholders indicated they required a more detailed report to provide comments.

A complete draft report was shared with the DSMAG, on April 29, 2016. EfficiencyOne received feedback from three DSMAG members as part of the final draft report review.[3] Most of the feedback was of a technical nature and resulted in improvements to the Report.

A final report was shared with DSMAG members on June 10, 2016, seeking comments by June 15th, 2016. Consideration of these comments resulted in additional changes to the Report.[4]

[3] Feedback was provided from the Affordable Energy Coalition, the Small Business Advocate, and Nova Scotia Power Inc.

[4] Comments were received from the Affordable Energy Coalition and Nova Scotia Power Inc. by June 16th, 2016. The Small Business Advocate provided comments on June 22nd, 2016.

2. SUMMARY OF CLEARESULT'S RECOMMENDATIONS

CLEAResult's findings indicate that EfficiencyOne's incentive setting methodology is well aligned with other surveyed jurisdictions, and follows recommended principles of incentive design.[5] CLEAResult has proposed three main areas of improvement for EfficiencyOne as presented in their general recommendations.

CLEAResult's general recommendations are:[6]

1. **It is recommended that EfficiencyOne consider all of the general principles for incorporation into an incentive setting process.**

   CLEAResult has provided a documented, incentive setting process (that incorporates these general principles) that can be leveraged by EfficiencyOne, along with the required template documents and tools.

2. **In addition, through recommending the general principles be followed in any incentive setting methodology that EfficiencyOne implements, there are several supporting requirements:**

   a) ***Ensure assumptions for residential and commercial LEDs, residential HVAC technology, commercial fluorescent technology and commercial Variable Frequency Drive (VFD) technology are kept up to date by conducting customer and technology research.***

   b) ***Further support technology research by implementing a TRM approach. The energy savings and cost effectiveness metrics of the measures provide several reference points for setting incentive levels.***

[5] CLEAResult, *EfficiencyOne: Incentive Setting Methodology* (June 30, 2016) [unpublished], at page 7
[6] *Ibid*, at page 39.

c) Develop a consolidated calculator that can conduct the analysis that supports the incentive-level setting process. The calculator should have the following functionality:

i. Capture and store measure-level information obtained from the recommended research activities and TRM process
ii. Perform short-term program design or incentive-level cost effectiveness screening
iii. Integrate the review protocol that has been provided in the Excel-based tool.

3. Through adopting an incentive setting methodology that follows the general principles, conduct a program financial simulation of all of the current incentives in the programs to evaluate their current levels.[7]

[7] *Ibid.*

3. EFFICIENCYONE'S IMPLEMENTATION PLAN

EfficiencyOne agrees with CLEAResult's three recommendations.

The five general principles CLEAResult suggests for incentive setting are:

1. Customer motivations and barriers for participation;
2. Technology savings, price and market penetration;
3. Supply chain and service provider considerations;
4. Financial impacts; and
5. Jurisdictional benchmarking (for new incentives).[8]

These principles have factored into previous business and research activities within EfficiencyOne when designing and updating incentives.

EfficiencyOne acknowledges and supports the need for timely implementation of the Report's recommendations. EfficiencyOne intends to implement the majority of recommendations by ~~December 31st~~March 31st, 2017~~6~~, and the remaining by ~~June~~ September 30th, 2017.

EfficiencyOne plans to complete the following actions within 2016 and the first quarter of 2017:

- Development of an incentive setting manual;
- Completion of LED A-Lamp market penetration research for Residential customers;
- Completion of a two-year research plan for market and technology research; and
- The development of a consolidated calculator for incentive setting.

All other indicated actions are planned to be completed prior to September~~June 30~~30th, 2017.

[8] *Ibid*, at page 40.

3.1 Recommendation 1

EfficiencyOne agrees with having a well-defined and transparent process for setting and defining incentive levels. Using the process flowcharts, review templates and other materials CLEAResult provided in the Report, EfficiencyOne will codify the Report's recommended practices into an Incentive Setting Manual. This manual will form the basis of mandatory practises for the development and revision of incentives.

The incentive setting manual will provide the following key features:

- Definition of roles and responsibilities with respect to incentive design and revision;
- Definition of requisite approval levels for making incentive changes for various types of measures;
- Practices and processes to be followed when designing or revising incentives;
- Required documentation with respect to incentive revision;
- Storage of incentive documentation;
- Internal controls and monitoring of practise and process compliance; and
- Roles and responsibilities with respect to the administration and updating of the incentive manual and associated practises.

EfficiencyOne will complete the incentive setting manual by ~~December~~ March 31st, 2017~~6~~. Associated staff training and implementation of all practices and process will occur prior to ~~June~~ September 30th, 2017.

EfficiencyOne suggests that the Evaluation and Verification process is the appropriate vehicle to ensure external oversight of EfficiencyOne's compliance with the practices and processes developed as part of this aspect of implementation.

3.2 Recommendation 2

3.2.1 Recommendation 2 a)

EfficiencyOne is supportive of maintaining up-to-date customer and technology research for its energy efficiency measures, especially those with high levels of annual expenditure.

EfficiencyOne is cognisant of the financial and resource challenges that the recommended frequency of customer and technology research could bring to the organization. Prior to September 31st, 2016, EfficiencyOne will endeavour to quantify the budget and resource impacts of such research frequencies and scope. EfficiencyOne will report on the results of these preliminary scoping activities in its Q3 Report, accompanied by a recommendation on the appropriate levels of research.

EfficiencyOne is committed to increasing the frequency of customer research with respect to perceived value, as well the current and forecast state of energy efficient technologies within the province. In addition, EfficiencyOne is committed to discussing and investigating appropriate methodologies for conducting customer research with subject matter experts in both the demand side management and customer research fields. These discussions will inform customer research techniques as EfficiencyOne moves forward with implementation.

Due to previous budget commitments it is not feasible to complete a large amount of the recommended customer and technology research in 2016. EfficiencyOne commits to perform market penetration research for LED A-lamps for Residential customers in 2016. Aspects of this research will be performed by EfficiencyOne's Evaluator as well as market research firms.

EfficiencyOne commits to developing a market research plan for 2017-2018 within the ~~2016 calendar year~~first quarter of 2017 to address CLEAResult's recommendations.

EfficiencyOne is currently determining the best approach for conducting technology and market penetration research. Potential options include:

- Frequent research conducted by market research agencies; or
- More frequent baseline studies (i.e. biannual studies) similar to those conducted within the development of DSM Potential Studies.

3.2.2 Recommendation 2 b)

EfficiencyOne agrees that a TRM is a valuable tool for a program administrator when deploying energy efficiency measures and programs.

EfficiencyOne is currently developing an electronic TRM for use in its new central data tracking and customer relationship management system. This electronic TRM is expected to be completed prior to ~~June~~ September 30th, 2017. ~~EfficiencyOne is also working to develop a print version of a TRM, which is better suited for regulatory and external uses. EfficiencyOne plans to file the completed print TRM, taking into account CLEAResult's recommended inclusions, prior to June 30th, 2017.~~[9]

3.2.3 Recommendation 2 c)

EfficiencyOne acknowledges the utility of a consolidated calculator for incentive design purposes.[10]

[9] EfficiencyOne is currently focusing its efforts toward the development of an electronic TRM. This format provides the functionality of a print TRM with the added ability to integrate with EfficiencyOne's operational data tracking systems.

[10] The Custom Incentives Program already uses elements of such a tool on a project-by-project basis.

EfficiencyOne will develop a consolidated calculator, per CLEAResult's recommendation. EfficiencyOne will leverage an existing program-specific cost-effectiveness calculator currently in use by the Custom Incentives program to expedite the development process. EfficiencyOne will develop this calculator prior to ~~the end of the 2016 calendar year~~March 31st, 2017.

3.3 Recommendation 3

EfficiencyOne agrees that conducting a financial simulation on existing incentive levels, using CLEAResult's six financial simulation metrics, is a valuable exercise. This exercise will be useful in determining potential revisions to current incentive levels, based on the results of the simulation. In addition, this process will be useful as a formalized starting point against which future incentive levels can be evaluated (so long as data is still reliable and valid).

Conducting a full financial simulation, per CLEAResult's recommendation, requires up-to-date customer and technology research for each technology within the portfolio. Consistent with Section 3.2.1, data quality and availability for all technologies in EfficiencyOne's portfolio is expected to improve as a two-year research plan is implemented through 2017 and 2018.

In spite of the potential improvements possible (i.e. enhanced customer and technology research intelligence) when conducting a financial simulation, EfficiencyOne does commit to conducting an initial financial simulation prior to June~~March 31st~~30th, 2017.

4. ONGOING REPORTING ON IMPLEMENTATION PROGRESS

EfficiencyOne is committed to keeping the Board and stakeholders informed of ongoing progress on the implementation of CLEAResult's recommendations. To this end, EfficiencyOne proposes the following reporting mechanisms:

- Quarterly Reports: EfficiencyOne will include an update on its progress implementing CLEAResult's recommendations in its quarterly reports, beginning with its 2016 Q3 Report and continuing until such time as implementation has been completed.
- Annual Progress Report: EfficiencyOne will include an update within its 2017 Annual Progress Report.
- Evaluation and Verification: EfficiencyOne will arrange for an external review of its progress implementing the Report's recommendations via its 2017~~6~~ Evaluation and Verification process.

5. CONCLUSION

EfficiencyOne is satisfied with the recommendations and conclusions presented by CLEAResult. The work of further optimizing EfficiencyOne's incentives is a work in progress, and to a degree will always remain so, due to the continuous improvement aspects of incentive design and revision. EfficiencyOne believes this Report provides the tools and methodology to enhance EfficiencyOne's incentive setting practices.

EfficiencyOne requests that the Board accept the recommendations and conclusions of the Report, EfficiencyOne's Implementation Plan and the ongoing reporting mechanisms proposed.

APPENDIX A: CLEARESULT REPORT

CLEAResult

EfficiencyOne: Incentive Setting Methodology

~~June 30, 2016~~
March 31, 2017

PREPARED BY CLEAResult

PREPARED FOR EfficiencyOne

Disclaimer & Limitations

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Executive Summary

As a result of the regulatory process for the 2016-2018 Demand Side Management (DSM) Resource Plan, EfficiencyOne was asked to review its current incentive level setting methodology. The Nova Scotia Utility and Review Board (UARB) recognized that optimizing incentive structures and levels is difficult, but direction was provided to explore an approach that would assess whether incentive levels are being set at an appropriate minimum level while still resulting in program participation. The UARB requested that a quantitative analysis be considered in the methodology.

In response to the direction provided by the UARB, EfficiencyOne retained CLEAResult to investigate ratepayer-funded energy efficiency program incentive-setting methodologies from other jurisdictions, identify best practices and assess the implications of applying them to Efficiency Nova Scotia's portfolio of programs. The objective was to develop a comprehensive incentive-setting methodology approach.

Incentive setting is not an exact science. It has evolved through experience, and is often part of a broader program design framework. This report aims to distill the key components of incentive setting for EfficiencyOne's use.

The methodology provides incentive setting considerations for all of the programs in Efficiency Nova Scotia's (ENS) portfolio, as well as specific considerations for four specific energy efficiency programs. In developing the recommendations, CLEAResult considered Nova Scotia's market characteristics, the maturity of the programs in its portfolio, and other program design characteristics. The recommendations also included an incentive update protocol (as supported by flow charts, a documentation template and an Excel-based tool) that prescribes both frequency and methodology of updates. The scope of the project focused on financial incentives, though the other types of incentives were discussed.

The jurisdictional research involved primary and secondary research. The required background was developed by examining publically available reference material, ~~while insight was gained~~as well as directly from program design, program evaluation or program management staff for each of the different jurisdictions to gain specific insight on the incentive setting process.

From reviewing the portfolio performance across the multiple jurisdictions studied, as well as comparing ENS's performance against Nova Scotia's Achievable Potential study[1], it is apparent that the ENS portfolio is performing at a level comparable to, or better than the other jurisdictions studied. The unit costs of conservation, along with the portfolio targets align favorably with the other jurisdictions.

One of the initial and most evident findings of the jurisdictional research is that there is minimal formalized and/or publically documented information on incentive design. Although many of the jurisdictions studied have applied best practices and documented approaches for program design, developed Technical Reference Manuals (TRMs) and performed market research, no consolidated document for incentive setting alone was found. However, through the interviews and research conducted, and by leveraging CLEAResult's experience across more than 900 active programs across North America, major themes and principles could be identified that were employed by all jurisdictions in their incentive level setting processes.

These principles include:

1. Assess and account for customer motivations and barriers to participation;
2. Determine technology savings, ~~price~~costs and market penetration;
3. Assess and account for supply chain and service provider considerations;
4. Determine financial impacts; and
5. Undertake jurisdictional benchmarking (for new incentives).

Against these general principles, EfficiencyOne's current incentive setting approach was reviewed and Nova Scotia's specific market characteristics were taken into consideration. The analysis covered both the general portfolio and four specific programs:

1. Instant Savings
2. Custom
3. Business Energy Rebates
4. Home Energy Assessment

[1] Nova Scotia 2015-2040 Demand Side Management (DSM) Potential Study – Navigant Consulting

It is important to note that our research indicates that EfficiencyOne conducts incentive setting according to these principles at a high-level. Supported by technology and market research and designed around financial parameters, EfficiencyOne's approach is well aligned to other comparable jurisdictions. Activities performed to-date, such as the recent price sensitivity research in the Instant Savings Program and features such as the flexibility to negotiate incentives individually with customers for the Custom Program, support these principles, but there is room for improvement. Our recommendations provided later in this document focus on continuing the current activities, but improving specific areas. In an effort to further refine and develop the incentive setting methodology, CLEAResult identified the following areas for improvement:

1. Lack of a formal and documented incentive-setting process across all measures and programs;
2. The application of older market penetration analysis for important and rapidly changing measures;
3. Lack of a TRM or similar documents for all measure assumptions to be consolidated; and
4. Absence of readily available tools to perform short-term cost effectiveness calculations.

CLEAResult is providing the following recommendations for the identified areas of improvement:

1. Formally establish, document and use a consistent incentive setting process that incorporates the identified general principles.

   Like most other jurisdictions, EfficiencyOne has not yet established a well-documented incentive level development process. EfficiencyOne would benefit as a peer leader by having a documented framework to ensure consistency in delivery and continuous refinement of the incentive setting process.

2. Conduct ongoing customer and technology research for identified technologies including residential and commercial LEDs, residential HVAC technology, commercial fluorescent technology and commercial Variable Frequency Drive (VFD) technology.
   - There are varying levels of rigour and different approaches to conducting this research depending on the jurisdiction reviewed. EfficiencyOne should conduct an assessment of their current research and identify if the required documentation requirements in the incentive level development process justify additional rigor. In some cases, existing research activities and data sources can be leveraged.

3. Ensure that the process used for determining energy savings and other measure assumptions provides the required information for incentive setting.
   - The energy savings and cost effectiveness metrics of the measures provide several reference points for setting the incentive level. EfficiencyOne should follow a TRM approach to support technology research, which will assist in gathering this information.

4. Develop a consolidated calculator/tool for short-term incentive setting and program design exercises, with the following functionality:
   - Capture and store measure-level information obtained from the recommended research activities and TRM process
   - Perform short-term program design or incentive-level cost effectiveness screening
   - Integrate the review protocol that has been provided in the Excel-based tool.

The consolidated calculator will allow EfficiencyOne to better conduct the analysis that supports incentive setting.

To support recommendation (1), CLEAResult developed an incentive setting process that uses these general principles that EfficiencyOne can use for incentive setting exercises. To complement the developed process, CLEAResult also created a documentation template that will ensure that the required analysis and documentation is considered for updating current incentive levels and for new incentives.

CLEAResult also developed an Excel-based tool that EfficiencyOne can use to identify specific incentive level setting considerations for different customer, program, technology and financial impact combinations. The model provides frequency recommendations for the incentive review process.

Finally, CLEAResult conducted a financial simulation for two programs:

1. Instant Savings
2. Custom

The purpose of this simulation was to evaluate EfficiencyOne's current incentive levels. To support this exercise, a financial analysis was conducted to evaluate the current incentive levels versus the three incentive level thresholds:

1. Cost to Customer
2. Program Budget
3. Cost Effectiveness

For Instant Savings, most of the incentive levels were within an appropriate range, but EfficiencyOne may wish to further investigate the current incentives for the heavy-duty timer and outdoor clotheslines in the Instant Savings program. The heavy-duty timer incentive level should be reviewed because the ~~cost~~Cost to ~~the customer~~Customer analysis has reached the suggested boundary. For outdoor clotheslines, the market penetration analysis indicates that the product may be standard practice in Nova Scotia homes.

For the Custom Program, EfficiencyOne should give careful consideration to project incentives for projects with energy savings persistence of less than seventeen years. This is to ensure projects stay within their ~~cost-effectiveness~~Cost Effectiveness incentive threshold. The incentive needs to be justified by the value of the lifetime energy savings.

It is recommended that the financial simulation be conducted for all of EfficiencyOne's programs.

Overall, it is recommended that EfficiencyOne continue to conduct the required supporting research and develop the supporting tools and processes that provide a platform for the incentive setting process. It is also recommended that EfficiencyOne leverage the proposed incentive setting process and the documentation template, or a variation thereof that encompasses all of the recommended content and functionality. Ideally, all of the required analysis and related activities would be consolidated into one exercise that is followed consistently and at the required intervals.

If EfficiencyOne pursues these recommendations, the implemented incentive setting process will be a market leader in North America.

Project Scope and Background

The UARB directed EfficiencyOne to present these recommendations as a result of the regulatory process for the proposed 2016-2018 Demand Side Management (DSM) Resource Plan. In its August 12, 2015 Decision, the UARB directed a budget of $102.15 million for the 2016-2018 DSM Plan period[2]. This direction occurred after the proposed budget adjustment in the Quantum Agreement. The initial energy and demand savings targets remained unchanged.

	Budget ($)	Energy Savings Target (GWh)	Demand Savings Target (MW)
Initial Filing	$121.5 million	405.9	62.5
Quantum Agreement	$113.5 million	405.9	62.5
Final Order	**$102.15 million**	**405.9**	**62.5**

Table 1: EfficiencyOne Targets and Budgets

Between the Quantum Agreement and the Decision, there was a regulatory hearing to address a number of issues that the UARB had identified in its Final Issues List.[3]

During the hearing, EfficiencyOne argued that, "incentive levels are determined by various factors including comparison to other jurisdictions, market knowledge gained through historical program operation, market research and consumer pricing information."[4]

The UARB provided the following direction to EfficiencyOne regarding incentive setting, which was the catalyst for this research:

> "E1 is directed to undertake research and make recommendations on a more rigorous program for determining incentives…The Board recognizes that optimizing incentives is difficult; however a guiding principle should be that incentives are designed at the minimum levels required to induce participation and employ some quantitative analysis."[5]

Accordingly, EfficiencyOne secured the services of CLEAResult to undertake a study to identify incentive setting best practices and recommend changes to EfficiencyOne's incentive setting process.

[2] Decision 2015 NSUARB 204 M06733, Nova Scotia Utility and Review Board, August 12, 2015, Available: https://nsuarb.novascotia.ca/sites/default/files/M06733%20Board%20Decision.pdf

[3] M06733, In the Matter of An Application by EfficiencyOne for Approval of a Supply Agreement for Electricity Efficiency and Conservation Activities between EfficiencyOne ("E1") and Nova Scotia Power Inc.("NSPI"), the establishment of a final agreement between the parties, and approval of a 2016-2018 Demand Side Management ("DSM") Resource Plan, Final Issues List (16 April 2016).

[4] Decision 2015 NSUARB 204 M06733, Nova Scotia Utility and Review Board, August 12, 2015, Available: https://nsuarb.novascotia.ca/sites/default/files/M06733%20Board%20Decision.pdf

[5] Decision 2015 NSUARB 204 M06733, Nova Scotia Utility and Review Board, August 12, 2015, Available: https://nsuarb.novascotia.ca/sites/default/files/M06733%20Board%20Decision.pdf

Project Methodology

To produce recommendations for an incentive level setting methodology based on industry best practices, CLEAResult undertook the following steps:

Jurisdictional Scans

CLEAResult undertook jurisdictional scans of various provincial and state utilities and energy efficiency agencies to:

1) identify the incentive level setting methodologies and best practices in other jurisdictions; and
2) account for multiple possible approaches and methodologies that can be used when setting incentive levels.

The jurisdictions were chosen based on the following considerations:

- geographical similarity to Nova Scotia;
- portfolio maturity;
- recognized market leadership by American Council for an Energy-Efficient Economy (ACEEE);
- applicable incentive setting methodology; and
- energy efficiency program delivery mechanism (e.g., electric or natural gas utility vs. public agency vs. energy efficiency utility).

To complete the jurisdictional scans, CLEAResult used a combination of primary and secondary research. The secondary research was used to compile market characteristics and quantitative metrics for the selected jurisdictions (e.g., total energy efficiency program budgets and targets, etc.). The primary research was used to confirm the findings of the secondary research and to gain deeper insight into the specific incentive setting methodologies and other considerations and processes used by the jurisdictions, which may not be available in public documents.

The best practices were reviewed by the CLEAResult Subject Matter Expert (SME) team, which has significant experience in program design, delivery and evaluation.

The result of the jurisdictional scans, contained in Appendix A, are presented as comparative metrics which can be used to benchmark ~~ENS)'s~~ENS's program incentives expenditure and total portfolio performance. The scans revealed multiple considerations and criteria that are used by other jurisdictions in setting incentives. As appropriate, these elements were integrated into the recommendations below.

Study of Nova Scotia's Market

To tailor the final findings to Nova Scotia's market, efforts were taken to understand the current landscape of energy efficiency programming, from both the perspective of EfficiencyOne and other major stakeholders in Nova Scotia. Secondary research was conducted to understand the electricity market in Nova Scotia. A review of Nova Scotia's current and forecasted electricity supply and demand was undertaken as well as a review of the population, building and load demographics. These factors are accounted for in our recommendations. Lastly, Nova Scotia's energy efficiency policies and the associated regulatory structure were also studied to fully understand how they currently drive incentive setting for ENS's programs.

Review of Efficiency Nova Scotia's Historical Performance

A review of ENS's historical program performance was undertaken to determine the success of the current programs in market. To obtain detailed information on select programs and their incentive setting methodologies, interviews were performed with selected program managers and staff. Lastly, program manuals and program evaluation reports were reviewed to gain insight into program operations, program maturity, success factors and recommended program modifications.

Analysis and Recommendations

The final analysis included a review of the theoretical underpinnings of incentive setting methodologies and established a framework, informed by jurisdictional best practices, on which CLEAResult's recommendations are based. This incentive setting framework is broadly presented and is applicable to setting incentives for any energy efficiency measure, program or portfolio.

The current incentive setting methodology for four of ENS's programs (Instant Savings, Custom, Business Energy Rebates, and Home Energy Assessment) were then compared against our recommended incentive setting methodology to identify any existing gaps. Nova Scotia's unique market characteristics were accounted for in the recommended incentive setting methodologies.

To assist EfficiencyOne in setting new, or modifying existing incentive rates, an Excel-based tool was created to provide considerations that should be used in the incentive setting process.

Program Financial Simulation

To test the recommendations, a program financial simulation was conducted for both the Instant Savings and Custom programs. The current incentives were evaluated against multiple criteria, with a recommendation provided for the "appropriateness" of each incentive.

Incentive Setting for Energy Efficiency Programs

Energy conservation programs feature different types of incentives to attract participation. The underlying theory behind the design of energy conservation programs is that some energy efficient options are difficult to reach and are surrounded by barriers that need to be overcome in order for that option to become a feasible choice.

The three main types of barriers that most programs aim to address are cost, time and lack of knowledge.[6] The efficient option or choice is either too costly, is inconvenient, or the customer is not aware of it. Often, multiple barriers can be present. In order to address these barriers, programs use three main types of incentives:

1. Financial
2. Convenience
3. Educational/Technical Assistance

These incentives can be used in isolation, or in combination with each other, depending on the specific barriers present. All three types of incentives should aim to alleviate barriers to participation.

Often, the main component of utility or government sponsored energy conservation programs are financial incentives for residential and business customers to encourage them to make an energy-efficient choice. Financial incentives address the cost barrier. The jurisdictions investigated in this project feature financial incentives as a key component of their program strategy.

Depending on the program and jurisdiction, financial incentives were found to be as high as 75-80 percent of the total efficiency program portfolio expenditure. For example, National Grid has incentive expenditures in this range for their entire portfolio of electricity conservation programs. This level of magnitude indicates that financial incentives are a significant portion of any energy efficiency program or portfolio budget, which emphasizes their influence. Some jurisdictions, such as Massachusetts and Oregon, feature requirements that program administration costs be minimized as a portion of the total program delivery budget to ensure participants receive the majority of financial benefit from the programs~~.~~ via financial incentives.

Often, direct financial incentives to program participants are supported with convenience incentives. These types of incentives exist to address the time barrier; they are composed of mechanisms or structures that make participation easier. Convenience incentives are sometimes quantified financially as incentives, and at other times they have ancillary benefits that are captured under program administration costs. It should be noted that there is a cost associated with providing the convenience incentive, regardless of whether they are accounted for as financial incentives or fall under other program administration costs, and that these costs should be tracked. For example, appliance retirement programs often leverage convenience incentives by offering in-home pick up of old appliances. Small business and low income programs often feature direct install components, where a pre-qualified contractor performs the work for the customer. ~~Direct~~In general, all direct install ~~is another example of a convenience incentive. In these~~ programs~~, there~~ are ~~financial and~~ examples of convenience incentives ~~that are often~~, combined with financial incentives.

The costs associated with providing convenience in both appliance retirement and direct install programs are often quantified financially as incentives~~. These~~, versus program administration costs. These specific types of programs in the ENS portfolio account for these costs as financial incentives. In some cases, items that make customer participation easier are not considered convenience incentives since they are categorized as part of good customer service or optimal program delivery. For example, an online incentive submission system that is developed to maximize the user experience may make participation easier, but the development and operational costs are not considered incentives. This quantification is due to the ~~service~~online application system not directly being related to energy efficiency, and the value of the ancillary benefits to the program administrator, such as improved application review, reporting and incentive payment processes.

The final type of incentives that are common in energy conservation programs are educational and technical assistance incentives. These incentives address the lack of knowledge barrier. From posting energy savings tips and a home energy assessment tool on a public website to providing residential and commercial on-site energy assessments or large industrial energy management labor resources, educational and technical assistance incentives can cover the entire spectrum of customers. Depending on the type of activity, these incentives may be quantified as a financial incentive if they are tied to

[6] Canadian Energy Efficiency Alliance, "CEEA 2014 Survey: Canadian Business Attitudes on Energy Efficiency," http://energyefficiency.org/wp-content/uploads/2014/05/CEEA-Survey-2014-Final.pdf, (2014).

specific energy efficiency projects and are associated directly with energy savings. For the programs in the ENS portfolio, educational incentives are not quantified as financial incentives.

Incentives are critical to achieving program success by removing barriers to participation. The ultimate goal of energy conservation programs is to achieve market transformation, which is ~~outlined~~discussed in the section below. ~~This~~Market transformation ensures that the efficient behaviour becomes standard practice, and savings can be attributed to Codes and Standards rather than claimed through incentive programs. This is considered sustainable success, since the market then leads the way on making the energy-efficient choice. However, it can take multiple years for any given technology or behaviour to achieve market transformation, and there may always be new efficiency levels or best practices for that technology or behaviour.[7]

MARKET TRANSFORMATION

The ACEEE defines market transformation as the "strategic process of intervening in a market to create lasting change in market behaviour by removing identified barriers or exploiting opportunities to accelerate the adoption of all cost-effective energy efficiency as a matter of standard practice."[8] Standard practice refers to the state where incentives are no longer necessary; the energy efficient behaviour becomes the norm and the market naturally gravitates towards that option without the need for intervention. The market transformation process can be illustrated using the following technology adoption curve:

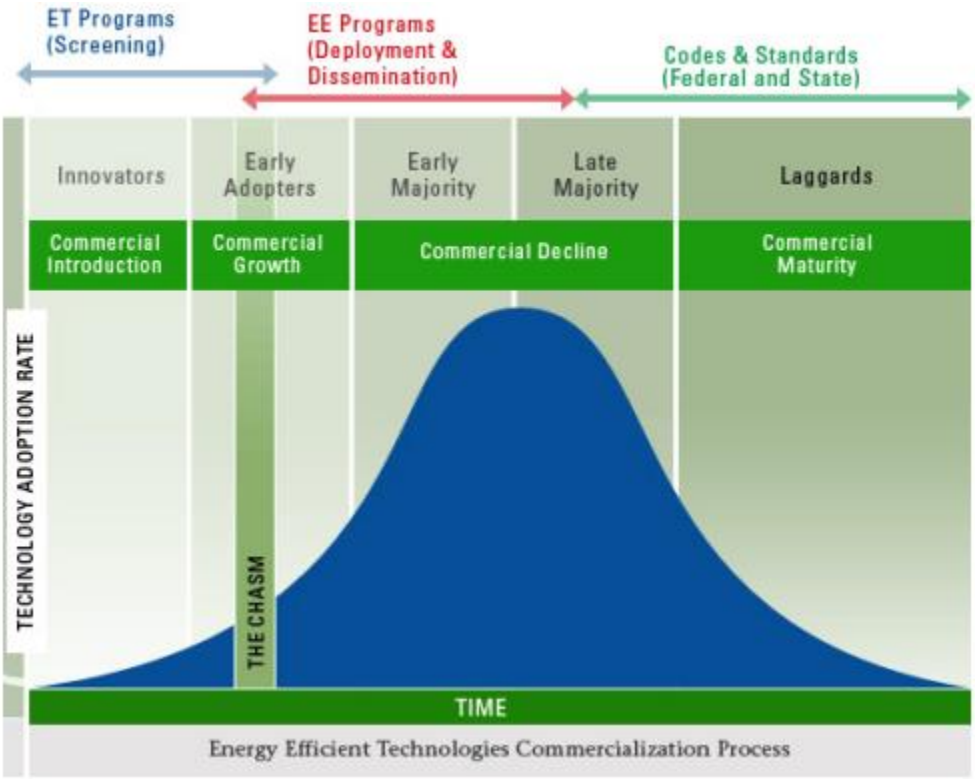


Figure 1: Technology Adoption Process [9]

[7] ACEEE, http://aceee.org/files/proceedings/2008/data/papers/10_56.pdf. Adapted from SoCal Edison
[8] ACEEE, http://aceee.org/portal/market-transformation
[9] ACEEE, http://aceee.org/files/proceedings/2008/data/papers/10_56.pdf. Adapted from SoCal Edison

For utility or government-sponsored energy efficiency programs, it is important to consider a technology's maturity when determining the best time to begin providing financial incentives to drive the market uptake of that technology. As identified in Figure 1 above, "The Chasm" is typically a time when a technology is sufficiently market ready yet requires financial assistance to begin market transformation at a large scale. Incentives are usually offered until the start of the late majority period. Usually, adjustments to baselines and energy savings persistence numbers need to be considered as the early majority period begins. Once the late majority period is reached, a program administrator must consider whether financial incentives are still required to drive additional market transformation. Quantitative indicators of this point will vary depending on the market and technology. Accordingly, during the early adopter to late majority period where energy efficiency programs are active, incentive setting and review is very important to program success. Program and technology maturity and penetration is a critical consideration during the incentive setting process.

INCENTIVE SETTING THEORY

Incentive setting for energy efficiency programs is a form of price setting, with some unique characteristics. The discussed theory is based on CLEAResult's knowledge and experience with conducting program design and incentive setting exercises, as well as our ongoing discussions with the energy efficiency industry.

~~Due to a general lack of competing incentives from other utilities or agencies, program administrators encounter less immediate, natural compliance (checks and balances) in terms of price setting rigor, other than for budget and reputational risks. In the private sector, an inappropriate price can lead to immediate failure; this risk is only present for program administrators for incentives that are substantially incorrect. It is important to account for this systemic problem in setting incentives, using a variety of methods.~~

PRICE SETTING

Price setting is the process of coming up with the cost of a good or service for a consumer. With price setting, there are two influences:

1. The value a consumer is willing to pay (participant perceived value)
2. The production and distribution costs plus the required premium (return on investment)

The first influence is based on the perceived value for the product or service. This is defined as the value the consumer is willing to pay for a product or service. The second influence is based on the associated return on investment criteria. These two influences must be balanced during any price setting process, as illustrated in Figure 2.

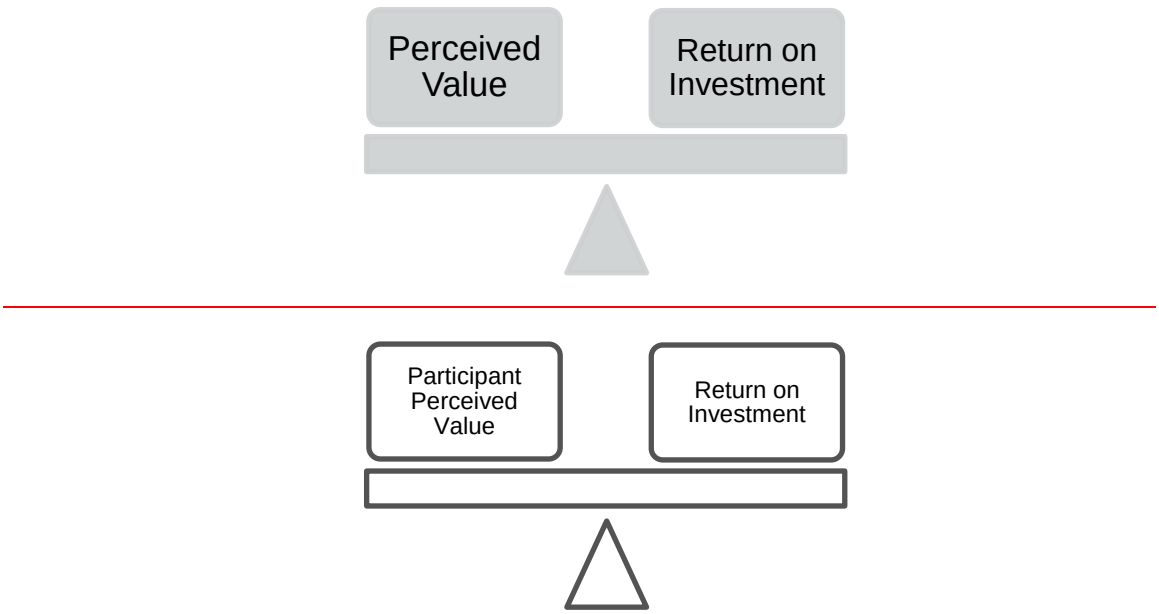


Figure 2: Balance of Price Setting Influences

The return on investment criteria, in most cases, can be quantified and precisely calculated; however, the perceived value to a consumer can only be measured on an individual basis. These individual values can potentially be aggregated, and a representative number for value established, but it is an imprecise exercise, affected both by sample size and the variable nature of a survey response. Additionally, what constitutes value will vary by consumer, depending on their priorities. The value to a consumer can never be known exactly; there is no mathematical formula that can be used to get a precise number. This makes establishing an exact minimum or maximum price extremely difficult.

~~Perceived~~Participant perceived value curves for sales will typically follow a sigmoid relationship, based on the price elasticity of demand. This relationship is shown in Figure 3, though it is meant to be illustrative. While uptake and incentives generally follow these relationships, it is difficult to quantify precisely. Energy efficient product uptake typically does not increase linearly with increased incentive levels until a critical value is reached.

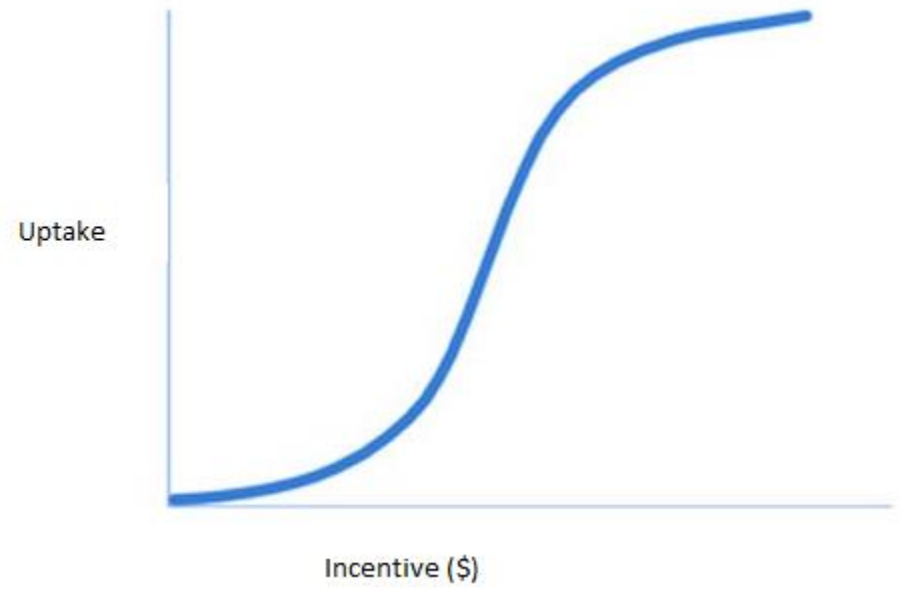


Figure 3: Uptake-Incentive Relationship[10]

Therefore, to identify participant perceived value to better understand how to characterize the curve, firms use several strategies for

triangulation.

1. Consumer Surveys
    - Price Sensitivity
    - Conjoint Analysis
2. Research Competitive Products
3. Supply Chain Discussion
4. Jurisdictional Benchmarking
5. Historical Experience

APPLICATION TO ENERGY EFFICIENCY PROGRAMS

As mentioned, incentive setting in energy efficiency programs is a unique form of price setting. For incentive setting in energy efficiency programs, the perceived value to the customer is the driving influence, while the return on investment can assist with setting target expenditure amounts. It should be highlighted that using the analysis from investigating these two influences to set incentives is not a precise exercise.

~~Within the incentive setting process, there can be the potential for less rigour by program managers/implementers due to the lack of competition and other actors. This systemic problem~~Due to a general lack of competing incentives from other utilities or agencies, program administrators encounter less immediate, natural compliance (checks and balances) in terms of price setting rigor, other than for budget and reputational risks. In the private sector, an inappropriate price can lead to immediate

[10] "The 3 Charts That Will Teach You Everything You Need to Know About Business," Business Insider, Available: http://www.businessinsider.com/the-3-charts-that-will-teach-you-everything-you-need-to-know-about-business-2010-7?op=1

failure; this risk is only present for program administrators for incentives that are substantially incorrect. This lack of natural compliance is a systemic problem that can be guarded against through applying an incentive setting methodology that features best practices in determining the two key influences to price: participant perceived value and return on investment ~~and perceived value~~. Finally, there needs to be a review protocol, which specifies how incentive levels should be reviewed, and if necessary, updated.

~~RETURN ON INVESTMENT~~

PARTICIPANT PERCEIVED VALUE

The determination of the participant perceived value is an evaluation of factors from the participant's perspective.

For energy efficiency programs, ~~return on investment is based on two general considerations: cost effectiveness and budget impact.~~

~~Cost Effectiveness~~

~~Cost effectiveness is usually determined using a benefit cost analysis which explicitly or implicitly compares the cost of energy efficiency to other electricity or natural gas supply resources and may include other considerations (e.g., environmental benefits). The two common explicit cost effectiveness tests are the Total Resource Cost (TRC) and the Program Administrator Cost (PAC) tests.~~

~~Budget Impact~~

~~Program administrators are not only affected by cost effectiveness concerns when determining their return on investment. From CLEAResult's experience, in several jurisdictions, the program budget is usually the limiting factor for expenditure; not cost effectiveness. These budget limited programs by default are cost effective if they generate the required lifetime net energy savings within the assigned budget.~~

~~An incentive may be cost effective, but may not fit within a program budget. Therefore, the budget impact needs to be considered in addition to cost effectiveness as the budget may set the financial ceiling.~~

~~The budget impact should be considered not only on a per unit savings basis, but also on a per participant basis and on a total budget impact basis. An incentive may be considered great value for money on a per unit savings basis, but due to high potential uptake, it may not make sense for the program budget.~~

~~Return on investment criteria typically set ceilings for incentives in energy efficiency programs. They ensure a minimum return for both the program administrator and society. However, incentives are often set at values below the return on investment ceiling, since the considerations involved in determining perceived value triangulate an incentive at a lower value.~~

~~PERCEIVED VALUE~~

~~For energy efficiency programs,~~participant perceived value leads to the motivation to participate. As discussed earlier, energy efficiency programs feature options that are not standard practice. Therefore, an incentive needs to be deployed to match the customer's perceived value of the energy efficient product or service. ~~Depending on the customer's motivations and barriers, either upfront costs, annual bill savings and paybacks, or a combination of both can be important considerations~~Often, the customer looks at much more than just the financial considerations of a decision, but it is a good place to start in determining participant perceived value.

Financial Considerations as Related to Participant Perceived Value

There are several different costs and metrics that may affect the financial considerations involved a participant's perceived value:

1. Retail Price
2. Project Costs
3. Project Payback
4. Incremental Equipment Costs (Participant Costs)

Retail Price: The market price that a customer would have to be pay for the efficient option.

Project Cost: The total upfront costs that a customer would have to pay for the efficient option including purchase and installation.

Project Payback: Some customers will only make purchase decisions based on a project payback meeting a certain maximum amount of years. Before a project payback can be calculated, there needs to be an assessment of the participant's Incremental Equipment Costs.

Incremental Equipment Costs: For incentive-setting, the Incremental Equipment Costs are an assessment of a participant's costs, be it a purchase or usage of a technology or service, when compared to a base case scenario. For the purposes of this study, the Incremental Equipment Costs are defined to include the difference in purchase and installation costs of the efficient equipment or service as compared to a base case. The Incremental Equipment Costs are determined as a Net Present Value (NPV) over the estimated useful life of the efficient option. In other jurisdictions, for specific programs and projects, lifecycle Operations and Maintenance (O&M) costs, and fuel costs, both for the efficient option and the base case, are included in the Incremental Equipment Cost calculation.

Per the above definition of the Incremental Equipment Cost, there are several different types of scenarios and calculation methodologies, which all vary by the status of the base case. As such, determining the base case is critical for Incremental Equipment Cost analysis (as well as other components of incentive setting and broader program design). The common base case scenarios have been outlined in Table 2.

Scenario	General Description
New Purchase/Installation	A customer may decide to make a new purchase for a technology or service. There is not a current technology or service in use. For example, if a customer purchases a new home and they have a choice of different new light fixtures and central air conditioning, since nothing currently exists, the base case would be a New Purchase/Installation scenario. The Incremental Equipment Cost is determined based on the comparison between the efficient technology or service, and the standard technology or service that is available to the customer. The standard technology or service is the base case. The standard technology is often considered to be the most popular technology in terms of sales or penetration at the time, or a hybrid of technology options based on sales or penetration mix assumptions. In some cases, the standard technology can be considered to be non-existent. For example, for a homeowner considering to upgrade their exterior wall insulation, if they currently don't have any insulation or are not planning to get any insulation in absence of the program, the standard technology is the non-insulated wall. The standard service is often considered to be the most popular service offering in terms of sales or penetration at the time. For example, if a program is offering any energy management service, and energy management services are not considered to be standard practice, the standard service could be considered to be not having an energy management service. For this scenario, Incremental Equipment Costs are defined as difference between the efficient option's purchase and installation costs, and those of the base case.
Replacement on Failure/Burnout	A customer may decide to make a purchase of a technology or service after their current technology or service has failed, burned out or expired. The Incremental Equipment Cost is determined based on the comparison between the efficient technology or service, and the standard technology or service. The standard technology or service is the base case. The standard technology is often considered to be the most popular technology in terms of sales or penetration at the time, or a hybrid of technology options based on sales or penetration mix assumptions. It does not need to be the current technology that has burned out. The standard service is often considered to be the most popular service offering in terms of sales or penetration at the time. It does not need to be the current service that has expired. For this scenario, Incremental Equipment Costs are defined as difference between the efficient option's purchase and installation costs, and those of the base case.
Early Replacement	A customer may decide to make a purchase of a technology or service before their current technology or service has failed, burned out or expired. The Incremental Equipment Cost is determined based on the comparison between the efficient technology or service and a combination of two different base cases: 1) The currently installed technology or currently used service for the Remaining Useful Life (RUL) of the currently installed technology or currently used service. The RUL is often estimated at one-third to one-half of the estimated useful life of the technology or service. 2) The standard technology or service for the remaining years from after the RUL throughout the duration of the EUL.

Scenario	General Description
	For example, if a customer was considering buying a new efficient window air conditioner, and their existing window air conditioner still worked, the base cases would as follows: • Year 1 to RUL: Existing Window Air Conditioner • RUL to EUL: Standard Window Air Conditioner The standard technology is often considered to be the most popular technology in terms of sales or penetration at the time, or a hybrid of technology options based on sales or penetration mix assumptions. The standard service is often considered to be the most popular service offering in terms of sales or penetration at the time. This approach to the calculation where a combination of two base cases is used is called the Remaining Useful Life Discounted Incremental Equipment Cost method (RULDICM). This method discounts the material and installation costs of the base case across the Remaining Useful Life of existing equipment, before subtracting them from the material and installation costs of the efficient equipment.
Replacement After Assumed Failure/Burnout	A customer may decide to make a purchase of a technology or service after their current technology or service is supposed to have failed, burned out or expired, but is still continuing to function. The Incremental Equipment Cost calculation is treated the same as the Early Replacement scenario. Even though the current technology or service is supposed to have failed, burned out or expired, it is still assigned an appropriate RUL.

Table 2: Incremental Equipment Cost Scenarios

A participant might look at one, a combination of some, or all of the above factors in their financial analysis of a purchase decision. In addition, they may conduct their own version of the Participant Cost (PC) test.

Participant Cost Test

In evaluating a participant's purchase decision from a financial perspective, the PC test is a useful analysis to deploy. It assesses all of the direct financial considerations that a participant faces in making a purchase decision, and indicates whether the financial benefits are greater than the financial costs.

General Description of PC Test	Influence of PC Test on Incentive Levels
The PC test is an evaluation of the financial benefits of a technology or service compared to the financial costs, from the perspective of the participant. The financial benefits include incentives, tax credits and utility bill savings. The benefits are evaluated throughout the estimated lifetime of the product or service, with an NPV determined using a set discount rate. The financial costs are the total costs to the participant to purchase, install and maintain the equipment or service, compared to the base case. The utility bill savings should not be included in this calculation, since they are considered in the financial benefits, and should not be double-counted. The costs are evaluated throughout the estimated lifetime of the product or service, with an NPV determined using a set discount rate.	The PC test can be used in incentive setting, since it allows the program administrator to quantify the financial impact that a technology or service has on a participant. The financial impact can be closely correlated to a participant's perceived value of a technology, especially for more sophisticated commercial and industrial customers who primarily make purchase decisions based on financial metrics. For example, if a PC test ratio is below 1.0, it indicates that the customer will not achieve payback on their purchase, and the incentive may have to be increased for the customer to be motivated to purchase. Depending on the program and jurisdiction, program administrators may have their own internal targets for PC test, which are often reflected through payback metrics.

The PC test is typically reported as a ratio (benefits/costs). A ratio over 1.0 indicates that the benefits are greater than the costs.	These metrics depend on the value of the incentive.

Table 3: Participant Cost Test and Relationship to Incentive Setting from a Participant Perceived Value Perspective

The analysis involved in determining the Incremental Equipment Cost and the PC test involve some of the same components. Both types of analyses require a definition of the base case, and a calculation of the cost differences between the efficient option and the base case. As discussed, the Incremental Equipment Cost can be broadened to include O&M and fuel costs, based on the specific program, measure, technology or project.

Figure 4: Components of Incremental Equipment Cost and Participant Cost Test

As required, the individual components may require an NPV analysis and discounting, depending on when the components are incurred.

Broader Considerations as Related to Participant Perceived Value

In the real world, determining participant perceived value during price-setting should not be thought of as a precise science~~.~~ that is only based on financial quantification. The same holds true for incentive setting ~~with~~within energy efficiency programs. While it may be possible to determine a customer's financial perspective as viewed through multiple lenses (e.g. retail price, project costs), there are broader considerations that affect a participant's perceived value. These considerations might not always be directly quantifiable. However, there are some key ~~considerations~~ activities and processes that should be used when conducting incentive-setting exercises to ~~determine~~ assist with determining participant perceived value and the value of a potential incentive. These activities and processes are applicable to determining both the financial considerations, and the broader considerations associated with a participant's perceived value.

Customer Research

A critical component of determining participant perceived value is actually asking potential customers what they would pay for a product or service, and what their price points are for difficult technology options. ~~This work~~Additionally, asking customers what other barriers they face in making a purchase decision can help determine incentive values. For example, the financial considerations associated with the purchase of Compact Fluorescent Lamps (CFLs) a few years ago indicated that customers should be motivated to purchase them; however, CFLs reached a saturation point where adoption stalled due to light quality and environmental concerns due to the presence of mercury; elements that the financial considerations did not capture.

Based on the Incremental Equipment Cost and PC analysis for Residential LED A Lamps, again, it would seem that customers should be motivated to purchase them. While Residential LED A Lamps are some of the most popular DSM measures in North America, they still have not become standard practice due to the feeling of customers that the upfront retail costs are still too high.

The customer research can be done directly through focus groups and surveys. With any incentive-setting exercise, it is important to get customer input frequently. It is also important to understand the greater picture surrounding the customer's purchase decisions. This perspective can often be answered by asking the following questions:

- What is their value proposition for moving forward?
- What do they think of their options?
- What are their primary barriers to moving forward?
- What are their challenges with the existing standard option?

This research is especially important when there are multiple potential customers/stakeholders for an efficiency project, and they have different motivations and barriers. This is often called the principal-agent problem and is most commonly encountered in rental units, where tenants and landlords have different motivations, based on:

- ~~which~~Which party is responsible for paying the energy bills;
- ~~the~~The structure for how the bill is determined and who makes the spending decisions for new equipment; and
- ~~who~~Who has the right to upgrade that equipment~~.~~?

Incentives and their associated delivery strategies need to be considered carefully in attempting to solve barriers in these situations.

Technology Research

Technology research is essential when identifying participant perceived value as well as completing other analysis associated with incentive setting. The three forecasts that need to be developed are:

- ~~market~~Market price;

- ~~technology~~Technology penetration; and
- ~~technology~~Technology performance.

It is important to know the price points for the different technologies and options. Additionally, understanding current and future market pricing and the impact on incremental equipment costs is essential in developing an incentive strategy. Pricing considerations can include upfront capital costs, labour costs for installation, operations and maintenance costs, etc.

Finally, it is important to consider limitations and how the technology is expected to evolve over the short to long-term (next few months to a one to two year) period. This analysis is critical for technology performance and setting energy consumption baselines, energy persistence values and incremental equipment costs. All of these factors are usually analyzed during the review and update of the ~~TRM,~~Technical Reference Manual (TRM), which typically contains measure assumptions.

After gathering the required information from the Technology Research, it should be possible to determine the inputs for cost effectiveness calculations and financial analysis from the participant's, the program administrator's and society's perspective.

Supply Chain and Stakeholder Discussion

In designing and delivering any best-in-class energy efficiency program, it is important to involve the supply chain and key stakeholders such as industry associations, other government agencies and community groups. Often, they can help with both customer and technology research, especially with providing supporting information and access to their contacts. They can also provide insight into their costs which can help shape the incentive-setting analysis. Finally, the supply chain and stakeholders can identify if there are other barriers or considerations in the market that need to be addressed through the incentive, or broader program design. For example, if an energy efficiency program targeted at commercial refrigeration used a direct install approach where only one centrally-procured contractor was able to install the equipment, and the target customers all wanted to use their own contractors due to trust and familiarity, then the value of the financial incentive may need to be adjusted, or the delivery strategy changed.

For optimal program delivery, the supply chain and stakeholders should also review potential incentive changes and be provided notice to prepare for those changes. Additionally, if the supply chain will be a critical component of a program's go-to-market strategy, it is important to determine the supply chain's barriers to participation. For example, if the program is a midstream lighting program delivered by distributors, it is important to know what the distributors' barriers are and what incentive will be required for them to stock, promote and sell the efficient products.

Another important element to the supply chain and stakeholder discussion is to determine if there are other incentives in the market that are not offered by program administrators. It is likely that the supply chain and stakeholders will be aware of these incentives, since they are a common vehicle for customers to learn about all of the incentives present in a market and help take advantage of them. Examples of other incentives for energy efficiency programs can be things like tax rebates, government incentives through other vehicles or other offers such as low cost financing on certain purchases.

Benchmarking

If an incentive or technology is new, there may not be any historical data to assist with forecasting price and penetration curves in a utility's local market. Benchmarking incentive rates against similar technologies or programs in other jurisdictions can mitigate this lack of local data. ~~Not including~~However, it should be noted that not only considering the disparity between the Canadian and U.S. dollar, some products and services have significantly different costs due to regulatory, infrastructure, supply chain, environmental and demographic factors.

To address ~~these issues~~the issue of the comparison of different jurisdictions, incentives in one jurisdiction can be established by referring to ~~the~~ incentives in ~~another~~a comparable jurisdiction (direct benchmarking). A comparable jurisdiction may be determined through the evaluation of population size, population demographics, climate, housing and building characteristics etc. A second option to address ~~these issues~~the issue of comparing different jurisdictions is involves explicitly accounting for ~~these factors.~~ the differences by making adjustments. For example, for comparison between Nova Scotia and Maine, an adjustment can be made to pricing based on the currency exchange rate. However, making adjustments for differences will not be an exact science.

An important element of benchmarking is to open up a dialogue with the other jurisdictions, if possible, to understand the nuances in the market and program delivery structure and how they may affect incentives. Any benchmarking exercise should consider these ~~factors~~differences.

Program Evaluation Review and Historical Experience

The final consideration in determining participant perceived value is reviewing previous evaluation reports and accounting for historical experience. Program evaluations typically include an analysis of barriers, customer and supply chain insight and recommendations for improvement. They also provide quantitative performance information regarding participation, savings and, depending on the jurisdiction, expenditure. Historical experience allows program administrators to understand the uptake implications of previous incentives. For example, if an incentive for an individual LED A Lamp was $8.00, and the measure uptake was significantly above the forecasted participation rates and allocated budget, the historical experience may indicate the need to lower the incentive rate.

RETURN ON INVESTMENT

The determination of the return on investment is an evaluation of factors from the program administrator's and broader society's perspective.

For efficiency programs, return on investment is based on two general considerations:

1. Cost effectiveness
2. Budget impact.

Cost Effectiveness

Cost effectiveness is usually determined using a benefit-cost analysis which explicitly or implicitly compares the cost of energy efficiency to other electricity or natural gas supply resources and may include other considerations (e.g., environmental benefits). The two common explicit cost effectiveness tests used in determining return on investment with regards to incentive setting are the Total Resource Cost (TRC) and the Program Administrator Cost (PAC) tests.

In addition to using cost effectiveness tests explicitly, there may be an opportunity to use unit costs based on lifetime energy savings. If these unit costs are below a certain target value, it serves as another potential indicator of cost effectiveness.

Cost Effectiveness Test	General Description and Features	Implication for Incentive Setting
TRC	The TRC is an evaluation of the total utility and participant benefits (both energy and non-energy benefits) compared to the utility and participant costs. The benefits are typically quantified as the avoided costs of supply and distribution for all resource savings (electricity, natural gas, water) as well as any non-energy benefit considerations. The program administration costs are the costs to the program administrator to run the program, excluding financial incentives. The participant costs are the total costs to the participant to purchase, install and maintain the equipment or service, compared to the base case. Incentives are not included in the participant cost calculation for the TRC. The utility benefits are evaluated during the lifetime of the assumed savings persistence, with a Net Present Value (NPV) determined, using a set discount rate. The program administration costs and participant costs are evaluated during the estimated lifetime of the product or service, with an NPV determined using a set discount rate. The program administration costs are often paid up front, without a need for discounting and future cash flow analysis. For simplicity of calculation, the assumed savings persistence and the estimated useful life are often set at the same value. The TRC can be reported as a ratio (benefits/costs) or as a net benefit (benefits-costs). A ratio over 1.0 indicates that the benefits are greater than the costs.	The TRC does not include the incentive in its calculation directly, though by including all participant costs, the incentive amount is included as a sub-set of the participant cost, provided the incentive is less than the participant cost.
PAC	The PAC is an evaluation of the total utility benefits of a technology or service for society compared to the utility costs. For electricity efficiency and conservation programs, the utility benefits are typically quantified as the avoided costs of supply and distribution for electricity. The utility costs are composed of program administration costs and incentive costs. The program administration costs are the costs to the program administrator to run the program, excluding financial incentives. The utility conservation benefits are evaluated during the lifetime of the assumed savings persistence, with a Net Present Value (NPV) determined, using a set discount rate. The program administration costs and the incentive costs are evaluated during the estimated lifetime of the product or service, with an NPV determined using a set discount rate. Both the program administration costs and the incentive costs are often paid up front, without a need for discounting and future cash flow analysis.	The PAC can be used in incentive setting. It forms the basis of the PAC Benefits (Cost Effectiveness) incentive threshold which is discussed later in this report. Depending on the program and the jurisdiction, program administrators may have their own internal targets for the PAC, which can affect the amount of money available for the incentive.

Cost Effectiveness Test	General Description and Features	Implication for Incentive Setting
	For simplicity of calculation, the assumed savings persistence and the estimated useful life are often set at the same value. The PAC can be reported as a ratio (benefits/costs) or as a net benefit (benefits-costs). A ratio over 1.0 indicates that the benefits are greater than the costs.	

Table 4: Cost Effectiveness Tests and Relationship to Incentive Setting from a Return on Investment Perspective

Budget Impact

Program administrators are not only affected by cost effectiveness concerns when determining their return on investment. From CLEAResult's experience, in several jurisdictions, the program budget is usually the limiting factor for expenditure; not cost effectiveness. These budget-limited programs by default are cost effective if they generate the required lifetime net energy savings within the assigned budget.

An incentive may be cost effective, but may not fit within a program budget. Therefore, the budget impact needs to be considered in addition to cost effectiveness as the budget may set the financial ceiling.

The budget impact should be considered not only on a per unit savings basis, but also on a per participant basis and on a total budget impact basis. An incentive may be considered great value for money on a per unit savings basis, but due to high potential uptake, it may not make sense for the program budget.

Return on investment criteria typically set ceilings for incentives in energy efficiency programs. They ensure a minimum return for both the program administrator and society. However, incentives are often set at values far below the return on investment ceiling, since the considerations involved in determining participant perceived value typically triangulate an incentive at a lower value.

THEORETICAL ~~LIMITS~~THRESHOLDS FOR INCENTIVES

Based on the return on investment criteria as well as perceived value considerations, there are three theoretical ~~limits~~thresholds for incentives~~.~~ that are based on quantitative analysis:

1. ~~Percentage of~~ Customer Cost
2. PAC Benefits (Cost Effectiveness)
3. Budget

Customer Cost Threshold

The Customer Cost theoretical threshold for incentive setting is based on a customer's perception of what they are paying for a product. There are several considerations that may go into determining Customer Cost (since customers evaluate their costs differently depending on the situation), and the parameter that is chosen to represent the Customer Cost is dependent on the combination of the customer, the efficient option and the replacement decision. There are several different parameters that can be considered including retail price, project cost, Incremental Equipment Cost and Participant Cost test/project payback.

Retail Price: Retail price is one of the first parameters to be considered. It is the market price that a customer would have to be pay for the efficient option.

Project Cost: For some efficient options, retail prices are not comprehensive in determining the cost to the customer. For example, some efficient options require installation and maintenance costs. These costs may not be included in retail pricing, but contribute to the customer's costs.

Incremental Equipment Cost: As discussed earlier, the Incremental Equipment Cost can be thought of as the difference in costs between the efficient option and the standard option.

Participant Cost Test/ Project Payback: Instead of providing customers with Participant Cost Test results, payback analysis is a simpler method of communicating the benefits of making a purchase decision for an efficient option. For example, it is much easier to tell a customer that their purchase decision will pay back within 2-3 years, instead of providing them with a Participant Cost test ratio that is greater than 1.0, which indicates that their NPV is positive. Sophisticated commercial customers will evaluate both NPV and payback analysis, but residential customers and smaller, less sophisticated commercial customers may not; as such, this information is useful to them.

Additionally, even if an efficient option has an attractive payback, there may still be challenges with access to upfront capital that an upfront incentive and/or financing offer can solve.

All of the above considerations (retail price, project cost, Incremental Equipment Cost, Participant Cost Test/payback analysis) contribute to the Customer Cost, depending on the type of customer, the efficient option and the replacement decision. A key focus of the customer, technology and supply chain research is to determine which Customer Cost threshold is applicable to the customer, if there is a combination of different parameters that need to be accounted for in incentive design, and if there is an opportunity for customer education (e.g. the Retail Price is very high, but the Participant Cost test shows that the efficient option will generate a positive NPV over the lifetime of the technology or service).

In Table 5 below, CLEAResult has provided suggestions for the Customer Cost threshold for different combinations of customers, technologies and replacement scenario. These suggestions are based on CLEAResult's program design and program management experience; they should be confirmed through the research activities involved in determining a participant's perceived value.

Unique Combination	Customer Cost Considered	Rationale for Selection
Residential Customer LED A Lamp Purchase Current Incandescent A Lamp Burned Out (Replacement on Burnout)	Retail Price	Residential customers for small purchases look at retail price. They do not typically look at Incremental Equipment Cost analysis or payback when making small purchases. As such, when setting incentive levels for this specific combination of customer, technology and replacement decision, the cost to customer threshold may be best aligned with retail price.
Residential Customer New Air Source Heat Pump Purchase Current Electric Baseboard is Working (New Purchase)	Project Costs, Incremental Equipment Cost, Payback	Residential customers for larger purchases will look at a combination of upfront costs and utility bill savings. They may look at purchases in terms of payback. As such, when setting incentive levels for this specific combination of customer, technology and replacement decision, the cost to customer threshold may be best aligned with the project costs as well as the Incremental Equipment Cost and payback.
Commercial Customer New Chiller Current Chiller is Working (Early Replacement)	Project Costs, Incremental Equipment Cost, Payback	Commercial customers for larger purchases will look at a combination of upfront costs, lifecycle operations and maintenance costs including utility bill savings, as well as the project payback. As such, when setting incentive levels for this specific combination of customer, technology and replacement decision, the cost to customer threshold may be best aligned with the project costs as well as the Incremental Equipment Cost and payback.

Table 5: Selection of Parameter for Customer Cost

After the appropriate Customer Cost parameter has been selected based on the different research activities, a percentage, proportion or limit can be assigned to develop the incentive level. For example, certain jurisdictions may have the principle that incentives should not be higher than 50% of the appropriate cost to customer. Another popular cost to the customer threshold for the commercial and industrial sectors is limiting incentives to a maximum that produces a two year payback.

As can be seen in the Recommendations, a full financial analysis should be documented for all incentive-setting including analysis of both current and estimated future retail pricing, Incremental Equipment Costs, running the Participant Cost Test, conducting measure-level TRC and PAC analysis, and assessing the budget and cost effectiveness impacts of the incentives.

PAC Benefits (Cost Effectiveness) Threshold

The PAC is the cost effectiveness test that reflects a program administrator's financial expenditure for a measure, program or portfolio. It is calculated by dividing the PAC benefits, which are the avoided supply and distribution costs of the electricity savings, by the PAC costs, which is the financial expenditure (program administrator costs for program overhead and delivery and incentive costs). At the measure level, PAC costs may include an assumption adder for program overhead and delivery costs, or may only include the incentive costs alone.

The PAC benefits are a financial quantification of a measure, program or portfolio's value to the electricity system, using the Avoided Costs. As discussed earlier, incentives are usually the largest component of a utility budget. As such, the PAC Benefits of a measure, program or portfolio provide a natural limit for incentives (when adjusted for overhead costs); Incentives (when adjusted for overhead costs) ideally should not be higher than the measure-level PAC benefits of a measure.

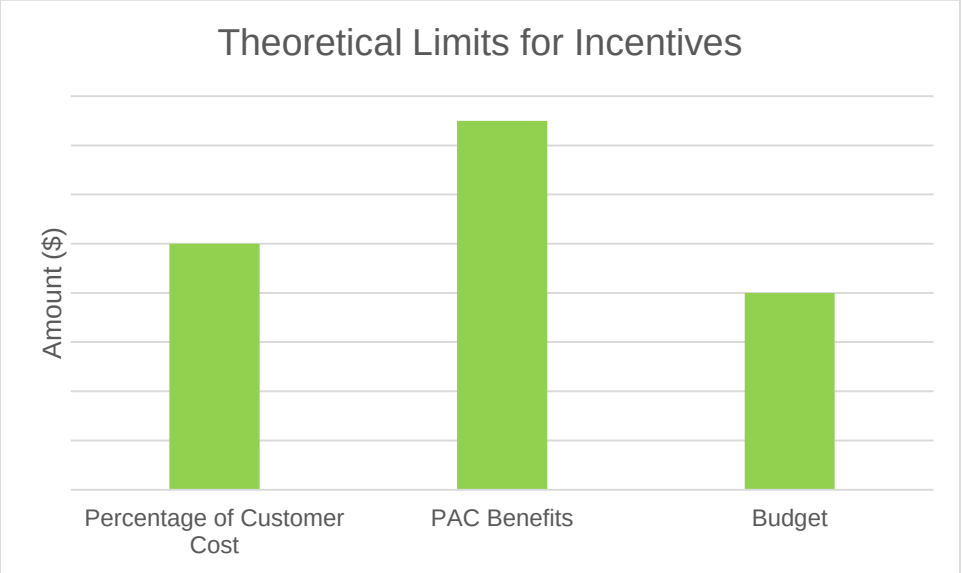
While most jurisdictions have a minimum requirement for measures, programs and portfolios to have a minimum PAC of 1.0, and remain cost effective, often incentive setting, program design and portfolio design can be developed to meet a higher PAC. For example, if a target PAC is 2.0, it means that incentives and overhead costs are limited to 50% of the PAC benefits.

Budget Threshold

Measure level, program or portfolio budgets can also limit incentive levels. For example, for high-volume measures, there may be an overall budgetary restriction due to the volume risk of participation. Additionally, certain jurisdictions may limit incentive spending using unitary savings metrics like $/kWh or $/kW. For example, if a jurisdiction has a total budget allocation of $0.30/kWh for their portfolio, there may be caution regarding setting any incentive levels higher than this amount. While all jurisdictions feature a certain level of portfolio management, with $/kWh spending in the commercial and industrial sectors typically lower than the residential sector, a balance must still be maintained, and as such, incentives may be limited by available budget.

Application of Thresholds

Incentives can exceed all three of these ~~limits~~ thresholds (and often do), but ~~the limits~~they provide a reference point that can be used during the design process. The ~~limits~~thresholds are independent of one another. They can all contribute to the concept of a maximum eligible incentive for a measure that program designers can use during the incentive setting process.



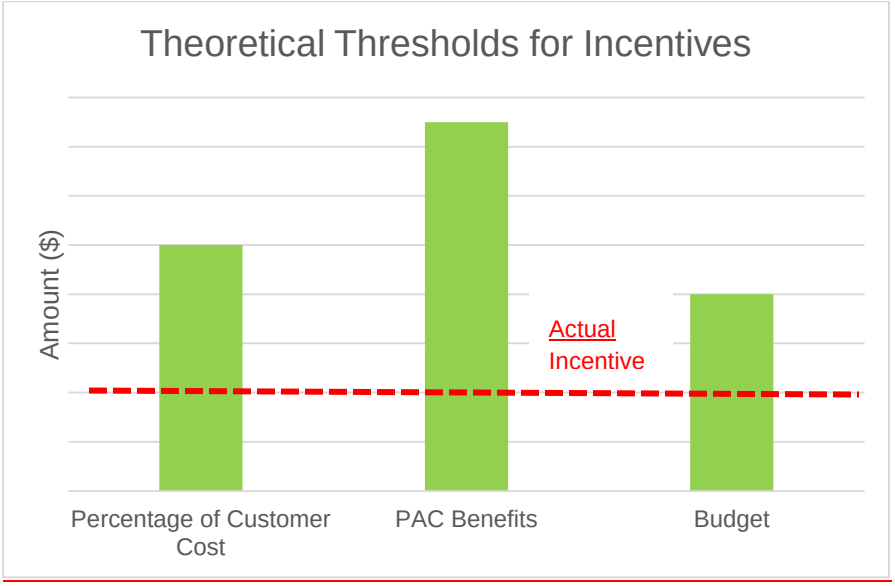


Figure 5~~4~~5: Theoretical Limits for Incentives

For any particular measure, any one of the theoretical limits can be the lowest or highest value. ~~Depending on the program and the target consumer, the customer cost limit may consider the retail price/project cost, the incremental cost or the project payback in the calculation. The PAC is used for this activity since it captures incentive costs; unlike the TRC.~~

The Role of Financing

If upfront costs are an issue, but not monthly or annual cash flows, the provision of low-interest or zero-interest financing may be valued by customers, either as a stand-alone incentive, or in combination with an upfront incentive. Program situations where financing may be attractive are when the customer has a PC test ratio greater than 1.0 and when the project payback analysis meets the customer's internal targets, but the upfront costs to purchase the efficient option requires more capital than the customer has available. The provision of financing is able to alleviate the issue of limited upfront capital, with the customer still being able to tolerate the impact on their monthly or annual cash flows.

From CLEAResult's energy efficiency program design and program delivery perspective, customers almost always prefer an upfront incentive to low-interest or zero-interest financing if both options are mutually exclusive.

The Importance of Education and Awareness

In almost all cases, education and awareness initiatives play a key role in motivating the customer to make a purchase decision. While educational incentives are not specifically discussed in this report, it is important to acknowledge that important role that they play in removing barriers to customer participation. Educational initiatives can also assist with the goal of achieving reduction in incentive levels; for example, if a measure makes financial sense for a customer to install, but the customer is just not aware of the financial benefits and is thus not participating, education and awareness can bridge this gap.

Education and awareness initiatives can also remove non-financial barriers from participation, such as a lack of knowledge about a program, technology, or service.

SUMMARY OF INFLUENCES ON INCENTIVE RATES

The different components involved in incentive setting are listed below in Table ~~2~~6. The table lists how a change in each component can influence measure level incentives. This highlights the multiple considerations that must be taken by program administrators when setting or altering incentives. In some cases, factors can create either upward pressure or downward pressure on incentives, depending on the specific situation. The considerations lend credence to the feedback obtained from many of the interviewees during the jurisdictional scans who echoed that setting incentive is "as much art as science."

Incentive Setting Component	Factors that can Place Upwards Pressure on Incentive Rates	Factors that can Place Downwards Pressure on Incentive Rates
Budget Impact	• Reduction in administration costs, leaving additional space in the budget. If there is a need to increase participation, increasing incentives may be an option	• If the budget is at risk of being exceeded, lower incentives may be required • Budget impact considerations can set ceilings on incentive levels
Customer Research	• Customers indicate that the incentive is not sufficient to motivate them to participate • There may be a lack of awareness of the technology, program or measure	• Customers indicate that the incentive offer is very attractive, and they may have participated even if the incentive was lower
Technology Research	• The technology has a forecasted increase in costs within the next program period	• The technology has a forecasted drop in costs or increase in market penetration within the next program period • Technology baselines are adjusted such that the ~~incremental cost~~Incremental Equipment Cost of the incented measure is lower, thus supporting the reduction in incentive
Supply Chain and Stakeholder Discussion	• Additional barriers are identified, which require more or increased incentives to address (e.g., distributors are unwilling to stock efficient products due to lack of perceived market demand)	• The program delivery structure may leverage cheaper supply chain costs, resulting in a reduction in the incremental equipment cost which may justify a smaller incentive
Benchmarking	• Comparable jurisdictions offer a significantly higher incentive drawing investment and supply chain participation to their market	• Should the majority of other comparable jurisdictions have significantly lower incentive rates for specific measures, it may indicate a change in market conditions which can support a reduced incentive rate
Program Evaluation Review and Historical Experience	• **Program evaluation suggests poor program and market performance due to lack of financial incentive**	• **Program evaluation suggests customers are motivated by other influences outside of the financial incentive**

~~Table 2: Summary of Influences on Incentive Rates~~
Table 6: Summary of Influences on Incentive Rates

INCENTIVE RATE REVIEW PROTOCOL

After determining incentive values by analyzing the considerations that determine the two influences (perceived value, return on investment) of incentive setting, the final requirement is to establish and follow a review protocol.

In some commercial environments, the review protocol is ongoing. For energy efficiency programs, it is best to review incentives on a periodic basis (ranging from quarterly to every two years). Periodic review is needed because, while certain elements can be ongoing, such as continuing customer and technology research, there are also standing engagement

mechanisms that involve the supply chain and key stakeholders. The review frequency is determined by the program delivery structure, the rate of market transformation and the incentive expenditure. It is acceptable to have different review frequencies for different technologies and programs.

Ideally, if there is budget and resources to conduct reviews, each incentive level should be reviewed annually at minimum. However, in some cases, a two year review process may be justifiable. Even if incentive levels cannot be reviewed comprehensively every year, the market price of the measure should always be updated. For certain technologies that either have high participation, are quickly evolving or both, it is important to assess incentive levels more frequently. For example, a quarterly assessment may be appropriate, but it can be a light touch assessment, provided that key metrics are tracked during the program record keeping process. For technologies that are either more mature, do not naturally have a high uptake due to niche application or both, there is less risk in having an annual incentive review process.

The other element of the review protocol is to list the factors for consideration, and how each factor will be assessed. These factors include:

- the price a customer will pay for the product;
- the price and penetration curve of the technology;
- the Incremental Equipment Costs and the Participant Cost Test
- the forecasted change in savings over time;
- the supply chain and stakeholder discussion;
- benchmarking;
- program evaluation;
- historical program performance review; and
- the financial impacts.
    - Cost Effectiveness Impacts
    - Budget Impacts.

In some cases, certain factors will be clear regarding analysis and recommendations, and in other cases, there will be additional work required. It is important to establish and understand the tolerance for these factors.

Jurisdictional Research

JURISDICTION IDENTIFICATION AND SELECTION

The selected jurisdictions were as follows:

- Ontario (IESO);
- Ontario (Union Gas);
- British Columbia (BC Hydro);
- California (PG&E);
- Oregon (Energy Trust of Oregon);
- Washington (Energy Trust of Oregon);
- New York (Con Ed);
- New York (NYSERDA);
- Vermont (Efficiency Vermont);
- Maine (Efficiency Maine); and
- Massachusetts (National Grid).

The jurisdictions were chosen for one or more of the following reasons:

- considered best-in-class;
- similar size to Nova Scotia;
- similar market structure, energy efficiency policy environment and energy efficiency program delivery structure to Nova Scotia; and
- similar climate to Nova Scotia.

BEST-IN-CLASS

In Canada, Ontario and British Columbia have the largest energy efficiency budgets and the longest history of designing and delivering energy conservation programs. They are also usually considered the leading provinces for promoting energy efficiency.

In the United States, the American Council for an Energy-Efficient Economy (ACEEE) 2015 State Efficiency Scorecard had the following results:[11]

[11] The 2015 State Energy Efficiency Scorecard, ACEEE, October 2015, Available: http://aceee.org/sites/default/files/publications/researchreports/u1509.pdf

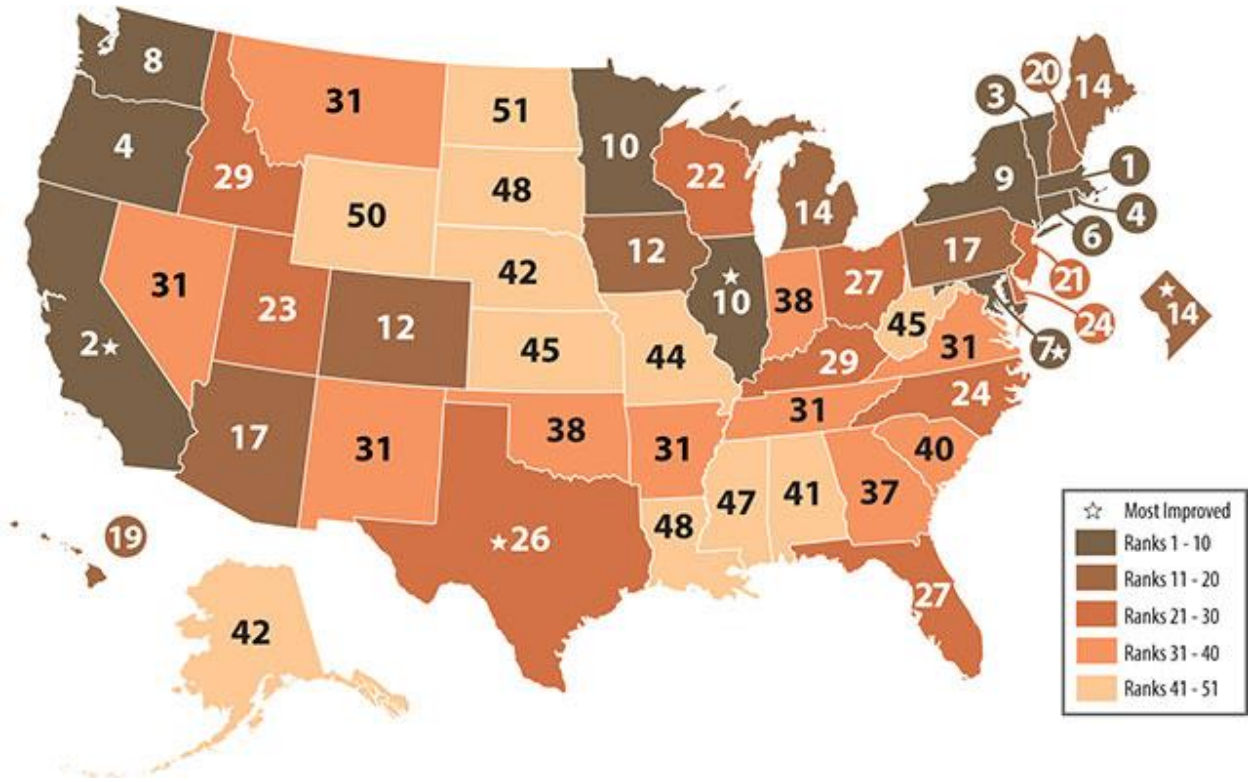


Figure ~~6~~5~~6~~: ACEEE State Energy Efficiency Scorecard

The American jurisdictions scanned in this report all rank in the top ten of the 2015 edition of the ACEEE scorecard, other than Maine, which is ranked at 14 out of 51 jurisdictions. The scorecard ranks the states based on criteria that reviews their policy and program efforts, their recent performance, identified best practices and leadership. All of the American jurisdictions selected have long-term Energy Efficiency Resource Standards (EERS), which demonstrate their commitment to energy efficiency as a sustainable form of electricity supply.

SIZE, STRUCTURE AND CLIMATE

Vermont, Maine and National Grid in Massachusetts all serve a similar population to ENS's programs. In terms of budget magnitudes, stock and sales data, and electricity savings targets, their similarity in size allows for comparative analysis. Efficiency Maine and Efficiency Vermont have very similar market structures to ENS, with all three serving as energy efficiency utilities.

Jurisdictions such as BC Hydro, IESO in the Ontario electricity sector, NYSERDA and the three utility companies in National Grid, New York Con Ed and PG&E, all have very different electricity systems, policy goals and oversight structures. They were selected to obtain the full spectrum of environments for which incentives can be set and offered. Union Gas was selected to offer a strictly natural gas energy efficiency perspective. Finally, jurisdictions in Maine, Vermont and Massachusetts were chosen as they have similar climates to Nova Scotia, so the types of efficiency technologies in the market, especially for HVAC and building envelope, are similar.

FINDINGS AND IDENTIFIED BEST PRACTICES

Our jurisdictional research has shown that the majority of jurisdictions employ similar methodologies and approaches to setting incentives. All of the jurisdictions have broad program design, TRM and/or market research processes, but there was not a consolidated, specific process on incentive-setting alone. While there are many detailed nuances which differ from jurisdiction

to jurisdiction (e.g., how they conduct supply chain research), our research has shown that the general framework and best practices for setting incentive rates follow the workflow highlighted below. It is important to note that the workflow does not necessarily represent concrete, sequential steps, as setting incentives is typically a process which incorporates all of the considerations described with analysis performed in parallel.

It is important to note that our research indicates that EfficiencyOne also performs many of these steps at a high-level; as such, our recommendations provided later in this document are focused on the details and nuances.

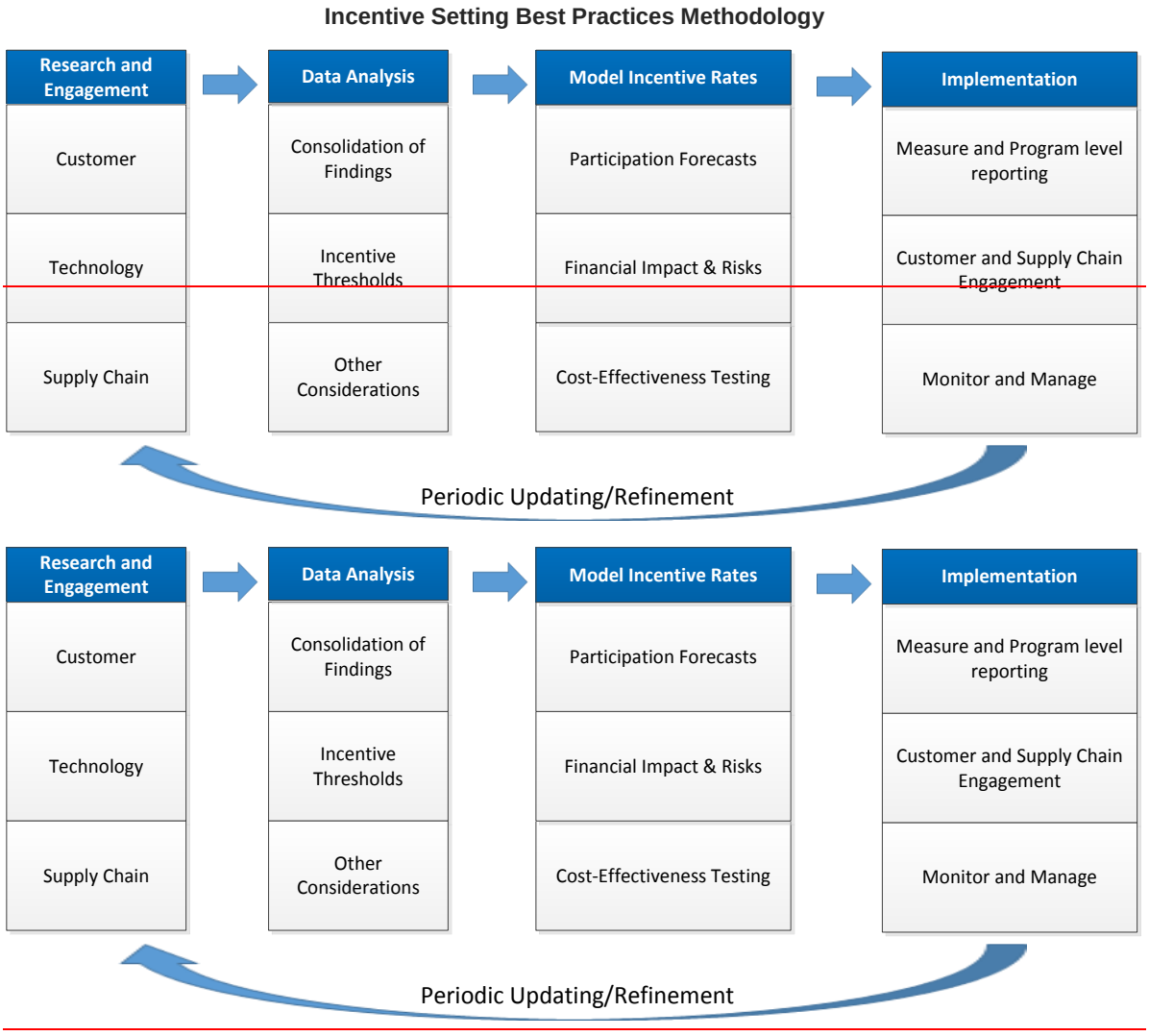


Figure 767: Identified Incentive Setting Best Practices Methodology

Research and Engagement Phase			
General Principle	Definition	Examples	Identified Best Practice
Customer Research	Most jurisdictions studied undertake customer research (either primary or secondary) to identify the motivations to participate in energy efficiency programs and the barriers preventing participation in specific programs or generally in energy efficiency initiatives.	PG&E holds periodic non-residential focus groups used to gather customer barriers and required incentives for moving forward. The Energy Trust of Oregon is mindful of the impact of incentive rates on the market barriers identified during its structured measure and incentive development process. Efficiency Vermont performs market analysis to assess market drivers and barriers as well as the customer value proposition. Efficiency Vermont outlines this information in the Draft Product Brief document. BC Hydro conducts primary research such as one-on-one consultations for larger customers. The objective is to determine awareness, barriers and purchase decisions.	Program administrators perform periodic studies with key participant groups to determine the following: • How customer motivations to participate have changed • How customer barriers to participation have evolved • The impact of existing incentives on participant behaviour The program evaluation process can be an appropriate means to perform this research. For new measures, this process should be undertaken at the outset of incentive development.
Technology Research	This research is conducted with the goal of understanding the savings opportunity for the technology, and to establish a range for the incentive level. All of the jurisdictions investigated identified this as a key element of their incentive setting practices. This phase can include benchmarking to obtain the required data from comparable jurisdictions.	PG&E will perform primary and secondary market research to determine measure performance and metrics. National Grid contributes to the Massachusetts Technical Advisory Committee (MTAC). The Committee reviews new energy efficiency technologies and publishes threshold technical requirements for qualifying products or processes to enable them to become eligible for incentives. Multiple jurisdictions create documents similar to TRMs. For example: Efficiency Maine's Residential and Commercial TRM provides documentation for energy and demand savings calculation of measures and operates as a common point of reference for the methods, formulas, assumptions and sources used. The Commission of Con Ed New York's market approves of technical manuals to provide a uniform, measure-specific approach to estimate the energy and demand savings for measures.	Program administrators maintain a resource similar to a TRM which contains the following information: • Measure savings vs. baseline • Assumptions and calculations used in calculating savings • Current status of baseline and efficiency technology in market

Research and Engagement Phase			
General Principle	Definition	Examples	Identified Best Practice
		The Energy Trust of Oregon will examine other jurisdictions' incentive rates when introducing new measures to its portfolio. For weather sensitive measures, it will examine jurisdictions which experience similar annual weather conditions.	
Supply Chain Research	Surveying the supply chain and service providers is extremely valuable during the incentive setting process. They can provide additional insight into customer barriers and motivations. Through product price research, they can assist in providing a point of reference to update or create incentive levels. Lastly, their feedback can be used to improve program delivery.	PG&E will hold on-camera interviews with distributors and manufacturers to determine measure price points and ~~incremental costs~~Incremental Equipment Costs as well as verify measure performance. The Energy Trust of Oregon is mindful of how incentive levels will influence the stocking levels of suppliers and distributors. Efficiency Vermont conducts market testing during the New Product Development process (their process for new program design). This involves testing the product prototype with customers and key stakeholders before launch.	Program administrators perform research in supply chains for their key measures to determine: • Baseline and efficient measure costs • Highlight the major barriers to participation found through customers interactions • Provide feedback on program delivery strategies • Determine how incentive rates in market will alter their business strategies

Table 7~~37~~: Research Engagement Phase

Data Analysis Phase			
General Principle	Definition	Examples	Identified Best Practice
Consolidation of Findings	Once the research and engagement phase is completed, findings must be compiled to be analyzed and weighed against each other. This sets the first stage for setting incentive rates.	The Energy Trust of Oregon undertakes this exercise during the Preliminary Measure Development stage of its Measure Development and Revision Process.	Program administrators include in their TRM (recommended above) or in separate documentation the major barriers identified in market and the potential means to address them.
Incentive Threshold Setting	Through the supply chain and customer research, the thresholds of ~~incremental cost~~Incremental Equipment Cost and the customer's willingness to pay can be determined to act as points of reference for further stages in the incentive development process.	PG&E will set a maximum incentive rate which is roughly 75-100% of ~~incremental cost~~Incremental Equipment Cost identified in the Research Phase.	Program administrators: • Capture ~~incremental costs~~Incremental Equipment Costs • Capture desired incentive rates from market participants

Data Analysis Phase			
General Principle	Definition	Examples	Identified Best Practice
			• Capture incentive rates used in benchmark jurisdictions (for new incentives) • Develop target budget and cost effectiveness thresholds
Other Considerations	When considering the inclusion of a measure in programs, efficiency administrators may include other considerations aside from the measure savings potential and the measure costs. These varied by jurisdiction but were driven by factors such as policy goals, supply chain availability, market readiness, go-to-market strategy, etc.	While NYSERDA will typically cap commercial incentive rates at 50% of project costs, it allows up to 70% of project cost to be incented for agricultural customers in order to promote energy efficiency in that sector.	Program administrators identify the key driving considerations related to individual measures and ensure that they are addressed in the Incentive Rate Modelling Phase as much as other constraints allow.

Table 848: Data Analysis Phase

Model Incentive Rates			
General Principle	Definition	Examples	Identified Best Practice
Participation Forecasts	To determine the impact of the measure on the total savings target and budget, it is critical to create a participation forecast.	In Ontario, the IESO requires that any new program or measure be approved through a formal business case submission process which includes a program participation forecast. Efficiency Vermont, through the new product development process, will estimate the total size of the market for that measure in order to forecast potential measure uptake.	A measure forecast should be created in order to determine the required program delivery approach and total budget impact. The best practices for determining participation forecasts are using historical experience and the total and achievable market size as indicators. If there other available incentives for ratepayers, or a bundling incentive option being considered, they should be noted and the participation forecast adjusted accordingly.
Financial Impacts & Risks	Using preliminary incentive rates identified in the previous phase and participation forecast, the impact on the aggregate administrator budget and the program budget can be determined. This	The Energy Trust of Oregon is mindful of the impact of incentive rates on the market barriers identified during its structured measure and incentive development process. Accordingly, it seeks to properly balance the needs for administration and incentive funding in its programs	Program administrators should undertake the following activities to identify financial impacts: • Determine the impact of

Model Incentive Rates			
General Principle	Definition	Examples	Identified Best Practice
	can set the stage for incentive adjustments in order to properly balance the incentive rate vs. the identified market barriers and the requirements to adequately deliver the program to meet savings goals. Many jurisdictions' studies weigh the impact of incentive rates on total program budgets.	required to overcome the identified market barriers. NYSERDA conducts financial forecasting as part of their incentive setting process in order to determine the impact on program budgets.	incentives on program budgets • Determine the volumetric risk impacts on program budgets • Identify where/how budget constraints may hinder the desired program delivery strategies to overcome customer barriers
Cost Effectiveness Testing	The cost effectiveness of measures, programs and portfolios should be tested to determine whether a modification in incentive or administration expenses is required to deliver the programs in a manner which meets the cost effectiveness standards set by regulators. All jurisdictions studied perform cost effectiveness testing and certain jurisdictions will perform it at the measure level when setting incentives. Typically, the jurisdictions used variants of the TRC and the PAC as the main tests. It is also important to note that many jurisdictions included other benefits aside from avoided capacity and energy when determining avoided costs.	PG&E performs streamlined cost effectiveness testing at every stage of the product development process in order to determine preliminary incentive rates to ensure that the incentive will allow for the proper market transformation goals to be achieved. There is no obligation for every measure to be cost-effective in PG&E's portfolio. The Energy Trust of Oregon measures cost effectiveness at both the measure and portfolio level using the TRC and the UCT. Yet, the Oregon Public Utilities Commission (PUC) has allowed for non-cost effective measures to be included in the portfolio if it meets certain criteria. This has been very beneficial in maintaining market momentum of measures and programs in a market where natural gas wholesale prices have fallen. Measure level testing excludes administration and delivery costs as these can vary greatly based on the go-to-market approach of the program. For incentives that are increasing, NYSERDA conducts cost effectiveness analysis for the TRC and PAC, and as required, presents it to New York PUC.	The following cost effectiveness testing best practices should be adopted by program administrators: • Measure level screening and either program or portfolio-level cost effectiveness testing • The allowance for non-cost effective measures to be included in portfolios should the measure require temporary cost effectiveness relief, should it be an emerging measure which aligns with policy goals or should the measures be targeted for a specific priority sector (e.g., low income) • The use of appropriate cost effectiveness tests for screening and threshold setting • The use of the average or weighted average costs of energy to determine avoided costs

Table 9~~5~~9: Model Incentive Rates

Review of Nova Scotia's Electricity System and Market

NOVA SCOTIA'S ELECTRICITY SYSTEM

In 2015, Nova Scotia had an annual electricity consumption of 10,400 GWh. The residential sector accounts for 45 percent of consumption, the commercial sector uses about 32 percent, and the industrial sector uses 23 percent. Nova Scotia's industrial load has been significantly reduced over the past few years. The loss of industrial load, the effort to bring renewables into the supply mix and increased fuel costs have all contributed to a 70 percent increase in Nova Scotia's retail electricity rate over the past 10 years.

Nova Scotia Power Inc. (NS Power) owns about 95 percent of Nova Scotia's infrastructure for generating and delivery electricity. NS Power is a private corporation (wholly owned by a public company) that is regulated by the UARB. The other five percent is owned by six municipal electric utilities that can generate their own power or purchase it from NS Power or independent power producers.

Nova Scotia is transitioning away from coal supply.[12] The 2014 supply mix was dominated by coal, accounting for 60 percent of generation. Domestic renewables (wind, hydro and tidal) accounted for more than 15 percent, more than 10 percent coming from natural gas and imported renewables at more than five percent. Efficiency and conservation activities currently contribute about eight percent of total generation.

By 2020, the province aims to dramatically reduce the coal contribution to the supply mix to between 20-35 percent, while increasing the domestic renewables share to 27 percent and the imported renewables share to 23 percent. The key themes that Nova Scotians want followed for the electricity system are:

- accountability;
- market competition;
- stable power rates in an accountable and transparent electricity system; and
- support for innovation, but not at any cost.

Provincial legislation also requires that, by 2020, 40 percent of Nova Scotia's electricity supply must come from renewable sources. Similarly, in 2020, the provincial cap on greenhouse gas emissions will be lowered by 25 percent to 7.5 million tonnes in 2020; this will be further reduced to 4.5 million tonnes by 2030.[13]

Nova Scotia is a winter peaking province with a very diverse load. The 2015 peak was just over 2,100 MW. During the shoulder seasons, loads can be as low as 700 MW. Therefore, the system needs to manage variable loads throughout the year, while maintaining price certainty for customers.

Projects such as the Maritime Link, allowing for a direct renewable to retail market, and expanding conservation efforts to offset load growth are critical.

NOVA SCOTIA MARKET CHARACTERISTICS

Nova Scotia has a population of approximately 950,000 people. There are just under 500,000 residential, commercial and industrial electricity accounts for NS Power.

[12] Our Electricity Future: Nova Scotia's Energy Plan 2015-2020, Nova Scotia Department of Energy, Available: http://energy.novascotia.ca/sites/default/files/Our-Electricity-Future.pdf

[13] Our Electricity Future: Nova Scotia's Energy Plan 2015-2020, Nova Scotia Department of Energy, Available: http://energy.novascotia.ca/sites/default/files/Our-Electricity-Future.pdf

Rate Class	Number of Customer Accounts *
Residential	456,991
Small General Business	24,109
General Business	11,349
Large General Business	19
Small Industrial	2,221
Medium Industrial	198
Large Industrial	32
Municipal	8
Total	**494,927**

*This does not include the customer accounts from the six municipal electric utilities.

Table 10~~6~~10: NS Power Customer Accounts by Rate Class

The following information was obtained from the Nova Scotia 2015-2040 DSM Potential Study, authored by Navigant Consulting in 2014~~.~~[14] , from information obtained from EfficiencyOne employees and from other industry data sources such as Stats Canada and ElectroFed.

RESIDENTIAL SECTOR

There are more than 390,280 residential households in Nova Scotia.[15] The majority of customers are on flat-billing residential electricity purchase agreements. Only 1,000 customers are on residential time-of-use pricing, which minimizes the ability to include messaging and incentives that reduce peak consumption in the residential sector. Of these homes, 75 percent are single family dwellings, both detached and attached. Residential new construction has been relatively consistent the past 35 years, with each six year period since 1980 contributing an average of 6-8 percent of the current residential housing stock. The average size of the homes is between 1,550-1,765 square feet, with 75 percent of homes being between 1,000 and 3,500 square feet~~.~~[16] [14~~14~~] .

The potential study indicated that 51 percent of all installed lamps were incandescent, with LEDs only making up four percent of the installed base~~.~~[17] [14~~14~~] . When comparing these stock numbers to 2015 residential sales data for Atlantic Canada, incandescent technology still dominates the market with the largest contribution in A lamps and decorative lamps, and the second largest share in reflector lamps. LEDs sales are increasing, especially in the reflector lamp category, but the total installed base indicates that significant efforts are still required to achieve market transformation in the residential lighting space.

In Nova Scotia, 31 percent of all primary heating systems in homes are electric~~.~~[18] [14~~14~~] . The dominant heating technology is fuel oil, with a 46 percent share. Secondary heating systems are found in 59 percent of Nova Scotia's homes, and of these, 32 percent are electric. This leads to an estimate of 225,000 electric heating systems in Nova Scotia, of which 140,000 are primary and 85,000 are secondary.

EfficiencyOne assumes that primary heating systems have 2,750 operating hours, while secondary heating systems are used a variable amount that is less than the primary hours of operation. This leads to a significant opportunity to pursue electricity

[14] Nova Scotia 2015-2040 Demand Side Management (DSM) Potential Study – Navigant Consulting
[15] http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/famil55a-eng.htm
~~[16] Nova Scotia 2015-2040 Demand Side Management (DSM) Potential Study – Navigant Consulting~~
~~[17] Nova Scotia 2015-2040 Demand Side Management (DSM) Potential Study – Navigant Consulting~~
~~[18] Nova Scotia 2015-2040 Demand Side Management (DSM) Potential Study – Navigant Consulting~~

savings in residential space heating, since substantial savings can be obtained in one home. Additionally, due to the average housing size (leading to lower heating requirements), there are more options for electricity-efficient heating systems.

Nova Scotia homes do not have a large space cooling load. The primary cooling system is an electric fan, while only three percent of homes have central air conditioning, and 18 percent have portable air conditioning units (room or window air conditioners). Nova Scotia is a winter peaking province, therefore electricity savings targeted at off-peak periods may not help with capacity management. Additionally, space cooling savings usually have higher unit costs ($/kWh) for electricity conservation programs due to the limited hours of operation.

Finally, Nova Scotia homes have a high proportion (61 percent) of electric water heaters. This majority also presents efficiency opportunities for larger savings coming from individual projects.

BUSINESS, NOT-FOR PROFIT AND INSTITUTIONAL SECTOR

The commercial sector accounts for businesses, not-for-profits and institutional customers. In Nova Scotia, there are 37,679 accounts that are represented by the Small Business Advocate. These accounts cover three rate classes (small general business, general business and small industrial). Of the 37,679 accounts, 24,109 are small business accounts. Not all of the 37,679 accounts are eligible for the Small Business Energy Solutions program, where annual consumption has to be less than 350,000 kWh.

In addition to the accounts represented by the Small Business Advocate, there are 19 large general business accounts, 32 large industrial accounts and 238 other business and industrial accounts.

Weekly operating hours for the different commercial customers are split relatively evenly between the different categories:

- 37-48 hours/week (22 percent) – 2100 hours annually;
- 49-72 hours/week (17 percent) – 3100 hours annually;
- 73-96 hours/week (14 percent) – 4400 hours annually;
- 97-120 hours/week (8 percent) – 5700 hours annually;
- 121-168 hours/week (34 percent) – 7500 hours annually and
- Other (5 percent).

Where possible, project applications should try and capture operating hours, either directly or through a proxy. An example of a proxy could be a listing of the assumed hours of operation for a specific business segment or business type. This is included in the incentive level setting recommendations.

Indoor lighting accounts for 60 percent of lighting energy consumption within the commercial sector. Fluorescent technology dominates indoor lighting in the commercial sector with 94 percent of the installed lamp base. The average lamp wattage is 36W, which indicates that the commercial lighting market is close to market transformation from the T12 to the efficient T8. Engineering estimates lead to the conclusion that total conversion of T12 to efficient T8 annual sales would only yield about 15 percent of the annual target. Tubular LEDs have a limited presence in Nova Scotia, so there may be an opportunity to drive future savings. There is also a large opportunity for lighting controls in indoor applications. As indicated, Nova Scotia commercial facilities are typically average, running 12 hours a day, with limited lighting controls penetration (32 percent of indoor lighting is continuous with no control features, while 58 percent only features on/off control).

Unlike the residential sector, the commercial sector features space cooling systems, with 60 percent penetration. The majority of the space cooling systems are direct expansion, meaning there is not a significant chilled water load. There may be an opportunity for rooftop unit equipment upgrades and maintenance incentives to drive savings. Currently, ENS offers financial incentives for rooftop unit equipment upgrades, but not maintenance work.

Finally, unlike the residential sector, the majority of heating systems in commercial buildings are electric, with baseboard heating as the dominant technology.

Efficiency Nova Scotia – Policy, Performance and Programs

Efficiency Nova Scotia Corporation (ENSC) commenced operations in 2010 after the enactment of the *Efficiency Nova Scotia Corporation Act* in 2009. Revisions to the *Public Utilities Act*, introduced through the *Electricity Efficiency and Conservation Restructuring (2014) Act*, pronounced a structural change for energy efficiency and conservation activities in Nova Scotia in 2015.

ENSC ceased to exist as Nova Scotia's DSM provider on January 1, 2015. In its place, the Minister of Energy created and awarded the ENS franchise. The first franchise holder is EfficiencyOne, an organization incorporated on July 8, 2014 under the *Canada Not-for-profit Corporations Act*. EfficiencyOne is a public utility pursuant to the *Public Utilities Act.*

HISTORICAL RESULTS AND COMPARISON TO OTHER JURISDICTIONS

We provide ENSC's historical portfolio savings from 2010-2014 below, along with a unit cost (first year energy savings), scale of relative effort, and a proxy for "residential customer motivation" comparison to the other jurisdictions:

Year	Residential Energy Savings (GWh)	Business, Not for Profit and Institutional Savings (GWh)	Residential Demand Reduction (MW)	Business, Not for Profit and Institutional Demand Reduction (MW)	Fully Allocated Residential Expenditure ($ million)	Fully Allocated Business. Not for Profit and Institutional Expenditure ($ million)	Fully Allocated Enabling Strategies ($ million)
2010	22	60	5.89	9.96	7.49	11.82	3.39
2011	44	98	12.11	16.75	19.71	13.12	2.96
2012	70	88	17.71	16.08	18.74	20.49	4.44
2013	80	84	16.80	17.30	17.68	18.09	3.85
2014	80	71	15.51	11.57	17.35	16.46	3.30
Total	**297.15**	**401.30**	**68.02**	**71.65**	**80.97**	**79.98**	**17.94**

Table 11~~7~~11: ENS Historical Performance

Utility/Agency	Unit Cost of Conservation	Annual Energy Savings as % of Retail Sales (2014)	Residential Electricity Rate (2014)
Nova Scotia	$0.25/kWh	1.3%	$0.148/kWh
Ontario (IESO)	$0.25/kWh	1.3%	$0.10-$0.124/kWh
British Columbia (B.C Hydro)	N/A	N/A	$0.10-$0.12/kWh
California (PG&E)*	$0.43/kWh	1%	$0.1625/kWh
Energy Trust of Oregon*	N/A	N/A	$0.11/kWh
New York (ConEd)*	$0.48/kWh	≈1%	$0.2885 cents/kWh
New York (NYSERDA)*	N/A	≈1%	$0.2005/kWh
Vermont*	$0.40/kWh	2%	$0.125-$0.195/kWh
Maine (Efficiency Maine)*	$0.20/kWh (Electric Base) $0.30/kWh (MACE Low Cost) $0.35/kWh (MACE High Cost)	1.6%	$0.1567/kWh
Massachusetts (National Grid)*	$0.46/kWh	2.94%	$0.165-$0.185/kWh

Table 12~~8~~12: Unit Cost, Energy Savings, and Residential Rate from Different Jurisdictions

**The dollar amounts for these jurisdictions are quoted in US dollars.*

As can be seen from Table ~~8~~12, the portfolio performance achieved by EfficiencyOne and the current energy efficiency targets in Nova Scotia are comparable to the other jurisdictions studied. The numbers support, at a portfolio level, that that there isn't a significant variation in ENS spending, especially with regards to incentive spending, compared to the other jurisdictions.

EFFICIENCY GOALS

As per the *Electricity Efficiency and Conservation Restructuring (2014) Act*, "Nova Scotia Power Incorporated shall undertake cost-effective electricity efficiency and conservation activities that are reasonably available in an effort to reduce costs for its customers."[19]

After the end of the most recent DSM planning process, ENS's 2016-2018 savings targets and budgets are as follows:

Year	Savings (GWh)	Expenditure ($ million)	Unit Cost ($/kWh)
2016	133.1	$33.21	$0.25/kWh
2017	136.5	$34.02	$0.25/kWh
2018	136.3	$34.92	$0.26/kWh
Total	405.9	$102.15	$0.25/kWh

Table 13~~9~~13: ENS's Targets and Budgets

[19] *Electricity Efficiency and Conservation Restructuring (2014) Act - http://nslegislature.ca/legc/bills/62nd_1st/1st_read/b041.htm*

From a total consumption perspective, ENS's annual target for 2015 is 1.3 percent of electricity sales for that year, which is comparable to other jurisdictions as seen in Table ~~8~~12.

POLICY CONSIDERATIONS

ACHIEVABLE POTENTIAL

In 2014, Navigant Consulting conducted an achievable potential study for Nova Scotia, (Nova Scotia 2015-2040 Demand Side Management (DSM) Potential Study)[20]. It indicated that the achievable potential and required expenditure for 2016, 2017, and 2018 were as follows:

Year	Annual Savings (GWh)	Expenditure ($ million)	Unit Cost ($/kWh)
2016	139.9	$50.5	$0.36/kWh
2017	141.7	$50.0	$0.35/kWh
2018	136.2	$52.4	$0.38/kWh
Total	417.8	$152.9	$0.37/kWh

Table ~~14~~1014: Nova Scotia Achievable Potential Summary

The numbers presented are for the base scenario, where the incentives do not change over time. This suggests that ENS's current savings targets are almost 100 percent of the achievable potential. However, the approved budget by the UARB is only between 50-70 percent of the forecasted required budget set forth in the Achievable Potential Study, depending on the year and the scenario.

This leads to the conclusion that ENS is running its portfolio efficiently, and is optimizing its savings for expenditure. The best practices identified earlier will be applied to ENS's portfolio and specific improvements will be suggested, but it should be clear that quantitatively, the performance of the portfolio from an expenditure to annual savings basis is good compared to the available achievable potential. The historical performance has also been good compared to other jurisdictions as shown in the historical results analysis above.

CLEAResult used the data from the *Nova Scotia 2015-2040 Demand Side Management (DSM) Potential Study* to provide background and context in terms of understanding the housing, commercial building and equipment stock in Nova Scotia, and the achievable savings potential through the current programs.

COST EFFECTIVENESS AND AVOIDED COSTS

At the portfolio level, cost effectiveness is guaranteed since the combination of savings targets and budget is lower than the cost effectiveness threshold (provided that the persistence of the energy savings is equal to or better than the forecast). However, during each program planning phase, ENS internally sets a cutoff of a TRC of 1.0 for each program. The TRC benefits include any potential impacts from wood or water consumption or savings (which are about 1 percent of the DSM Resource Plan portfolio benefits). The PAC is used for informational purposes, but is not part of the review protocol.

All program measures are tested at the measure level for TRC, and non-compliant measures can be removed. Occasionally, measures that do not pass the measure level TRC are included in programs due to other considerations, such as market transformation or program delivery strategy. Similar strategies are applied to non-cost effective measures in other jurisdictions

[20] Nova Scotia 2015-2040 Demand Side Management (DSM) Potential Study – Navigant Consulting

to maintain market momentum and adapt to sudden changes in avoided costs (e.g., Energy Trust of Oregon). At the measure level, program administration costs are included in the TRC screening.

The program administration costs are allocated based on a unit program administration costs/kWh savings adder. This is an interesting approach since, for TRC screening, the only cost parameter that ENS controls is the program administration costs (incentives are not directly included in the TRC). Other jurisdictions have applied different approaches for measure level testing, choosing to exclude administration costs as these can vary greatly depending on the maturity of the measure in the market.

In conducting cost effectiveness screening, ENS uses the Energy Efficiency Resource Assessment Model (EERAM), developed by Navigant. This model is typically targeted for long-term (20-25 years) energy savings potential and planning purposes. It is not used for incentive setting.

Avoided costs are updated every three to four years with the filing of the Integrated Resource Plan (IRP). Nova Scotia Power Inc. provides the avoided costs.

The current methodology has conservation activity competing with the lowest cost of supply. This is different to many other jurisdictions where avoided costs are typically calculated using either the average or marginal cost of supply and potentially other costs, such as renewable standards. Nova Scotia is forecasted to have excess electric generation capacity until 2019. Therefore, current avoided costs for capacity are set at $0/kW for any demand savings occurring up to that time. Because of this, measures and projects that pass the TRC and PAC are only able to claim the benefit of avoided energy costs until 2020. After 2020, they can claim both avoided energy and capacity benefits.

This can be a challenge since momentum through awareness and a continued presence in the market is required for long-term efficiency program success. It is difficult to modify energy efficiency program performance and the measure portfolio (both selection and incentive levels) to adjust for annual variations in the avoided costs. Deployment of specific programs or measures can take advantage of annual variations, but it is difficult to apply this approach to an entire portfolio. Other jurisdictions, such as Oregon, have addressed this issue by providing relief from a cost effectiveness perspective when there needs to be alignment with energy efficiency policy and portfolio savings goals.

The avoided costs of energy are the same across all time periods in the year. This means that the benefits derived from energy savings do not depend on the time that the energy savings occur. There is not a premium for measures that contribute energy savings coincidently with peak periods, outside of avoided capacity savings during system peak.

CLEAResult understands that ENS is currently investigating the opportunity to recognize local avoided costs, and to consider discount and premium zones for electricity conservation. This position will be considered in any incentive methodology recommendations.

OTHER CONSIDERATIONS

Through the most recent program evaluation process, ENS has identified that some educational initiatives are incurring savings attribution issues, and have received tentative disallowance. This specifically was the case for the Home Energy Reports (HER) program. In the future, this may lead to additional difficultly minimizing expenditure by moving funding from financial incentives to educational incentives. This issue must be considered if an eventual goal is to ultimately eliminate financial incentives from programs, and reach market transformation of an energy efficient culture.

Finally, ENS does not use dual baselines in their energy savings estimates for measures for operational tracking. Dual baselines involve assuming a set baseline for a number of years, and then another baseline for the remaining number of years assumed in the energy savings persistence. Instead, they use an average wattage/consumption approach. This may be acceptable for determining annual energy savings, but may present challenges when determining lifetime energy savings. An approach should be considered for tracking lifetime energy savings through program management.

EFFICIENCY NOVA SCOTIA'S PROGRAM PORTFOLIO

The following table contains a summary of ENS's current programs, target market and incentive structure.

Commercial customers are defined as businesses, not-for-profits and institutional customers.

Current Programs

Mass Market programs (programs that do not target individual customers specifically) cover all types of program scenarios. For example, a retail program can cover all four of these scenarios (New Purchase/Installation, Replacement on Failure, Early Replacement and Replacement after Assumed Failure), and customers are not accepted into the program or declined from participating based on what category they fit in. In Table 15, CLEAResult and EfficiencyOne have outlined the predominant scenarios considered in the program design.

Program Name	Program Offer and Incentive Structure	Type of Program (for CE modelling purposes)
Residential Profile	An online assessment tool is provided for customers to enter information about their home and receive energy savings tips and information regarding options and incentives. The online assessment tool is provided free of charge. The expenditure for this effort is not included as an incentive, and savings are not attributed to its use.	Education and Awareness (no attributable savings)
Instant Savings	Residential customers receive instant discounts at the point of purchase for qualifying products at participating retailers. Incentives are offered on lighting and lighting control products, power bars, outdoor timers, programmable thermostats, outdoor clothesline kits and qualifying refrigerators and clothes washers. A delivery agent is involved to coordinate retailer efforts, provide the required training and manage compliance issues.	Replacement on Failure New Purchase/Installation Early Replacement
Appliance Retirement	Residential customers receive a financial incentive for the old equipment that is being provided to the program, free equipment pickup, and environmentally friendly decommissioning.	Early Retirement Early Replacement
Home Energy Assessment	Residential customers that are electrically heated receive a subsidized home energy assessment ($99 to the customer) which provides recommendations for energy efficiency upgrades with costs, savings and incentive options. The energy assessment is conducted by service organizations that are procured by EfficiencyOne. As desired, customers complete the upgrades, have a follow-up assessment to evaluate installed projects and savings, and confirm the appropriate incentive.	Early Replacement New Purchase/Installation
Residential Direct Install and Rental Properties and Condos	Residential customers receive products directly installed at no cost by qualified partners. These products include lighting measures, domestic water heating measures (where electric water heating) and power strips.	Early Replacement New Purchase/Installation
Green Heat	Residential customers that are electrically heated receive incentives or low cost financing for the installation of qualifying heating technologies. Pre-approval for installation must be granted for rebate eligibility or low cost financing. A final application/documentation review is required after installation to confirm the rebate payment or access to low cost financing.	New Purchase/Installation Early Replacement
New Home Construction	Residential customers that are planning to build electrically heated homes can have a Certified Energy Advisor review the building plans, and provide customized recommendations to improve the energy efficiency of the design. The review by the Certified Energy Advisor costs $99, and based on changes to the design, the customer can receive up to $2,000 in rebates. The rebate is paid after the Certified Energy Advisor	New Purchase/Installation

Program Name	Program Offer and Incentive Structure	Type of Program (for CE modelling purposes)
	conducts a follow-up assessment to evaluate the new energy performance of the home, either through the ENERGY STAR®, EnerGuide, or R2000 rating systems.	
Business Energy Rebates	This incentive offer for commercial and industrial customers is offered through a midstream with participating distributors, or downstream using an application process. Qualifying equipment is provided with a prescriptive incentive. Alternatively, qualifying customers are offered interest-free financing for 24 months instead of the prescriptive incentives.	Replacement on Failure New Purchase/Installation Early Replacement
Small Business Energy Solutions (SBES)	Qualifying small commercial and industrial customers (with an annual consumption under 350,000 kWh) receive qualifying products installed with up to 60 percent of the costs covered. Customers are also offered interest-free financing for 24 months in addition to the rebates.	Early Replacement New Purchase/Installation
Custom	Commercial, institutional and industrial customers are eligible to apply to the Custom Program for measures or projects that do not fit under a prescriptive project stream. Scoping and/or Feasibility studies have to be conducted before the project is approved to proceed. The incentive is calculated based on multiple factors (total cost, cost per kWh, simple payback and percentage of project cost), and is individually negotiated with each customer. Interest-free, multi-year financing is available for the remaining project costs. There is also a compressed air-focused component where customers can have a no-cost targeted study performed to investigate compressed air energy efficiency opportunities. Additionally, there is a leak fixing incentive. For larger commercial and industrial customers, recommissioning specialists will review the building's original operating documents, equipment, temperature settings and scheduling to ensure everything is working properly and set for optimal efficiency. The specialists provide the customers with a report outlining the enhancements made, and other areas for energy savings. The work conducted by the recommissioning specialists is partially covered (depending on cost, payback, and unit cost), up to a maximum of $25,000 per building. Customers can access other programs for the other energy savings opportunities. For commercial and industrial customers planning a new build, a building expansion or a major renovation, the program provides assistance with design through energy modeling assistance, fully covered up to $15,000. Customers can apply for prescriptive incentives for qualifying equipment, as well as access to additional incentives or interest-free, multi-year financing for the remaining incremental measure costs.	*Dependent on Project Parameters*
Energy Management Information Systems (EMIS)	For larger commercial and industrial customers, the EMIS program offers access to a performance management system to monitor and analyze energy usage in the facility. The program provides funding and facilitates the installation, training for, and evaluation of the installed equipment. The decision to maintain the system at the customer's facility is made annually.	New Purchase/Installation
Strategic Energy Management (SEM)	For larger commercial and industrial customers, SEM provides a comprehensive approach to energy management that results in sustainable energy and cost savings over the long-term. ENS provides support for implementing the SEM approach by facilitating energy mapping, monitoring and reporting, employee training, and support for	New Purchase/Installation

Program Name	Program Offer and Incentive Structure	Type of Program (for CE modelling purposes)
	employee engagement activities.	

Table 151115: ENS Program Overview

Low Income Program Plans

ENS's DSM portfolio currently does not feature an electricity DSM program exclusively directed towards the low income sector. However, there are plans for an energy efficiency incentive offering to this sector. CLEAResult has included a summary of the plans below:

> *Market analysis performed by Efficiency Nova Scotia in 2015 identified an opportunity to evaluate and begin development of a pilot program specifically designed to support efficiency improvements in low income multi-unit buildings. The pilot program would deliver building-wide upgrades that reduce electricity consumption in eligible properties. It is expected that the pilot program would provide 100 percent coverage for an energy audit to identify all opportunities. Additional rebates would be available for measures such as: insulation; air sealing; efficient heating systems; heat recovery systems; pipe insulation; sensors and timers; and Heating, Ventilation and Air Conditioning (HVAC) controls.*
>
> *The pilot program delivery is intended to be modeled after the SBES delivery model and unit cost, and will support all providers of affordable rental housing. The pilot aims to remove the 350,000 kWh cap currently established under SBES so that larger, affordable housing properties are not arbitrarily neglected. Due to the limited budget of the pilot, considerations on funding caps will also be developed at both the owner and project levels (i.e. restricting the amount of funding for any one landlord or project).*[21]

Programs Studied in Recommendations

The following table contains an analysis of the barriers and the associated incentive strategy for the four investigated programs.

Program	Identified Barriers	Incentive Strategy
Instant Savings	1) Residential customers worry about upfront costs. For example, LED penetration, despite dropping upfront costs from 2013-2015, LEDs still account for less than 10 percent of A Lamp sales due to their retail price compared to incandescent lamps. Appliances are large budget items, and features are prioritized over efficiency. 2) Residential customers need simplicity; submitting incentive applications is a barrier to participation. 3) Retailers and their employees show varying degrees of awareness, engagement and knowledge of the program.	1) Residential customers receive incentives at the point of sale. The incentives are typically between 15-50 percent, but may be higher for some measures. 2) Residential customers receive instant discounts at the point of purchase for qualifying products at participating retailers. Receiving the discount at the point of purchase prevents the need for an incentive application. 3) A delivery agent is involved to coordinate retailer efforts, provide the required training and manage compliance issues. Additionally, strategies, tactics and campaigns are used to promote participation through improving customer awareness and education, while also conducting retailer training to improve engagement and program knowledge.

[21] Email Communication from EfficiencyOne Program Management Staff – May 25, 2016

Program	Identified Barriers	Incentive Strategy
Home Energy Assessment	1) Residential customers lack knowledge about the potential for savings in their homes. 2) Residential customers worry about upfront costs.	1) Residential customers receive a subsidized energy assessment to learn about the energy efficiency opportunities in their homes, and the potential costs, savings, and incentive options. They also have access to a personal energy planning service for additional support. 2) Residential customers receive incentives for installing eligible measures. The incentive is typically 15-25 percent of the project costs.
Business Energy Rebates	1) For efficiency projects, commercial and industrial customers are concerned about upfront capital. 2) Commercial and industrial customers have a lack of education about energy efficient projects. 3) Commercial and industrial customers show an unwillingness to change their practices.	1) Commercial and industrial customers receive prescriptive incentives for purchased products. Incentives are capped at 50 percent of project costs, but usually do not reach this amount. 2) Through the midstream application, the distributors are engaged to educate the contractors. The contractors are one of the major points of influence for customers, and through this educational effort, awareness for energy efficiency grows. 3) Through the midstream application, in addition to the contractor education benefit that will pass down to the customers, the distributors are encouraged to stock more efficient products, forcing the market to change in terms of the options available.
Custom Program	1) Commercial and industrial customers have measures that are not included in the prescriptive programs. This includes the new construction, recommissioning and compressed air project streams that fall within the Custom Program.	1) The program allows projects that do not fit into the prescriptive incentive programs, provided they meet eligibility criteria, and undergo studies to verify their energy savings and costs.

Table 161216: Barriers and Incentive Strategy for EfficiencyOne Programs Studied

Incentive Setting Methodology Analysis and Recommendations

CLEAResult's analysis and recommendations for incentive level setting methodology will focus on the following areas:

1. General Principles;
2. Formal and Documented Incentive Setting Process;
3. Program-Specific Recommendations;
    - Instant Savings Program;
    - Custom Program;
    - Business Energy Rebates Program; and
    - Home Energy Assessment Program.
4. Complementary Excel Tool for Review Protocol Considerations;
5. Program Financial Simulation;
    - Instant Savings Program; and
    - Custom Program.

SUMMARY OF RECOMMENDATIONS

1. **It is recommended that EfficiencyOne consider all of the general principles for incorporation into an incentive setting process.**

   CLEAResult has provided a documented, incentive setting process (that incorporates these general principles) that can be leveraged by EfficiencyOne, along with the required template documents and tools.

2. **In addition, through recommending the general principles be followed in any incentive setting methodology that EfficiencyOne implements, there are several supporting requirements:**

   a) Ensure assumptions for residential and commercial LEDs, residential HVAC technology, commercial fluorescent technology and commercial Variable Frequency Drive (VFD) technology are kept up to date by conducting customer and technology research.

   b) Further support technology research by implementing a TRM approach. The energy savings and cost effectiveness metrics of the measures provide several reference points for setting incentive levels.

   c) Develop a consolidated calculator that can conduct the analysis that supports the incentive-level setting process. The calculator should have the following functionality:

      i. Capture and store measure-level information obtained from the recommended research activities and TRM process
      ii. Perform short-term program design or incentive-level cost effectiveness screening
      iii. Integrate the review protocol that has been provided in the Excel-based tool.

3. **Through adopting an incentive setting methodology that follows the general principles, conduct a program financial simulation of all of the current incentives in the programs to evaluate their current levels.**

GENERAL PRINCIPLES FOR INCENTIVE RATE SETTING

Based on CLEAResult's experience and research on best practices, it is recommended that any incentive level setting methodology should include the following general principles to understand:

1. Customer motivations and barriers for participation;
2. Technology savings, price and market penetration;
3. Supply chain and service provider considerations;
4. Financial impacts; and
5. Jurisdictional benchmarking (for new incentives).

CUSTOMER MOTIVATIONS AND BARRIERS

As discussed, understanding customer motivations and barriers to participation are important. A key component of the customer research is understanding how customers view costs associated with the efficient option; this will allow the appropriate Customer Cost parameter to be identified, and the incentive (and supporting education efforts) to be designed with the customer's perspective and their perceived value in mind.

This customer research can be performed in numerous ways; it is often done through surveys of both randomly selected participants and non-participants, for specific research projects, ongoing program management activity or program evaluations.

For incentive setting and general program design purposes, there are two types of market research that can be used to provide comprehensive incentive modelling assistance.

1. Price Sensitivity Research
2. Conjoint Analysis

Price sensitivity research focuses solely on how customer motivation to purchase changes with the price point of a product or service. It does not analyze customer motivation for any other factors. Conjoint analysis, on the other hand, looks at a multiple-variable analysis to attempt to determine customer motivation to purchase for different combination of variables. Price is often one of the variables for conjoint analysis when it is applied to incentive setting.

These types of research can be expensive, and it is advised that they are only used for high-value incentive expenditure for individual measures (greater than $400,000 in annual expenditure over multiple (2+) years). The $400,000 value was obtained from a high-level evaluation of ENS's current individual incentive expenditure compared to the total portfolio expenditure.

Price Sensitivity Research

Price sensitivity is usually defined as the affect the price for a product or service has on the consumers' motivation to purchase it. For incentive setting in energy efficiency and conservation programs, it is important to understand what is required to move the market and encourage participation, while also ensuring the ratepayer's interests are protected.

Price sensitivity is also known in economic terms as the price elasticity of demand. It is important to note that consumers are not a homogenous group for most energy efficiency purchasing decisions, so it is practically impossible to get an exact answer for optimal pricing, and the associated price elasticity. However, by conducting this research, indications of general accuracy can be obtained, which help support other analyses and historical experience.

A popular price sensitivity analysis is Van Westendorp's Price Sensitivity Meter.[22] A wide variety of researchers prefer this technique since it can apply to multiple industries and it is simple to understand. The technique involves asking four price-related questions, which are then evaluated as a series of cumulative distributions, a distribution for each question. The four questions are:

1. At what price would you consider the product to be so expensive that you would not consider buying it? (Too Expensive)

[22] Roll et al. Innovative Approaches to Analyzing the Price Sensitivity Meter: Results of an International Comparative Study - https://www.researchgate.net/profile/Heidi_Korhonen3/publication/48330473_Determinants_to_Service_Innovation_Success_an_Organizational_Orientation_Perspective/links/0046353c383c558013000000.pdf#page=182

2. At what price would you consider the product to be priced so low that you would feel the quality could not be very good? (Too Cheap)
3. At what price would you consider the product to be starting to get expensive, so that it is not out of the question, but you would have to give some thought to buying it? (Expensive)
4. At what price would you consider the product to be a bargain – a great buy for the money? (Cheap)

Since consumers are not a homogenous group, the distributions are needed with a significant sample size. The intersection of the cumulative distribution curves indicate what could be acceptable pricing levels for consumers for a particular product or service. For example, the intersections of the curves for Too Cheap and Cheap (questions (2) and (4)) predict the price of marginal cheapness, and can set the lower boundary of an acceptable price range for consumers. Similarly, the intersections of the curves for Too Expensive and Expensive (questions (1) and (3)) predict the price of marginal expensiveness, and can set the upper boundary of an acceptable price range for consumers.

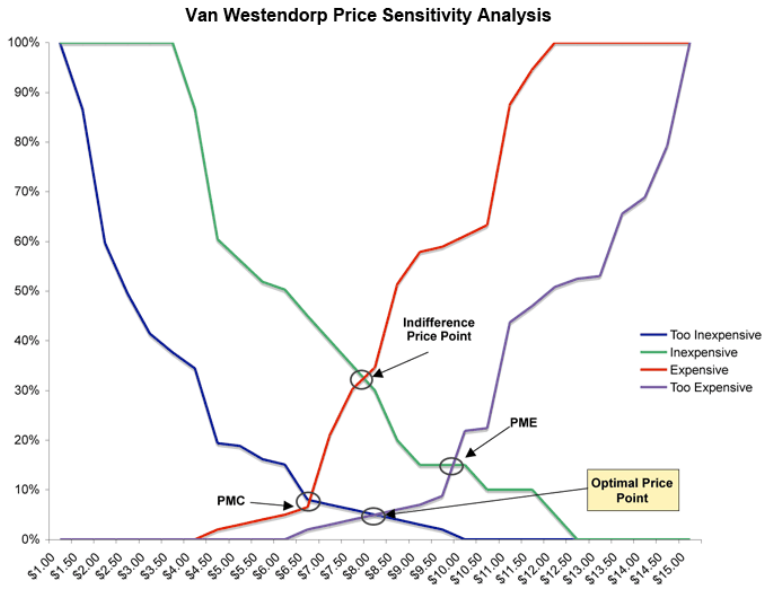


Figure 8~~7~~8: Van Weste~~r~~ndorp's Price Sensitivity Meter[23]

While this analysis is not exact, it provides a useful reference point for setting incentives at one point in time. The Price of Marginal Expensiveness (PME) establishes the upper boundary of acceptable consumer pricing, while the Price of Marginal Cheapness/Inexpensiveness (PMI) establishes the lower boundary.

As the technology and consumer motivations for purchase evolve, the cumulative distribution curves will change, accordingly.

The Van Westendorp Price Sensitivity Meter is just one of many options for understanding price sensitivity and consumer reaction to pricing. There are several other price sensitivity options available in the market, some which are similar, and others which are based on completely different methodologies.

CLEAResult does not recommend any particular type of price sensitivity research; instead the broader recommendation is that price sensitivity research should be performed where appropriate, especially for measures that result in large amounts of incentive spending.

[23] https://rmsbunkerblog.wordpress.com/2010/09/09/understanding-the-van-westendorp-pricing-model-market-research-in-central-ny-syracuse-upstate-new_york-surveys/

Conjoint Analysis

Conjoint analysis can be used to evaluate how individual attributes contribute to consumers' value of a product or service. With many efficiency programs and incentive offers, there can be multiple benefits to the consumer including financial, educational and convenience. All of these benefits increase consumer value, and it may be possible to understand how much of a customer's value is financially driven. If this can be understood, there is a platform to understand what should be an acceptable incentive level.

Conjoint analysis is based on asking consumers to make a series of trade-offs regarding individual product or service attributes. When these trade-offs are analyzed, the relative importance of each benefit can be observed. The trade-offs are usually conducted based on a ranking or rating system that categorizes individual benefits. To better understand the data, consumers should be segmented as much as possible, so that the analysis can be conducted by different consumer segments.

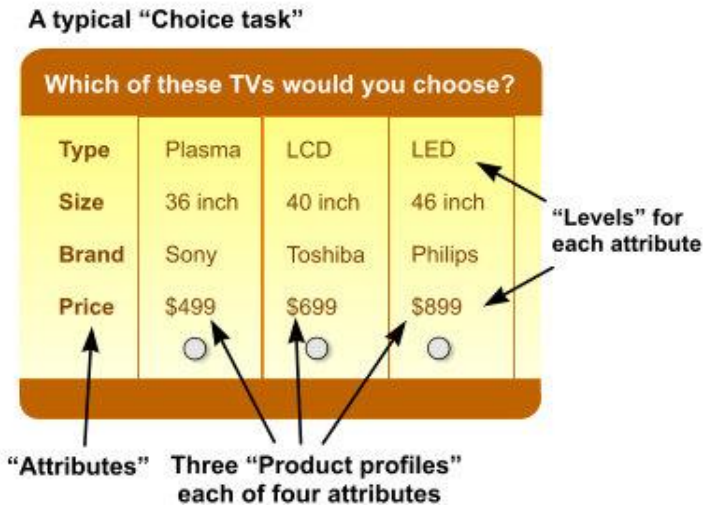


Figure 989: Example of Conjoint Analysis Choice Task[24]

CLEAResult recommends using both Price Sensitivity Research and Conjoint Analysis for individual measure incentives but only for incentive expenditure over $400,000 annually over multiple (2+) years. Otherwise, it is not needed to have research of this level of sophistication.

EfficiencyOne already conducts a lot of the customer (and technology) research required for the incentive level setting process. In evaluating future research requirements, it is advisable that EfficiencyOne review its currently available research, compare it to the documentation requirements in the proposed incentive level setting process, and identify if additional efforts are required. In many cases, the existing research efforts can be leveraged for both customer and technology research.

TECHNOLOGY RESEARCH

Technology research can provide both the basis for the value of the incentive investment through understanding the energy savings and it can provide insight into how often the incentive should be reviewed. It is very important to maintain a continued understanding of the following parameters for incentivized measures:

- Efficient Technology Name;
- Efficient Technology Description;
- Efficient Technology Wattage (if available);

[24] http://www.dobney.com/Conjoint/Conjoint_analysis.htm

- Efficient Technology Penetration Estimate;
- Forecast Efficient Technology Penetration Estimate (in 1 year);
- Efficient Technology Retail Price;
- Forecast Efficient Technology Retail Price (in 1 year);
- Sector;
- Customer;
- Application(s);
- Operating Hours;
- Base Case Technology Name(s);
- Base Case Technology Description(s);
- Base Case Technology Penetration(s);
- Forecast Base Case Technology Penetration(s) (in 1 year);
- Forecast Base Case Technology Retail Price(s) (in 1 year);
- Annual Operating Costs
- Annual Maintenance Costs
- Current Incremental Equipment Cost;
- Forecast Incremental Equipment Cost (in 1 year);
- Energy Savings;
- Expected Energy Savings Persistence;
- Any Program Dependent Parameters (*Should be clearly identified*);
    - Net-to-Gross (NTG) Ratio
- Measure-level TRC and PAC results (*can include adders for overhead delivery costs as required*)
- Participant Cost test results
- Incentive screening threshold in terms of cost to the customer (discussed in financial impact analysis);
- Incentive screening threshold in terms of the program budget (discussed in financial impact analysis); and
- Maximum incentive in terms of cost effectiveness (discussed in financial impact analysis).

Understanding these parameters provides another analysis point for setting incentive levels. For example, if the market penetration of the efficient technology is estimated to be higher than 50 percent, it may be time to consider reducing or eliminating the associated incentive. The above analysis is often performed through a measure assumptions review or TRM update process.

Through the TRM process and from Program Evaluations, this information for prescriptive measures can be reviewed and updated annually or bi-annually as required. During these review, all parameters listed can be updated accordingly.

SUPPLY CHAIN AND SERVICE PROVIDER RESEARCH

The supply chain and service providers should be engaged to support the customer and technology research efforts. It may be difficult to directly contact customers and technology manufacturers to conduct customer and technology research. The supply chain may be able to facilitate the research activities by providing their contacts, and hosting research events.

~~It~~Additionally, it can be difficult to get firsthand information about customer motivations, price elasticity and the parameters associated with technology. In these situations, it is important to involve the supply chain to obtain additional insight. Also, the supply chain can provide another point of reference for incentive setting analyses by providing reference data (sales, shipments, installations etc.), as well as offering their insight for whether the incentive is appropriate, and if it will motivate customers as desired.

Finally, discussions with the supply chain and service providers, along with other stakeholders, can identify other barriers that the incentives and the broader program design and program delivery strategy must overcome. For example, even if an incentive is extremely financially lucrative for customers, it may be administratively burdensome for the supply chain to apply on behalf of customers due to the program delivery strategy; in such a situation, increasing or decreasing incentive levels may not have an impact, unless the application barrier is overcome.

Having regular interactions with the supply chain and service providers is important for incentive setting activities, and for broader program design and management. Many jurisdictions feature standing panels and/or scheduled discussions with the supply chain, service providers and key stakeholders to obtain this insight.

FINANCIAL IMPACT ANALYSIS

Any incentive setting exercise needs to incorporate the financial impacts into the analysis. It is important to understand how changes in incentives could affect the financial performance of a program.

There are six main components to understanding the financial impact of changing incentive levels.

1. **What is the current incentive, forecasted participation and forecasted incentive expenditure?**
2. **What is the market penetration?**

The incentive thresholds discussed in Figure ~~9~~5 and Figure 10 can be used to provide three points of reference for the incentive setting process.

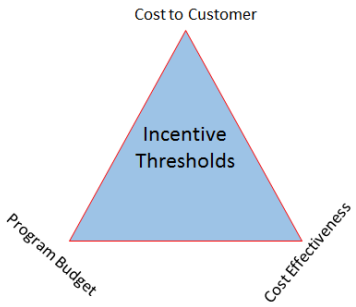


Figure 10~~9~~10: Incentive Thresholds used in Financial Impact Analysis

3. **What is the acceptable incentive threshold in terms of ~~cost to the customer~~Customer Cost?**

With respect to ~~cost to the customer~~Customer Cost, there may be an acceptable incentive level threshold that is based on the retail price, ~~incremental~~project cost, Incremental Equipment Cost or ~~simple~~project payback. In every case, incentive amounts have a suggested limit of 100% of Incremental Equipment Cost. This limit can be exceeded, but should be justified by the Program Administrator.

The appropriate basis for the Customer Cost threshold should be informed by conducting the customer research, and understanding what customers think about when making purchase decisions. Based on CLEAResult's program design experience, we have provided a suggested basis for the Customer Cost incentive threshold in Table 17 below. However, each individual program design with its' associated go-to-market, promotion and cost effectiveness approach is unique.

For certain programs, this threshold is often set at 50-70 percent of retail price or project costs, or a minimum

of a one year payback period. This does not mean the incentive should be 50-70 percent of the retail price or project costs or that projects should have a minimum of one year payback. ~~Recommendations for an Absolute Limit could be 100 percent of retail price or project cost, or to obtain a one year payback. The Absolute Limit should not be breached for any situation. However, for most incentives, there is not a need to approach the Absolute Limit. Therefore, it is important to define a Suggested Boundary/Ceiling. This lower value can be used as the guideline for checking whether incentive pricing is too high.~~These are suggested boundaries or ceilings. **In some cases, it may be required to exceed the Suggested Boundary/Ceiling. These values are guidelines only, and should not be implemented as a hard limit or cap.**

There may be an acceptable compensation level threshold in terms of cost to the customer that is based on the retail price, ~~incremental cost~~Incremental Equipment Cost or simple payback. The threshold is defined for design purposes, and is not a target; it serves as a ceiling.

The values for~~ the Absolute Limit and~~ the Suggested Boundary/Ceiling are derived from the jurisdictional studies and CLEAResult's experience from program design and incentive setting activities.

Customer and Decision	Basis for ~~Cost to~~ Customer Cost Incentive Threshold			
	~~Suggested~~ Basis	~~Absolute Limit~~	Suggested Boundary/Ceiling	
Low Income Customer, Direct Install Model	Project Cost		100%	~~100%~~
Residential Customer, Small Purchase at Retailer	Retail Price, Incremental Equipment Cost		50%, 100%	~~50%~~
Residential Customer, Direct Install	Project Cost		100%	~~50%~~
Residential Customer, Large Capital Equipment Purchase	Incremental Equipment Cost		100%	~~50%~~
Residential Customer, Large Purchase	~~Project~~Incremental Equipment Cost		100%	~~50%~~
Commercial and Industrial Small Business Customer, Direct Install	Project Cost	~~100%~~	70%-100%	
Commercial and Industrial Customer, Small Purchase at Distributor	Retail Price, Incremental Equipment Cost		50%, 100%	~~50%~~
Commercial and Industrial Customer, Large Capital Equipment Purchase	Incremental Equipment Cost, ~~Simple~~ Payback		100%, ≥ 1 Year	~~50%, ≥ 1 Year~~
Commercial and Industrial Customer, Large Purchase	~~Project~~Incremental Equipment Cost, ~~Simple~~ Payback		100%, ≥ 1 Year	~~50%, ≥ 1 Year~~

Table 17~~13~~17: Basis for ~~Cost to~~ Customer Cost Incentive Threshold

4. What is the acceptable incentive threshold in terms of program budget?

With respect to program budgets, there may be an acceptable incentive level threshold that is based on total expenditure or unit costs. For certain programs, this threshold is often set at a maximum incentive for a project, or on some kind of unit cost parameter such as $/kWh. Recommendations for~~ an Absolute Limit or~~ a Suggested Boundary/Ceiling should be based on the forecasted program expenditure net of any expected program administration costs. It should be emphasized that budget considerations can set ceilings for incentives, but they shouldn't be the driver for the amount of the proposed incentive; understanding the Customer Cost is always the priority.

Customer and Decision	Basis for Program Budget Incentive Threshold

	Basis	~~Absolute Limit~~	Suggested Boundary/Ceiling
Low Income Customer, Direct Install Model	$/kWh	~~$1.50/kWh~~	$1.20/kWh
Residential Customer, Small Purchase at Retailer	$/kWh	~~$1.00/kWh~~	$0.50/kWh
Residential Customer, Direct Install	$/kWh~~, Total Incentive~~	~~$1.00/kWh, $25,000~~	$0.75/kWh~~,~~ ~~$15,000~~
Residential Customer, Large Capital Equipment Purchase	$/kWh	~~$1.00/kWh~~	$0.50/kWh
Residential Customer, Large Purchase	$/kWh	~~$1.00/kWh~~	$0.50/kWh
Commercial and Industrial Small Business Customer, Direct Install	$/kWh, Total Incentive	~~$1.00/kWh, $25,000~~	$0.75/kWh~~,~~ ~~$15,000~~
Commercial Customer, Small Purchase at Distributor	$/kWh	~~$0.50/kWh~~	$0.25/kWh
Commercial Customer, Large Capital Equipment Purchase	$/kWh, Total Incentive	~~$0.50/kWh,~~ ~~$1,000,000~~	$0.25/kWh, $500,000
Commercial Customer, Large Purchase	$/kWh, Total Incentive	~~$0.50/kWh,~~ ~~$1,000,000~~	$0.25/kWh, $500,000

Table 18~~14~~18: Basis for Program Budget Incentive Threshold

5. What is the acceptable incentive threshold in terms of cost effectiveness?

With respect to cost effectiveness, there may be an acceptable incentive level threshold that is based on measure, program or portfolio cost effectiveness targets for the PAC. Suggestions for ~~an absolute limit or~~a boundary/ceiling could be based on the forecasted PAC benefits net of any expected program administration costs. This approach is similar to using a lifetime energy savings approach. Lifetime energy savings will have an associated cost effectiveness benefit, and as long as spending is under that amount, the cost effectiveness is not threatened. The lifetime energy savings approach won't include the capacity benefits that the cost effectiveness approach includes in the calculation.

It should be emphasized that cost effectiveness considerations can set ceilings for incentives, but they shouldn't be the driver for the amount of the proposed incentive; understanding the Customer Cost is always the priority.

It is recommended that EfficiencyOne develop a consolidated calculator, where one of the functionality elements is to be able to determine the individual cost effectiveness incentive level thresholds for each measure. The data points and functionality needed to build an appropriate consolidated calculator are listed in Appendix B.

6. What is the proposed incentive, forecasted participation and forecasted incentive expenditure?

Ideally, the proposed incentive is supported by the customer and technology research, and is within the incentive screening thresholds identified above. When the proposed incentive and forecasted participation are determined, the total forecasted incentive expenditure can be found, and compared to the current incentive's forecasted incentive expenditure (Component 1). This allows program administrators to understand the macro-level budget impact for any incentive changes. The historical performance would be one of the main factors in determining the forecasted participation.

Beyond using the lifetime energy savings to quantify the overall PAC cost effectiveness benefit of the measure and using it to document the cost effectiveness incentive level threshold, cost effectiveness screening is not being explicitly recommended as a part of the financial impact analysis.

JURISDICTIONAL BENCHMARKING

Jurisdictional benchmarking is not essential for existing incentives. The current program performance, historical experience and recommended research should provide a comprehensive analysis for incentive setting. It is recommended as best practice to check in periodically with other jurisdictions regarding their programs and incentive levels.

For new incentives, jurisdictional benchmarking should be included due to the absence of current program performance and historical experience. It is important to understand what other jurisdictions offer as incentives, and what nuances and factors may affect these incentive levels due to market size, delivery approach and other influences.

GENERAL PORTFOLIO SUMMARY FOR CURRENT AND RECOMMENDED ACTIVITIES

General Principle	Current Activities	Recommended Activities
Understand Customer Motivation and Barriers for Participation	Currently, EfficiencyOne uses four different methods to understand customer motivation and barriers to participation: 1. Market research to assess customer awareness of programs and reasons for participation/non-participation; 2. Annual surveys through program evaluation process; 3. Active program management which involves customer feedback and CSAT/QA surveys; and 4. Specialized research engagements such as program design or achievable potential study.	• EfficiencyOne should continue these current activities. • An annual survey on key customer and technology combinations should be introduced to provide trending data going forward. It is suggested that the following technology portfolios be studied as they show the highest current participation/savings or future potential (key measures): ○ Residential LED Lighting Technology; ○ Residential HVAC Technology; ○ Commercial Fluorescent Lighting Technology; ○ Commercial LED Lighting Technology; and ○ Commercial Variable Frequency Drive Technology. • If any measures or technologies could lead to a large annual incentive expenditure (over $400,000 over multiple years), it may be worth conducting some price sensitivity or conjoint analyses. *Since the retail price of electricity has increased 70 percent in the past ten years, it is important to understand ~~customer's~~customers affordability concerns and enhance their understanding of available options for reducing their electricity bill. This has been indicated as a consideration in Nova Scotia's electricity system planning[25]. A consistent, multi-pronged market research effort to understand customer motivation and barriers can aid in these efforts. Any existing research activities or data sources can be leveraged to support the recommended research efforts.*

[25] Our Electricity Future: Nova Scotia's Energy Plan 2015-2020, Nova Scotia Department of Energy, Available: http://energy.novascotia.ca/sites/default/files/Our-Electricity-Future.pdf

General Principle	Current Activities	Recommended Activities

Understand Technology Savings, Price and Market Penetration	EfficiencyOne currently understands technology savings, price and market penetration through three different avenues:
	
	1. Annual review through program evaluation process;
	2. Specialized research engagements for program design; and
	3. Collecting cost/price information, where possible, through program delivery.
		• EfficiencyOne's ability to collect cost/price information through program delivery and account management activities should be commended and continued.
		• EfficiencyOne should continue these current activities.
		• EfficiencyOne should introduce a formal measures assumption validation process and summary manual. Many other jurisdictions refer to the manual as the TRM and have formal processes for introducing and updating the assumptions for the measure savings and cost information.
		  ○ The parameters should be supported by appropriate primary or secondary research and calculations and these metrics should be reviewed on a periodic basis to confirm they are still valid. Some of this activity may be covered by the program evaluations. Please refer to the Technology Research section for a list of parameters that CLEAResult recommends including in the research.
		  ○ For LEDs in the residential and commercial sector, the updates should occur annually.
		  ○ The updates should be reviewed by a committee, which consists of technical experts from EfficiencyOne's staff, and one external member. All members on the committee should have a technical background, and specifically understand and have experience with quantifying measure energy savings, penetrations and costs. The review process for updates should occur annually, ideally in conjunction with, or adjacent to the program evaluation process, so that the two exercises can be collaborative and leverage research.

Understand Supply Chain and Service Provider Considerations	EfficiencyOne interacts with the supply chain through three different avenues: 1. Active program management which involves supply chain interaction; 2. Annual surveys through program evaluation processes; and 3. Specialized research engagements such as program design or achievable potential study	• EfficiencyOne should maintain the current manner that it uses to engage the different supply chains and service providers. It may be a consideration to develop program-specific standing advisory panels that involve the supply chain and service providers as a value add activity but it is not an essential recommendation.

General Principle	Current Activities	Recommended Activities
Understand Financial Impacts	EfficiencyOne conducts cost effectiveness testing using the TRC test. The TRC is calculated at the measure level to qualify measures, though some measures are included that do not pass the TRC test for strategic considerations. The measure level cost effectiveness screen includes total portfolio administration costs spread using a unit cost approach. The TRC is also used at the program level to screen programs for potential implementation, with the program administration costs included. Ex-post cost effectiveness is not conducted. EfficiencyOne currently tracks the programs' financial impact through individual program management operations. When incentive changes are considered, EfficiencyOne creates a financial forecast of the incentive impact on the program budget and unit costs. EfficiencyOne is implementing a new software-based data management and tracking system to track measure implementations.	• EfficiencyOne should continue understanding the macro-level budget impacts from incentive level changes • EfficiencyOne should determine the three appropriate incentive screening thresholds for each measure, either through the TRM process, or through a different process. • For the software-based data management and tracking system, based on the program delivery structure, there may be options to improve tracking frequency. It is advised that as much granularity as possible should be used for frequency. This granularity will provide insight into potential program or portfolio budget risks before they arise and allow EfficiencyOne to modify program spending accordingly. It is understood that some programs may only be able to track data monthly.

Table 191519: General Portfolio Summary Table Recommendations

The priority for ensuring information is updated to account for the four principles is based on the relevance of the research at hand. For example, if EfficiencyOne has recently conducted customer research to understand motivations and barriers to participation, it may not be necessary to re-do the customer research for the specific incentive level setting exercise. It may be of more use to put research resources to another effort.

FORMAL & DOCUMENTED INCENTIVE SETTING PROCESS

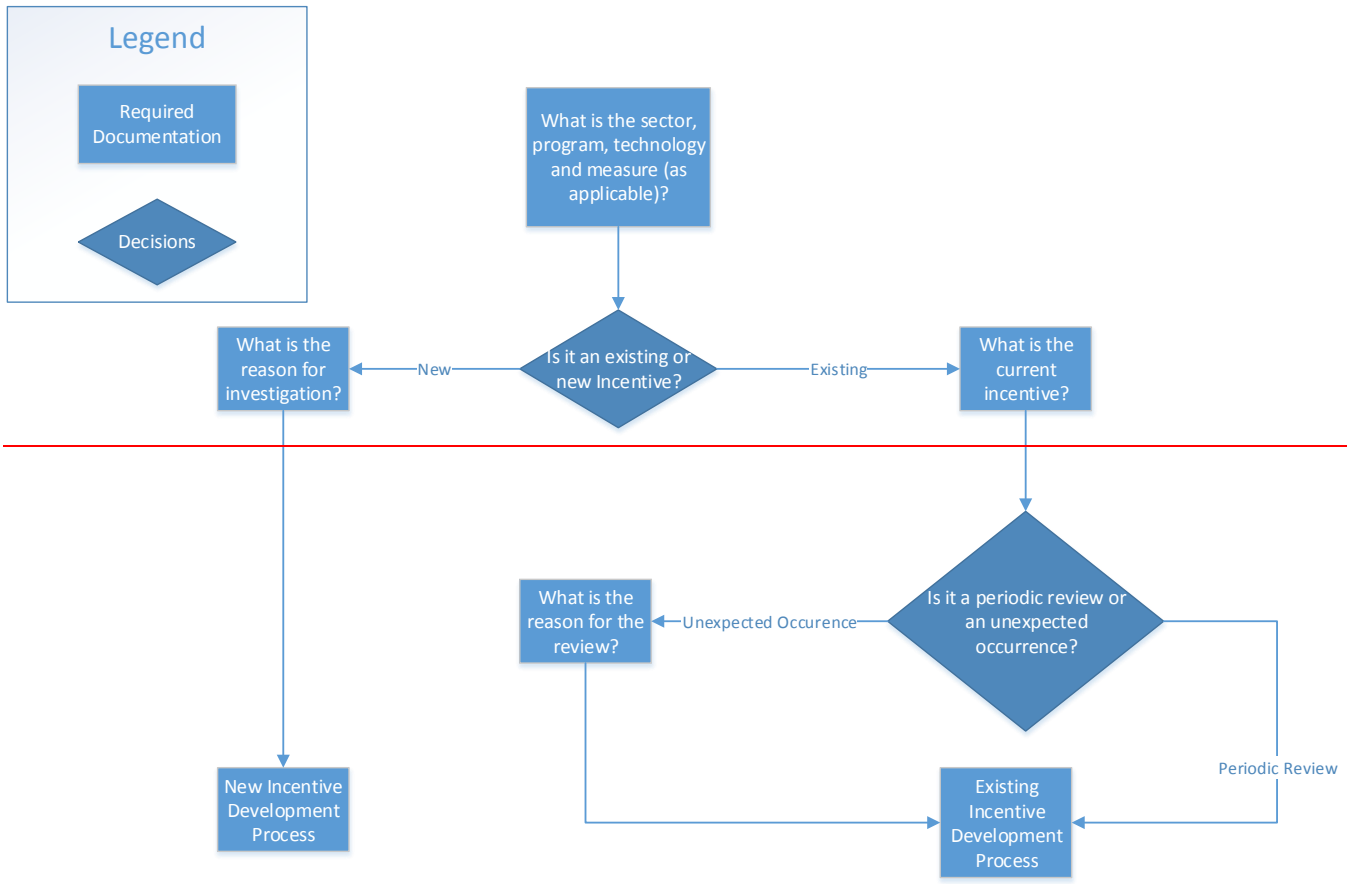
It is recommended that ENS use a formal and documented incentive setting process for all incentive setting exercises. This does not necessarily mean that every step of the process needs to be fully completed, or even conducted, but there should be justification and documentation for what was included in the process. The following flow charts illustrate three potential processes to use:

1. Initial Process (applicable to all incentive setting exercises);
2. Existing Incentive Development Process (for existing incentives that are being reviewed); and
3. New Incentive Development Process (for new incentives that are being considered for implementation).

The flow charts do not explicitly list the need to document other incentives that may be available in the market for ratepayers to access. It is important to take the potential availability of these other incentives into consideration in terms of the customer research for reduced barriers, the technology research for the potential in reduced energy savings and demand reduction due to attribution issues, and for the financial impact analysis which includes both the incentive screening thresholds and the participation forecast.

INITIAL PROCESS

The initial process should be followed for the beginning of all incentive setting exercises.



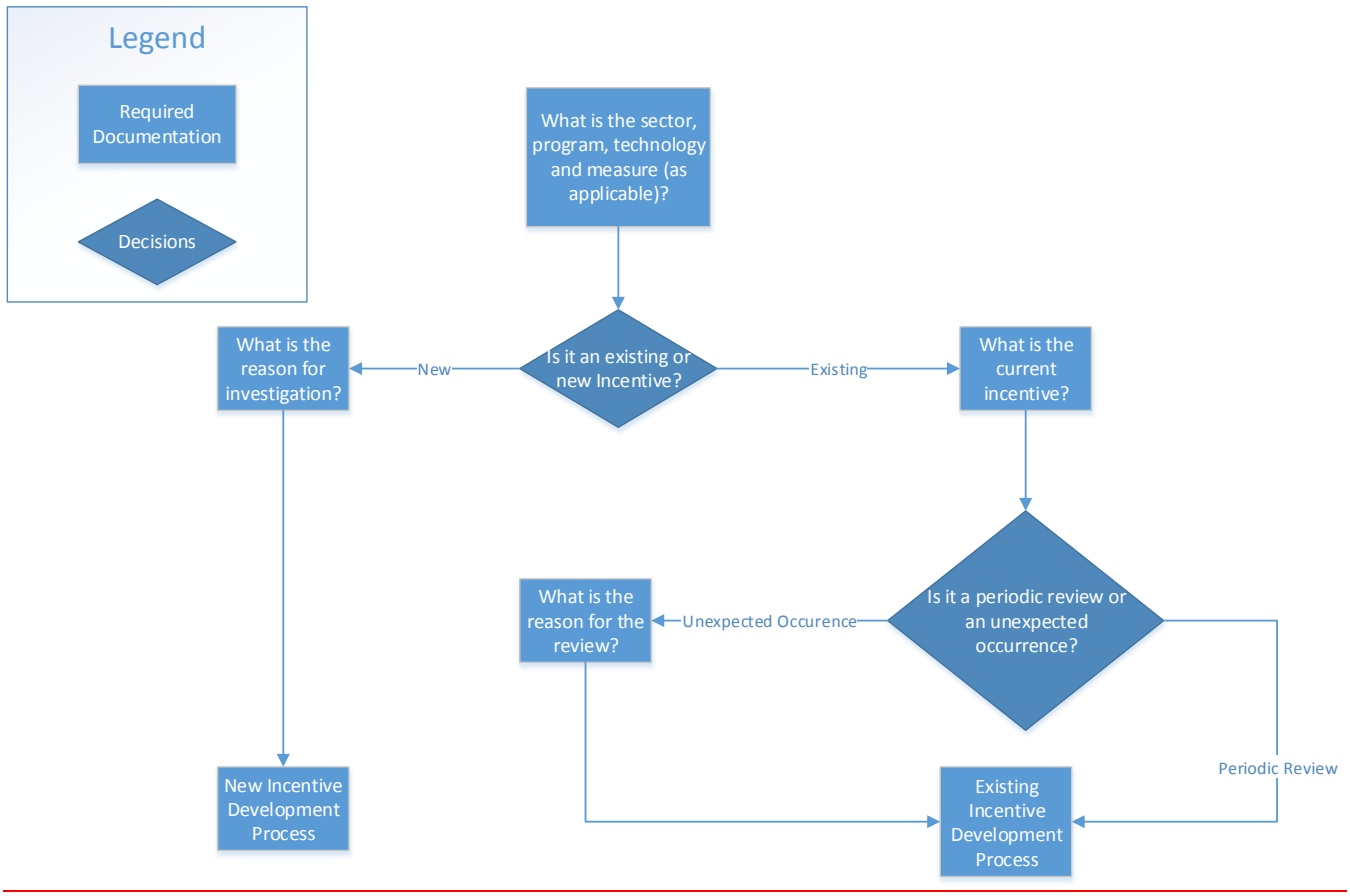


Figure 111011: Initial Process for Incentive Setting

EXISTING INCENTIVE DEVELOPMENT PROCESS

The existing incentive development process should be followed for all existing incentives. While it does not necessarily need to be step-wise, all four steps should be covered in the analysis. It would be difficult to complete step (4), without completing steps (1)-(3).

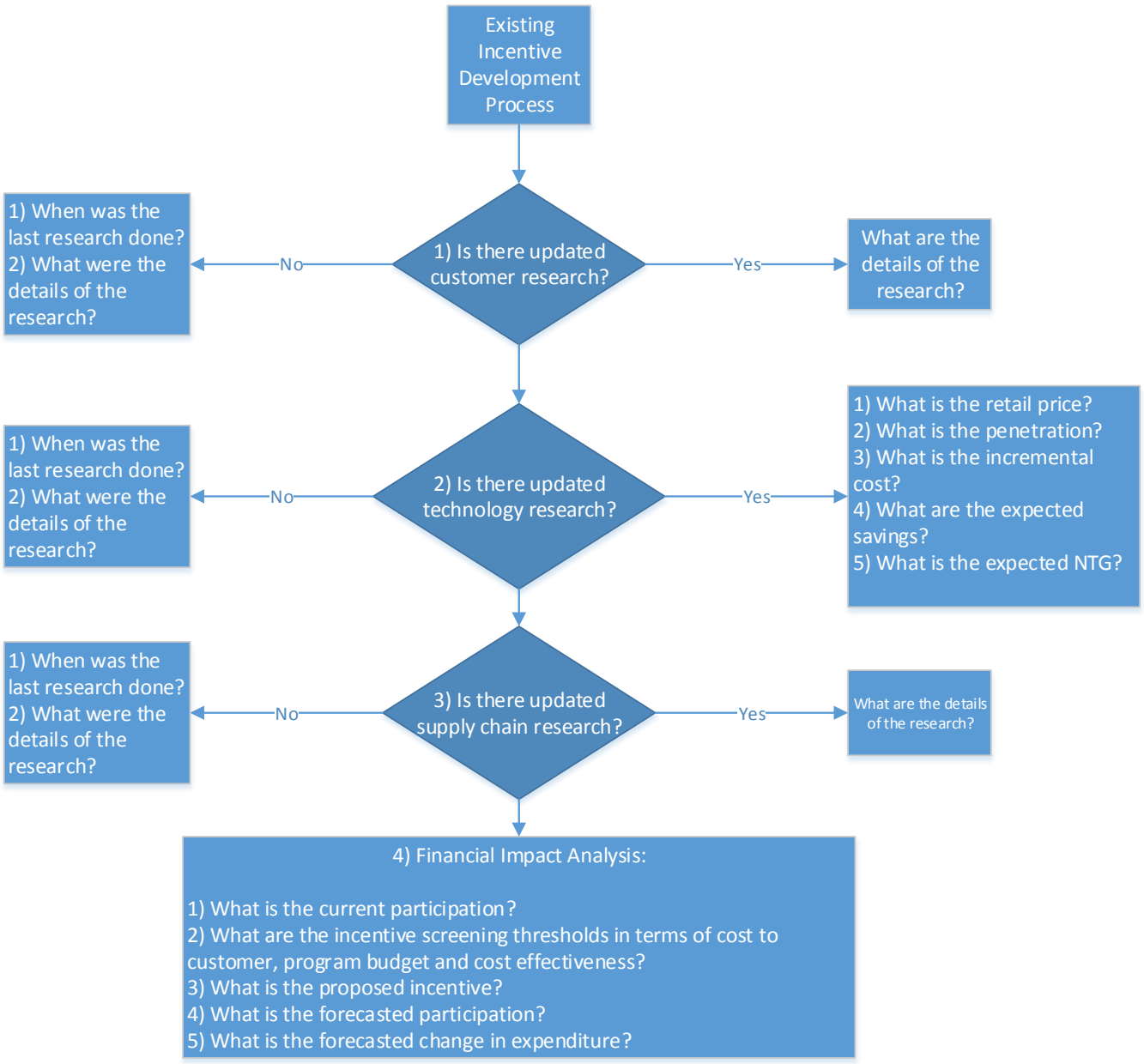


Figure 121112: Existing Incentive Development Process

NEW INCENTIVE DEVELOPMENT PROCESS

The new incentive development process should be followed for all new incentives. While it does not necessarily need to be step-wise, all five steps should be covered in the analysis. It would be difficult to complete step (5), without completing steps (1)-(3).

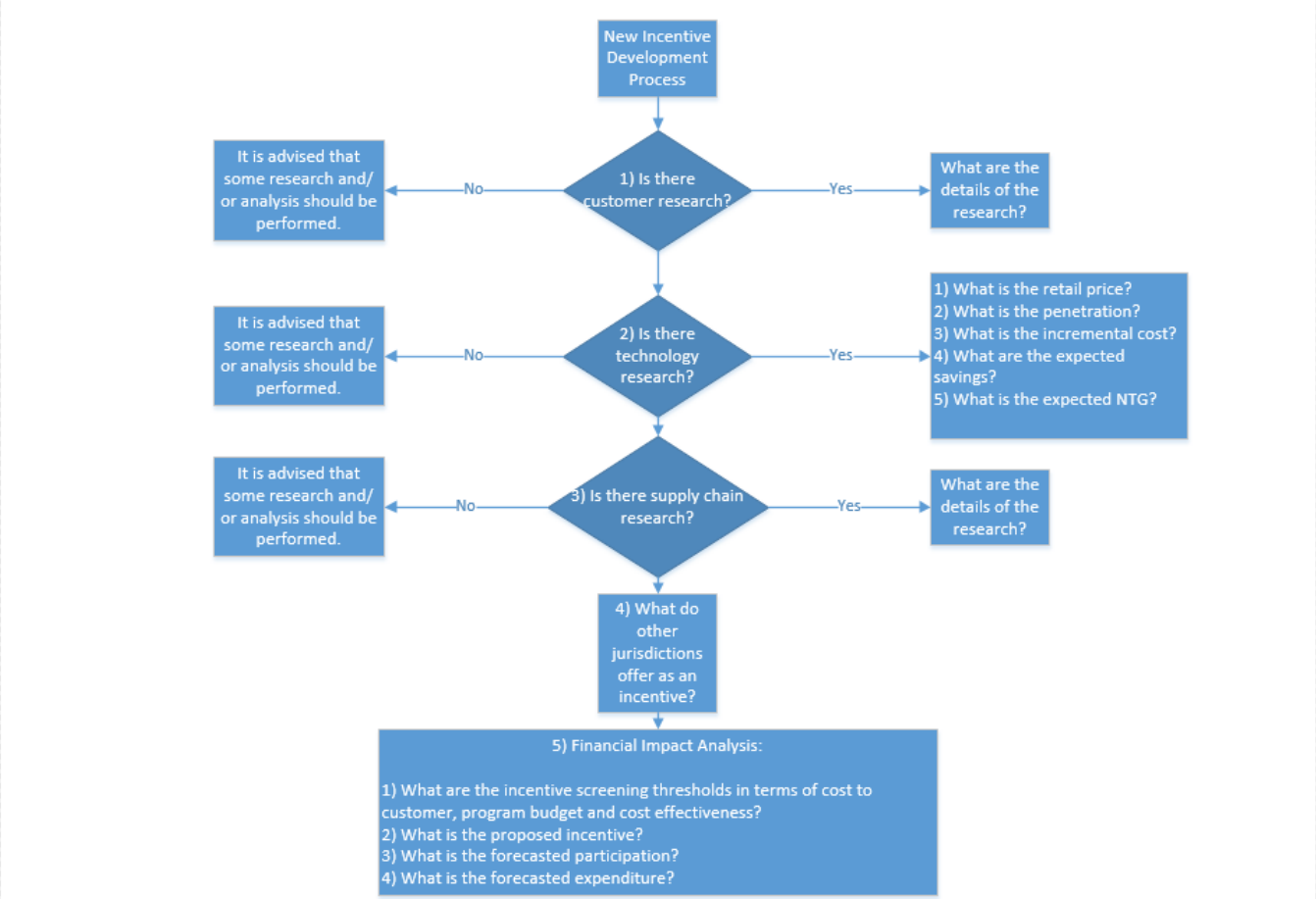
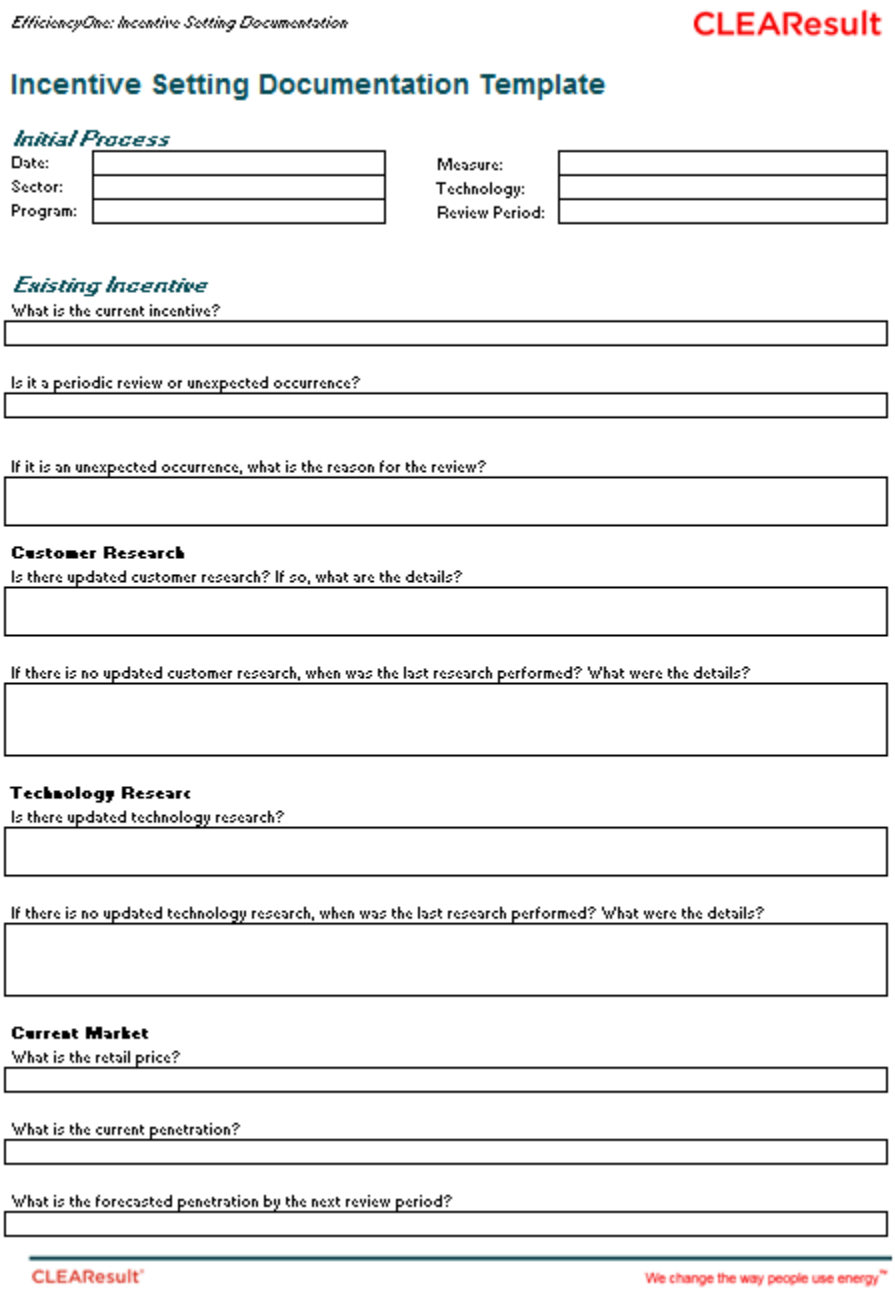


Figure 131213: New Incentive Development Process

DOCUMENTATION

To complement the processes, CLEAResult is providing a template document that can be used for review and approval of any incentive setting exercise. This template document can provide a record of the considerations involved in setting the incentives, and can also serve as a platform for the review and approval process. The template document contains all of the required documentation steps in the flow charts, as indicated by the legend.

The template is provided as an attached Excel file, with a selected screenshot of the first page provided below:



EfficiencyOne: Incentive Setting Documentation CLEAResult

Incentive Setting Documentation Template

Initial Process

Date:		Measure:	
Sector:		Technology:	
Program:		Review Period:	

Existing Incentive

What is the current incentive?

Is it a periodic review or unexpected occurrence?

If it is an unexpected occurrence, what is the reason for the review?

Customer Research

Is there updated customer research? If so, what are the details?

If there is no updated customer research, when was the last research performed? What were the details?

Technology Researc

Is there updated technology research?

If there is no updated technology research, when was the last research performed? What were the details?

Current Market

What is the retail price?

What is the current penetration?

What is the forecasted penetration by the next review period?

CLEAResult® We change the way people use energy™

INSTANT SAVINGS PROGRAM SUMMARY FOR CURRENT AND RECOMMENDED ACTIVITES

For the Instant Savings Program, CLEAResult has the following recommendations:

General Principle	Current Activities	Recommended Activities
Understand Technology Savings, Price and Market Penetration	For Instant Savings, EfficiencyOne gains an understanding of technology savings, price and penetration through the following activities: 1. Energy Efficiency Standards (Regulations); 2. Program Evaluation; 3. Industry Data; and 4. Specific Studies. In 2014, in response to upcoming codes and standards and penetration forecasts, EfficiencyOne eliminated CFLs from the program. This provides a recent example of proactivity regarding the incentive setting process. Annually, through the program evaluation process, the energy savings assumptions are reviewed, and updated as required. EfficiencyOne has active conversations with retailers (please see below) to understand market price and penetration information as well as access to other industry data for sales/shipments of certain products. Through the Achievable Potential Study conducted in 2014, EfficiencyOne has an understanding of the stock of different technologies in the residential sector, some of which are associated with the Instant Savings program.	• The current activities should be continued. • The recommendations in the General Principles section should be implemented to support this program. This covers both incentive level changes and introduction of new measures. • The energy savings assumptions validation should be expanded as required by the recommended TRM process outlined in the General Principles recommendations section. • LED-associated technology, such as dimmer switches whose savings are affected by the technology consumption, should also be updated annually for savings assumptions. *As discussed in General Principles, there should be annual reviews of the assumptions for LEDs in the residential and commercial sector. In the residential sector, the installed base of technology still seems to favour incandescent technology, but sales data shows LEDs increasing in penetration. This increased penetration is expected to happen quickly within the next five years. This anticipated transformation is the reason for the annual updates.*
Understand Customer Motivation and Barriers for Participation	For Instant Savings, EfficiencyOne gains an understanding of customer motivations and barriers through the following activities: 1. Market Research; and 2. Program Evaluation. In 2014, EfficiencyOne commissioned market research to identify the optimum rebate levels for products supported by the Instant Savings program. This research confirmed the incentive that customers would require to participate in the offer. Annually, through the program evaluation process, participant and non-participant surveys are conducted to determine free ridership and spillover savings.	• Conduct the price sensitivity research every year for the most popular program measures ≥ $400,000 in annual expenditure. • The participant and non-participant surveys should continue to be held annually, as they are required to evaluate customer motivation and barriers. • The recommended semi-annual survey for residential LED technology can be used to help understand customer motivations and barriers for this program.

General Principle	Current Activities	Recommended Activities
Understand Supply Chain and Service Provider Considerations	For Instant Savings, EfficiencyOne gains an understanding of the supply chain and service provider considerations through the following activities: 1. Ongoing Program Management; and 2. Program Evaluation. EfficiencyOne conducts annual one-on-one meetings with participating retailers and manufacturers to identify stocking plans, product pricing and joint marketing strategies for the following year. This provides insight into the technology assessment required for the TRM process. It is recommended that these annual meetings continue. Additionally, the delivery agent provides EfficiencyOne with an open channel of communication to retailers and manufacturers. Through the annual program evaluation process, there are interviews conducted with retailers and the delivery agent to understand their perspective, and suggestions for improvement.	• The current activities should be continued. EfficiencyOne, both through active program management (including with the delivery agent) and through the program evaluation process, receive insight from the supply chain. This communication is encouraged to continue, and this insight to be frequently sought out. This insight can also support the recommended market and technology research activities. • Additionally, it is recommended that EfficiencyOne try and understand if retailers or manufacturers will provide their own incentives on products during the next campaign or immediate program period. It may be difficult to gather this insight as it is understood that retailers reserve the right to make "game time" decisions regarding product sales. A complementary incentive will greatly affect uptake through increased participation, and ideally, it should be accounted for in any incentive analysis. This insight becomes even more valuable since real-time reporting of program activity is difficult to achieve for this program, which prevents instant correction.
Understand Financial Impacts	For Instant Savings, EfficiencyOne gains an understanding of financial impacts through the following activities: 1. Program Evaluation; 2. Program Planning; and 3. Financial Analysis. During the program evaluation process, the energy savings assumptions and net-to-gross ratios are reviewed, and updated as required. These inputs affect the cost effectiveness impact. During the DSM planning process, a cost effectiveness forecast is developed with all measures, programs, and the portfolio being screened for cost effectiveness using the TRC and PAC. Regulatory requirement is TRC of ≥1.0 at the program level. Since retailers require at least six months' notice, incentive levels are not changed during campaigns. When an incentive change is proposed during the program planning process, EfficiencyOne conducts a financial forecast to track the budget impact.	• The current activities should be continued. • The recommendations in the General Principles section should be implemented to support this program. This covers both incentive level changes and introduction of new measures.

Table 2016~~16~~20: Instant Savings Program Recommendations

Other Considerations for the Instant Savings Program

The current price floor for a participating measure is $0.99, regardless of the incentive. This floor ensures the customer pays something for the measure, and may assist with increasing the Net-to-Gross ratio. The price floor plays a similar role to incentive caps in commercial sector programs that require customers to contribute a portion of the incremental equipment or project cost. This is not possible with a point-of-purchase retailer program, since the cashier at the retailer cannot perform individual calculations on project costs or percentage contributions. However, to provide similar protection as the commercial sector programs, ENS may choose to consider different price floors for different measures in Instant Savings, based on their anticipated retail prices and the incremental equipment costs because customer contribution caps are rarely reached in the commercial sector programs, so the protection is rarely encountered.

CUSTOM PROGRAM SUMMARY FOR CURRENT AND RECOMMENDED ACTIVITIES

For the Custom Program, CLEAResult has the following recommendations:

General Principle	Current Activities	Recommended Activities
Understand Customer Motivation and Barriers for Participation	For the Custom Program, EfficiencyOne gains an understanding of customer motivations and barriers through: 1. Market Research; 2. Ongoing Program Management; 3. Program Benchmarking; and 4. Program Evaluation. <u>Market Research</u> In 2014, EfficiencyOne conducted research into the existing market barriers and consequentially the required support that businesses need to pursue energy efficiency options. This research indicated that financial support is critical for participation. For the New Construction component, customer surveys found that program implementation incentives of $1/square foot were insignificant compared to the total construction costs of $100-$200/square foot. Because of these surveys, ENS understood that financial incentives were not driving participation decisions, and that an educational incentive was more valuable in terms of energy modeling and commissioning expertise, in combination with giving customers access to financial incentives in Custom and through another program, the Business Energy Rebates. <u>Ongoing Program Management</u> Through general program management, EfficiencyOne has business development managers who are responsible for major customers. The business development managers are frequently in contact with customers. This direct customer communication and project payback documentation requirements provide key data points that EfficiencyOne uses for incentive level setting and understanding customer	• Market research should continue to be conducted, especially for areas that are underperforming in terms of participation. • From the recommendations in the General Principles, the semi-annual surveys for commercial fluorescent technology, commercial LED technology, and commercial VFD technology can be used to help understand customer motivations and barriers. • ENS should continue its current program management, program benchmarking (required for new programs) and program evaluation activities to understand motivations and barriers for the large commercial and industrial sector. If possible, ENS should attempt to aggregate this research, and conduct segmentation analyses to develop a commercial sector market characterization.

	motivation barriers. Through ongoing program management efforts, the limited uptake in the low cost financing offer indicates that direct financial support in the form of an incentive is more attractive, versus alleviating cash flow and capital purchasing concerns. For larger Custom Retrofit projects, EfficiencyOne has seen a 10 percent uptake on financing, indicating that some larger customers are sensitive to capital outlays and cash flow considerations. This level of uptake in financing has not been observed for smaller Custom projects or the residential sector. The small business sector has seen a significant uptake in financing in the past, Through the delivery of the Custom Compressed Air Optimization service, customers frequently identified that they were aware that their compressed air networks leaked, but they did not know how to assess the leaks or quantify the potential savings from optimization. EfficiencyOne introduced a new education incentive that provided technical assistance to customers to address these knowledge gaps. Customers were then offered an incentive to fix the leaks. The results from the educational incentive for leak fixing led to the deployment of low incentive costs for annual savings. <u>Program Benchmarking</u> When the Custom Retrofit program was designed in 2008, the initial incentive was designed using a $/kWh incentive rate based on a similar program by Manitoba Hydro. It was unknown what incentive level customers in Nova Scotia would respond to. Through program experience and discussions with customers, this incentive rate now sets a ceiling for individually negotiated incentives with each prospective program participant. <u>Program Evaluation</u> Through the annual program evaluation process, participant surveys are conducted to determine free ridership and spillover savings.	

Understand Technology Savings, Price and Market Penetration	For the Custom Program, EfficiencyOne gains an understanding of technology savings, price and penetration through ongoing program management. EfficiencyOne currently captures all technology savings and cost information through the feasibility study and/or project application process which are the best methods for obtaining this information, especially if it is supported by engineering calculations, technical due diligence and vendor invoices.	• Continue the current activities of collecting the energy savings and cost information through the feasibility studies and/or program application process. Due to the variability in operating hours in the commercial sector, this is important information for determining the energy savings. • The recommendations in the General Principles section should be implemented to support this program. This covers incentive level changes. • Additionally, EfficiencyOne should start tracking project type data so that it can be matched with the measure type to provide insight into general participation trends in participation, which will assist with analyzing market penetration. The semi-annual surveys for commercial fluorescent technology, commercial LED technology and commercial VFD technology can be used to complement the analysis of market penetration. • EfficiencyOne should engage the supply chain to gather insight into the types of projects they are expecting and any forecasted changes in costs or savings due to increased adoption or new efficiency options. This insight assists with market penetration analysis. The recommended supply chain engagement events in the General Principles section can be leveraged for this work. Below are two examples for large savings opportunities provided with Nova Scotia's market characteristics in mind: 1. Space cooling systems that feature direct expansion technology, either through incentives for purchasing efficient equipment or controllers, or for system maintenance. This analysis would assist with setting incentive levels for these measures. 2. Electric baseboard space heating systems especially for the installation of controls or with major renovation projects. This analysis would assist with setting incentive levels for these measures. • Finally, the incentive screening thresholds for program budget and cost effectiveness should be established on a per kWh basis for the Custom Program. It may be better to do this on a lifetime kWh basis, or account for energy savings persistence separately. Since the avoided costs are consistent amongst time periods in Nova Scotia, the incentive screening threshold (per kWh) is the same for any measure that has the same amount of energy savings persistence. These numbers should be calculated and updated every time the avoided costs are updated, consistent with the recommendations in the General

		Principles section.
Understand Supply Chain and Service Provider Considerations	For the Custom Program, EfficiencyOne gains an understanding of the supply chain and service provider considerations through: 1. Ongoing Program Management and 2. Program Evaluation. <u>Ongoing Program Management</u> Through the program management/account management process and the development of the different feasibility studies, EfficiencyOne's Business Development Managers regularly interact with the supply chain. <u>Program Evaluation</u> Through the annual program evaluation process, there are interviews conducted with select supply chain partners to understand their perspectives and suggestions for improvement.	• The current activities should be continued. • EfficiencyOne's should use its active program management and program evaluation processes to actively solicit insight from the supply chain and to support recommended market and technology research activities. • The major reason for continued engagement of the supply chain (beyond good program management) is to understand market penetration of the different technologies and to validate findings regarding customer motivations and barriers.
Understand Financial Impacts	For the Custom Program, EfficiencyOne gains an understanding of financial impacts through: 1. Individual Project Screening; 2. Ongoing Program Management; and 3. Program Evaluation. During the review of the project application, a TRC cost effectiveness analysis is conducted for each project to confirm eligibility. Due to ongoing program management (the individual negotiations of financial incentives), the budget impact is always being quantified from both a total financial impact and a unit cost perspective. During the program evaluation process, the energy savings assumptions and NTG ratios are reviewed and updated as required. These inputs affect the cost effectiveness impact.	CLEAResult recommends that: • The current activities should be continued. • The recommendations in the General Principles section should be implemented to support this program including incentive level changes. • The individual project screening for cost effectiveness should be expanded to include the PAC as well.

Table 211721: Custom Program Recommendations

Other Considerations for the Custom Program

The Custom Program Retrofit incentive provides a level of flexibility that is best-in-class. Incentives are individually negotiated, based on four different parameters:

1. Capped at percentage of project costs;
2. Capped by simple payback;
3. Informed by incentive rate ($/kWh of first year savings); and
4. Capped at total dollar amount.

Through obtaining energy savings, project costs and required payback thresholds from the customer, the program has complete visibility into the potential financial implications of the incentive from the customer, the utility and society's perspective. This allows ENS to set an incentive that satisfies all three perspectives. Additionally, any costs for feasibility studies are included in the final incentive payment.

Current program data indicates that incentives are on average 20-25 percent of project costs, while they contribute to just under 60 percent of the program expenditure. Total program expenditure is averaging $0.10/kWh - $0.15/kWh, with a split between lighting and non-lighting projects that is beginning to skew towards non-lighting. The incentives typically result in a 2-3 year simple payback, though some institutions will accept a lower payback threshold.

In Nova Scotia, the avoided supply costs for energy do not differentiate the benefits derived associated with the time of the energy savings. This means there is not a cost effectiveness benefit (from energy savings) to promoting a diversity of measures in the portfolio. ENS should be encouraged to continue to promote more non-lighting measures to encourage portfolio diversity. The current incentive framework provides the flexibility to do so without changing any of the current parameters; this minimizes the impact of any such change.

Another issue to be aware of is being able to deal with participant and potential participant communication. Since the incentives are individually negotiated, there is the possibility for increased incentive costs due to information sharing and/or collusion. However, the current incentive framework caps protect against this risk. There is also the additional protection of the incentive contract containing a confidentiality clause regarding the amount of the incentive.

Finally, since the location of the energy savings are known, the consideration of local avoided costs with premium and discount zones can be applied to the Custom Program and can be used to influence the incentive negotiation. EfficiencyOne can implement these considerations once the local avoided costs are developed.

BUSINESS ENERGY REBATES CURRENT AND RECOMMENDED ACTIVITIES

For the Business Energy Rebates program, CLEAResult has the following recommendations:

General Principle	Current Activities	Recommended Activities
Understand Customer Motivation and Barriers for Participation	For the Business Energy Rebates Program, EfficiencyOne gains an understanding of customer motivations and barriers through: 1. Market Research; 2. Ongoing Program Management; 3. Program Benchmarking; and 4. Program Evaluation. <u>Market Research</u> In 2014, EfficiencyOne conducted research into the existing market barriers and, consequentially, the required support that businesses need to pursue energy efficiency options. This research indicated that financial support is critical for participation. <u>Ongoing Program Management</u> Through general program management, EfficiencyOne has a Business Development Manager that is dedicated to reaching out to participating distributors. Distributors can provide insight on the contractor and customer program experience. EfficiencyOne also has dedicated Application Coordinators for application support and approval in the program. They work with both the distributors in the midstream program and customers who access the downstream application process. Through these efforts, as well as the need for project invoices to be submitted, reference points are provided for what is acceptable in terms of an incentive, when understanding customer motivation and barriers. <u>Program Benchmarking</u> When the original program was designed, the incentives were based on a similar program that was offered for Efficiency Vermont, with adjustments made for different product pricing in the two jurisdictions. <u>Program Evaluation</u> Through the annual program evaluation process, participant surveys are conducted to determine free ridership and spillover savings. Through these surveys, their motivations and barriers are determined.	• Continue to conduct the market research, especially for areas where participation is underperforming. • From the recommendations in the General Principles, the semi-annual surveys for commercial fluorescent technology, commercial LED technology, and commercial VFD technology can be used to help to understand customer motivations and barriers. • Continue all current program management, program benchmarking (as required for new programs) and program evaluation activities to develop a clear understanding of motivations and barriers existing within the commercial and industrial sector. If possible, EfficiencyOne should aggregate this research, and conduct segmentation analyses to develop a commercial sector market characterization.

General Principle	Current Activities	Recommended Activities
Understand Technology Savings, Price and Market Penetration	For the Business Energy Rebates program, EfficiencyOne gains an understanding of technology savings, price and penetration through: 1. Ongoing Program Management and 2. Program Evaluation. <u>Ongoing Program Management</u> EfficiencyOne currently captures technology savings and cost information through discussions with the manufacturers and distributors, as well as through the submission of project invoices, which confirm product pricing. <u>Program Evaluation</u> Through the annual program evaluation process, the energy savings assumptions are reviewed, and updated as required.	• Continue the current activities of engaging the supply chain and reviewing the project invoices to understand technology savings and pricing. • Investigate the potential to develop a method, beyond randomized audits, to document and understand the different operating hours for the program participants in the Instant Rebates stream because those hours are highly variable within the commercial sector. It is understood that a runtime analysis has been conducted recently. • Implement the recommendations in the General Principles section to support this program. Those recommendations include both incentive level changes and introduction of new measures. • EfficiencyOne should start to understand the technology penetration of the different products in the program. The semi-annual surveys for commercial fluorescent technology, commercial LED technology and commercial VFD technology can be used to complement the analysis of market penetration.
Understand Supply Chain and Service Provider Considerations	For the Business Energy Rebates program, EfficiencyOne gains an understanding of the supply chain and service provider considerations through: 1. Ongoing Program Management and 2. Program Evaluation. <u>Ongoing Program Management</u> Through the delivery of the program, EfficiencyOne interacts with the supply chain regularly through the Program Manager, Business Development Manager and Application Coordinators. <u>Program Evaluation</u> Through the annual program evaluation process, interviews are conducted with select supply chain partners to understand their perspectives and suggestions for improvement.	• EfficiencyOne should continue these current activities.
Understand Financial Impacts	For the Business Energy Rebates Program, EfficiencyOne gains an understanding of financial impacts through: 1. Ongoing Program Management and 2. Program Evaluation.	• EfficiencyOne should continue these current activities. • Implement the recommendations in the General Principles section to support this program. This covers both incentive level changes and

General Principle	Current Activities	Recommended Activities
	Ongoing Program Management Due to ongoing program management, the costs of the products are always monitored. This monitoring allows the Program Manager to understand whether incentives are too high compared to the ~~incremental cost~~Incremental Equipment Cost, and whether the 50 percent financial cap is being reached. Program Evaluation During the program evaluation process, the energy savings assumptions and net-to-gross ratios are reviewed, and if required, they are updated. These inputs affect the cost effectiveness impact.	introduction of new measures.

Table 22~~18~~22: Business Energy Rebates Program Recommendations

Other Considerations for Business Energy Rebates Program

From reviewing program operations, the Business Energy Rebates program tracks retail pricing through the application process. This allows program managers to understand if incentive levels are too high compared to the retail prices, using the first type of incentive screening threshold, which is the cost to the customer. The program is forecast to have a high PAC, which assumes that the cost effectiveness threshold is not in danger of being breached due to incentives being too high. As long as there is continued active program tracking to monitor program budgets and the retail prices, the program should be effective in setting appropriate incentive levels. It is understood that similar to the retail program, customer/project information is not provided for the Instant Rebates stream. With this chosen program delivery structure, it will be difficult to include premium and discount zones to align with local avoided costs, when they are available.

HOME ENERGY ASSESSMENT CURRENT AND RECOMMENDED ACTIVITIES

For the Home Energy Assessment program, CLEAResult has the following recommendations:

General Principle	Current Activities	Recommended Activities
Understand Customer Motivation and Barriers for Participation	For the Home Energy Assessment Program, EfficiencyOne gains an understanding of customer motivations and barriers through the following activities: 1. Market Research; 2. Ongoing Program Management; 3. Program Benchmarking; and 4. Program Evaluation. <u>Market Research</u> EfficiencyOne conducted research with the participants in the Home Energy Assessment program. It was found that some customers were implementing a subset of recommended measures after receiving an audit report, although they did not complete a final audit to receive the incentives. The research found that the initial audit provided benefit to homeowners, and that it was the key to lowering unit costs for the program, through the tracking of the program-enabled/spillover savings. This was one of the factors that led to the decision to subsidize the audit incentive further. In 2014, EfficiencyOne commissioned research to identify the incentive levels and financing options required to encourage homeowners to make major efficiency upgrades (> $5,000). The research found that a 25 percent incentive would have a greater impact than interest-free financing. This is an example of a conjoint analysis, where different benefits of the program were evaluated to determine their individual contribution to value for the customer. EfficiencyOne conducted demographic research to understand the characteristics of the general population, program participants and non-participants. <u>Ongoing Program Management</u> Through general program management, EfficiencyOne frequently interacts with the service organizations and contractors to understand what customers are saying, and what are their motivations and barriers. Through these efforts as well as the need for project receipts to be submitted by participants, there can be a triangulation point for what is acceptable in terms of an incentive when understanding customer motivation and barriers. <u>Program Benchmarking</u> When the original program was designed, the incentives were based on a similar program offered by the Federal government. The rebates from the federal government were discontinued in 2012, with a corresponding reduction in participation. <u>Program Evaluation</u> Through the annual program evaluation process, participant surveys are conducted to determine free ridership and spillover savings. Through these surveys, their motivations and barriers are determined.	• It is recommended that market research continue to be conducted, especially for areas that are underperforming in terms of participation, either in terms of technology, demographic segments or geographical areas. • As per the recommendations in the General Principles, the semi-annual surveys for residential HVAC technology should be conducted to help understand customer motivations and barriers. • EfficiencyOne should continue all of the current activities with regards to ongoing program management, program benchmarking (as required for new measures) and program evaluation.

General Principle	Current Activities	Recommended Activities
Understand Technology Savings, Price and Market Penetration	For the Home Energy Assessment program, EfficiencyOne gains an understanding of technology savings, price and penetration through the following activities: 1. Ongoing Program Management and 2. Program Evaluation. <u>Ongoing Program Management</u> EfficiencyOne captures technology savings through the confirmation of the information in the final audit report. There are also frequent discussions with the service organizations that help support this analysis. <u>Program Evaluation</u> Annually, through the program evaluation process, the energy savings assumptions are reviewed, and updated as required.	• The current activities of engaging the Service Organizations and Natural Resources Canada to understand technology savings should be continued. • The recommendations in the General Principles section should be implemented to support this program. This covers both incentive level changes and introduction of new measures. • Additionally, EfficiencyOne should start to understand the technology penetration of the residential HVAC and building envelope technologies in the program. The Achievable Potential study indicates that Nova Scotia has a significant base of primary and secondary electric heating systems. As the technology mix changes due to the increased price of electricity and the decreased in costs of other options, the base case assumptions may change.
Understand Supply Chain and Service Provider Considerations	For the Home Energy Assessment program, EfficiencyOne gains an understanding of the supply chain and service provider considerations through the following activities: 1. Ongoing Program Management and 2. Program Evaluation. <u>Ongoing Program Management</u> Through the delivery of the program, EfficiencyOne interacts with the supply chain regularly through the discussions with the service organizations. <u>Program Evaluation</u> Through the annual program evaluation process, there are interviews conducted with select supply chain partners (Service Organizations) to understand their perspective, and suggestions for improvement.	• The current activities should be continued.

General Principle	Current Activities	Recommended Activities
Understand Financial Impacts	For the Home Energy Assessment program, EfficiencyOne gains an understanding of financial impacts through the following activities: 1. Program Evaluation. <u>Program Evaluation</u> During the program evaluation process, the energy savings assumptions and net-to-gross ratios are reviewed, and if required, they are updated. These inputs affect the cost effectiveness impact.	• The current activities should be continued. The recommendations in the General Principles section should be implemented to support this program. This covers both incentive level changes and introduction of new measures. •

Table 23~~19~~23: Home Energy Assessment Program Recommendations

Other Considerations for the Home Energy Assessment Program

The Home Energy Assessment program recently introduced an updated incentive structure, which featured an increased incentive for the initial audit, and premiums associated with bundling of incentives to encourage larger projects from participants. It will be of interest to see how these changes are received by customers, and whether there is an increase in participation and/or in savings. From the initial data that CLEAResult has received, it appears that the bundling approach is showing some promising results. The average savings realized per participating home have increased, with the unit cost for delivery decreasing. It is difficult to isolate the effects of bundling since there were changes implemented to both the audit and measure incentive amounts that were introduced at the same time.

It has been observed that bundling is an effective tactic in encouraging participation. Retailers frequently use bundling in their sales strategies to clear inventory. When applied to the energy efficiency program space, bundling may be a worthwhile tactic for programs where there is a significant resource expenditure for customer acquisition. This is because any increases in unit costs (when compared to an unbundled incentive offer) may be offset by generating the additional savings from the expenditure associated with customer acquisition. In short, if customer acquisition is a sunk cost, it may make sense to leverage as much as possible from that cost.

The provision of the personal energy planning services has helped customers understand their options and increased the savings from each project. Since delivery of the program is through the participating service organizations, and the project locations are clearly identified, there may be the opportunity to include premium and discount zones for incentives to align with local avoided costs.

Incentive Level-Setting Excel-Based Tool for Review Protocol

To assist with determining incentive levels, CLEAResult has developed an Excel-based tool (which is provided as a separate file). The tool requires certain parameter inputs, and using those, provides a set of considerations that can be used in setting incentive levels. The considerations are not exhaustive, but they can provide a platform for the analysis. When combined with the general principles, incentive-setting process flow and the incentive documentation template, EfficiencyOne will have a set of recommendations and tools to assist with determining incentives. The tool does not provide any specific financial recommendations for incentives.

The input parameters for the tool are as follows:

- Sector
    - Residential
    - Business, Not for Profit and Institutional (Commercial) and Industrial
- Program Delivery Channel
    - Direct to Customer
    - Contractors
    - Retailers
    - Distributors
    - Other Vendors
- Financial Motivation for Participant
    - Upfront Cost
    - Payback
- Financial Impact
    - Small (under $100,000 in annual measure incentive expenditure)
    - Medium (between $100,000 - $400,000 in annual measure incentive expenditure)
    - Large (greater than $400,000 in annual measure incentive expenditure)

Once these parameters are selected, a set of considerations are provided that should be used in the incentive setting process.

Excel-Based Tool for Considerations in Incentive Setting and Review Protocol	
Select the Sector:	Residential
Select the Program Delivery Channel:	Retailers
Select the Financial Motivation:	Upfront Cost
Select the Financial Impact:	Small - Under $100,000 in incentive expenditure annually

It should be noted that for prescriptive LED measures in either the residential or business, not for profit and institutional sectors, the incentive level should be reviewed two times a year, or more frequently, as required, regardless of the financial impact.

Considerations

There is an additional sales and promotional effort from retailers. The incentive should focus on how the retailer can generate the customer's interest. The incentive needs to offset a substantial portion of the retail cost, but it doesn't need to be as high as the direct to customer approach (suggested boundary up to 50%). It should be a prescriptive incentive, offered at point-of sale.

The total financial impact is small, so it only needs to be reviewed once a year. There should be regular check-ins with retailers to gauge product pricing and market penetration levels.

Figure 141314: Excel-Based Tool for Review Protocol

It should be noted that for prescriptive LED measures in either the residential or business, not for profit and institutional sectors, the incentive level should be reviewed two times a year, or more frequently as required, regardless of the financial impact.

Program Financial Simulation Analysis

INSTANT SAVINGS PROGRAM FINANCIAL SIMULATION

For the Instant Savings Program, the program financial simulation analysis included the following six steps for each measure:

1. Identify the current (2015) participation and incentive level;
2. Determine the market penetration;
3. Determine an appropriate cost to customer incentive level threshold;
4. Determine an appropriate program budget incentive level threshold;
5. Determine an appropriate cost effectiveness incentive level threshold; and
6. Compare the current incentive level to the three thresholds to determine if a change was required

The following table includes the measure parameters obtained from EfficiencyOne:

Measure Parameters

Measure	Current Incentive Level ($)	2015 Participation	Incentive Expenditure*	Per Unit Net Energy Savings (kWh)**	Per Unit Net Peak Demand Savings (kW)***	Energy Savings Persistence (Years)
ENERGY STAR® LED A Lamp	$3.00	253,461	N/A	25.5	1.021	25
ENERGY STAR® LED Specialty Lamp	$5.00			25.5	1.021	25
ENERGY STAR® LED Recessed Downlight	$12.00	8,709	$104,508	51.9	0.072	16
ENERGY STAR® LED Fixture	$12.00	7,291	$87,492	151.8	0.175	13
Dimmer Switch	$4.00	6,430	$25,720	18.7	0.019	10
Indoor Motion Sensor	$5.00	439	$2,195	50.4	0.003	10
Motion Sensor with Dimmer Switch	$5.00	5	$25	59.0	0.000	10
Outdoor Motion Sensor	$5.00	569	$2,845	174.9	0.015	10
Power Bar with Timer	$5.00	71	$355	59.1	0.001	10
Smart Power Bar	$10.00	299	$2,990	59.2	0.003	10
Heavy-Duty Timer	$10.00	1,558	$15,580	134.2	0.033	10
Programmable Thermostat	$15.00	4,799	$71,985	243.1	0.185	11
Outdoor Clothesline	$5.00	1,448	$7,240	165.0	0.037	10

Table 242024: Instant Savings Measure Parameters

Obtained from taking the current incentive multiplied by the 2015 participation. It does not account for any change in incentive levels in 2015.

**Determined by adjusting the per unit gross energy savings for interactive effects, the NTG ratio and line losses.*

**** Determined by adjusting the per unit gross demand savings for interactive effects, the NTG ratio and line losses.*

It should be noted that CLEAResult did not review the individual measure assumptions for the per unit energy and peak demand savings, and energy savings persistence.

Market Penetration

From reviewing the baseline study for the residential sector (a component of the DSM Potential Study[1]), and other data provided by EfficiencyOne, CLEAResult has developed the current estimates for market penetration of the measures. It should be noted that these are estimates only.

Measure	Estimated Market Penetration
ENERGY STAR® LED A Lamp	Low (under 30%)
ENERGY STAR® LED Specialty Lamp	Low (under 40%)
ENERGY STAR® LED Recessed Downlight	Low (under 30%)
ENERGY STAR® LED Fixture	Low (under 30%)
Dimmer Switch	Unknown
Indoor Motion Sensor	Unknown
Motion Sensor with Dimmer Switch	Unknown
Outdoor Motion Sensor	Unknown
Power Bar with Timer	Unknown
Smart Power Bar	Low (under 30%)
Heavy-Duty Timer	Unknown
Programmable Thermostat	Low (under 40%)
Outdoor Clothesline	High (over 50%)

*For the purposes of this analysis, the unknown market penetrations were assumed to be under "Low (under 40%)". The incentive for outdoor clotheslines should be investigated, since their usage may already be standard practice in Nova Scotia.

Table 252125: Market Penetration of Instant Savings Measures

[1] Nova Scotia 2015-2040 Demand Side Management (DSM) Potential Study – Navigant Consulting

Cost to Customer Incentive Level Threshold

As discussed in the Financial Impact Analysis section of the General Principles recommendations, a program that features residential customers making small purchases at retailers should use retail prices as the parameter for cost to customer. As per Table 26~~Table 2226~~, CLEAResult suggests the cost to customer boundary should be 50 percent for this type of incentive.

EfficiencyOne conducted price sensitivity research in 2014. The results of that analysis were used in this exercise. It should be noted that EfficiencyOne should update these numbers internally with the information provided from ongoing program management activities, as the estimated 2016 retail prices for the measures will be more accurate.

Measure	2014 Retail Price	2014 PMI	2014 PME	Estimated 2016 Retail Price	2016 Cost to Consumer (Estimated 2016 Retail Price – Current Incentive)	Estimated 2016 PME*	Cost to Consumer Less than PME?	Current Incentive as % of Retail Price
ENERGY STAR® LED A Lamp	$15.00	$5.00	$13.50	$12.00	$9.00	$13.50	Yes	25%
ENERGY STAR® LED Specialty Lamp	$30.00	$7.00	$20.50	$25.00	$20.00	$20.50	Yes	20%
ENERGY STAR® LED Recessed Downlight	$45.00	$20.20	$44.30	$45.00	$33.00	$44.30	Yes	27%
ENERGY STAR® LED Fixture	Not Included	Not Included	Not Included	$45.00	$33.00	$44.30	Yes	27%
Dimmer Switch	$30.00	$7.00	$20.70	$25.00	$21.00	$20.70	No	16%
Indoor Motion Sensor	$24.00	$10.10	$28.80	$25.00	$20.00	$28.80	Yes	20%
Motion Sensor with Dimmer Switch	Not Included	Not Included	Not Included	$30.00	$25.00	$24.84	No	17%
Outdoor Motion Sensor	$24.00	$15.00	$35.10	$25.00	$20.00	$35.10	Yes	20%
Power Bar with Timer	Not Included	Not Included	Not Included	$20.00	$15.00	$18.00	Yes	25%
Smart Power Bar	$50.00	$15.60	$45.00	$50.00	$40.00	$45.00	Yes	20%
Heavy-Duty Timer	Not Included	Not Included	Not Included	$20.00	$10.00	$18.00	Yes	50%
Programmable Thermostat	$30.00	$11.75	$29.99	$30.00	$15.00	$29.99	Yes	50%
Outdoor Clothesline	Not Included	Not Included	Not Included	$20.00	$15.00	$20.00	Yes	25%

Table 26~~2226~~: Cost to Customer Incentive Threshold for Instant Savings Measures

*The Estimated 2016 PME was based on the 2014 PME

It appears that in terms of the customer cost incentive level threshold, all of the current incentives are suitable. The only two measures where the current customer cost is more than the PME are the dimmer switch and the motion sensor with dimmer switch. The PME's of both these measures are based on the analysis for the dimmer switch. It should also be noted that the difference between the customer cost and the PME for both of these measures is ≤two percent of the customer cost.

From reviewing the current incentive compared to the retail price, all of the current incentive levels fall within acceptable ranges of typical retail sales events (between 10-30 percent). The only three measures that do not are ENERGY STAR® A Lamps, Heavy-Duty Timers and Programmable Thermostats.

ENERGY STAR A Lamps have low market penetration and deliver the highest amount of savings for the Instant Savings program. It is advised that based on the cost to customer incentive level threshold, the incentive level does not change.

Programmable Thermostats have low market penetration, so the cost to customer incentive level threshold (50 percent) being reached is justified.

The market penetration of heavy duty timers is unknown. The cost to customer incentive level threshold is not breached at 50 percent, so the incentive can be justified based on this threshold.

Program Budget Incentive Level Threshold

As discussed in the Financial Impact Analysis section of the General Principles recommendations, a program that features residential customers making small purchases at retailers should use $/kWh for the program budget impact. As per 14, CLEAResult suggests the program budget boundary should be $0.50/kWh for this type of incentive. EfficiencyOne has a program budget of $0.26/kWh for this program. Based on historical expenditures, the costs for program administration have been between 20-30 percent of the total expenditure. Therefore, the incentive expenditure, on a $/kWh basis is as follows:

Parameter	Program Budget Incentive Level Threshold
Total Expenditure (Incentive + Program Administration)	$0.26/kWh
Incentive Expenditure (@ 30% Program Administration Expenditure)	$0.18/kWh
Incentive Expenditure (@ 20% Program Administration Expenditure)	$0.21/kWh

Table 27~~23~~27: Program Budget Incentive Level Threshold for Instant Savings Program

Each measure in the Instant Savings program has its associated program budget incentive level threshold listed below.

Measure	Current Incentive ($)	Per Unit Net Energy Savings (kWh)	Program Budget Incentive Level Threshold at 30% Program Administration Expenditure	Program Budget Incentive Level Threshold at 20% Program Administration Expenditure	Is Current Incentive Lower than Program Budget Incentive Level Threshold at 30% Program Administration Expenditure
ENERGY STAR® LED A Lamp	$3.00	25.5	$4.59	$5.35	Yes
ENERGY STAR® LED Specialty Lamp	$5.00	25.5	$4.59	$5.35	No
ENERGY STAR® LED Recessed Downlight	$12.00	51.9	$9.35	$10.91	No
ENERGY STAR® LED Fixture	$12.00	151.8	$27.33	$31.88	Yes
Dimmer Switch	$4.00	18.7	$3.37	$3.93	No
Indoor Motion Sensor	$5.00	50.4	$9.07	$10.58	Yes
Motion Sensor with Dimmer Switch	$5.00	59.0	$10.61	$12.38	Yes
Outdoor Motion Sensor	$5.00	174.9	$31.48	36.73	Yes
Power Bar with Timer	$5.00	59.1	$10.63	$12.40	Yes
Smart Power Bar	$10.00	59.2	$10.65	$12.43	Yes
Heavy-Duty Timer	$10.00	134.2	$24.16	$28.18	Yes
Programmable Thermostat	$15.00	243.1	$43.76	$51.05	Yes
Outdoor Clothesline	$5.00	165.0	$29.70	$34.65	Yes

Table 282428: Program Budget Incentive Level Threshold for Instant Savings Measures

It appears that in terms of the program budget incentive level threshold, the majority of the current incentives are suitable. The only three measures that breach the program budget incentive level threshold are the ENERGY STAR specialty lamp, ENERGY STAR recessed downlight and the dimmer switch.

The current incentive for the ENERGY STAR specialty lamp is 9 percent higher than the program budget incentive level threshold (assuming a 30 percent program administration expenditure). It means a reduction of $0.41 from the current incentive of $5.00 to meet the threshold. The current incentive for the ENERGY STAR recessed downlight is 30 percent higher than the program budget incentive level threshold (assuming a 30 percent program administration expenditure). It means a reduction of $2.65 from the current incentive of $12.00 to meet the threshold.

The current incentive for dimmer switches is 20 percent higher than level threshold (assuming a 30 percent program administration expenditure). It means a reduction of $0.63 from the current incentive of $4.00 to meet the threshold.

It should be noted that EfficiencyOne has a program budget expenditure limit of $0.26/kWh. This is applied at the program level, which allows “less expensive budget impact” measures to subsidize “more expensive budget impact” measures.

Cost Effectiveness Incentive Level Threshold

EfficiencyOne has a PAC target of 1.9 for this program. For the calculation, it is assumed that program administration costs are 30 percent of total expenditure, which leaves the incentive costs at 70 percent of expenditure. Therefore the program administration expenditure is 43 percent of the incentive expenditure. This ratio can allow the PAC target to be adjusted to only include the incentive expenditure.

Alternatively, the program administration costs can be determined for each measure, and included in the cost effectiveness calculations. If this is done, the PAC threshold remains at 1.9.

To model PAC cost effectiveness for each individual measure, CLEAResult developed a simplified cost effectiveness calculator that makes several assumptions that aren't accurate in detailed cost effectiveness calculations as discussed, it is recommended that EfficiencyOne develop a cost effectiveness calculator for incentive level setting, and broader short-term program design purposes.

Measure	PAC of Current Incentive Level (including Program Administration Costs)	Is PAC of Current Incentive Greater than Cost Effectiveness Incentive Level Threshold (including Program Administration Costs)
ENERGY STAR® LED A Lamp	506.49	Yes
ENERGY STAR® LED Specialty Lamp	303.92	Yes
ENERGY STAR® LED Recessed Downlight	9.17	Yes
ENERGY STAR® LED Fixture	20.04	Yes
Dimmer Switch	5.32	Yes
Indoor Motion Sensor	4.10	Yes
Motion Sensor with Dimmer Switch	4.19	Yes
Outdoor Motion Sensor	14.84	Yes
Power Bar with Timer	4.37	Yes
Smart Power Bar	2.36	Yes
Heavy-Duty Timer	7.35	Yes
Programmable Thermostat	16.81	Yes
Outdoor Clothesline	17.57	Yes

Table 29~~25~~29: Cost Effectiveness Incentive Level Threshold for Instant Savings Measures

For all of the measures, the cost effectiveness incentive level threshold is not breached.

Comparison of Current Incentive to Incentive Level Thresholds

Measure	Current Incentive	Cost to Customer Threshold Exceeded?	Program Budget Threshold Exceeded?	Cost Effectiveness Threshold Exceeded?
ENERGY STAR® LED A Lamp	$3.00	No	No	No
ENERGY STAR® LED Specialty Lamp	$5.00	No	Yes	No
ENERGY STAR® LED Recessed Downlight	$12.00	No	Yes	No
ENERGY STAR® LED Fixture	$12.00	No	No	No
Dimmer Switch	$4.00	No	Yes	No
Indoor Motion Sensor	$5.00	No	No	No
Motion Sensor with Dimmer Switch	$5.00	No	No	No
Outdoor Motion Sensor	$5.00	No	No	No
Power Bar with Timer	$5.00	No	No	No
Smart Power Bar	$10.00	No	No	No
Heavy-Duty Timer	$10.00	Yes	No	No
Programmable Thermostat	$15.00	Yes	No	No
Outdoor Clothesline	$5.00	No	No	No

Table 30~~26~~30: Comparison of Current Incentive to Incentive Level Thresholds for Instant Savings Measures

Based on the comparison of the suggested incentive levels, it is proposed that all of the measures maintain their current incentive levels, except for programmable thermostats, heavy duty timers and outdoor clotheslines. These measures warrant further analysis.

Even though programmable thermostats have an incentive of 50 percent of their retail price, their low market penetration and high per unit energy savings make them important for future program success, especially when considering Nova Scotia's base of primary electric heating systems. Therefore, for market penetration and savings potential reasons, this incentive does not need to be updated at the moment.

For heavy-duty timers, the current incentives fall comfortably within the program budget and cost effectiveness incentive level thresholds. It is recommended that the input parameters for this analysis be confirmed, especially their market penetration. There may be an opportunity to reduce the incentive. For example, in Ontario, the incentive is only $4.00 for heavy-duty timers.

For outdoor clotheslines, while the suggested boundaries of the three incentive screening thresholds are not breached, it appears their market penetration is high, and their usage may be standard practice in Nova Scotia. Therefore, it is appropriate

to consider reducing the incentive, or removing it since it may be in the early majority or late majority stage of market transformation as indicated by the Technology Adoption Curve.

CUSTOM PROGRAM FINANCIAL SIMULATION

For the Custom Program Retrofit track, the program financial simulation analysis included the following steps:

1. Identify the average project parameters for the analysis;
2. Determine an appropriate cost to customer incentive level threshold;
3. Determine an appropriate program budget incentive level threshold;
4. Determine an appropriate cost effectiveness incentive level threshold; and
5. Compare the current incentive level to the three thresholds to determine if a change was required

Identification of Parameters for Average Custom Retrofit Project

The parameters for an average Custom Retrofit project were provided by EfficiencyOne. To provide multiple options for modelling, three different measure archetypes were selected, each with varying degrees of energy savings persistence that are commonly seen in large custom projects. The energy savings persistence will only affect the cost effectiveness incentive level threshold. It should be noted that since an average measure archetype is used, CLEAResult can only comment on average project incentives, and not specific project incentives.

Measure	Average Gross Energy Savings per Project (MWh)	Average Gross Peak Demand Savings per Project (kW)	NTG	Average Net Energy Savings per Project (MWh)	Average Net Peak Demand Savings per Project (kW)	Energy Savings Persistence	Average Project Incentive ($)
Custom Project Retrofit Track	230.75	17.92	92%	212.29	16.49	10	$24,106
Custom Project Retrofit Track	230.75	17.92	92%	212.29	16.49	15	$24,106
Custom Project Retrofit Track	230.75	17.92	92%	212.29	16.49	20	$24,106

Table 31~~27~~31: Parameters for Average Custom Retrofit Project

Cost to Customer Incentive Level Threshold

As discussed in the Financial Impact Analysis section of the General Principles recommendations, a program that features commercial customers making either large capital equipment purchases or large project purchases should use the ~~incremental cost~~Incremental Equipment Cost or the project cost respectively, as well as simple project payback for the cost to customer. As per ~~Tables 13 and 14~~Table 17, CLEAResult suggests the cost to customer boundary should be 50 percent of the project cost and no less than a one year simple project payback for this type of incentive. These are suggested boundaries for the incentive level, and the actual incentives will usually be much lower.

Measure	Project Cost ($)	Simple Project Payback	Current Cost to Customer	Cost to Customer Threshold	
Custom Project Retrofit Track	$96,424	4 years	25%	50%	2 years

Table 32~~28~~32: Cost to Customer Incentive Level Threshold for Average Project in Custom Retrofit

The cost to customer threshold is not breached for either the project cost or the simple payback period.

It is recommended that EfficiencyOne start determining ~~incremental costs~~Incremental Equipment Costs for each project, so that parameter can be analyzed as well.

Program Budget Incentive Level Threshold

As discussed in the Financial Impact Analysis section of the General Principles recommendations, a program that features commercial and industrial customers making either large capital equipment purchases or large project purchases should use $/kWh and total incentive for the program budget threshold. As per Table ~~14~~18, CLEAResult suggests the program incentive budget boundary should be $0.25/kWh and $500,000 for this type of incentive.

For the 2016 Custom Program, EfficiencyOne has a total expenditure limit of $0.20/kWh, so these numbers will be used instead of $0.25/kWh in evaluating the appropriateness of incentives. The program budget incentive threshold is not exceeded for the average custom retrofit project.

Measure	Program Budget Incentive Threshold	Current Program Budget Incentive
Custom Project Retrofit Track	$25,475	$24,106

Table 33~~29~~33: Program Budget Incentive Level Threshold for Average Project in Custom Retrofit

Cost Effectiveness Incentive Level Threshold

EfficiencyOne has a PAC target of 4.9 for this program. For the calculation, it is assumed that program administration costs are 40 percent of total expenditure, which leaves the incentive costs at 60 percent of expenditure. Therefore the program administration expenditure is 67 percent of incentive expenditure.

Measure	Energy Savings Persistence	Cost Effectiveness Threshold
Custom Project Retrofit Track	10	3.14
Custom Project Retrofit Track	15	4.50
Custom Project Retrofit Track	20	5.69

Table 34~~30~~34: Cost Effectiveness Incentive Level Threshold for Average Project in Custom Retrofit

As can be seen from the above analysis, the PAC is greater than 4.9 for measures that have an energy savings persistence greater than 15 years. The break-even point at current incentive and program administration cost targets is an energy savings persistence between 16-17 years. When evaluating individual project incentives, EfficiencyOne should take into consideration the energy savings persistence of the project.

Comparison of Current Incentive Level to Incentive Level Thresholds

Measure	Cost to Customer Incentive Level Threshold Exceeded?	Program Budget Incentive Level Threshold Exceeded?	Cost Effectiveness Incentive Level Threshold Exceeded?
Custom Project Retrofit Track	No	No	No

Table 35~~31~~35: Comparison of Current Incentive Level to Incentive Level Thresholds for Average Project in Custom Retrofit

The Custom Program has appropriate incentive levels for the average project.

A key consideration for EfficiencyOne is to start tracking ~~incremental costs~~Incremental Equipment Costs so that the cost to customer can be fully understood. The ~~incremental costs~~Incremental Equipment Costs are different than the project costs, and play more of a factor in equipment replacement decisions, versus new purchase,

The program budget incentive level threshold is not exceeded.

Finally, for projects where the energy savings persistence is less than 17 years, consideration should be given to potentially decreasing the incentive. An energy savings persistence between 16-17 years is the break-even point for the target cost effectiveness threshold.

Appendix A – Jurisdictional Scans

JURISDICTIONAL SCANS - GENERAL OBSERVATIONS

Jurisdiction	Peak Load (MW) or Annual Consumption (Therms)	Population Served	Types of Electricity Generation
Nova Scotia (ENS)	2,124 MW	≈950,000	Coal, Renewables, Natural Gas
Ontario Electricity	27,005 MW	≈13.8 million	Nuclear, Natural Gas, Hydroelectric
Union Gas	N/A	N/A	-
British Columbia (BC Hydro)	11,681 MW	>4.4 million	Hydroelectric, Thermal, Diesel-Generation
California (PG&E)			
Energy Trust of Oregon - Oregon			Coal, Hydroelectric, Natural Gas, Nuclear, Wind, Solar, Wood
Energy Trust of Oregon - Washington			
New York (ConEd)	12,316 MW	>9,000,000	Nuclear, Natural Gas, Hydroelectric, Other Renewables, Coal, Petroleum-Fired
New York (NYSERDA)			
Vermont (Efficiency Vermont)	1,255 MW*	≈500,000	Nuclear, Hydroelectric
Maine (Efficiency Maine)	1,863 MW*	1.33 million	Renewable, Hydroelectric, Natural Gas, Coal, Petroleum-Fired
Massachusetts (National Grid)	13,128 MW*	≈1.1 million	Natural Gas, Nuclear

Table 363236: Jurisdiction Overview

*Peak for all of state

Jurisdiction	Current Framework Period	Annual Savings Target*	Annual Budget* ($ million)	% Incentive	Unit Cost of Savings Target	Target per Retail Sales	Residential Retail Rates
Nova Scotia (ENS)	2016-2018	135.3 GWh	$34.05	≈70%	$0.25/kWh	1.3%	$0.148/kWh
Ontario Electricity	2015-2020	1,450 GWh	$366.67	N/A	$0.25/kWh	1.3%	$0.10-$0.12/kWh
Union Gas	2015-2020	211,791,091 m3 (Cumulative Cubic Meters)	$51.05	N/A	$0.24/m3		$0.1069/m3
British Columbia (BC Hydro)	2007-2020	884 GWh	N/A	N/A	N/A	N/A	$0.10-$0.12/kWh
California (PG&E)	2016+ Rolling Portfolio	593 GWh	$365.1M	81%	$0.43/kWh	1%	$0.1625/kWh
Energy Trust of Oregon - Electricity	2015-2020	55.1 aMW	$141.3M	65%	N/A	N/A	$0.1109-$0.1137/kWh

Jurisdiction	Current Framework Period	Annual Savings Target*	Annual Budget* ($ million)	% Incentive	Unit Cost of Savings Target	Target per Retail Sales	Residential Retail Rates
Energy Trust of Oregon – Gas	2015-2020	6 MMTh	$26.3M		$4.38/Therm	N/A	10.59 - 11.72 $/Mcf
New York (ConEd)	2009-2015 (EEPS) 2012-2015 (EEPS II)	163.56 GWh (EEPS) ***Average	$78.25 (EEPS) $84.23 (EEPS II) ***Average		$0.48/kWh	≈1%	$0.2885/kWh
New York (NYSERDA)						≈1%	$0.2005/kWh
Vermont	2015-2017	107.27 GWh	$43.43	55%	$0.40/kWh	2%	$0.125-$0.195/kWh
Maine (Efficiency Maine)	2014-2016	136.03 GWh (Base) 191.43 GWh (MACE Low Cost)** 191.43 GWh (MACE High Cost) 54,057.3 Dth (Base) 118,016 Dth (MACE) ***Average	$26.87 (Electric Base) $58.04 (Electric MACE Low Cost) $67.03 (Electric MACE High Cost) $0.529 (Gas Base) $1.18 (Gas MACE) ***Average		$0.20/kWh (Electric Base) $0.30/kWh (MACE Low Cost) $0.35/kWh (MACE High Cost) $9.79/Dth (Base) $10.00/Dth (MACE)		$0.1567/kWh
Massachusetts/ National Grid	2016-2018	646.33	$299.20	80%	$0.46/kWh	2.94%	$0.165-$0.185/kWh

*Annual savings targets and budgets may be presented based on calculation of averages

Table 373337: Jurisdiction Savings Targets and Budgets

APPENDIX A-1: ONTARIO ELECTRICITY

SUMMARY

Jurisdictional Scan	
State/Province	Ontario
Utility/Agency	Independent Electricity System Operator (IESO)
Fuel	Electricity
Key Contact/Interviewee	Evelyn Lundhild
Consultant	Mayuran Srikantha

JURISDICTION OVERVIEW

Electricity Market

The following entities are the key players in the electricity system in Ontario.

- Ontario Government - Ministry of Energy
- Ontario Energy Board (OEB)
- Independent Electricity System Operator (IESO)
- 72 Local Distribution Companies (LDCs)

The Ministry of Energy sets policy for the electricity sector, and is able to provide the IESO and the OEB with direction through the use of ministerial directives. Through these directives, the IESO received guidance to develop the 2015-2020 Conservation First Framework in collaboration with the 72 LDCs.

The OEB is responsible for providing oversight and regulating the LDCs and natural gas utilities in Ontario. As such, the OEB reviews the LDCs rate applications. Conservation activity is funded separately through the IESO, and is (generally) independent of the rate setting process. Previously, from 2011-2014, participation and performance in Conservation programs were mandatory as a condition of license. This condition has been relaxed slightly since all conservation activities for LDCs are now reviewed and approved by the IESO, but there are still some conservation performance specifications in their distribution licenses.

The IESO has four major roles with regards to the electricity system in Ontario:

1. Operates the real time and day ahead markets
2. Contracts with electricity generators for long-term supply
3. Coordinates the long-term electricity system planning process
4. Provides oversight for Ontario's electricity conservation efforts

With regards to the oversight of electricity conservation efforts, the IESO is responsible for setting individual LDC savings targets and budgets, approving their conservation (CDM) plans, ensuring consistency (where possible) with regards to incentives and program delivery for customers across Ontario, managing the EM&V process, providing innovation funding for both the private sector and LDCs to leverage, and for managing the reporting and financial settlement process with LDCs.

Electric Utilities

Ontario has 72 electric utilities (LDCs). The majority of them are municipally owned, but there are a few investor-owned utilities that operate in Ontario. For conservation and efficiency program purposes, they all follow the same guidelines, regardless of ownership structure.

The LDCs range in size. The two largest LDCs are Toronto Hydro and Hydro One, both with over 500,000 customers. In comparison, Atikokan Hydro, one of the smallest LDCs, has just over 1,600 customers.

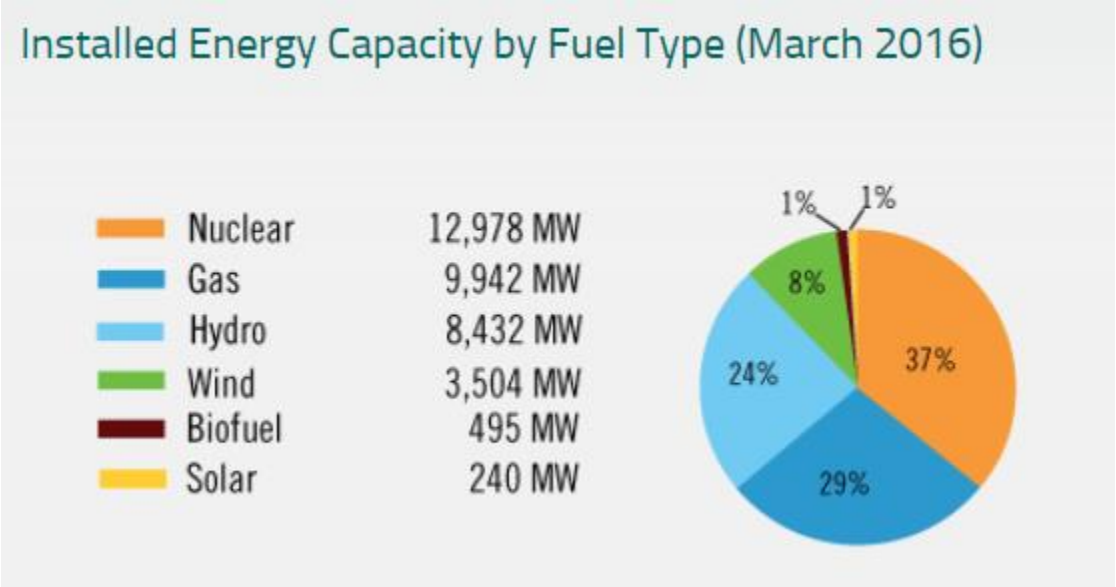
Electricity Generation

Ontario is a summer peaking province, with a peak load of 27,005 MW, which was recorded in August, 2006. Last year, the summer peak was over 22,000 MW. Some LDCs in Ontario are winter peaking.

In 2015, total electricity consumption was 114 TWh, with the sectors having the following individual consumptions:

- Residential: 45 TWh (39%)
- Commercial: 50 TWh (44%)
- Industrial: 19 TWh (17%)

Ontario's supply mix is as follows[1]:



ONTARIO ENERGY EFFICIENCY PROGRAM INCENTIVE AND COST EFFECTIVENESS POLICY

Conservation programs being delivered provincially though the IESO (formerly the OPA) started in 2006, through the delivery of third tranche programs by specific LDCs. Starting in 2007, certain programs began to be offered province-wide such as instant rebates for efficient products at participating retailers (then known as "Every Kilowatt Counts"), an appliance retirement program ("The Great Refrigerator Round up") and a business incentive program delivered through multiple partners ("ERIP", "BOMA", "MEER").

Cost Effectiveness Testing

In their conservation (CDM) plans, LDCs need to show portfolio cost effectiveness (TRC and PAC) if they are offering province-wide programs. If LDCs are offering local programs (only for their territory), those programs need to show program-level cost effectiveness. The only exception is the program to support the low-income sector which can have a TRC of 0.7. The TRC does include societal benefits, so it could be considered an SCT.

[1] http://www.ieso.ca/Pages/Power-Data/Supply.aspx

The IESO is responsible for maintaining cost effectiveness, both from a TRC and PAC perspective, for the programs province-wide and the entire portfolio.

Avoided Costs

For electricity, the major categories of benefit are:

- Avoided Capacity Costs
- Avoided Energy Costs
- Transmission and Distribution Costs
- 15% Adder for additional societal benefits
    - Environmental benefits
    - Employment benefits
    - Other societal benefits

ONTARIO (IESO) –OVERVIEW

Ontario Facts

Ontario covers a land area of 917,741 square kilometers. It has a population of just under 13.8 million people, which is almost 40 percent of Canada's entire population.

Customer Class Breakdown

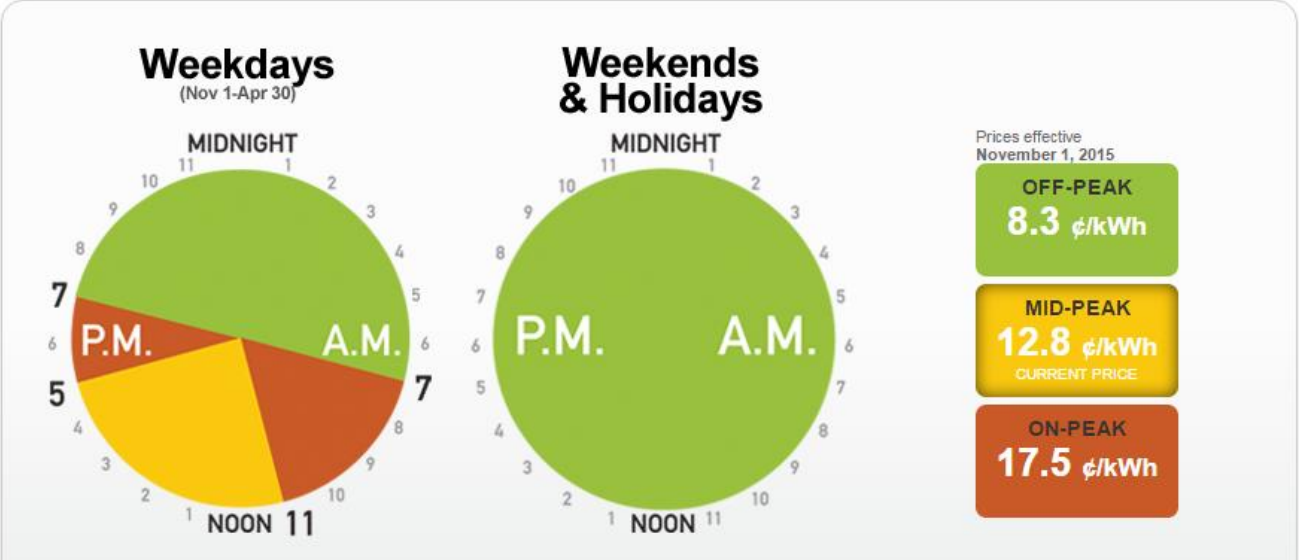
In Ontario, there are 4,988,859 total electricity customers. The customers are broken down as follows:

- Residential Accounts: 4,502,650
- GS < 50 kW: 430,842
- GS >= 50 kW: 54,688
- GS > 5 MW: 117

Retail Prices of Electricity

In Ontario, the average retail price of electricity averages between $0.10-$0.13/kWh all-in for a customer's bill. Ontario is on time-of-use rates, with the following pricing structure for the winter period (November 1 – April 30)[2]:

[2] http://www.ontarioenergyboard.ca/OEB/Consumers/Electricity/Electricity+Prices



All weekends and holidays are considered off-peak. For the winter period, the on-peak period for pricing coincides with the system peak which occurs in the early morning and evening when the space heating load is highest.

In the summer period, the on-peak period for pricing occurs in the afternoon, which also coincides with the system peak, which is driven by space cooling load.

ONTARIO - ENERGY EFFICIENCY PROGRAMMING

Previous Results (Savings, Expenditure, Cost Effectiveness)

Before the current Conservation First Framework (CFF, 2015-2020), Ontario's previous cycle for efficiency programs was from 2011-2014. The following results are summarized for that period[3]:

Program	Net Savings (GWh)	Expenditure
Appliance Retirement	58	Not available
Retailer Coupons	280	Not available
Heating & Cooling Incentive	174	Not available
Home Assistance Program	55	Not available
Other Residential Programs	5	Not available
Total Residential Programs	572	Not available
Retrofit	1,527	Not available
Small Business Lighting	289	Not available
Audit	76	Not available
Process & Systems Upgrade	81	Not available
High Performance New Construction	47	Not available
Energy Managers	117	Not available

[3] 2011-2014 Conservation Results: http://www.ieso.ca/Documents/2011-2014_Conservation_Results_Report.pdf

Industrial Accelerator Program	69	Not available
Other Business Programs	540	Not available
Total Business Programs	2,746	Not available

Program	TRC	PAC
Consumer	1.3	1.6
Low Income	0.6	0.6
Aboriginal	1.1	1.1
Business	1.3	2.8
Industrial	0.9	1.3
Non-LDC Demand Response	1.6	1.1
Non-LDC Industrial	0.6	0.5

Highlights from the results include:

- Retrofit program delivered 46 percent of portfolio savings
- Over 9.9 million energy efficient products incentivized through participating retailers
- Portfolio LUEC: $37/MWh
- Portfolio TRC: 1.2
- Portfolio PAC: 2.1

FUTURE TARGETS

The Conservation First Framework covers the time period from 2015-2020. The province-wide budget for the six years is $2.2 billion, of which LDCs are provided with $1.8 billion. The IESO retains some funds for central services and coordinated program delivery.

For the 2015-2020 period, the total Ontario target is 8.7 TWh. The LDCs have a combined target of 7 TWh. On an annual basis, the total savings target for Ontario is 1.3 percent of sales.

Each LDC is required to complete a CDM plan, which must meet all required cost effectiveness requirements, as well as align with their provided budget and target. A summary table of each LDC's savings targets and budgets is provided below:

LDC Name	Target (GWh)	Budget
Algoma Power Inc.	7.5	$2,107,963
Atikokan Hydro Inc.	1.1	$311,330
Attawapiskat Power Corporation	0.5	$148,832
Bluewater Power Distribution Corporation	62.4	$15,838,687
Brant County Power Inc.	16.0	$4,109,140
Brantford Power Inc.	54.3	$14,048,458
Burlington Hydro Inc.	99.0	$25,825,521
Cambridge and North Dumfries Hydro Inc.	85.0	$21,763,931
Canadian Niagara Power Inc.	28.5	$7,355,555

LDC Name	Target (GWh)	Budget
Centre Wellington Hydro Ltd.	8.7	$2,252,724
Chapleau Public Utilities Corporation	1.0	$298,764
COLLUS PowerStream Corp.	16.9	$4,446,841
Cooperative Hydro Embrun Inc.	1.8	$525,743
E.L.K. Energy Inc.	16.2	$4,273,057
Enersource Hydro Mississauga Inc.	483.3	$122,499,403
Entegrus Powerlines Inc.	56.8	$14,695,867
EnWin Utilities Ltd.	151.3	$38,421,929
Erie Thames Powerlines Corporation	27.6	$7,104,954
Espanola Regional Hydro Distribution Corporation	2.4	$685,489
Essex Powerlines Corporation	31.4	$8,532,573
Festival Hydro Inc.	34.7	$8,768,149
Fort Frances Power Corporation	4.0	$1,109,758
Fort Albany Power Corporation	0.3	$98,990
Greater Sudbury Hydro Inc.	34.7	$9,672,498
Grimsby Power Incorporated	10.9	$2,894,613
Guelph Hydro Electric Systems Inc.	99.0	$24,920,625
Haldimand County Hydro Inc.	19.9	$5,410,280
Halton Hills Hydro Inc.	30.9	$8,387,497
Hearst Power Distribution Company Limited	3.2	$843,903
Horizon Utilities Corporation	330.7	$84,830,304
Hydro 2000 Inc.	1.4	$394,750
Hydro Hawkesbury Inc.	7.9	$2,139,160
Hydro One Brampton Networks Inc.	255.2	$66,798,531
Hydro One Networks Inc.	1,159.0	$321,989,874
Hydro Ottawa Limited	394.5	$105,242,155
Innisfil Hydro Distribution Systems Limited	13.0	$3,680,241
Kenora Hydro Electric Corporation Ltd.	5.3	$1,407,448
Kashechewan Power Corporation	0.5	$155,966
Kingston Hydro Corporation	34.5	$8,674,286
Kitchener-Wilmot Hydro Inc.	105.7	$27,710,719
Lakefront Utilities Inc.	12.2	$3,077,834
Lakeland Power Distribution Ltd.	11.3	$2,970,479
London Hydro Inc.	196.7	$51,192,690
Midland Power Utility Corporation	10.8	$2,739,690
Milton Hydro Distribution Inc.	45.4	$11,911,927
Newmarket-Tay Power Distribution Ltd.	36.2	$9,649,555
Niagara Peninsula Energy Inc.	74.4	$19,056,865
Niagara-on-the-Lake Hydro Inc.	11.7	$2,993,633
Norfolk Power Distribution Inc.	18.9	$5,056,939
North Bay Hydro Distribution Limited	20.3	$5,545,424
Northern Ontario Wires Inc.	4.3	$1,174,934
Oakville Hydro Electricity Distribution Inc.	92.4	$24,575,982
Orangeville Hydro Limited	14.1	$3,705,603

LDC Name	Target (GWh)	Budget
Orillia Power Distribution Corporation	16.6	$4,318,856
Oshawa PUC Networks Inc.	73.0	$19,963,922
Ottawa River Power Corporation	8.7	$2,282,373
Parry Sound Power Corporation	4.5	$1,171,912
Peterborough Distribution Incorporated	37.9	$9,781,455
PowerStream Inc.	535.4	$140,696,240
PUC Distribution Inc.	26.4	$7,440,107
Renfrew Hydro Inc.	4.2	$1,070,574
Rideau St. Lawrence Distribution Inc.	5.0	$1,306,239
Sioux Lookout Hydro Inc.	3.7	$1,016,095
St. Thomas Energy Inc.	17.5	$4,643,532
Thunder Bay Hydro Electricity Distribution Inc.	48.4	$12,927,445
Tillsonburg Hydro Inc.	11.3	$2,881,461
Toronto Hydro-Electric System Limited	1,576.1	$400,296,506
Veridian Connections Inc.	153.0	$40,482,340
Wasaga Distribution Inc.	6.3	$1,814,647
Waterloo North Hydro Inc.	82.4	$21,192,868
Welland Hydro-Electric System Corp.	25.5	$6,584,437
Wellington North Power Inc.	5.9	$1,493,412
West Coast Huron Energy Inc.	8.1	$2,012,404
Westario Power Inc.	23.0	$6,101,269
Whitby Hydro Electric Corporation	58.4	$15,860,460
Woodstock Hydro Services Inc.	23.0	$5,898,316
Ontario LDCs	7,000.0	1,835,264,930.7

INCENTIVE LEVEL SETTING METHODOLOGY

While Ontario does not have a documented incentive level setting methodology, a formal process has been established for all potential program changes and new program proposals. This process covers incentive level changes. All proposed changes and new programs must follow a business case development, review and approval process. Individual LDCs, groups of LDCs, or the official LDC-IESO working groups that oversee program design and delivery can all decide to explore a potential incentive change. The change must get general buy-in from the LDC community and approval from the IESO to proceed to business case development. During the business case development process for an incentive level change, the following considerations have to be addressed:

- Technology Costs
- Technology Savings
- Current and Future Technology Penetration
- Market Structure and Delivery Strategy
- Market Research for Customer and Supply Chain Insight
- Historical Participation and Program Evaluation Insight
- Financial Impact
- Cost Effectiveness Impact
- Program Operations Impact including changes to processes, documents and implementation considerations

The business case, once developed, is reviewed by the relevant LDC-IESO working groups, as well as internal IESO management. The ultimate approval and authorization to proceed is provided by the IESO.

The IESO and the LDCs conduct several activities that support the incentive level setting process:

- Standing market research surveys with residential customers and businesses
- Specific market research projects that assist with incentive level development
- Ongoing channel engagement with key supply chain actors
- Rigorous annual program evaluations that cover both impact and process evaluations
- Ongoing technology and measure research to update the Measures & Assumptions (M&A) list
- Best-practice research from other jurisdictions

The insight, analysis and recommendations from these activities are all inputs into the incentive setting process.

Often, incentive levels are reviewed during the program evaluation or program design process. Program evaluation occurs annually, while program design addresses a gap in the market place or in response to an issue. Ontario does not currently prescribe a frequency for incentive level review for the different programs, but certain programs and delivery strategies have natural review cycles. For example, the retailer program incentive levels are reviewed each year and before each campaign. A key market structure insight to consider is that retailers need six to eight months advance notice for incentive level changes, so analysis and recommendations have to be conducted with this structural issue in mind.

Recently, the Retrofit program approved new incentive levels for the prescriptive lighting track. This process involved reviewing historical participation information; calibrating what the incentive level change would mean for those historical participants; and analyzing what future impacts would be on uptake, the budget and cost effectiveness based on current and future participation trends.

ONTARIO CORE PROGRAM OFFERINGS (RESIDENTIAL AND BUSINESS)

Currently, the conservation programs in Ontario cover the residential, low income, small business, commercial and industrial, and large industrial sectors. The programs cover financial incentives for energy efficient technologies, energy efficiency and energy management coaching and assistance, assessments and direct install of products for the low income and small business sectors, and various capability building and training initiatives for the supply chain. Ontario has featured rigorous evaluation of the conservation program portfolio for the past five years, and due to program maturity, energy efficiency baselines are moving up. For example, standard efficiency T8s, the foundation of several utility programs are now the baseline for efficiency. Recently, Ontario just released a pay-for-performance framework for LDC funding of Conservation Program delivery, the first of its kind in North America.

Program Name	Program Area	Program Measures	Links
Retailer (Coupons, Instant Rebates)	Residential	This program features prescriptive incentives for qualifying measures, purchased from participating retailers. The incentives are provided at point of purchase. Qualifying measures include LEDs, controls, power strips, pipe wrap etc. The incentives are based on up-front cost to the customer, with program cost effectiveness setting a secondary ceiling. Prior to 2010, incentives were limited to a maximum of 30 percent of the retail price.	https://saveonenergy.ca/Consumer/Programs/Instant-Rebates.aspx
Appliance Retirement	Residential	This program features free pick up and environmentally friendly decommissioning of appliance. Additional incentives were not provided	

Program Name	Program Area	Program Measures	Links
		since the program, pilot and barriers analysis determined that biggest barrier to appliance retirement was lack of convenience. The program ended in 2015 due to successful removal of the majority of old, pre-1994 inefficient units. Qualifying equipment included full sized fridges and freezers, with customers given the option of providing window air conditioners and dehumidifiers as secondary equipment.	
Heating & Cooling Incentive	Residential	This program features mail-in or online submission of rebates through participating HVAC contractors for qualifying high efficiency furnaces ($250) and central air conditioners ($250 or $400). The incentives were set based on analyzing the up-front cost difference to the consumer between a standard unit and an efficient unit. Program cost effectiveness set a secondary ceiling, with the program equipment mix (75 percent furnace/25 percent air conditioner) allowing the less cost effective air conditioners to be provided with a higher incentive.	https://saveonenergy.ca/Consumer/Programs/HVAC-Rebates.aspx
Residential New Construction	Business	This program features both a prescriptive and performance track for incentives. Prescriptive incentives are available for installation of energy efficiency lighting and HVAC equipment. The performance track provides $500 or $1,000 per home for obtaining the appropriate Energuide rating. Incentives were set based on attracting builder to consider program for additional electricity efficiency measures.	
Retrofit Prescriptive	Business	This program features prescriptive incentives for qualifying equipment. Incentive applications are submitted online or through a paper-based approach, and are paid after equipment installation and review of the application. Incentives were set based on upfront cost. The incentives were capped at 50 percent of the total costs. Secondary ceilings for triangulating incentive levels were based on amount of savings delivered and cost effectiveness.	https://saveonenergy.ca/Business/Program-Overviews/Retrofit-for-Commercial/Available-Incentives/Prescriptive.aspx
Retrofit Custom	Business	This program was designed to be for larger projects in the commercial and industrial sector, and to capture any projects that might not fall into the Retrofit prescriptive track. Incentives were set based on kW or kWh savings realized, with lighting savings receiving a lower incentive rate than non-lighting savings to encourage greater penetration of the latter category. The incentives were capped at 50 percent of the total cost. With the recent update, the $/kW incentive rate has been removed.	https://saveonenergy.ca/Business/Program-Overviews/Retrofit-for-Commercial/Available-Incentives/Custom.aspx

Program Name	Program Area	Program Measures	Links
		An M&V Plan is required for incentive approval. The incentive rates guarantee measure cost effectiveness for almost all technologies and applications from a program administrator perspective.	
Small Business Lighting	Business	This program is targeted to pursuing lighting efficiency for small business customers (under 100 kW) through a direct install approach. Recently, the incentives for the program were updated to include cost sharing for certain measures that were more expensive on a savings delivered basis. Incentives are based on the lower of the price of the equipment supply and installation, or a prescribed incentive rate per kWh savings. The customer is required to contribute the remaining amount if the incentive rate is the limiting factor. The incentive rate helps guarantee measure cost effectiveness from a program administrator perspective. The program still features a free lighting assessment audit for the customer.	https://saveonenergy.ca/Business/Program-Overviews/Small-Business-Lighting-and-AC.aspx
Energy Managers		This program provides funding for hiring an Energy Manager for larger commercial or industrial customers. The incentive funding is provided through either a guaranteed salary option or a pay for performance option based on realized savings through the year. The pay for performance stream sets funding at $40/MWh. Energy Managers are provided annual savings targets which help with program cost effectiveness.	https://saveonenergy.ca/Business/Program-Overviews/Energy-Managers.aspx
Process & Systems Upgrade (including Industrial Accelerator Program (IAP) portion)		This program is targeted towards large customers, including transmission-connected customers. The incentive funding is provided based on the lower of three options: a prescribed incentive rate for savings, a 40 percent project cost cap or the incentive required to drop the project to a one year payback. In practice, usually one of the first two options is encountered.	https://saveonenergy.ca/Business/Program-Overviews/Process-and-System-Upgrades.aspx http://www.ieso.ca/Pages/Participate/Industrial-Accelerator-Program/Process-and-Systems.aspx

APPENDIX A-2: ONTARIO GAS (UNION GAS)

The incentive setting methodology and cost effectiveness section was based on secondary research and interview with Union Gas. All other sections are based solely on secondary research performed by CLEAResult.

GEOGRAPHIC DEFINITIONS

Union Gas Limited (Union Gas) and Enbridge Gas Distribution Inc. (Enbridge) are the two primary natural gas utilities in Ontario. Together, they serve close to 3.5 million natural gas customers throughout Ontario.

LOAD AND CONSUMPTION INFORMATION

- Total Number of Customers in Ontario (2014): 3,489,238
- Union Gas: 1,400,536
  - Residential: 1,300,000
  - Commercial and Industrial: 116,000
  - Large Volume: 1,000
- Union Gas Sales in 2014 (General Service, in 10^3 m^3)
  - M1 Rate*: 3,328,692
  - M2 Rate*: 1,284,428
  - 01 Rate*: 1,053,067
  - 10 Rate*: 379,430

*M1 and 01 rates are residential, M2 and 10 rates are commercial. M1 and 01 are for customers who consume less than 50,000 m3 per year. M2 and 10 are for medium - large commercial and small industrial customers who consume greater than 50,000 m4 per year. Most residential customers fit in M1 and 01 but there are some commercial customers in M1 and 01.

Cost Rates

Figure 15~~14~~15: Union Gas' Rates [1]

Area	Residential Rate (cents/m3)	C&I Rate (cents/m3)
Eastern ON	10.8100	10.8100
Fort Francis	10.5266	10.5266
Northern ON	10.7178	10.7178
Northwestern ON	10.6017	10.6017
Southern ON	10.8007	10.8007

[1] Union Gas, "Current natural gas rates," https://www.uniongas.com/residential/rates/current-rates (2016)

Figure 161516: Historical Canadian Natural Gas Demand by Sector [2]

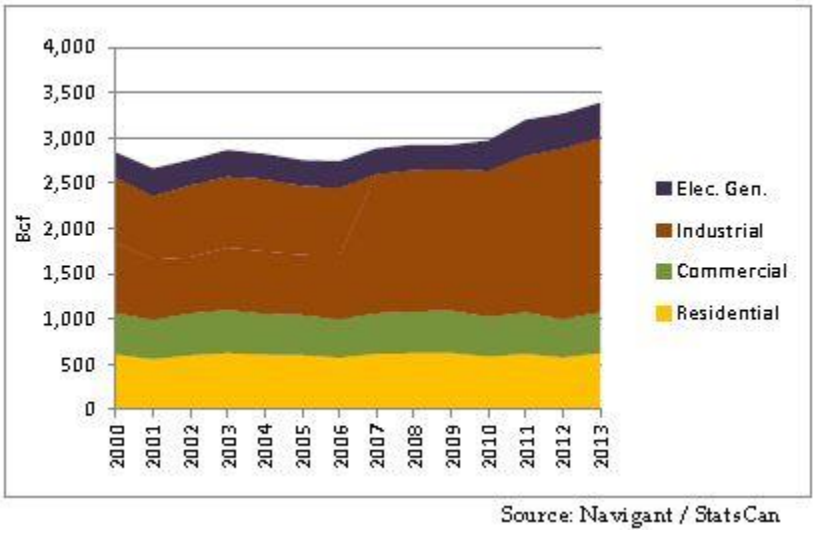
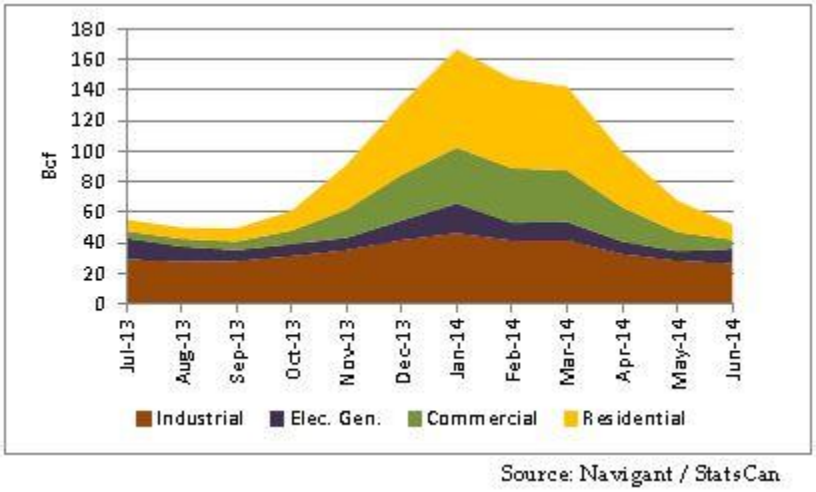


Figure 171617: Ontario Monthly Natural Gas Demand by Sector [22]



MARKET STRUCTURE OVERVIEW

DSM is a core part of the conservation first policy in Ontario as per the 2013 Long-Term Energy Plan. In 2014, the Minister of Energy issued a directive to the Ontario Energy Board (OEB) for the development of a new framework for natural gas DSM. The OEB regulates Ontario's natural gas sector and has responsibilities revolving around rates for the transmission and distribution of natural gas.

A part of this directive, the DSM Framework is to enable the achievement of all cost-effective DSM and align closely with electricity Conservation and Demand Management (CDM) efforts as applicable. OEB, along with stakeholders and comments from the public, were to develop this framework with a final version completed in December 2014.

The result is a DSM framework designed to reduce natural gas consumption in Ontario and contains all gas utilities' DSM activities. This includes guiding principles for gas utilities in their design of individual programs, development of DSM strategies

[2] Navigant Consulting Inc., "2014 Natural Gas Market Review Final Report," http://www.ontarioenergyboard.ca/oeb/_Documents/EB-2014-0289/2014_Natural_Gas_Market_Review_Final_Report.pdf (2014)

and for assessing the appropriateness DSM plans for 2015-2020. The framework can also be used in gas utilities' proposal reviews/approvals for their DSM plans by the OEB. Guiding principles include:

1. Invest in DSM where the cost is equal to or lower than capital investments and/or the purchase of natural gas
2. Achieve all cost-effective DSM that result in a reasonable rate impact
3. Where appropriate, coordinate and integrate DSM and electricity CDM efforts to achieve efficiencies
4. Gas utilities will be able to recover costs and lost revenues from DSM programs
5. Design programs so that they achieve high customer participation levels
6. Minimize lost opportunities when implementing energy efficient upgrades
7. Ensure low-income programs are accessible across the province
8. Programs should be designed to pursue long-term energy savings
9. Shareholder incentives will be commensurate with performance and efficient use of funds
10. Ensure DSM is considered in gas utility infrastructure planning at the regional and local levels

For each program developed based on the guiding principles, Union Gas and Enbridge submits participant proposed annual budgets, eligibility criteria, target metrics and shareholder incentives for the OEB's approval. There is a mid-term review in 2018 that intends to establish more specific direction and to assess performance on annual metrics, budget levels, impact on customer rates and shareholder incentives. The utilities will be required to file all completed studies and reports at the mid-term review. These include:

- Infrastructure Resource Planning study
- Natural Gas Conservation Potential study
- Report on free rider reduction efforts and results across all programs
- On-bill presentment status report
- Joint studies and initiatives with electric utilities

The gas utilities are also the administrator of their own programs. Gas utilities are required to provide annual reports to the OEB. The OEB will be leading program evaluation starting in 2016, by hiring the Evaluation Contractor (EC) and chairing the Evaluation Advisory Committee (EAC). The utilities are a member of the EAC.

PORTFOLIO MATURITY AND HISTORICAL PERFORMANCE

DSM of natural gas has been practiced in Ontario for 21 years. The previous DSM Guidelines (EB-2008-0346) were in place from June 2011 regarding development of new multi-year DSM plans for the gas utilities 2012-2014. Prior, the gas utilities were guided by the Decision in the Generic DSM Proceeding in 2006 (EB-2006-0021) from the OEB. The principles and priorities were for gas utilities to follow from 2007-2009.

Figure 18~~17~~18: Total Savings and Costs of Gas Utilities [3]

Year	Annual Savings (m^3)	Costs ($)
2012	137,438,488	31,322,216
2013	179,966,564	32,838,926
2014		30,091,000(Budget)

[3] Ontario Energy Board, Multiple documents from: "Natural Gas Demand Side Management," http://www.ontarioenergyboard.ca/oeb/_Documents/EB-2014-0289/2014_Natural_Gas_Market_Review_Final_Report.pdf (2016)

Figure 191819: TRC Ratio in 2012-2013 by Programs [33]

Program Category	TRC Ratio (2012)	TRC Ratio (2013)
Union Gas	3.91	3.83
—Residential	5.07	4.4
—Commercial/Industrial	3.07	2.01
—Low-Income	1.32	0.77
—Large Volume	6.33	8.74
—Optimum Home	N/A	N/A

CURRENT CYCLE

The gas utilities have developed and submitted their annual DSM program budgets for all proposed programs for OEB approval 2015-2020. The budgets are comprehensive including financial, marketing and communications, administration and staffing requirements and program evaluation. The OEB has approved annual DSM budgets for the 2015-2020 with modifications:

Figure 201920: Gas Program Budgets [4]

Approved Annual DSM Budgets

Utility	2014 (Actuals)	2015	2016	2017	2018	2019	2020	2015-2020 Total
Enbridge	$ 32,511,266	$ 37,722,230	$ 56,361,117	$ 62,933,844	$ 67,554,087	$ 66,421,773	$ 67,757,376	$ 358,750,427
Union	$ 33,713,172	$ 33,988,000	$ 56,821,373	$ 58,570,073	$ 63,272,305	$ 63,268,773	$ 64,349,541	$ 340,270,066
Total	$ 66,224,438	$ 71,710,230	$ 113,182,490	$ 121,503,917	$ 130,826,393	$ 129,690,546	$ 132,106,917	$ 699,020,493

Notes:
2014 budgets are actuals while 2015-2020 are approved.
Excludes the maximum annual shareholder incentive of $10.45 million / utility / year.

Figure 212021: Gas Program Budgets Incentive/Admin Split [44]

Union Overhead Budgets	2016	2017	2018	2019	2020
Proposed Program Overhead Costs	$10,023,000	$8,342,000	$8,505,000	$8,524,000	$8,542,000
Approved Program Overhead Costs	***$8,747,373***	***$9,696,073***	***$9,868,305***	***$9,901,773***	***$9,919,541***
Proposed Portfolio Overhead Costs	$11,735,000	$6,142,000	$5,642,000	$5,642,000	$5,642,000
Approved Portfolio Overhead Costs	***$11,235,000***	***$5,642,000***	***$5,642,000***	***$5,642,000***	***$5,642,000***
Total Proposed Overhead Costs	$21,758,000	$14,484,000	$14,147,000	$14,166,000	$14,184,000
Total Approved Overhead Costs	***$19,982,373***	***$15,338,073***	***$15,510,305***	***$15,543,773***	***$15,561,541***

Reference: Proposed overhead costs - Union Application, Exhibit A, Tab 3, Schedule 4, Page 6.

The gas utilities have also developed targets for each proposed program 2015-2020. The gas utilities incorporated multiple performance metrics via a weighted scorecard approach that weighs lifetime natural gas savings more highly. It is recognized that the industry and market is to look more broadly at conservation and with other key priorities outside of just savings. The result is the scorecard as seen below.

[4] Ontario Energy Board, "Decision and Order EB-2015-0029/EB-2015-0049," http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/rec/513656/view/Decision_and_Order_Enbridge_Union%20_DSM_20160120.PDF (2016)

Figure 222122: Union Gas Scorecard [44]

Union	Resource Acquisition	Low-Income	Large Volume	Market Transformation	Performance-based
Cumulative natural gas savings metric weight	75%	100%	100%	0%	0%
Other metric weight	25%	0%	0%	100%	100%

Union Gas proposed other metrics targeting:

- Participants in the Home Reno Rebate program
- Homes built in the Optimum Home new construction program
- Participants in the RunSmart and Strategic Energy Management programs

Figure 232223: Union Gas Targets & Performance Metrics [44]

Resource Acquisition Scorecard

Metric	Units	Weight	2016 Target
Metrics and Targets			
Cumulative Savings	CCM (millions)	75%	1,110
Home Reno Rebate Participants	Homes	25%	3,000

Low Income Scorecard

Metric	Units	Weight	2016 Target
Metrics and Targets			
Single Family Cumulative Savings	CCM (millions)	60%	34
Social & Assisted Multi-Family Cumulative Savings	CCM (millions)	35%	15
Market Rate Multi-Family Cumulative Savings	CCM (millions)	5%	2

Market Transformation Scorecard

Metric	Units	Weight	2016 Target
Metrics and Targets			
Homes built >20% above code	Homes	100%	2015 Actual +20%

Performance Based Scorecard

Metric	Units	Weighting 2016	2017	2018	2019	2020	2016 Target	2017-2018 Targets
Metrics and Targets								
RunSmart Participants	Participants	50%	20%	10%	10%	10%	25	125% of Prior Year Actual
SEM Participants	Participants	50%	20%	10%			3	2+ Prior Year Actual
RunSmart Savings (%)	m3		60%	40%	40%	40%		10% Aggregate Participant Savings
SEM Savings (%)	m3			40%	50%	50%		2018: 5%; 2019-2020: 102% of Prior Year Actual

Figure 242324: Union Gas Targets and Budgets [44]

Resource Acquisition - Residential	2016 OEB Approved Budget	2016 OEB Approved CCM Targets	2016 OEB Approved Participant Targets	2017 OEB Approved Budget	2018 OEB Approved Budget	2019 OEB Approved Budget	2020 OEB Approved Budget	Total OEB Approved Budget (2016-2020)
Home Reno Rebate	$ 7,233,000	85,745,550	3,300	$ 9,880,000	$ 12,226,000	$ 12,226,000	$ 12,226,000	$ 53,791,000
Energy Savings Kits (ESK) - *Rejected*	$ -	-		$ -	$ -	$ -	$ -	$ -
Behavioural - *Rejected*	$ -	-		$ -	$ -	$ -	$ -	$ -
Residential Resource Acquisition Program Budget	$ 7,233,000			$ 9,880,000	$ 12,226,000	$ 12,226,000	$ 12,226,000	$ 53,791,000
Residential Overhead (Evaluation & Administration) - Revised	*$ 1,378,657*			*$ 1,488,828*	*$ 1,681,697*	*$ 1,681,697*	*$ 1,681,697*	*$ 7,912,576*
Development and Start-up - Revised	$ -			$ -	$ -	$ -	$ -	$ -
Evaluation	*$ 550,000*			*$ 700,000*	*$ 850,000*	*$ 850,000*	*$ 850,000*	*$ 3,845,000*
Administrative costs - Revised	*$ 819,657*			*$ 779,828*	*$ 822,697*	*$ 822,697*	*$ 822,697*	*$ 4,067,576*
Residential Program Total Including Overhead	$ 8,611,657	85,745,550		$ 11,368,828	$ 13,907,697	$ 13,907,697	$ 13,907,697	$ 61,703,576
Resource Acquisition - Commercial & Industrial								
Commercial & Industrial Prescriptive	$ 6,755,000	302,055,812		$ 6,763,000	$ 7,486,000	$ 7,149,000	$ 7,149,000	$ 35,302,000
Commercial & Industrial Direct Install - *Revised*	$ 500,000	6,699,181		$ 2,500,000	$ 2,500,000	$ 2,500,000	$ 2,500,000	$ 10,500,000
Commercial & Industrial Custom (Studies & Metering)	$ 7,808,000	819,603,817		$ 7,808,000	$ 7,808,000	$ 7,808,000	$ 7,808,000	$ 39,040,000
Commercial & Industrial Resource Acquisition Program Budget	$ 15,063,000			$ 17,071,000	$ 17,794,000	$ 17,457,000	$ 17,457,000	$ 84,842,000
Commercial & Industrial Overhead - Revised	*$ 4,253,176*			*$ 4,964,334*	*$ 4,931,584*	*$ 4,946,286*	*$ 4,946,286*	*$ 24,041,667*
Evaluation	*$ 180,000*			*$ 180,000*	*$ 180,000*	*$ 180,000*	*$ 180,000*	*$ 945,000*
Administrative costs - Revised	*$ 4,064,176*			*$ 4,775,334*	*$ 4,742,584*	*$ 4,757,286*	*$ 4,757,286*	*$ 23,096,667*
Commercial & Industrial Program Total Including Overhead	$ 19,316,176	1,128,358,810		$ 22,035,334	$ 22,725,584	$ 22,403,286	$ 22,403,286	$ 108,883,667
Resource Acquisition Total	**$ 27,927,833**	**1,214,104,360**		**$ 33,404,162**	**$ 36,633,281**	**$ 36,310,983**	**$ 36,310,983**	**$ 170,587,243**
Performance-Based								
RunSmart	$ 297,000	(% savings; no 2016 target)	28	$ 592,000	$ 837,000	$ 582,000	$ 802,000	$ 3,110,000
Strategic Energy Management (SEM)	(budget included above)	(% savings; no 2016 target)	3	***	***	***	***	***
Performance-Based Program Budget	$ 297,000			$ 592,000	$ 837,000	$ 582,000	$ 802,000	$ 3,110,000
Performance-Based Overhead	*$ 251,000*			*$ 251,000*	*$ 251,000*	*$ 251,000*	*$ 251,000*	*$ 1,255,000*
Evaluation	*$ 35,000*			*$ 35,000*	*$ 35,000*	*$ 35,000*	*$ 35,000*	*$ 175,000*
Administrative costs	*$ 216,000*			*$ 216,000*	*$ 216,000*	*$ 216,000*	*$ 216,000*	*$ 1,080,000*
Performance-Based Total	**$ 548,000**			**$ 843,000**	**$ 1,088,000**	**$ 833,000**	**$ 1,053,000**	**$ 4,365,000**
Low Income								
Home Weatherization - *Revised*	$ 6,335,000	36,049,492		$ 6,136,000	$ 7,495,000	$ 8,063,000	$ 8,374,000	$ 36,403,000
Aboriginal	$ 8,000	N/A		$ 419,000	$ 511,000	$ 456,000	$ 448,000	$ 1,842,000
Furnace End-of-Life	$ 761,000	1,736,856		$ 784,000	$ 924,000	$ 919,000	$ 917,000	$ 4,305,000
Multi-Family	$ 2,651,000	18,855,839		$ 3,359,000	$ 2,984,000	$ 3,031,000	$ 3,573,000	$ 15,598,000
Low Income Program Budget	$ 9,755,000			$ 10,698,000	$ 11,914,000	$ 12,469,000	$ 13,312,000	$ 58,148,000
Low Income Overhead - Revised	*$ 1,652,470*			*$ 1,644,841*	*$ 1,655,954*	*$ 1,675,720*	*$ 1,693,488*	*$ 8,323,473*
Evaluation	*$ 220,128*			*$ 213,015*	*$ 225,948*	*$ 244,982*	*$ 263,008*	*$ 1,167,082*
Administrative costs	*$ 1,432,342*			*$ 1,431,826*	*$ 1,431,006*	*$ 1,430,737*	*$ 1,430,480*	*$ 7,156,391*
Low Income Total	**$ 11,407,470**	**56,642,187**		**$ 12,342,841**	**$ 13,570,954**	**$ 14,144,720**	**$ 15,005,488**	**66,471,473**
Large Volume								
Large Volume - *Revised*	$ 3,150,000	Section 5.29		$ 3,150,000	$ 3,150,000	$ 3,150,000	$ 3,150,000	$ 15,750,000
Large Volume Overhead - Revised	*$ 850,000*			*$ 850,000*	*$ 850,000*	*$ 850,000*	*$ 850,000*	*$ 4,250,000*
Evaluation - Revised	*$ 63,000*			*$ 63,000*	*$ 63,000*	*$ 63,000*	*$ 63,000*	*$ 315,000*
Administrative costs - Revised	*$ 787,000*			*$ 787,000*	*$ 787,000*	*$ 787,000*	*$ 787,000*	*$ 3,935,000*
Large Volume Total	**$ 4,000,000**	**Section 5.29**		**$ 4,000,000**	**$ 4,000,000**	**$ 4,000,000**	**$ 4,000,000**	**$ 20,000,000**
Market Transformation								
			2015 Actuals +					
Optimum Home - *Revised*	$ 841,000		20%	$ 841,000	$ 841,000	$ 841,000	$ 841,000	$ 4,205,000
Commercial Savings By Design - New	$ 500,000		8	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 4,500,000
Program Budget	$ 1,341,000			$ 1,841,000	$ 1,841,000	$ 1,841,000	$ 1,841,000	$ 8,705,000
Market Transformation Overhead - Revised	*$ 362,070*			*$ 497,070*	*$ 497,070*	*$ 497,070*	*$ 497,070*	*$ 2,350,350*
Evaluation - Revised	*$ 26,820*			*$ 36,820*	*$ 36,820*	*$ 36,820*	*$ 36,820*	*$ 174,100*
Administrative costs - Revised	*$ 335,250*			*$ 460,250*	*$ 460,250*	*$ 460,250*	*$ 460,250*	*$ 2,176,250*
Total MT budget	**$ 1,703,070**			**$ 2,338,070**	**$ 2,338,070**	**$ 2,338,070**	**$ 2,338,070**	**$ 11,055,350**
Total Program Budget without Overheads	$ 36,839,000			$ 43,232,000	$ 47,762,000	$ 47,725,000	$ 48,788,000	$ 224,346,000
Total Program Overhead	*$ 8,747,373*			*$ 9,696,073*	*$ 9,868,305*	*$ 9,901,773*	*$ 9,919,541*	*$ 48,133,066*
Total Program Budget with Program-level Overhead	$ 45,586,373			$ 52,928,073	$ 57,630,305	$ 57,626,773	$ 58,707,541	$ 272,479,066
Portfolio-level Overhead - Revised	*$ 11,235,000*			*$ 5,642,000*	*$ 5,642,000*	*$ 5,642,000*	*$ 5,642,000*	*$ 33,803,000*
Research	*$ 1,500,000*			*$ 1,000,000*	*$ 1,000,000*	*$ 1,000,000*	*$ 1,000,000*	
Evaluation	*$ 1,300,000*			*$ 1,300,000*	*$ 1,300,000*	*$ 1,300,000*	*$ 1,300,000*	
Administration	*$ 2,935,000*			*$ 2,842,000*	*$ 2,842,000*	*$ 2,842,000*	*$ 2,842,000*	
Pilots - Revised with Direct Install Pilot Removed	*$ 500,000*			*$ 500,000*	*$ 500,000*	*$ 500,000*	*$ 500,000*	*$ 2,500,000*
DSM Tracking and Reporting System Upgrades	*$ 5,000,000*			*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
Total DSM Budget Pre-Inflation	$ 56,821,373			$ 58,570,073	$ 63,272,305	$ 63,268,773	$ 64,349,541	$ 306,282,066
Cumulative Inflation @ 1.68% - *Rejected*	$ -			$ -	$ -	$ -	$ -	$ -
GRAND TOTAL	**$ 56,821,373**	**1,270,746,547**		**$ 58,570,073**	**$ 63,272,305**	**$ 63,268,773**	**$ 64,349,541**	**$ 306,282,066**

COST EFFECTIVENESS TESTING

Technical Reference Manual

The EC reviews and proposes updates to the OEB with regards to data within the TRM. This occurs yearly. This review and update includes input assumptions to reflect the findings of the annual DSM evaluation and audit. Additional research may be required to include new technologies to the TRM and improve existing assumptions.

Cost Effectiveness Requirements

The gas utilities' overall DSM goals are to achieve all the cost-effective DSM available in its market. The OEB determined that cost effectiveness should be based on the Total Resource Cost-plus (TRC-plus) test when screening prospective programs.

Low-income programs are screened with the same TRC-plus test as Resource Acquisition programs but have a lower requirement of a minimum of 0.7 while Resource Acquisition programs are to have TRC-plus ratio of at least 1.0.

Market transformation programs and pilots are not held to the same requirement as their goals are to change behaviours throughout the marketplace. These programs are not required to have a cost effectiveness test.

Avoided Supply Cost (Benefits)

Given the differences between Union Gas' and Enbridge's geography, system and customers and such, it is expected the avoided supply cost will be different between the two gas utilities.

Under the TRC-plus test, benefits include:

- Avoided natural gas costs
- Avoided transmission and distribution costs (such as pipelines and storage facilities)
- A 15 percent non-energy benefit adder accounting for other benefits not related to the reduction in natural gas such as environmental, economic and social benefits

Costs

Under the TRC-plus test include:

- Costs incurred by program participants (~~incremental costs~~Incremental Equipment Costs)
- Costs of running the energy efficiency programs (delivery and administration costs)

INCENTIVE RATE SETTING

Union Gas is responsible for setting incentive levels for their programs. Periodic reviews of the appropriateness of incentive levels is conducted and adjustments to financial incentives are made. Below is an overview of the process employed by Union Gas when examining an incentive level for a new measure or proposing a significant change to an existing measure.

1. **Market Research**
   The process starts by performing both primary and secondary market research in order to determine the measure performance metrics and costs. The objective is to determine awareness, barriers and purchase decisions. Market penetration and age of technology is considered as well (e.g. new technology versus widespread solutions).
2. **Technical Reference Manuals**
   The Technical Evaluation Committee approve/deny measures for TRMs which are used for savings and assumptions and enables Union Gas to include solutions in programs. Measures with large savings potential can warrant higher incentive levels.
3. **Benchmarking**
   Union Gas also reviews other jurisdictions and evaluates their measures and incentives relative to what is offered in other territories. The goal is to be relatively similar to other territories in their incentives. Other factors such as ~~incremental costs~~Incremental Equipment Costs are investigated.
4. **Incremental Equipment Cost Design**
   Based on the market research and technology, Union will attempt to incentivize a portion of the ~~incremental cost~~Incremental Equipment Cost determined to motivate customers to implement. Typically, this has fallen between 25-35 percent of ~~incremental costs.~~ Incremental ~~costs~~Equipment Costs. Incremental Equipment Costs for measures with base cases, are calculated by the difference between the measure cost and standard measure cost. For measures without base cases, the ~~incremental cost~~Incremental Equipment Cost is taken as the full measure cost.
5. **Incentive Rate Finalized**
   Once the incremental measure cost is finalized, Union Gas will set a standard incentive using the above considerations.

The above process is used for prescriptive measures. For custom measures, a similar process as steps 1-5 is followed but other considers may be evaluated such as customer rate class.

EXISTING MAIN PROGRAMS – UNION GAS [44]

Program Area	Program Name	Description	Incentives	Links
Resource Acquisition	Home Reno Rebate	Program provides an audit of customer homes to identify areas of improvement and also rebates or incentives to perform the recommended improvements.	- Incentives for the audit - Basement Insulation: $450 - $1,000 for insulating 100 percent of the basement (Incentive amount depends on spec) - Exterior Wall Insulation: $1,000 - $1,500 - Attic Insulation: $250 - $500 - Air Sealing: $100 - $150 - Furnace/Boiler: $500 - Water Heater: $200 - Window: $40 per window	https://www.uniongas.com/residential/save-money-energy/rebates-promotions/home-reno
	C&I Prescriptive	Program provides customers rebates for a list of recommended efficient technologies and equipment.	- Check link for list of measures and incentives	https://www.uniongas.com/business/save-money-and-energy/space-heating-programs https://www.uniongas.com/business/save-money-and-energy/water-heating-programs https://www.uniongas.com/business/save-money-and-energy/cooking-programs
	C&I Custom	This program is similar to the above but provides incentives based on overall natural gas savings realized by the	- Contract customers: $0.10 up to $100,000 - General service customers: $0.20 up to	https://www.uniongas.com/busi

		customer's specific needs.	$40,000 (Total not to exceed 50 percent of project cost)	ness/save-money-and-energy/engineering-projects
Low-Income	Home Weatherization	Program provides low-income qualified residential customers with a home energy assessment and weatherization at no cost. Customers are also eligible to receive energy efficient showerheads, faucet aerators and a programmable thermostat.	The following at no cost: - Home Energy Assessment - Insulation - Water Saving Products - ProgrammableThermostat	https://www.uniongas.com/residential/save-money-energy/rebates-promotions/weatherization/offer
	Aboriginal	This program combines customers with free natural gas energy efficiency measures installed by Union Gas representatives and carbon monoxide detector at no cost. Also, financial incentive to upgrade existing furnaces.	- No cost for measures and installation - Financial incentives for upgrading furnaces	
	Furnace End-of-Life	Program provides social and assisted housing providers and private market customer financial incentives to upgrade to a 95 percent or higher efficiency rating.	- Financial incentives for upgrading furnaces	
	Multi-family	Program targets customers living in social-housing buildings/privately-owned buildings with a high proportion of low-income residents with measures, audits and education.	- Financial incentives to use towards boilers, ventilation systems, custom measures and window upgrades. Tenants are eligible to receive energy efficient showerheads, faucet aerators, and educational information related to energy conservation	
Performance Based	RunSmart	Program provides smaller commercial and industrial customers with a free on-site building assessment, a report on their energy use and recommendations on how to improve their energy efficiency through operational changes.	- Education, Healthcare, Office, Multi-Unit Residential and Entertainment Commercial Customers has financial rate of: $0.10/m3 to a maximum of $20,000	https://www.uniongas.com/business/save-money-and-energy/engineering-projects
Large Volume	Large Volume	This program provides large volume	- Check link for details	https://www.uni

		customers with technical support and customer training along with financial incentives for energy saving projects.		ongas.com/business/save-money-and-energy/engineering-projects
Strategic Energy Management		The Strategic Energy Management is a long-term and deep savings initiative for large customers. The customer's energy will be tracked and measured against their baseline performance for continuous improvements.	Incentives are structured to support initial start-up costs as well as provide incentives for measured energy efficiency improvements over the 5-year participation.	http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/rec/472262/view/

APPENDIX A-3: BRITISH COLUMBIA (BC HYDRO)

GEOGRAPHIC DEFINITIONS

BC Hydro is in British Columbia, Canada. They generate and deliver electricity to 95 percent of the population of the province serving over four million people.

LOAD AND CONSUMPTION INFORMATION

- Peak Demand (2017 Forecast): 11,681 MW
- Consumption (2017 Forecast): 63,238 GWh
    - Residential: 19,761 GWh (31%)
    - Commercial: 17,815 GWh (28%)
    - Industrial: 19,016 GWh (30%)

- Annual Savings Target: 884GWh

Figure 252425: Customer Count and Loads[1]

Customers	Count	Electricity Sold 2014 (Gigawatt-Hours)
Residential	1,709,071	17,965
Light Industrial and Commercial	201,812	18,501
Large Industrial	177	13,994
Other	3,489	2,558
Trade	239	50,082
Total	**1,914,788**	**103,100**

In BC Hydro, approximately 90 percent of their customer accounts are residential accounts. The remainder is either commercial or industrial and each represents about one third of the total electricity supplied.[2]

RATE INFORMATION[3]

- Residential Customers: $0.0829/kWh (First 1,350kWh), $0.1243/kWh thereafter
- Small Business: $0.1116/kWh
- Medium Business: $0.1030/kWh (First 14,800kWh), $0.0719/kWh thereafter up to individual baseline
- Large Business: $0.1114/kWh (First 14,800kWh), $0.0536/kWh thereafter up to individual baseline

GENERATING CAPACITY (2015)

- Hydroelectric: 11,440 MW (91%)
- Thermal: 1,069 MW (8.5%)
- Diesel Generation: 59 MW (0.5%)

[1] BC Hydro, "BC Hydro Annual Report 2014," https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/accountability-reports/financial-reports/annual-reports/bc-hydro-annual-report-2014.pdf (2014)

[2] BC Hydro, "BC Hydro Service Plan 2013/14-2015/16," https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/service-plans/bc-hydro-service-plan.pdf

[3] BC Hydro, "General Service Business Rates," https://www.bchydro.com/accounts-billing/rates-energy-use/electricity-rates/business-rates.html (2016)

MARKET STRUCTURE OVERVIEW

BC Hydro is a provincial Crown corporation. Their mandate is to generate, distribute, purchase and sell electricity. The sole shareholder of BC Hydro is the Province of British Columbia. BC Hydro reports to the Ministry of Energy and Mines (Ministry) with the British Columbia Utilities Commission (BCUC) has their regulator. BCUC's primary responsibility is regulation of natural gas and electricity utilities in the province. They are an independent regulatory agency operating under and administering the Utilities Commission Act.

The Integrated Resource Plan is long-term strategic plan for BC Hydro to address growth in electricity demand over 20 years. The 2007 BC Energy Plan contains policies BC Hydro is to follow. BC Hydro and other utilities that fall within this plan are to pursue and invest in all cost-effective demand side management (DSM). They are encouraged to develop a diversified program portfolio for the benefit of all ratepayers. DSM programs are funded by ratepayers.

The Clean Energy Act also contributes to the 2007 BC Energy Plan providing further guidance to meeting objectives. It sets targets for increased investments in clean and renewable energy, electricity self-sufficiency as well as reduced greenhouse gas emissions. It also directs BC Hydro to have 66 percent of future incremental energy demand be met through conservation by 2020.

The Ministry monitors utilities' progress on DSM and energy efficiency assessing barriers to the cost-effective program implementation. They may also propose regulatory directions to BCUC as required. The Ministry is also involved with assessing if appropriate incentives are available for utilities to identify and pursue cost-effective programs.

PORTFOLIO MATURITY AND HISTORICAL PERFORMANCE

Figure 262526: Electricity Savings from Energy Efficiency Programs F2003 - F2007[44]

	Cumulative Electricity Savings (GWh/year)		
	Plan	Actual	Variance
F2003	353	358	1%
F2004	610	739	21%
F2005	890	1,147	29%
F2006	1,177	1,391	18%
F2007	1,743	1,879	8%

CURRENT CYCLE

There is a forecast of 10,610 GWh of savings per year and 1,756 MW of savings in 2020. The year 2020 is also the milestone year for the 2007 Energy Plan's conservation target. This is based on the Conservation Potential Review (CPR) conducted in 2006 and 2007. The CPR actually determined a range of 6,200 to 10,800 GWh per year of achievable electricity savings by 2021 impacted by market, government policy and DSM measures. [4]

[4] BC Hydro, "2008 Long-Term Acquisition Plan Appendix K," http://www.bcuc.com/Documents/Proceedings/2008/BCH_LTAP_B-1-1_APPENDICES/Appendix%20K.pdf

Figure 272627: Planned Energy Savings in F2020 (GWh/yr)[44]

	Codes and Standards	Rate Structures	Programs	Total
Residential	2,760	980	1,070	4,810
Commercial	500	390	1,480	2,370
Industrial	110	730	2,590	3,430
Total	**3,370**	**2,090**	**5,150**	**10,610**

Figure 282728: Planned Capacity Savings in F2020 (MW)[44]

	Codes and Standards	Rate Structures	Programs	Total
Residential	584	217	202	1,003
Commercial	65	63	194	322
Industrial	14	95	321	430
Total	**662**	**375**	**719**	**1,756**

Below is the cumulative rate of annual electricity savings resulting from DSM activities. This includes programs, codes and standards and rate structures.

Figure 292829: Cumulative GWh/Year following the 2008 BC Energy Plan[44]

GWH/YEAR	F2008	F2009	F2010	F2011	F2012
Target	295	761	1,700	2,300	3,500
Actual	326	983	1,778	2,348	

BC Hydro has developed annual cumulative targets using the Conservation Potential Review and research related to other DSM tools.[22]

The LTAP 2008 also includes support initiatives in the DSM Plan[44]:

- Codes and standards support
- Public awareness and education
- Community engagement
- Technology innovation
- Indirect and portfolio enabling activities
- Information technology
- Rate structures

INCENTIVE LEVEL-SETTING METHODOLOGY

The following is a rough sketch of what we have seen in other territories.

BC Hydro is responsible for setting incentive levels for their programs and introducing new measures and programs. This is performed through business cases for programs and typically occurs every two to three years. Below is an overview of the process employed by BC Hydro when examining an incentive level for a new measure or proposing a significant change to an existing measure.

6. **Benchmarking**
   BC Hydro reviews other jurisdictions and evaluates their measures and incentives relative to what is offered in other territories. Other factors such as ~~incremental costs~~Incremental Equipment Costs are investigated. Benchmarking is usually performed by directly contacting the utility of programs.
7. **Market Research**
   Market research depends on the sector/incentive. It can either be achieved by broad primary research or by one-on-one consultations for larger customers. The objective is to determine awareness, barriers and purchase decisions.
8. **Technical Reference Manuals**
   The engineering team, M&V team, program managers, evaluation group and other in-house BC Hydro resources approve/deny measures for TRMs which are used for savings and assumptions. They enable BC Hydro to include solutions in programs. All proposed incentives go through a governance process for technical and business review.
9. **Incremental Equipment Cost Design**
   Based on the market research and technology, BC Hydro will attempt to incentivize a portion of the ~~incremental cost~~Incremental Equipment Cost determined to motivate customers to implement. Typically, 50-75 percent of ~~incremental costs~~Incremental Equipment Costs have been incented. For "Replace on Burnout" measures, the ~~incremental cost~~Incremental Equipment Cost is calculated as the difference between the measure cost and that of the standard measures. For Retrofit/Direct Install measures, the ~~incremental cost~~Incremental Equipment Cost is taken as the full measure cost including the price of labour. For larger end uses, it is specific to the project, taking into account technology life left – for instance, a very old pump could be repaired almost indefinitely. An old compressor unit will likely be tossed out.
10. **Incentive Rate Finalized**
    Once the incremental measure cost is finalized, BC Hydro will set a standard incentive using the above considerations. Other considerations include:
    - Interaction with conservation rates
    - Interaction with codes and standards
    - Estimated free-ridership and spillover – for instance, no free ridership might mean that the incentive is too low

COST EFFECTIVENESS REQUIREMENTS

Total Resource Cost (TRC) is used by BC Hydro and the BCUC at the program level to evaluate performance. Programs must have a TRC of 1.0 or greater. There is an expectation of low-income programs. Internally, other cost effectiveness tests are used including utility cost and ratepayer impact measure.

Calculating Cost effectiveness

Cost effectiveness analysis is performed by looking at the stream of benefits and costs resulting from the DSM investment. Four metrics are calculated for each test:

1. Benefit-cost ratio = PV (benefits) / PV (costs)
2. Net present value (NPV) = PV (benefits) - PV (costs)
3. Gross Levelized cost ($/kWh) = PV (costs) / PV (energy savings)
4. Net Levelized cost ($/kWh)1 = PV (costs – all benefits except for electric energy benefits) / PV (energy savings)

TRC Test

Benefits	Costs
• Avoided electric energy costs • Avoided electric capacity costs • Avoided non-electric fuel costs • Customer non-energy impacts[2]	• Utility program costs • Allocated overhead costs • Customer costs • Partner organization program costs

Utility Test

Benefits	Costs
• Avoided electric energy costs • Avoided electric capacity costs	• Utility program costs • Utility incentive costs • Allocated overhead costs

Non-Participant Test (RIM)

Benefits	Costs
• Avoided electric energy costs • Avoided electric capacity costs	• Utility program costs • Utility incentive costs • Allocated overhead costs • Lost revenues

Participant Test

Benefits	Costs
• Electricity bill savings • Non-electricity bill savings • Utility and partner incentive costs • Customer non-energy impacts	• Customer costs

BC HYDRO PROGRAMS

Program Type	Programs	Details
Residential	Behaviour Program[5]	This program intends to inform and educate residential customers about their electricity consumption and motivate customers to reduce that consumption through behavioural changes in their homes. Customers engage in a one-year challenge in reducing electricity consumption by 10 percent, and receive $50 if successful in addition to the bill savings.
	Lighting Program	This program motivates residential customers to make energy efficient choices in their homes and seasonal lighting to transform the market to include more energy efficient lighting products.
	Renovation Rebate Program[5]	Primarily focused on lowering space heating load, this program is targeted towards electrically heated homes and townhouses with forced-air furnaces. It is followed by a home energy assessment. Based on the recommendations on the assessment, customers choose to complete one or more retrofits to improve energy efficiency in their homes. On average, each participant receives about $1,250 in incentives.
	New Home Program	This program intends to create demand and build homes that are more energy efficient than minimum requirements of the B.C. Building Code. Individual measures vary between sites, but will be measured using the EGNH rating system. On a scale of 0-100, homes that achieve greater than 77 may be branded as Power Smart Silver, rating of 80 or more will be branded as Power Smart Gold. Incentives vary depending on the level of achievement, and incentives are also provided for ENERGY STAR appliance and lighting packages.
	Low Income Program[6]	The Low Income Program provides some low-cost energy savings measures that can easily be installed by a homeowner or tenant. The energy saving package includes CFL lamps, faucet aerators, low-flow showerheads, pipe wrap, caulking, draft proofing materials, outlet gaskets, window film, and a number of additional measures as well as energy saving tips. Further offerings are available and delivered through ECAP. They provide qualified low-income residential account holders with a home energy evaluation, the installation of additional energy saving products such as energy-efficient refrigerators and personalized energy efficiency advice. All services and equipment are provided free of charge.
	Appliances and Electronics (Seasonal)	This program motives customers to purchase ENERGY STAR compliant appliances and electronics. This program will focus on the largest energy consuming and most common appliances and electronics that have an ENERGY STAR label.
Commercial	BC Hydro Leaders in Energy Management	This program provides a range of technologies, but focuses on indoor and outdoor lighting, information technology infrastructure (e.g., data servers), heating, ventilation and air conditioning equipment, refrigeration and building operations. There are a number of tools and resources through the program to support this initiative including: • Business Management: Access tools to help you get started by identifying energy efficiency opportunities in your organization • Asset Management: Apply for funding to support energy efficiency implementation projects • Change Management: Obtain education and training to gain energy efficiency expertise and for participant's employees engaged in the process • Peer and Public Recognition: Celebrate designation and

[5] BC Hydro, "Demand Side Management Milestone Evaluation Summary Report F2013," https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/revenue-requirements/directive-66-f2013-demand-side-management-milestone-evaluation-summary-report.pdf (February 2014)

[6] BC Hydro, "F2012 Demand Side Management Milestone Evaluation Summary Report," https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/revenue-requirements/directive-66-f2012-demand-side-management-milestone-evaluation-summary-report.pdf (December 2012)

Program Type	Programs	Details
		achievements
	High Performance Building	The objective of this program is to acquire energy savings by reducing the energy intensity of new commercial buildings through more efficient design and construction relative to standard practices, and to transform the new commercial building industry to a higher level of energy efficiency. • Whole Building Design: Offers co-funding of energy studies to quantify potential energy savings from integrated design and energy saving measures for the building envelope, lighting and HVAC systems • Energy Efficient Lighting Design: Provides funding for the creation of an energy efficient lighting design and a daylighting study and an incentive for the implementation of approved designs
	Energy Management Assessment (Commercial) Program	This program helps participants to take the first step towards improving energy management practices. It involves: • A diagnostic workshop with senior management • Responding to a series of questions regarding energy management which produces a detailed report that highlights areas of opportunities within your organization • Working together with BC Hydro to provide you with resources to implement recommendations and develop action plans • Conducting a benchmark analysis which ranks your organization against other within your industry • An annual review to track progress
Industrial	Energy Studies & Audits	Energy assessments are given to determine how to use energy and trim costs. Eligibility is based on energy consumption and system size. The types of studies available are: • Customer Site Investigation • Plant-wide Audit • End Use Assessment • Energy Efficiency Feasibility Study
	Project Incentives	• Self-Serve Incentive Program: Industrial customers and facilities that use 500 megawatt-hours or more electricity per year ○ Eligible technologies are: Compressed Air Systems between 40 and 200 horsepower; and/or Industrial Lighting • Distribution: Customers that use more than one gigawatt-hour of electricity per year that will save at least 50 megawatt-hours per year ○ Funding covers all aspects of your project including: design, equipment, installation, disposal and tax • Transmission: Customers that use more than one gigawatt-hour of electricity per year that will save at least 300 megawatt-hours per year ○ Funding covers all aspects of your project including: design, equipment, installation, disposal and tax • New Plant Design: Customers in early stage of planning a new facility or expanding an existing facility, an expectation to increase the power load by five percent or more, and an electricity savings potential of more than 300 megawatt-hours per year
	Strategic Energy Management	• Industrial Energy Manager: Customers with more than 10 gigawatt-hours of electricity consumption per year, must hire an energy manager as a full-time employee ○ 100 percent funding of: energy management consulting services, required training for a new energy manager, on-site Energy Management Assessment • Energy Management Assessment: Must participate in the Strategic Energy Management Program ○ A free three-hour on-site facilitated session provided

Program Type	Programs	Details

		• Employee Energy Awareness
		  ○ Variety of free materials given to remind, educate, and to introduce new operational procedures
		  ○ BC Hydro also provides funding to help energy managers deliver on Workplace Conservation Awareness

Others	Sustainable Communities Program	• Community Energy & Emissions Plan (CEEP): Intended for improved energy management and it can be used to foster green economic development in the community • Community Energy Manager (CEM): Funding for a dedicated staff resource within local government to drive sustainable policies and projects that reduce electricity consumption and greenhouse gas emissions within the community • Local Area Plan (LAP): To integrate energy planning and conservation measures into land use planning for a specific area. Funding provided for energy experts to participate on the multidisciplinary planning team and to provide data compilation, analysis and recommendation • Project Implementation (Pilot): Funding to drive energy conservation plans, policies and projects into action
	Business Energy Advisors	A Business Energy Advisor will meet with participants to tour their business and identify energy saving opportunities for both electricity and natural gas. Advisors will also introduce applicable incentives for upgrading to energy efficient technologies to better understand consumption as well as simple energy saving behaviours a business can do.

APPENDIX A-4: CALIFORNIA (PG&E)

BACKGROUND

Efficiency Nova Scotia has contracted CLEAResult to conduct energy conservation and energy efficiency program incentive research. The project covers the following areas:

- Identification of best practices for incentive rate setting from other jurisdictions
- Application to Nova Scotia's market

The goal of the project is to generate a guideline for program incentive setting, which features best practices and considerations. Ultimately, this will be used by Efficiency Nova Scotia to help optimize their energy conservation and efficiency program design and delivery to meet their conservation and environmental protection goals.

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OVERVIEW

Jurisdictional Scan	
State/Province	California
Utility/Agency	Pacific Gas & Electric
Fuel	Electricity
Key Contact/Interviewee	Carolyn Weiner Manager, EE Core Products carolyn.weiner@pge.com office: 415-973-2391 cell: 415-852-8663
Consultant	Jonathan Houle

STATE OVERVIEW OF ELECTRICITY MARKET

As the largest U.S. state by population[1], and second largest in terms of energy consumption[2] California has a rich history of providing utility and government sponsored energy efficiency programs to its residential and industrial customer base. Regarding energy efficiency programs, the following are the key stakeholders in utility or agency sponsored energy efficiency and demand management program regulation and delivery:

- California Public Utilities Commission
- Load Serving Entities, specifically the Investor Owned and Publically Owned Utilities
- California Energy Commission
- California ISO

[1] Enchantedlearning.com, http://www.enchantedlearning.com/usa/states/population.shtml

[2] U.S Energy Information Association – Detailed State Data, https://www.eia.gov/electricity/data/state/

Load Serving Entities

California is served by approximately 81 load serving entities (LSEs)[3]. These are broken down as:

- Investor-Owned Utilities - 6
- Electricity Service Providers - 22
- Publicly Owned Utilities - 46
- Rural Electricity Cooperatives - 4
- Community Choice Aggregators - 3

The five largest utilities based on and total electricity consumption (in 2014) were:

1. Southern California Edison Company (SCE)
2. Pacific Gas and Electric Company (PG&E)
3. Los Angeles Department of Water and Power (LADWP)
4. San Diego Gas & Electric (SDG&E)
5. Sacramento Municipal Utility District (SMUD)

Electricity Generation

Figure 1 below highlights the various forms of generation (both in-state and out of state) used to meet California's electricity needs in 2014[4]. Figure 2 highlights the historical trend of installed in-state capacity from 2001 to 2014.[5]

2014 Total System Power in Gigawatt Hours

Fuel Type	California In-State Generation (GWh)	Percent of California In-State Generation	Northwest Imports (GWh)	Southwest Imports (GWh)	California Power Mix (GWh)	Percent California Power Mix
Coal	1,011	0.5%	-	17,877	18,888	6.4%
Large Hydro	14,052	7.1%	160	2,138	16,350	5.5%
Natural Gas	121,934	61.3%	1	10,151	132,087	44.5%
Nuclear	17,027	8.6%	-	8,193	25,220	8.5%
Oil	46	0.0%	-	-	46	0.0%
Other	16	0.0%	-	-	16	0.0%
Renewables	44,887	22.5%	11,423	3,493	59,803	20.1%
Biomass	6,721	3.4%	762	24	7,507	2.5%
Geothermal	12,186	6.1%	150	694	13,030	4.4%
Small Hydro	2,426	1.2%	361	-	2,787	0.9%
Solar	10,557	5.3%	-	2,009	12,566	4.2%
Wind	12,997	6.5%	10,151	766	23,913	8.1%
Unspecified Sources of Power	N/A	N/A	25,676	18,757	44,433	15.0%
Total	198,973	100.0%	37,261	60,609	296,843	100.0%

Figure 302930: California Total System Power 2014

[3] http://energyalmanac.ca.gov/electricity/overview.html

[4] http://energyalmanac.ca.gov/electricity/total_system_power.html

[5] http://energyalmanac.ca.gov/electricity/electric_generation_capacity.html

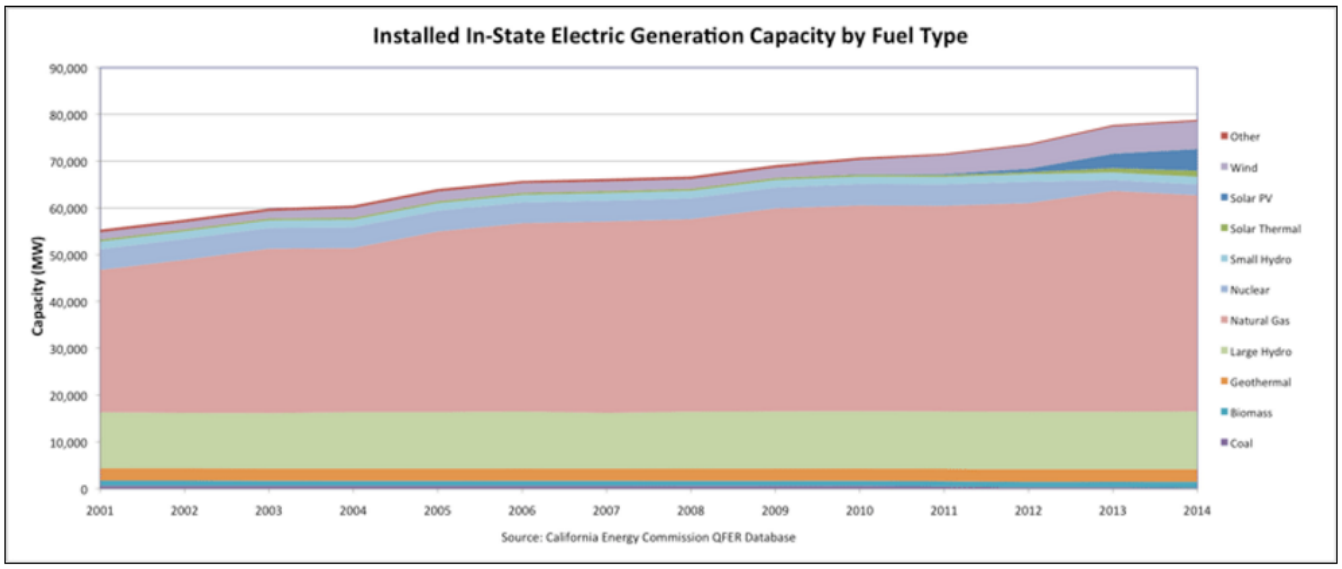


Figure 313031: California Total Installed In-State Capacity by Fuel Type

Average Retail Prices[6]

Sector	Retail Rate (cents/kWh)
Residential	16.25
Commercial	15.62
Industrial	12.34

Table 383438: Average Retail Rates California - 2014

CALIFORNIA ENERGY EFFICIENCY PROGRAM INCENTIVE & COST EFFECTIVENESS POLICY

California has long been recognized as one of the leading jurisdiction in North America regarding the regulatory standards and policies established to guide the design and delivery of energy efficiency programming. Recently, in order to set annual target and budgets for Program Administrators (PAs), the CPUC moved forward in a proposed decision[7] to create a "Rolling Target" system where long-term targets would be set and updated on an annual basis to include the next year in the long-term forecast. This new rule would require IOUs to submit annual budget to the Commission for approval along with a "business plan" every five years.

While PAs do not have set budget over the term of the forecast, D.14-10-046 has committed to funding roughly $1B in ratepayer funds towards energy efficiency and conservation programs on a go-forward basis.

[6] Energy Information Association, http://www.eia.gov/electricity/state/california/index.cfm
[7] Rulemaking 13-11-005, California Public Utilities Commission, Filed August 18, 2015 http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M154/K225/154225993.PDF

Cost Effectiveness Testing

As detailed in D.14-10-046[8], the CPUC has interpreted its mandate to deliver cost-effective energy efficiency and conservation programs as meaning that all energy efficiency portfolios of delivery agents should be cost effective. Within the utility and agency sponsored energy efficiency and conservation community, California's Standard Practice Manual is seen as a benchmark regarding the integration of energy efficiency as a resource and how to use cost effectiveness testing to weigh the contribution of those resources. Programs are evaluated based on Total Resource Cost (TRC) test and the Program Administration Cost (PAC) test.

The Energy Efficiency Policy Manual requires that the energy efficiency portfolio as a whole has higher benefits than costs for both the TRC and PAC tests. The Standard Practice Manual defines the TRC test as the measurement of the net benefits and costs that accrue to society, which is defined as a program administrator (usually a utility) and all of its customers. It compares the benefits, which are the avoided cost of generating electricity and supplying natural gas, with the total costs, which include program administration and customer costs. The TRC does not include the costs of incentives. On the other hand, the PAC test does not include the costs incurred by participating customers but does include incentives paid to participating customers. The PAC test measures the benefits and costs that accrue to the program administrator, which is usually, but not always, the utility.

California uses its DEER database to perform measure level cost effectiveness testing. Additionally, Energy and Environment Economics (E3) has made a portfolio cost effectiveness testing model.

Avoided Costs

Within California, the avoided costs of electricity are generated by E3 for a 20-year period based on the following components: generation energy, generation capacity, ancillary services, transmission and distribution capacity, environment (i.e., avoided greenhouse gases), and the avoided renewable portfolio standard. The avoided cost model is periodically updated to improve the accuracy of how benefits of demand-side resources are calculated. Natural gas avoided costs include: commodity costs, losses, transmission and distribution, and emissions.[9]" The most recent update was completed in 2011.

Please see Table 1 below which details what factors are taken into account when examining each avoided cost component in California:

Component	Basis of Annual Forecast	Basis of Hourly Shape
Generation Energy	Forward market prices and the $/kWh fixed and variable operating costs of a CCGT	**Historical hourly day-ahead market price shapes from MRTU OASIS**
Generation Capacity	Residual capacity value a new simple-cycle combustion turbine	**Top 250 CAISO hourly system loads**
Ancillary Services	Percentage of Generation Energy value	**Directly linked with energy shape**
T&D Capacity	Marginal transmission and distribution costs from utility ratemaking filings	**Hourly temperature data**
Environment	Synapse Mid-Level carbon forecast developed for use in electricity sector IRPs	**Directly linked with energy shape with bounds on the maximum and minimum hourly value**
Avoided RPS	Cost of a marginal renewable resource less the energy market and capacity value associated with that resource	**Flat across all hours**

Table 393539: California Avoided Cost Components

[8] Decision 14-10-046, California Public Utilities Commission, Filed November 14, 2013 http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M129/K228/129228024.pdf

[9] Energy and Environmental Economics (E3), Energy Efficiency Avoided Cost 2011 Update, December 2011, https://ethree.com/public_projects/cpuc4.php

PACIFIC GAS & ELECTRIC (PG&E) – UTILITY OVERVIEW

Utility Facts[10]

- Service area stretches from Eureka in the north to Bakersfield in the south, and from the Pacific Ocean in the west to the Sierra Nevada in the east
- 141,215 circuit miles of electric distribution lines and 18,616 circuit miles of interconnected transmission lines
- 42,141 miles of natural gas distribution pipelines and 6,438 miles of transportation pipelines
- 5.3 million electric customer accounts
- 4.4 million natural gas customer accounts

Fourth Quarter and full year, 2015 vs. 2014

	Three Months Ended December 31,		Twelve Months Ended December 31,	
	2015	2014	2015	2014
Sales from Energy Deliveries (in millions kWh)	21,015	20,944	85,860	86,303
Total Electric Customers at December 31			5,311,178	5,276,025
Total Gas Sales (in Bcf)	226	214	854	870
Total Gas Customers at December 31			4,415,332	4,394,283
Sources of Electric Energy (in millions kWh)				
Total Utility Generation	6,790	7,444	30,372	28,794
Total Purchased Power	12,713	11,496	48,175	52,008
Total Electric Energy Delivered (1)	21,015	20,944	85,860	86,303

Figure 323132: PG&E 2015 Annual Report - 2014 vs. 2015 Utility Fact[11]

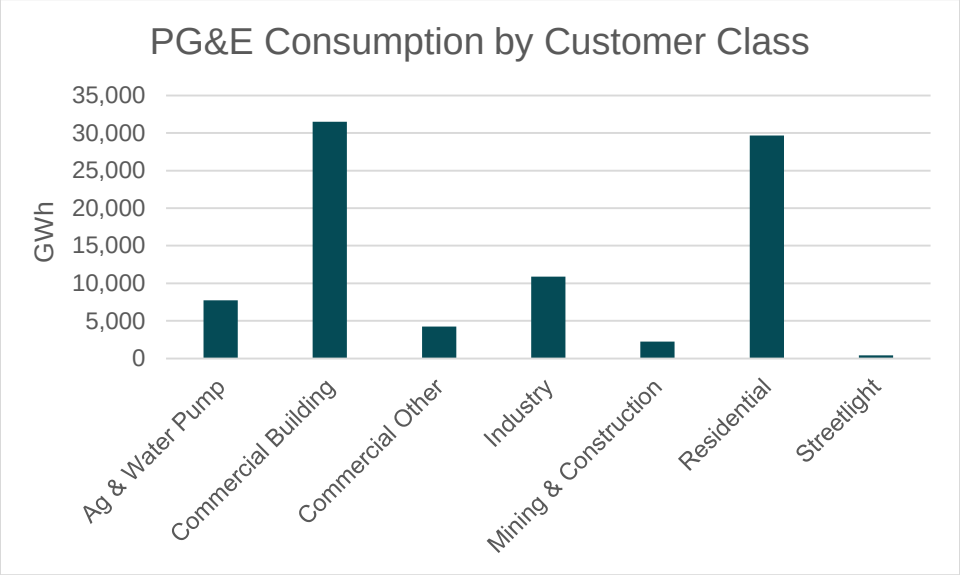
Customer Class Breakdown

The chart below highlights PG&E's consumption by customer class as identified by California's Energy Consumption Data Management System[12]. The total annual energy consumption in 2014 was 86TWh.

[10] PG&E Company Profile, https://www.pge.com/en/about/company/profile/index.page

[11] http://www.pgecorp.com/news/pdf/2015Q4EarningsSlides.pdf

[12] http://www.ecdms.energy.ca.gov/elecbyutil.aspx



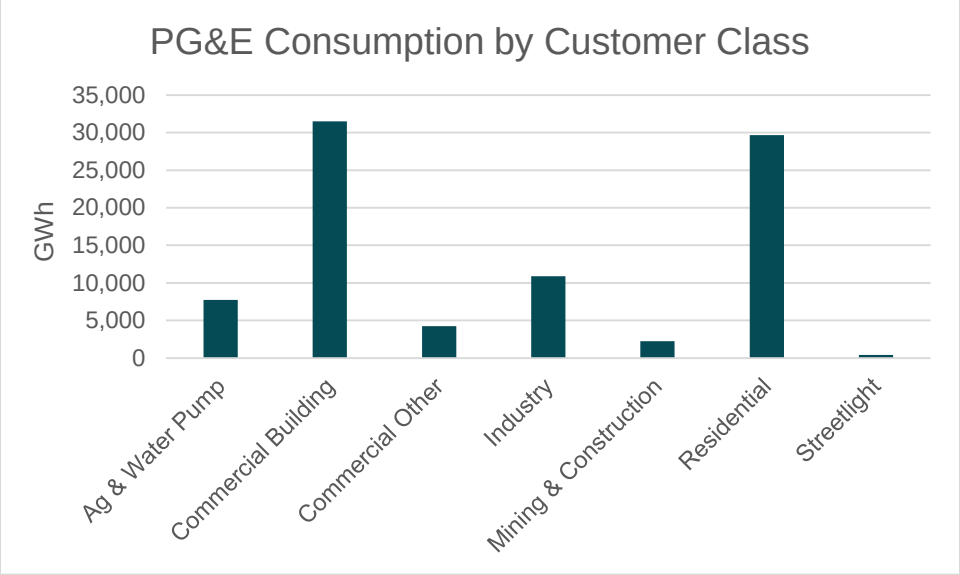


Figure ~~333~~233: PG&E Consumption by Customer Class

PG&E - ENERGY EFFICIENCY PROGRAMMING

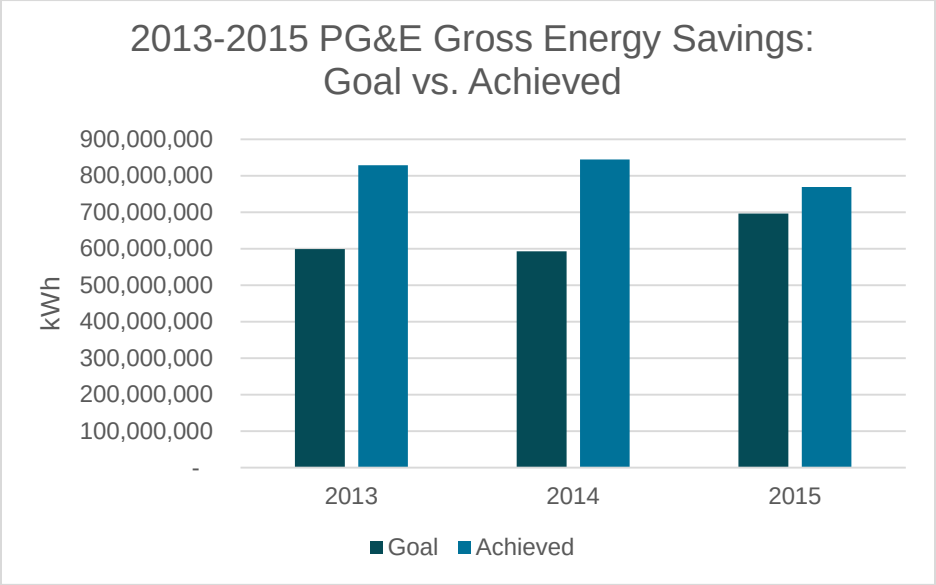
PG&E has been delivering energy efficiency programs to its customers since 1976 having kept more than 168 million metric of CO_2 out of the atmosphere based on cumulative lifecycle gross energy savings. [13]

Savings

PG&E's programs have proven very successful at reducing energy consumption and incentivizing energy efficient behaviours and investment decisions. In the 2013-2015 period, PG&E managed to achieve between 110-143 percent of annual gross

[13] http://www.pge.com/en/about/environment/pge/energyefficiency/index.page

energy savings goals and 130-164 percent of annual demand goals delivered through PG&E Programs (excludes Codes & Standards savings).[14]



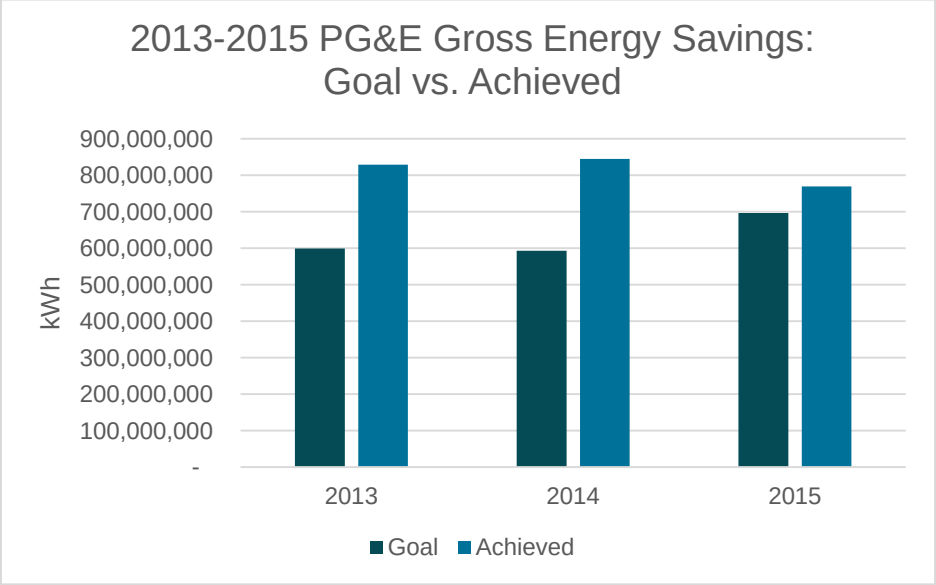
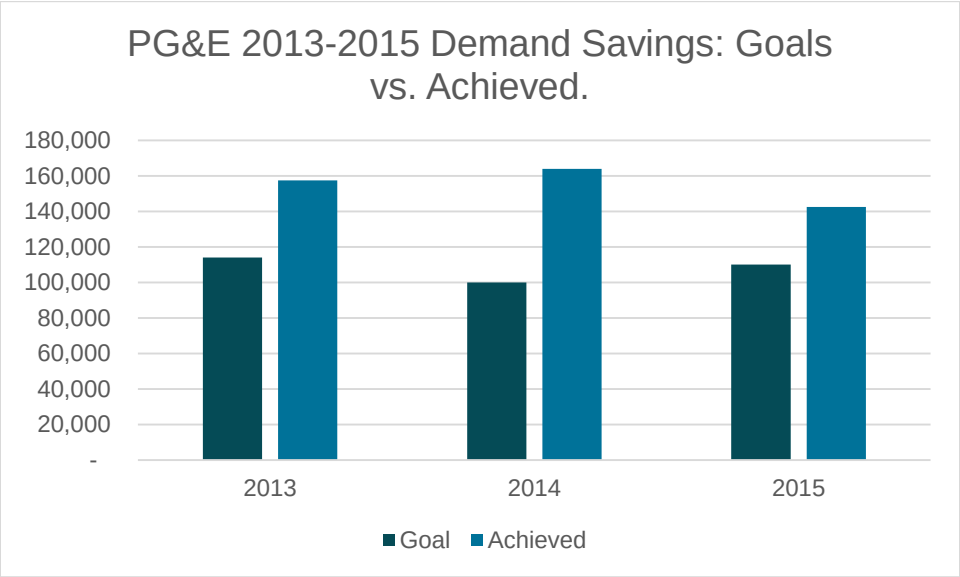


Table 403640: PG&E 2013-2015 Gross Energy Savings

[14] http://eestats.cpuc.ca.gov/Views/Documents.aspx



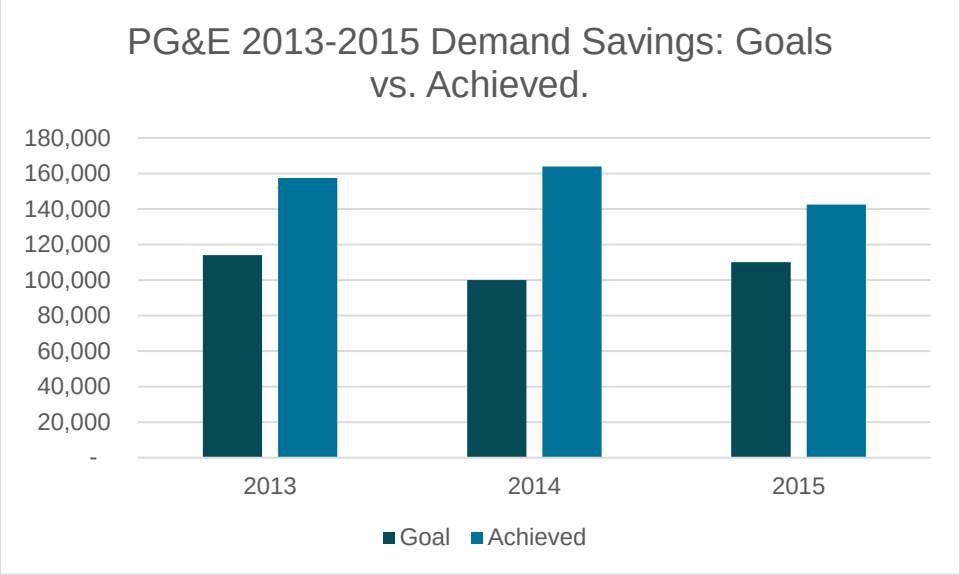


Table 413741: PG&E 2013-2015 Demand Savings

Budget & Spending

PG&Es total budget spending on energy efficiency programming (including Codes & Standards funding and On-Bill Financing) achieved through actual expenditures of $1.53B vs. a budget of $1.68B. This is to be commended given PG&E's ability to exceed its targets. The budget specific to energy efficiency programming is as follows:

2013-2015 Total Portfolio $/kWh*			
	2013	**2014**	**2015**
Gross Savings (kWh)	828,999,924	845,181,086	769,529,791

Spending	$ 317,221,372	$ 365,056,021	$ 385,199,846
$/kWh	$ 0.38	$ 0.43	$ 0.50
*Excludes C&S,EM&V and On-Bill Financing expenses reported			
**Budgeted, not actuals			

PG&E 2013-2015 Incentive-to-Administrative Spending Ratios			
	2013	**2014**	**2015**
Incentive	261,270,952	296,147,345	N/A
Administration	$ 55,950,420	$ 68,908,676	N/A
Incentive: Administration Spending Ratio	82:18	81:19	N/A

Cost Effectiveness

All California PAs must deliver energy efficiency portfolios which have a TRC and PAC greater than 1. Below is PG&E's historical cost effectiveness for its 2013 and 2014 program portfolio.

PG&E 2013-2015 Incentive-to-Administrative Spending Ratios			
	2013	**2014**	**2015**
TRC	1.33	1.38	N/A
PAC	2.36	2.18	N/A

FUTURE TARGETS

Below are individual IOU gross annual targets filled to the CPUC in R-13-11-005:

Table 1. Annual GWh

	PG&E			SCE			SDG&E		
Year	IOU Programs	Net C&S[17]	Total	IOU Programs	Net C&S	Total	IOU Programs	Net C&S	Total
2016	625	611	1,236	674	631	1,304	183	143	327
2017	637	506	1,144	694	522	1,216	186	119	305
2018	507	408	916	528	421	949	141	96	237
2019	511	401	912	542	414	955	144	94	238
2020	519	381	900	553	393	946	147	89	236
2021	524	326	850	542	337	879	147	76	223
2022	541	295	836	559	304	863	151	69	220
2023	558	254	812	573	262	835	154	59	214
2024	581	240	821	593	247	840	158	56	214

Figure 343334: California IOU Annual GWh Energy Efficiency Targets 2016-2024

Table 2. Annual MW

	PG&E			SCE			SDG&E		
Year	IOU Programs	Net C&S	Total	IOU Programs	Net C&S	Total	IOU Programs	Net C&S	Total
2016	85	141	226	122	145	267	25	33	58
2017	87	105	193	123	108	231	26	25	51
2018	69	103	172	99	106	206	20	24	44
2019	70	103	173	103	107	210	20	24	44
2020	71	101	173	107	104	211	21	24	45
2021	74	94	169	103	97	201	21	22	43
2022	80	90	170	109	92	201	22	21	43
2023	86	84	171	113	87	200	23	20	43
2024	92	82	173	119	84	203	25	19	44

Figure 353435: California IOU Annual MW Energy Efficiency Targets 2016-2024

INCENTIVE LEVEL SETTING METHODOLOGY

PG&E's Energy Efficiency Products organization was formed approximately six years ago in part to standardize and streamline the measures developed and marketed through PG&E's breadth of energy efficiency programs. One of the organization's responsibilities is to provide PG&E the resources to actively study market and technology trends (both

technologically and economically) while optimizing PG&E's portfolio of incentivized products based on the technological and market maturity of a measure.

It is important to highlight the regulatory approach for communicating incentive levels to California's Public Utility Commission. The PA's Program Implementation Plans provide incentive levels for each measure offered in that respective program; when a change is made to an incentive level, the PA is required to report that change when it changes more than 50 percent of the reported amount. Historically, the Public Utility Commission may focus on the portfolio cost effectiveness including the total incentive spend for programs as well as other major cost elements like administration, marketing, and other non-incentive implementation costs.

To ensure measure design is properly vetted, PG&E's Products organization has instituted a structured process in which new energy efficiency solutions and services are researched and evaluated for their appropriateness for inclusion in the energy efficiency program portfolio and appropriate incentive levels are defined. This "gated" process ensures that all new and existing technologies are properly vetted by engineering and program staff and are approved on their technical merits (i.e., energy savings potential) by the Commission. Outside of regulatory proceedings this process, named SPARC (Smart Products and Rewards Customers), has been presented to the Commission and is attached in Exhibit A.

Below is an overview of the process employed by PG&E when examining an incentive rate for a new product or proposing a significant change to an existing incentive rate (change in incentive greater than 50 percent). Please note that PG&E uses a streamlined version of the E3 Cost Effectiveness model at each stage in order to calculate preliminary measure level incentives and cost effectiveness to ensure that the incentives will be properly set to achieve the appropriate market transformation goals while maintaining portfolio level cost effectiveness. It is important to note that for PG&E, there is no requirement for individual measures to have a TRC or PAC greater than 1 which allows PG&E to invest in high potential measures and technologies.

11. **Market Research**
    PG&E staff will begin the incentive setting process by performing both primary and secondary market research in order to determine the measure performance metrics and costs. This will include holding interviews with the appropriate manufacturers and distributors to obtain information on their price buildups while also obtaining a sample set of sufficient size to determine the above metrics. These results of manufacturer and distributor interviews are kept confidential in order to protect any competitive information or market intelligence which may have the potential to harm a certain manufacturer or distributor.
12. **Work Paper**
    Once measure level data is acquired from the market, the Products organization will engage its engineering staff to produce a Work Paper. The Work Papers, similar to TRMs found in other jurisdictions, are documents which detail how measure savings are to be calculated including the appropriate EM&V protocols as well as the measure costs. Once completed, the Work Papers are approved by the Commission and the measure is now available to be offered with a PAs program portfolio. It is important to note that the Work Papers do not include any incentive rates as this is determined by the PA and reviewed with the CPUC through Program Implementation Plans.
    The next step in the incentive design is to determine the proposed measure's ~~incremental cost.~~Incremental Equipment Cost. Generally, PG&E will attempt to incentivize 75-100 percent of the ~~incremental cost~~Incremental Equipment Cost of new measure and adjust accordingly as the technology and market penetration matures. For "Replace on Burnout" measures the ~~incremental cost~~Incremental Equipment Cost is calculated as the difference between the measure cost and that of the standard measures contained in the building code. For Retrofit/Direct Install measures, the ~~incremental cost~~Incremental Equipment Cost is taken as the full measure cost including the price of labor.
13. **Incentive Rate Finalized**
    Once the incremental measure cost is finalized, the Products team will set a standard incentive using the above considerations. Currently, PG&E is attempting to standardize this process in order to cascade the incentive rate not only into PG&E's utility administered programs but as well as third-party programs (3P) administered by outside implementers. The 3Ps have the option to provide "kickers" (increased incentive rates) in order to drive additional market participation in their programs.

For programs where the incentives are not fixed but are based on a $/kWh or $/kW, a similar gated process as the above is employed but is somewhat modified using the following considerations:

- Historical Project Costs: In order to determine the broad project costs, a sample set of historical projects is reviewed.

- Payback Period: PG&E attempts to set the $/kWh or $/kW incentives based on bringing average project payback per category (i.e., lighting vs. non-lighting) to approximately under five years. A product is usually not incentivized should it have a payback greater than 10 years without incentives.
- Targeted vs. Non-Targeted Incentives: The targeted incentives are put in place to try and encourage program participants to implement “deeper” measures/retrofits.
- Cost Effectiveness: Cost effectiveness is only tested at the program level and not the measure level.
- Incentive Update Frequency: The $/kW and $/kWh incentives are not updated as frequently as the fixed incentives within PG&E’s portfolio. The last update was performed approximately three years ago.

APPENDIX A-5: OREGON & WASHINGTON (ENERGY TRUST OF OREGON)

BACKGROUND

Efficiency Nova Scotia has contracted CLEAResult to conduct energy conservation and energy efficiency program incentive research. The project covers the following areas:

- Identification of best practices for incentive rate setting from other jurisdictions
- Application to Nova Scotia's market

The goal of the project is to generate a guideline for program incentive setting, which features best practices and considerations. Ultimately, this will be used by Efficiency Nova Scotia to help optimize their energy conservation and efficiency program design and delivery to meet their conservation and environmental protection goals.

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OVERVIEW

Jurisdictional Scan	
State/Province	Oregon, Washington
Utility/Agency	Energy Trust of Oregon
Fuel	Electricity, Natural Gas
Key Contact/Interviewee	Marshall Johnson Residential Sector Manager Marshall.johnson@energytrust.org Office: 503-445-2949
Consultant	Jonathan Houle

OVERVIEW OF ENERGY TRUST OF OREGON UTILITIES & ENERGY MARKETS

The Energy Trust of Oregon serves four utilities which cover two states:

- Portland General Electric (PGE), Oregon – Electricity
- Pacific Power, Oregon – Electricity
- NW Natural, Oregon & Washington – Gas
- Cascade Natural Gas, Oregon– Gas

The Energy Trust is regulated by the Oregon Public Utilities Commission and the Washington Utilities and Transportation Commission. Please note that Cascade Natural Gas and NW Natural also operate their own energy efficiency programs in markets outside of Oregon.

Utility	Description

Cascade Natural Gas[1]	• 272,000 customers in 96 communities
	  ○ 68 in Washington
	  ○ 28 in Oregon
	  ○ 60,000-70,000 of those customers are served by the Energy Trust
	• 32,000 square miles

NW Natural[2]	• Over 700,000 customers[3]
	  ○ 14,000 miles of distribution and transmission pipeline
	  ○ ~647,000 residential, ~67,000 commercial, ~1,000 industrial
	• 90% Oregon & 10% Washington
	  ○ In total 100 cities in 18 counties with a population of 3.5 million

Portland General Electric[4]	• Total Population Served: 1,800,000
	• Number of retail customers:
	  ○ Residential: 735,502
	  ○ Commercial: 105,231
	  ○ Industrial: 260
	• Cities Served: 52
	• Total GWh delivered: 19,266GWh

Pacific Power (PacifiCorp)	• Customers Total: 1,783,000
	  ○ Residential: 1,551,000
	  ○ Commercial: 196,000
	  ○ Industrial and irrigation: 36,000
	• Customers by state
	  ○ Oregon: 562,050
	  ○ Washington: 128,140
	  ○ California: 44,732
	  ○ Utah: 835,232
	  ○ Wyoming: 138,868
	  ○ Idaho: 73,871

Please note that not all customers highlighted above are served by the Energy Trust of Oregon as the utilities operate outside of the Energy Trust's service area. In total, the Energy Trust serves approximately 1.5 million customers.

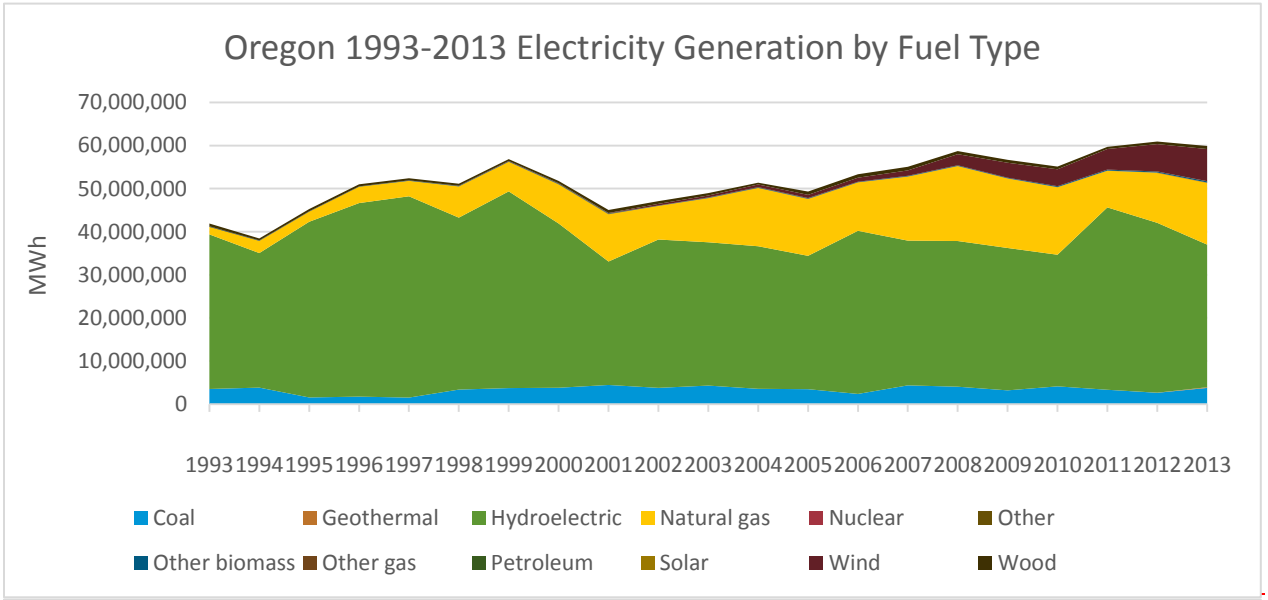
[1] http://www.cngc.com/utility-navigation/about-us

[2] http://www.snl.com/Cache/1001201668.PDF?Y=&O=PDF&D=&fid=1001201668&T=&iid=4057132

[3] http://www.snl.com/Cache/33120620.pdf?IID=4057132&FID=33120620&O=3&OSID=9

[4] https://www.portlandgeneral.com/our-company/pge-at-a-glance/quick-facts

STATE ELECTRICITY GENERATION MIX



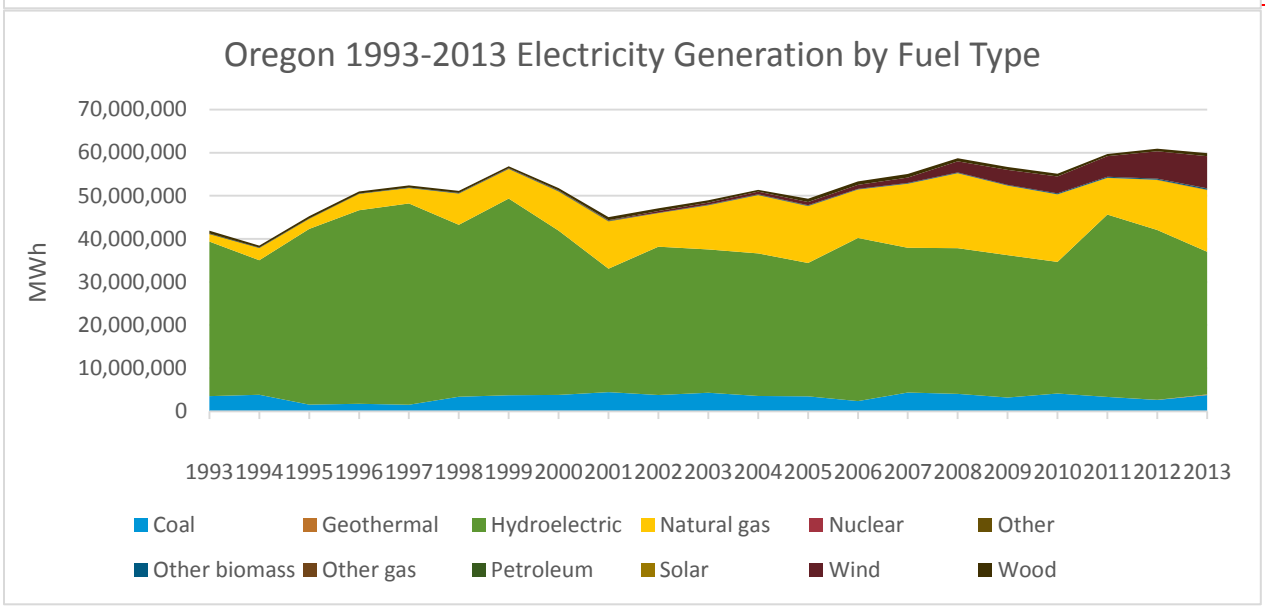
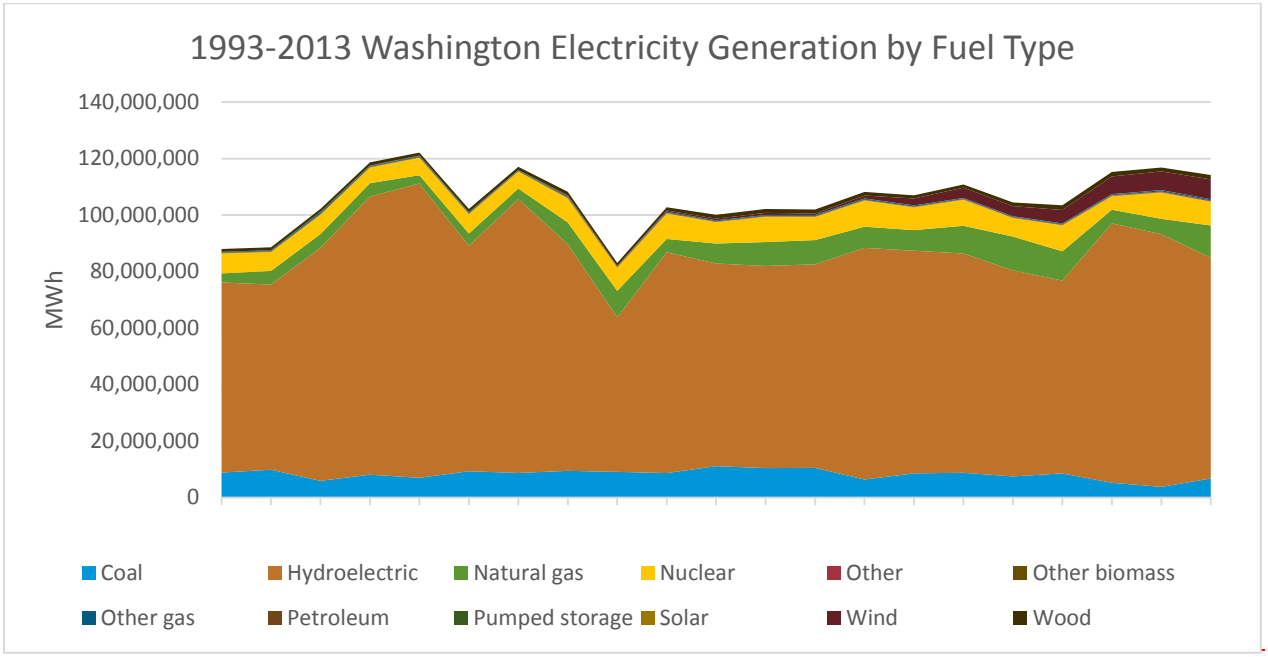


Figure 363536: Oregon 1993-2013 Electricity Generation by Fuel Type[5]

[5] http://www.eia.gov/electricity/state/oregon/index.cfm



1993-2013 Washington Electricity Generation by Fuel Type
140,000,000
120,000,000
100,000,000
80,000,000
60,000,000
40,000,000
20,000,000
0
MWh
Coal
Hydroelectric
Natural gas
Nuclear
Other
Other biomass
Other gas
Petroleum
Pumped storage
Solar
Wind
Wood

Figure 37~~36~~37: Washington 1993-2013 Electricity Generation by Fuel Type[6]

RETAIL ENERGY RATES

Below are the 2014 electricity rates for Portland General Electric and Pacific Power and the 2014 retail natural gas rates for Oregon and Washington sourced from the U.S. Energy Information Association. These rates are inclusive of transmission and distribution and are in U.S. dollars.

[6] http://www.eia.gov/electricity/state/washington/index.cfm

2014 Retail Electricity Rates[7] (cents/kWh)	Portland General Electric	Pacific Power
Residential	11.37	11.09
Commercial	9.14	9.08
Industrial	6.46	7.37

2014 Retail Electricity Rates[8] ($/Mcf)	Oregon	Washington
Residential	11.72	10.59
Commercial	9.44	9.03
Industrial	5.79	8.55

ENERGY TRUST OF OREGON STRUCTURE AND FUNDING[9]

History

In 1999, Oregon lawmakers and citizens envisioned a future with Oregon homes and businesses powered by clean, affordable energy. They established stable, consistent funding to help Oregonians invest in energy efficiency and renewable resources. A new non-profit organization—Energy Trust of Oregon—was created to lead the way.

Energy Trust began operation in March 2002, charged by the Oregon Public Utilities Commission with investing in cost-effective energy efficiency, helping to pay the above-market costs of renewable energy resources, delivering services with low administrative and program support costs and maintaining high levels of customer satisfaction.

Customers of four utilities in two states now fund and directly benefit from Energy Trust programs.

Energy Trust of Oregon Funding

Through state legislation, tariffs and other requirements, Energy Trust is funded by customers of Portland General Electric, Pacific Power, NW Natural and Cascade Natural Gas. Customers of all four utilities pay a dedicated percentage of their utility bills to support a variety of energy-efficiency and renewable energy services and programs.

As a result of a 1999 energy restructuring law, Oregon's two largest electric investor-owned utilities (PGE and Pacific Power) are required to collect a three percent “public purpose charge” from their customers. The funds support:

1. Energy conservation in K-12 schools delivered through school districts
2. Low-income housing energy assistance delivered through Oregon Housing and Community Services
3. Energy efficiency and renewable energy programs for residential and business customers delivered through Energy Trust, an independent, third party approved by the OPUC in 2001

In addition to its work under the 1999 energy restructuring law, Energy Trust administers gas conservation programs for Oregon residential and business customers of NW Natural (as of 2003) and Cascade Natural Gas (as of 2006). In 2009, through an agreement with NW Natural and the Washington Utilities and Transportation Commission, Energy Trust began serving NW Natural's customers in Washington.

[7] http://www.eia.gov/electricity/data.cfm#sales

[8] http://www.eia.gov/dnav/ng/ng_pri_sum_dcu_SOR_a.htm

[9] https://energytrust.org/about/who-we-are/

The last piece of Energy Trust funding is separate legislation passed in 2007 that allows PGE and Pacific Power to work with Energy Trust on capturing more low-cost electric efficiency for their customers—avoiding the need to purchase more expensive electricity.

The pace at which Energy Trust energy-efficiency programs delivered savings changed significantly after 2008. In 2013, Energy Trust programs saved twice as much electric energy (58 average megawatts) as they did in 2009 (27 aMW). This doubling in annual savings was made possible by the passage of SB 838, which allowed the electric utilities to supplement funding for electric efficiency beyond the three percent charge established in Energy Trust's enabling legislation, to acquire all cost-effective energy efficiency identified in their long-term planning processes.

Natural gas savings also increased from 2.7 million annual therms in 2009 to 5.3 MMTh in 2013 as Energy Trust programs matured and expanded to address the needs of more customers and closely align with utility long-term planning. Also in 2009 Energy Trust and NW Natural entered into agreements to provide program offerings for a portion of NW Natural industrial demand-side management customers and for NW Natural customers in southwest Washington.

With the passage of SB 838 and the expanded gas efficiency agreements, Energy Trust's goals were set to acquire cost-effective energy efficiency as determined within utility long-term planning. Prior to that, goals were limited by funding and not by opportunity. Achieving this higher level of performance required a focused effort to diversify and refine Energy Trust programs, generate faster feedback from participants on program effectiveness, process more incentives and serve more customers with strategies tailored to meet their needs. It also required a larger annual budget and expenditures, bringing Energy Trust's expenditures for energy efficiency to $117 million in 2013, as compared to $63 million in 2008.[10]

Northwest Power Plan[11]

The Northwest Power & Conservation Council represents the regional power planning efforts of Idaho, Washington, Oregon and Montana. The Northwest Power Act requires that the Council produce a 20-year Power Plan each 5 years. The most recent Plan was released in February 2016. Within the Plan, it identifies energy efficiency as the resource with the least cost, while also avoiding risks of volatile fuel prices, financial risks associated with large-scale resources and also mitigating the risk of carbon reduction policies. Energy efficiency was also identified as contributing significantly to the region's future capacity needs.

Accordingly, the Council has stated that the development of all cost-effective energy efficiency should remain the priority in the region to meet electricity resource needs. The Council has balanced the cost of procuring energy efficiency resources to ratepayers against the cost of future capacity and generation requirements.

ENERGY EFFICIENCY BUDGETS AND TARGETS[12]

Below are the annual budgets and targets presented by the Energy Trust in its Annual Budget and Action Plans referred to below.

	2013	2014	2015	2016
Electricity Efficiency	$125,804,504	$130,262,893	$130,359,188	$141,288,266
Gas Efficiency	$28,471,175	$28,946,948	$23,316,785	$26,347,507
Total	$154,275,679	$159,209,841	$153,675,973	$167,635,773

	2013	2014	2015	2016

[10] http://assets.energytrust.org/api/assets/plans/2015-2019_Strategic_Plan0.pdf
[11] https://www.nwcouncil.org/media/7149935/7thplanfinal_chap03_resstrategy.pdf
[12] https://energytrust.org/About/policy-and-reports/Plans.aspx

Electricity Savings (aMW)	50.3	57.7	53.1	55.1
Natural Gas Savings (MM Therms)	6.0	6.1	5.8	6.0

INCENTIVE-TO-ADMINISTRATION EXPENSE RATIOS

Below are the incentive-to-administration expense ratios by year obtained from the annual approved budgets for the Energy Trust's Annual Budget and Action Plans. The expenses listed are related to energy efficiency. Please note that "administration" in this context refers to both Energy Trust's costs of managing its budget and programs, third party delivery agent costs, marketing, IT and evaluation costs. The incentives include only costs related to providing product incentives or direct services to program participants. (i.e., audits).

	2013	2014	2015	2016
Incentive Costs	$85,792,815	$87,475,385	$81,650,474	$90,618,627
Administration	$68,482,871	$71,734,454	$72,025,504	$77,017,143
Incentive-to-Administration Ratio	56:44	55:45	53:47	65:35

2015-2019 STRATEGIC PLAN[13]

Goal: Acquire all achievable, cost-effective energy efficiency for utility customers

Five-year energy-efficiency goals:

- Between 2015 and 2019, save 240 average megawatts (aMW) of electricity
- Between 2015 and 2019, save 24 million annual therms (MMTh) of natural gas

[13] http://assets.energytrust.org/api/assets/plans/2015-2019_Strategic_Plan0.pdf

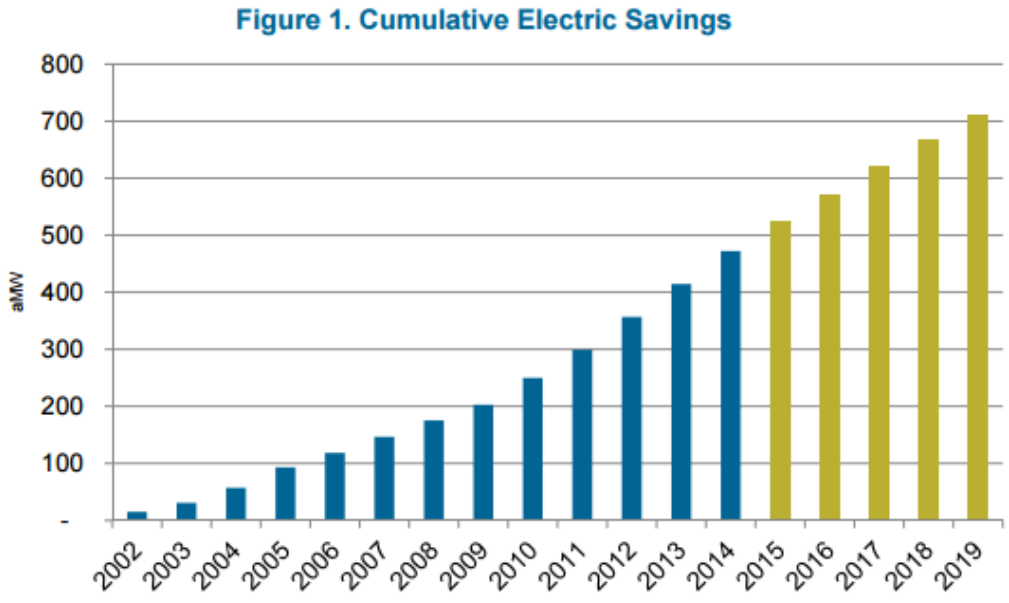


Figure 383738: Energy Trust 2015-2019 Cumulative Electric Savings Target

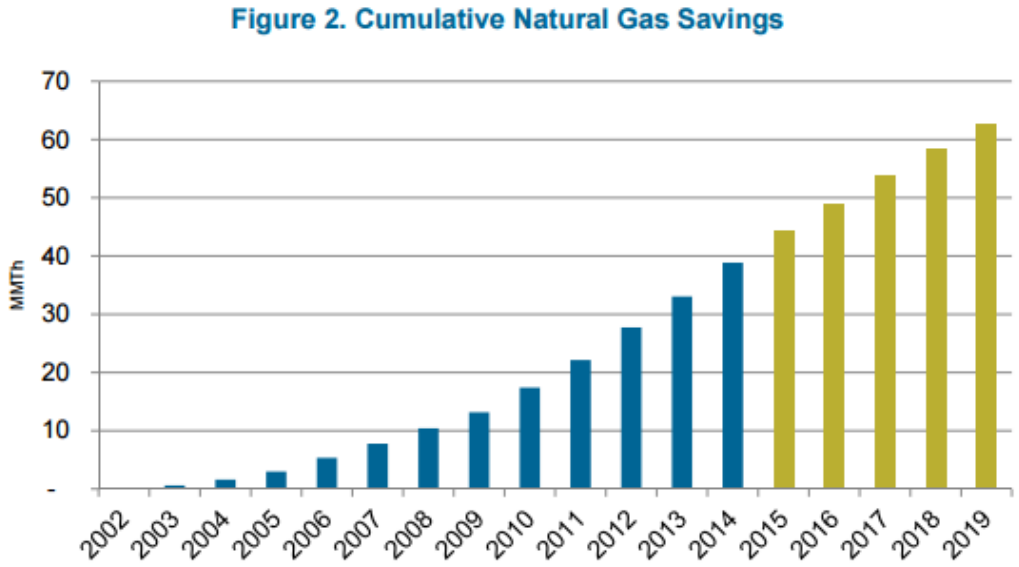


Figure 393839: Energy Trust 2015-2019 Cumulative Natural Gas Savings Target

COST EFFECTIVENESS TESTING & AVOIDED COSTS[14]

Cost Effectiveness - Electricity

When evaluating cost effectiveness, the OPUC defined in Docket UM-551 that the following cost effectiveness tests are to be used:

- Utility System Test
- Societal Cost Test (similar to TRC)

Programs and measures that pass both tests (i.e., benefit cost ratio 1.0 or greater), or are likely to over time, are eligible for Energy Trust Investment. Cost effectiveness is used to qualify measures for introduction within the Energy Trust's program portfolio while portfolio level cost effectiveness testing is reported *ex post* to report on portfolio performance.

Costs

The OPUC has defined that the following elements be considered when determining the costs from the societal perspective[15] (i.e., Total Resource Cost):

1. Total cost of efficiency measures and actions[16], including costs to the Energy Trust and participants
2. Energy Trust administrative costs
3. Energy Trust program management costs

The utility system test includes only the Energy Trust incentives and items 2 and 3 above (i.e., all Energy Trust efficiency costs, not those paid by consumers). Costs excluded are the value of Oregon and/or Federal tax credits will be deducted from the cost of measures because similar tax credits are not included in avoided costs used by the Energy Trust. Program administration or management costs of local program that are paid by federal or state agencies will not be included as they are often associated with non-energy consideration such as equity, employment, etc. and are not included in the benefit cost tests under PUC guidance.

Benefits (Avoided Costs)

In the societal test, the Energy Trust will include the following benefits:

1. The value of the electrical and/or gas energy saved based on the avoided cost forecasts of the utilities whose customers are served by the Energy Trust, as reviewed and approved by the PUC.[17] Periodically, the Energy Trust will work with the utilities and PUC to develop an average, or merged cost forecast. This will be done separately for the electric utilities and gas utilities, so that the Energy Trust program decisions are based on a single set of price forecasts for each fuel. The Energy Trust may include factors such as hedge value, if not considered in the utility forecasts, based on agreement with the utilities and PUC.
2. Non-energy benefits will be quantified by a reasonable and practical method. Unless and until the OPUC develops an alternative approach, the Energy Trust may use proxies for these benefits where research shows that the benefits are large, they cannot quantified and they clearly influence consumer decisions.
3. For electricity, both line losses and avoided transmission and distribution construction.
4. Natural gas capacity benefits from reduced transmission and delivery losses will be included where significant and quantifiable.
5. In addition, the Energy Trust will apply in its analysis the 10 percent credit for energy efficiency as required under the Northwest Power Act and OPUC Docket UM-551. This credit recognizes the benefits of conservation in addressing risk and uncertainty.

Avoided costs based on integrated resource planning will be provided to the Energy Trust by utilities. The utility system test will include items 1, 3, 4 and 5 above.

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[14] https://energytrust.org/library/policies/4.06.000.pdf

[15] In Washington, the primary cost/benefit criterion is the societal test, applied to entire programs. In addition to this guidance, the Energy Trust will continue to apply the test to specific measures to assure consistency of program across states and optimal ratepayer value.

[16] For equipment or structures that would be purchased regardless of efficiency actions, this is the ~~incremental cost~~Incremental Equipment Cost of upgrading the efficiency of the purchase beyond common practice.

[17] This includes the value of avoided peak energy use.

Currently, utility avoided costs include the forecast value of reduced carbon dioxide emissions. OPUC guidance provides that other environmental pollutant costs may be considered only when specified by the PUC.

Exceptions to Cost Effectiveness for Measure inclusion into programs[18]

For measures which do not pass both the utility and societal (total resource cost) tests, the OPUC does allow measures to be included in programs assuming the measure meets the following conditions as defined in Docket UM-551:

1. The measure produces significant non-quantifiable non-energy benefits. In this case, the incentive payment should be set at no greater than the cost effective limit (defined as the present value of avoided cost plus 10 percent) less the perceived value of bill savings (e.g., two years of bill savings)
2. Inclusion of the measure will increase market acceptance and is expected to lead to reduced cost of the measure
3. The measure is included for consistency with other DSM programs in the region
4. Inclusion of the measure helps to increase participation in a cost-effective program
5. The package of measures is included in a pilot or research project intended to be offered to a limited number of customers
6. The measure is required by law or is consistent with Commission policy and/or direction

Portfolio vs. Measure Level Cost Effectiveness

As mentioned above, cost effectiveness is calculated at both the measure and program levels. It is important to note that there are fundamental differences in what costs are included when testing cost effectiveness at each levels. When performing measure level testing, administration and delivery costs are excluded from the calculation. The reasoning behind this approach is that the costs are, to a large extent, tied to the programs and not dependent on which measures are included. Therefore, the measure level testing only includes the measure's incremental or full costs depending on whether it is a retrofit or replace on burnout or new construction measure.

To counterbalance the measure level testing, the Energy Trust also performs program level testing which includes administration and delivery costs in order to ensure that the total benefits of the savings obtained are greater than the total costs of the programs. Programs are required to achieve a benefit-cost ratio greater than 1 for both UCT and TRC tests.

Historical Cost Effectiveness Results

Below are the cost effectiveness results which were calculated for each program as part of the Energy Trust's 2014 Annual Report.[19]

Program	Utility Cost Test Benefit Cost Ratio	Societal (Total Resource Cost) Test Benefit Cost Ratio
New Homes and Products	2.0	1.7
Existing Homes	2.0	2.5
Existing Building (including Multifamily)	2.5	1.7
New Buildings	3.0	1.9
Production Efficiency	3.5	2.0

[18] http://edocs.puc.state.or.us/efdocs/HAA/um1696haa94619.pdf
[19] http://assets.energytrust.org/api/assets/reports/2014_ETO_Annual_Report.pdf

COST EFFECTIVENESS – NATURAL GAS

The current market condition for natural gas prices (i.e., low price environment) has caused the Energy Trust and PUCs to re-examine gas measures over the last few years. The Energy Trust has been able to call upon Order 94-950 and the exemption conditions listed. In this case, condition 6, whereby a measure is consistent with Commission policy or direction was referenced. The Energy Trust was given relief with measure level cost effectiveness and currently applies the following guidelines:

- Total gas energy efficiency portfolio must have a TRC equal or greater than 1.0
- Measures with a TRC of 0.5-0.9 may receive specific exceptions from the OPUC if Energy Trust requests
- A measure with a TRC less than 0.5 should be removed from the portfolio unless for substantiated reasons

The reasoning behind this approach is that it allows the Energy Trust to maintain its program delivery infrastructure as well as market momentum for the programs until such time that gas prices increase and the portfolio can be grown. By performing cost effectiveness tests at the portfolio level, it allows the Energy Trust to examine the effect of measure with lower cost effectiveness and thus manage program delivery and promotion efforts accordingly.

MEASURE DEVELOPMENT & INCENTIVE SETTING PROCESS

The Energy Trust has created a standardized, four step process (see Appendix A for flow chart) by which to introduce new measures to their product portfolio and set their maximum eligible incentives. The Energy Trust and its program delivery agents can then determine the measure incentives up to the maximum eligible level while balancing the remainder of their delivery and administration expenses required to meet their goals.

Idea Generation & Vetting	Preliminary Measure Development	Detailed Measure Development	Measure Approval
• Identify new measure from multiple souces • Determine if measure addresses the appropriate considerations** • Determine if measure is to be pursued/updated or "parked" for the future	• Collection and analysis of preliminary measure information • Internal Program Lead creates plan to develop measure • Identify if any other program may use measure and identify potential cross-program issues • Preliminary program criteria check and engineering check • If measure is identified as a good fit for current program, it is promoted to the detailed development stage	• Identify technical guidelines and data, identify any data gaps and create research plan for gaps • Stakeholder outreach • Facilitation of cross-program coordination • Cost Effectiveness testing • Draft Measure Approval Document (MAD)** • If measure has sufficient available and reliable data, strong stakeholder interest, cost effective and proper timing and fit it is promoted to approval level • Measures with insufficient data can be piloted	• Finalize MAD • Manager of Planning Engineering published MAD

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Considerations for vetting ideas, measures and measure updates

Below are the considerations taken by the Energy Trust and its program delivery agents when introducing a new measure into its program portfolio or updating a measure's metrics:

- Savings potential
- Budget impact
- Fit into long-term strategy
- Stakeholder interest
- Risk Analysis with regards to pursuing or not pursuing measure
- Market availability and maturity
- Market acceptance
- Market timing
- Energy Trust previous experience with the measure

Measure Assumptions Document (MAD)

What is a MAD: It is the decision of record determining measure cost effectiveness and authorizing use of a measure. The measure is clearly defined along with the conditions under which it is approved. The MAD provides documentation of all final assumptions used to characterize a measure and determine its cost effectiveness. Variables that are considered key to the savings calculations and cost effectiveness of the measure are highlighted. Any needs for follow up research are listed. While the majority of analysis originates with Energy Trust delivery contractors, all MADs are approved by Energy Trust engineering staff.

A MAD will contain the following sections:

- Valid date: Publication and expiry date

- Scope: Identifying the measure as new, replacement or retrofit
- Program: List of approved programs for which the measure can be used
- Market segment: List of the building types for which the measure can be used (if applicable)
- Description of Measure: Description of the technology and how it saves energy
- Revision History: Describes why changes are being made to the measure (if needed)
- Additional Details
- Cost Effectiveness: The measure's cost effectiveness results along with any exceptions that may have been granted if needed
- Incentive: Lists the maximum measure incentive in the same structure in which it will be incentivized (i.e., $/lamp, $/hp)
- Requirements: Defines the requirements for the measure/project to qualify for incentive (e.g., measure specifications, participation limits and data collection requirements)
- Baseline Conditions
- Savings: Describe what the measure savings are and how they are to be calculated along with the assumptions
- Measure Costs: Includes how to account for the costs (i.e., full vs. incremental) along with sources
- Technological Characteristics: Measure life, load profiles, non-energy benefits, etc.

Incentive Setting Considerations

When setting a measure incentive the following components are some of the key considerations taken by the Energy Trust and their program delivery agents:

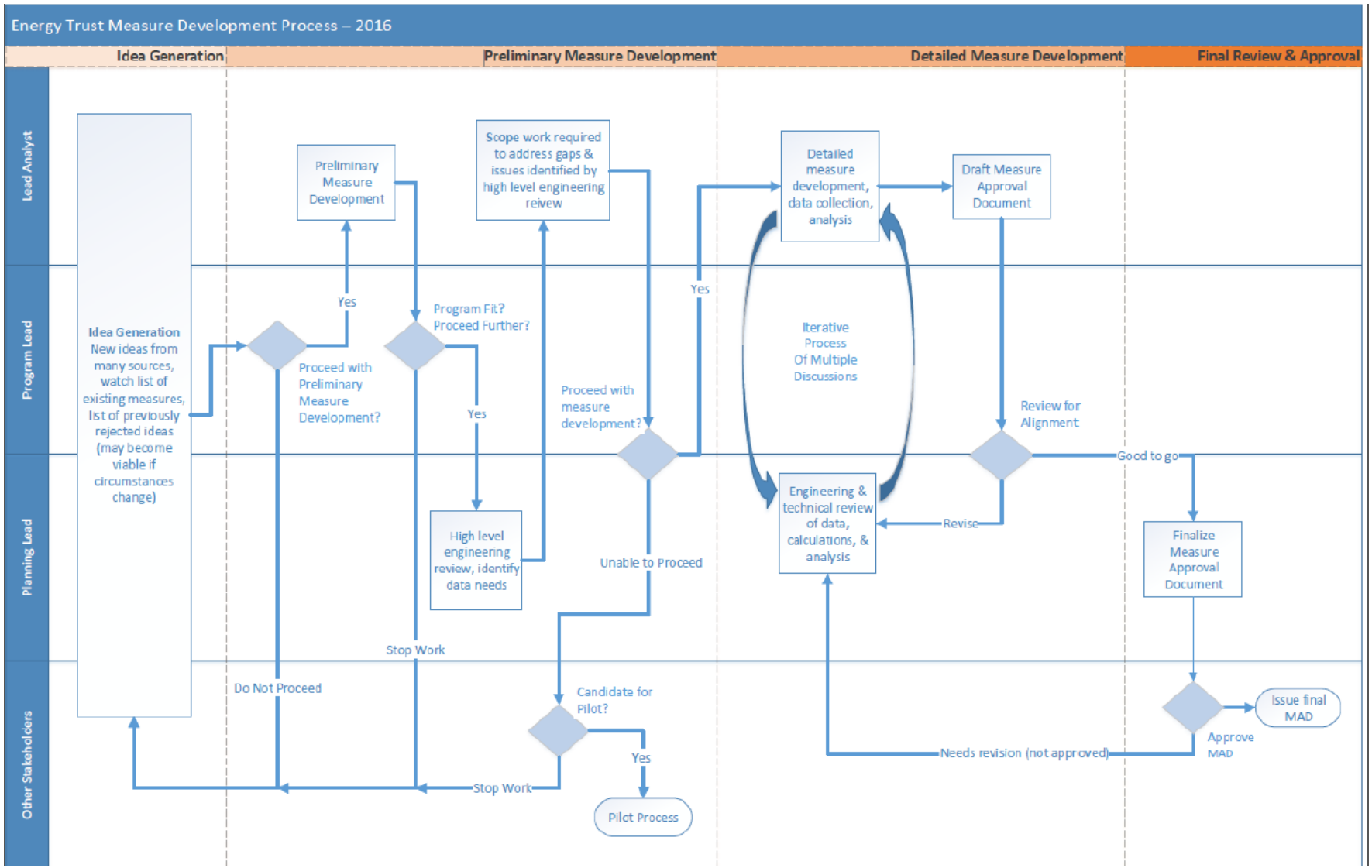
- Relationship of incentive to measure ~~incremental cost~~Incremental Equipment Cost
    - The baseline setting process is a key part of properly determining measure ~~incremental costs~~Incremental Equipment Costs
- Determination of the incentive's impact on market uptake and barriers
    - The Energy Trust is also mindful of how an incentive will drive participation of distributors with regards to stocking levels
- Total portfolio cost effectiveness and budget
    - The state of the market above will impact the required go-to-market strategy and hence the balance between incentives and program delivery

Overall, it was commented that the process of setting incentives is "more of an art than a science" and determining the ideal incentive for a measure or program is a very difficult if not nearly impossible task. Hence, having a process to update the incentives on a regular basis can be important to adjust incentives as the market evolves and transforms.

It was noted that the Energy Trust has an internal guideline whereby a portfolio's maximum LUEC must be approximately 3-3.5 cents/kWh for electricity programs and approximately 50 cents/therm for natural gas programs. It is important to note that this is a guideline, the total savings goals are still determined annually by the Commissions. In Oregon, the Commission sets annual performance measure for each utility under the Energy Trust and in 2016, they are 3.4 cents/kWh and 3.5 cents/kWh for PGE and PacifiCorp respectively and 37 cents/therm and 47 cents/therm respectively for Northwest Natural and Cascade.[20] Within the performance measures, the Energy Trust is also evaluated for achieving 85 percent of its 2016 savings goal for each utility and 115 percent of its LUEC target. Lastly, the Energy Trust is also held to a financial performance standard whereby it should target that eight percent of its budget is used to administer the activities of the Energy Trust with the remainder being spent on participant incentives and program delivery agents.

[20] https://energytrust.org/library/forms/2016_OPUC_Performance_Measures.pdf

APPENDIX A: MEASURE DEVELOPMENT PROCESS



APPENDIX A-6: NEW YORK (CONSOLIDATED EDISON)

GEOGRAPHIC DEFINITIONS

Consolidated Edison of New York (Con Ed) is one of the seven large utilities in the state of New York. Con Ed provides service to the downstate markets of New York City and Westchester County.

LOAD AND CONSUMPTION INFORMATION

Peak Demand

- Electricity: 12,316 MW (2015)
- Gas: 1,068 MDt (2016)

Electric Retail Price per kWh in 2014 for Con Ed (In Cents)

- Residential: 28.85
- Commercial: 22.16
- Industrial: 20.18
- Transportation: 17.44

Retail Price per Thousand Cubic Feet in 2015 for New York State (In Dollars)

- Residential: 11.20
- Commercial: 6.89
- Industrial: 8.13 (2014 Price)

State Net Generation (GWh): 11,794

- Nuclear: 4,044 (34%)
- Natural Gas: 3,978 (34%)
- Hydroelectric: 2,270 (19%)
- Coal: 606 (5%)
- Wind: 422 (4%)
- Wood: 32 (0%)
- Petroleum: 254 (2%)
- Other Biomass: 133 (1%)
- Solar: 3 (0%)
- Other: 74 (0%)

NY Electric Utility Net Generation (GWh): 2,639

- Hydroelectric: 1,802 (68%)
- Natural Gas: 746 (28%)
- Petroleum: 112 (4%)
- Coal: 2 (0%)

Figure 403940: Electricity Use and Number of Customers[1]

ELECTRIC - (millions of kilowatt-hours)

YEAR	RESIDENTIAL	COMMERCIAL & INDUSTRIAL (C&I)	RAILROADS & RAILWAYS	PUBLIC AUTHORITIES	TOTAL SALES AND DELIVERIES TO FULL-SERVICE CUSTOMERS *	DELIVERY SERVICE FOR ENERGY CHOICE	DELIVERY SERVICE TO NYPA AND OTHERS	SERVICE FOR MUNICIPAL AGENCIES	TOTAL SALES AND DELIVERIES IN FRANCHISE AREA	OFF-SYSTEM AND ESCO SALES
2014	**9,868**	**9,834**	**2**	**53**	**19,757**	**26,221**	**9,951**	**374**	**56,303**	**490**
2013	10,273	9,776	2	67	20,118	26,574	9,846	380	56,918	605
2012	10,718	9,848	2	53	20,621	25,990	10,268	322	57,201	962
2011	11,404	11,148	4	66	22,622	24,234	10,408	562	57,826	691
2010	11,518	12,559	5	60	24,142	23,098	10,834	619	58,693	471
2009	10,952	12,457	6	67	23,482	21,859	10,651	675	56,667	798

ELECTRIC DATA - (average number of customers)

YEAR	RESIDENTIAL	C&I	OTHER	TOTAL	RETAIL CHOICE (Included in Total)
2014	**2,868,468**	**493,466**	**6,148**	**3,368,082**	**896,565**
2013	2,859,556	488,715	6,344	3,354,615	896,266
2012	2,849,583	489,646	6,366	3,345,595	829,260
2011	2,832,772	490,176	6,358	3,329,306	690,163
2010	2,807,492	494,199	6,375	3,308,066	627,642
2009	2,780,685	492,451	4,718	3,277,854	615,197

Figure 414041: Gas Use and Number of Customers[11]

GAS - (thousands of dekatherms)

YEAR	RESIDENTIAL	GENERAL	FIRM TRANSPORTATION	TOTAL FIRM SALES AND TRANSPORTATION	INTERRUPTIBLE SALES	DELIVERY SERVICE FOR NYPA AND OTHERS	OFF-SYSTEM SALES	TRANSPORTATION OF CUSTOMER-OWNED GAS	TOTAL SALES AND TRANSPORTATION
2014	**46,661**	**28,969**	**68,731**	**144,361**	**10,498**	**152,560**	**15**	**163,073**	**307,434**
2013	38,872	28,135	61,139	128,146	10,900	136,061	4,638	151,599	279,745
2012	33,457	24,138	52,860	110,455	5,961	156,193	730	162,884	273,339
2011	38,160	26,536	54,291	118,987	10,035	132,056	97	142,188	261,175
2010	37,963	25,629	51,859	115,451	8,521	124,556	7	133,084	248,535
2009	39,749	28,245	48,671	116,665	8,225	124,218	2	132,445	249,110

GAS DATA - (average number of customers)

YEAR	RESIDENTIAL	C&I	OTHER	TOTAL	RETAIL CHOICE (Included in Total)
2014	**942,977**	**122,052**	**4,051**	**1,069,080**	**226,035**
2013	943,925	120,023	4,022	1,067,970	227,599
2012	943,864	119,738	4,000	1,067,602	216,493
2011	942,103	118,824	3,976	1,064,903	182,319
2010	939,220	118,840	3,959	1,062,019	166,702
2009	936,527	117,773	3,955	1,058,255	151,212

MARKET STRUCTURE OVERVIEW

The electric and natural gas Energy Efficiency Portfolio Standard (EEPS) was established in 2008 by the New York State Public Service Commission (the Commission). This initiative is part of the broader State policies for clean energy industry and economy development. Through the EEPS, New York State Energy Research and Development Authority (NYSERDA), as well as the major investor-owned utilities in New York, must provide incentives to homeowners and businesses for energy efficiency improvements. The overall goal is to reduce New Yorkers' electricity usage by 15 percent from the forecasted 2015 level with comparable results in natural gas conservation. This initiative is funded through the ratepayers through the System Benefits Charge (SBC)[2]. The Commission administers this initiative and funds may only be used for programs upon their approval. Utilities are required to report to the Commission annually on programs, budgets and expenditures.

The Evaluation Advisory Group (EAG) exists to advise the Commission and the Department of Public Service (DPS) on statewide evaluation and reporting. The DPS acts as an oversight agency for EEPS program evaluations. The Commission intends for the EAG to act as an advisor to DPS.

NYSERDA's energy efficiency role is the designated administrator of a set of programs separate from the utilities. However, there is some collaborative programs as well. They are funded by the PSC and act like more of a centralized service.

The EEPS was replaced by the Clean Energy Fund (CEF) in February of 2016[3].

[1] Consolidated Edison Inc., "6-Year Financials and Operating Statistics," http://www.google.ca/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&ved=0ahUKEwi83d-_0aLMAhVIMz4KHeg8A34QFggbMAA&url=http%3A%2F%2Fphx.corporate-ir.net%2FExternal.File%3Fitem%3DUGFyZW50SUQ9NjA0MjI5fENoaWxkSUQ9MzE1MTkwfFR5cGU9MQ%3D%3D%26t%3D1&usg=AFQjCNFFMp7_hHqge3xg5LvjnlxhewoUaA&sig2=x7NSjBgK2fQcE3Ov1iJvFw&bvm=bv.119745492,d.cWw

[2] State of New York Public Services Commission, "Order Establishing Energy Efficiency Portfolio Standard and Approving Programs," http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7bD9F7E0DF-A518-4199-84CC-C2E03950A28D%7d (June 2008)

[3] State of New York Public Service Commission, "Order Extending Clean Energy Programs," http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7b0A5494A4-2CD1-4CFE-8BEE-B3E943C04F01%7d (December 2015)

KEY PLAYERS

Electric Utilities[4]:

- Bath Electric, Gas & Water Systems
- Central Hudson Gas & Electric Corp.
- Consolidated Edison Company of New York, Inc.
- Fishers Island Electric Corporation
- City of Jamestown
- Board of Public Utilities
- Town of Massena Electric Department
- New York State Electric & Gas Corp.
- National Grid
- Orange & Rockland Utilities, Inc.
- Pennsylvania Electric Company
- Penn Yan Municipal Utilities Board
- Village of Penn Yan
- City of Plattsburgh
- Plattsburgh Municipal Lighting Department
- Rochester Gas & Electric Corp.
- City of Salamanca Board of Public Utilities
- Village of Akron
- Village of Andover
- Village of Angelica
- Village of Arcade
- Village of Bergen
- Village of Boonville - Municipal Commission of Boonville
- Village of Brocton
- Village of Castile
- Village of Churchville
- Village of Endicott
- Village of Fairport
- Village of Frankfort
- Frankfort Power & Light
- Inc. Village of Freeport
- Freeport Electric
- Village of Green Island
- Village of Greene
- Village of Groton
- Village of Hamilton
- Village of Holley
- Village of Ilion
- Ilion Board of Light Commissioners
- Village of Little Valley
- Municipal Electric Department
- Village of Mohawk
- Mohawk Municipal Commission
- Inc. Village of Philadelphia
- Village of Richmondville

[4] State of New York Public Service Commission, "Electric Utilities Listing," http://www3.dps.ny.gov/W/PSCWeb.nsf/All/03627EFC626529EE85257687006F39CD?OpenDocument

- Village of Rockville Centre
- Village of Rouses Point
- Village of Sherburne
- Village of Silver Spring
- Village of Skaneateles
- Skaneateles Electric Light Department
- Village of Spencerport
- Village of Springville Electric Systems
- Village of Theresa
- Village of Wellsville
- Village of Westfield

Natural Gas Utilities regulated by NYSPSC[5]:

- Bath Electric, Gas & Water System
- Central Hudson Gas & Electric Corporation
- Chautauqua Utilities, Inc.
- Consolidated Edison Company of N Y, Inc.
- Corning Natural Gas Corporation
- Empire State Pipeline
- Filmore Gas Company, Inc.
- Keyspan Energy Delivery (New York)
- Keyspan Energy Delivery (Long Island)
- National Fuel Gas Distribution Corporation
- N.E.A. Cross of New York, Inc.
- New York State Electric & Gas Corporation
- Niagara Mohawk Power Corporation
- Orange and Rockland Utilities, Inc.
- Reserve Gas Company, Inc.
- Rochester Gas & Electric Corporation
- St. Lawrence Gas Company, Inc.
- Valley Energy, Inc.
- Woodhull Municipal Gas Company

The New York Independent System Operator:

The New York Independent System Operator (NYISO) operates the wholesale markets to manage the flow of electricity across the state.

PORTFOLIO MATURITY AND HISTORICAL PERFORMANCE[6]

In the 1980s to 1990s, New York State electric utilities operated large scale energy efficiency programs. The annual spending on these programs was $286 million at its peak in 1992. Total utility spending during 1990-1996 was over $1.2 billion. This resulted in 5,744 GWh of energy savings. The SBC was then established in 1996 with the NYSERDA as the administrator, and utility energy efficiency programs were scaled back. Efforts of New York Power Authority (NYPA), Long Island Power Authority (LIPA) and the Division of Housing and Community Renewal (DHCR) were also present in the market during this period.

[5] State of New York Public Service Commission, "Natural Gas Utilities regulated by NYSPSC," http://www3.dps.ny.gov/W/PSCWeb.nsf/All/AF91A30E4F00289785257687006F3A53?OpenDocument
[6] State of New York Public Service Commission, "Staff Preliminary Proposal for Energy Efficiency Program Design and Delivery," http://www.dps.ny.gov/07M0548/07M0548_EPS_StaffTeamPrelimProposal_FINAL.pdf (August 2007)

Figure 424142: NYSERDA Efficiency Programs: Energy Savings and Program Costs: 1998-2009[7]

Year	Cumulative Annual Reductions		Cumulative Annual Peak Non-Curtailable Electric Demand Reductions	Cumulative Peak Curtailable Demand Reductions	Annual Spending
	Electric (GWh)	Other (MMBtu)	(MW)	(MW)	($ Millions)
System Benefits Charge					
1998-2001	399	1,470,403	106	Not available	$ 27.4*
2002	690	3,000,000	218	434	$ 113.7
2003	1,000	2,800,000	270	610	$ 129.3
2004	1,400	2,600,000	325	535	$ 135.5
2005	1,950	4,000,000	445	595	$ 137.5
2006	2,350	4,049,000	495	618	$ 146.1
2007	3,060	4,660,000	650	550	$ 154.0
2008	3,220	5,400,000	700	575	$ 163.8
2009**	3,454	5,250,000	755	590	$ 147.0
Con Edison Gas Funded					
2005	-	-	-	-	$ 0.4
2006	-	-	-	-	$ 1.4
2007	-	134,689	-	-	$ 2.5
2008	-	232,135	-	-	$ 7.3
2009	-	277,740	-	-	$ 10.2
National Fuel Gas Funded					
2008	-	24,778	-	-	$ 1.7
2009	-	59,133	-	-	$ 6.1
National Grid Funded					
2008	-	1,811	-	-	$ 0.18
2009	-	28,229	-	-	$ 2.7
System-Wide Program					
2006	10	-	3	9	$ 3.6
2007	38	-	13	31	$ 17.1
2008	82	-	24	61	$ 5.7
2009 **	83	-	24	67	$ 2.0
Total	3,537	5,615,102	779	657	$ 1,223.18

The figure above summarizes NYSERDA administered programs from 1998- 2008. It also includes three energy efficiency programs that NYSERDA administers on behalf of three utilities: Consolidated Edison, National Fuel Gas, and National Grid.

CURRENT CYCLE

The State of New York's target for electricity use reduction is 15 percent for the 2008-2015 period with similar targets for gas. This target is part of the EEPS divided in two phases. Phase 1 is from 2009-2011 and Phase 2 is from 2012-201522.

[7] "Energy Efficiency Assessment, New York State Energy Plan," http://www.google.ca/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&ved=0ahUKEwjE7ZPB9aLMAhUCOj4KHQziBIcQFggiMAA&url=http%3A%2F%2Fenergyplan.ny.gov%2F-%2Fmedia%2Fnysenergyplan%2Ffinal%2FEnergy_Efficiency.pdf&usg=AFQjCNHew5BlRXlfZTubclHm31tEfsN36g&sig2=NHDE3his-pjfp6vRdysS8w (August 2007)

Figure 434243: Overall Targets 2007 - 2015[8]

	Energy Efficiency Savings (GWh)								
	2007	2008	2009	2010	2011	2012	2013	2014	2015
Statewide Goals [1]									
New York State 15 x 15 Goals	564	1,471	3,991	7,263	10,631	14,082	17,608	21,222	24,927
NYSERDA SBC III Cumulative State Goals	401	739	1,076	1,413	1,751	2,188	2,626	3,063	3,500
Jurisdictional Gap for the State (EEPS Goals)			833	2,820	4,557	5,563	5,898	6,390	7,687
Con Edison Territory Goals									
NYS PSC Approved EEPS Goals for Con Edison Territory [2]			505	909	1,313	1,717	2,121	2,525	2,828
NYSERDA SBC III Goals for CE Territory [3]	148	273	398	523	648	810	972	1,133	1,295
Total	**148**	**273**	**903**	**1,432**	**1,961**	**2,527**	**3,093**	**3,658**	**4,123**
Energy Efficiency Potential Studies									
Con Edison Energy Efficiency Study 2010 [4]									
Maximum Achievable Potential (MAP)				1,801	3,324	4,784	5,995	6,570	7,061
Realistic Achievable Potential (RAP) (mid)				435	948	1,628	2,355	2,923	3,511
Optimal Energy Efficiency Study 2008 [5]									
MAP			674	1,815	3,400	4,853	6,424	8,081	9,824

Figure 444344: Electric Program Budgets[9]

Program Names	C&I Custom Efficiency	C&I Equipment Rebate	Small Business Direct Install	Residential Direct Install	Appliance Bounty	Residential Room Air Conditioning	Residential HVAC	Residential Electric	Multi-family Energy Efficiency
2009	N/A	$54,185,252	$76,702,689	N/A	N/A	N/A	$10,544,823	N/A	$16,589,934
2010	$10,660,000			$3,832,285	$5,659,857	$2,593,500			
2011									
2012	$29,365,716	$144,919,976	$111,567,548	$4,519,285	$5,564,562	$2,739,807	$5,907,497		$29,493,216
2013								$17,741,736	
2014				Discontinued	Three programs combined into Residential Electric Program.				
2015									

Figure 454445: Gas Program Budgets[99]

Program Names	Residential HVAC	Multifamily Low-Income	Multifamily Energy Efficiency	C&I Gas Efficient Equipment Rebate	C&I Custom Gas Efficiency
2009	$7,006,015	$2,671,200	$13,469,308	$5,595,624	N/A

[8] Global Energy Partners, LLC, "Energy Efficiency Potential Study for Consolidated Edison Company of New York, Inc. Volume 1: Executive Summary," http://www.coned.com/documents/Volume_1_Executive_Summary.pdf (June 2010)
[9] State of New York Public Service Commission, "Energy Efficiency Portfolio Standard," http://documents.dps.ny.gov/public/EEPS/EEPSSearch.aspx?SearchType=PRG&PA=2&ProgramType=Gas&ProgramStatus=Open,Closed&SectorSubsector=2:3,1~3:2,1~1:2,1

2010					$3,046,588
2011					
2012	$8,066,906	$4,748,800	$25,945,436	$12,790,000	$6,963,628
2013					
2014					
2015					

Figure 464546: Electric Savings Result[99]

Program Names (Savings in MWh)	Accumulated Savings to Year	C&I Custom Efficiency	C&I Equipment Rebate	Small Business Direct Install	Residential Direct Install	Appliance Bounty	Residential Room Air Conditioning	Residential HVAC	Residential Electric	Multi-family Energy Efficiency
2009	765	N/A			N/A	N/A	N/A			
2010	62,398									
2011	227,910				2,633 (18%)	17,402 (53%)	3,213 (40%)	6,444 (87%)	N/A	
2012	405,083									
2013	565,843	111,506	186,784 (57%)	480,021 (93%)						58,021 (125%)

Program Names (Targets in Dth)	Target to Date	Residential HVAC	Multifamily Low-Income	Multifamily Energy Efficiency	C&I Gas Efficient Equipment Rebate	C&I Custom Gas Efficiency
2009	*Up to 31,772 tember	203,911	90,232	remain the same 779,336	304,595	202,614

Figure 474647: Gas Savings Results[99]

2010	48,589					
2011	406,013					
2012	519,379					
2013	852,363					
2014	1,251,943					
2015	1,399,660 *Up to September 2015					

Program Names (Savings in Dth)	Total Cumulative Savings	Residential HVAC	Multifamily Low-Income	Multifamily Energy Efficiency	C&I Gas Efficient Equipment Rebate	C&I Custom Gas Efficiency
2009	97	159,415 (78%)	73,442 (81%)	649,881 (83%)	278,759 (92%)	81,788 (40%)
2010	22,582					
2011	190,779					
2012	413,892					
2013	659,338					
2014	935,548					
2015 (Up to September)	1,102,401 (79%)					

COST EFFECTIVENESS TESTING

Estimating Energy Savings

The Commission approves a series of technical manuals to provide a standard measure-specific approach to estimate the energy and demand savings.

Cost Effectiveness Requirements

Cost effectiveness is evaluated at the program level by TRC. Fast track programs that were implemented early in the cycle had to score well above a TRC of 1.0. This was done to ensure that significant energy savings would result accounting for margins of error.

Avoided Supply Costs in TRC Calculation

The benefits calculated in the TRC are the avoided supply costs. The avoided supply costs include the reduction in costs of electric energy, natural gas, generation and transmission, and distribution capacity, valued at marginal cost for the periods when there is a load reduction.

Costs in TRC Calculation

The costs calculated in the TRC are costs paid by the program administrators and participants plus the increase in supply costs for any period when load is increased.

INCENTIVE RATE SETTING[22]

The incentive setting process involves collaborative discussions between the utilities, NYSERDA and other interested stakeholders. The goal is to achieve statewide uniformity in terms of qualifying technology and incentive levels. However, program designs and measures are still catered to the needs of individual utilities' customers.

EXISTING PROGRAMS

The following are programs a part of the EEPS. Major changes are expected when the CEF portfolio is introduced.

Program Analysis

Initiatives	Target Market	Incentive Setting Methodology
Residential Electric Rebate (Electric)	Residential customers looking to upgrade HVAC, water heater, or install programmable thermostats.	Rebate for HVAC systems, electric heat pump water heater, and programmable thermostat. Incentive amount set depending on efficiency. https://www.conedhvacrebates.com/assets/pdf/CE_Resi_Elec_Rebate_App_WRITEABLE.pdf
Residential Gas Rebate (Gas)	Residential customers looking to upgrade HVAC, water heater, or install programmable thermostats.	Rebate for water heaters, boilers, furnace, controls and programmable thermostat. Incentive amount set depending on efficiency. https://www.conedhvacrebates.com/assets/pdf/CE_Resi_Gas_Rebate_App_WRITEABLE.pdf
Residential Bounty (Electric)	Residential customers looking to upgrade to a more energy efficient freezer or refrigerator. Also, rebates available to customers with old window or wall or air conditioning units.	Rebate of $50 for freezer and refrigerators. Rebate of $25 for window, wall, and air conditioning units. http://www.coned.com/energyefficiency/residential_bounty_program.asp
Central Air-Conditioning (Electric)	Residential or business customers looking to add a thermostat to their property. Residential customers who already own a smart thermostat.	Get a free thermostat ($400 value), and $25 thank you cheque for residential customers, or $50 for business customers. $85 if there is already an existing smart thermostat (residential). http://www.coned.com/energyefficiency/residential_directloadcontrol_program.asp
Residential Rebate (Electric)	Residential customers looking to upgrade to more energy efficient appliances.	Appliance rebate up to $75 available on refrigerators, dishwashers, clothes washer, and dehumidifier. Rebate amount depends on efficiency. https://www.conedhvacrebates.com/assets/pdf/CE_Resi_Appliance_Rebate_App_WRITEABLE.pdf
Bring Your Own Thermostat (Electric)	For residential customers who have already purchased a qualifying thermostat, that are willing to participate in a two year air-conditioner adjustment program.	$85 given with an agreement of participating in the two year program. http://www.coned.com/energyefficiency/bring_your_own_thermostat.asp
Small Business	Small business looking to save money and energy.	Free on-site energy efficiency survey, then have energy-saving lighting or refrigeration equipment installed. ConEd will pay up to 70% of the

Initiatives	Target Market	Incentive Setting Methodology
Direct Install (Electric)	http://www.coned.com/energyefficiency/businessdirect.asp	cost directly to the contractor. Business only pays the difference. http://www.coned.com/energyefficiency/businessdirect.asp
Neighborhood (Electric)	Delivers energy-saving and management solutions to local communities where the demand for electricity is expected to grow significantly because of the vitality in businesses and housing markets. Con Edison provides special incentives and opportunities in the neighborhoods that form part of our Neighborhood Program. Each program is constructed from groups of neighborhoods and each will have its own specific incentives and opportunities based on Con Edison's operational needs in those specific areas.	Existing neighborhood initiatives includes free lighting, water heating and refrigeration products for small businesses and free lighting products free for apartment buildings. There is also a NYSERDA partnership for combined heat and power (CHP). Con Edison will match NYSERDA's (PON 2568) base incentive up to $1,800/kW (or 100 percent of the project cost, whichever is less). http://www.coned.com/energyefficiency/Neighborhood_program.asp
Multi-family Energy Efficiency (Electric and Gas)	Customers that own/manage a multifamily building looking to make their property more energy-efficient.	Free in-unit direct installation, free common area direction installation, custom measures at $0.25 per kWh saved, or $2 per therm saved. Set incentive rates available for lighting upgrades in common areas, as well as boilers, radiator valves, insulation, building envelope, and energy management systems. http://www.coned.com/energyefficiency/multifamily-rebates.asp
Commercial and Industrial Prescriptive Rebates (Electric and Gas)	Prescriptive rebates available to C&I customers looking to upgrade their equipment.	Rebates for lighting and controls http://cdn.platform.honestbuildings.com/wp-content/uploads/sites/5/2016/02/Lighting-and-LEDs_v14.pdf HVAC, furnaces, boilers and chillers http://cdn.platform.honestbuildings.com/wp-content/uploads/sites/5/2015/12/HVAC-Furnaces-Boilers-and-other-Gas_v9.pdf Motors http://cdn.platform.honestbuildings.com/wp-content/uploads/sites/5/2015/12/Motors_v5.pdf VFDs http://cdn.platform.honestbuildings.com/wp-content/uploads/sites/5/2015/12/VFDs_v7.pdf All C&I projects capped at 50% or $250,000 for electric and $100,00 for gas for HVAC and VFD projects, whichever is less. TRC test is required and the benefit must be greater than costs.
Commercial and Industrial	Performance incentives available to C&I customers looking to	All C&I custom measures incented at $0.16 per kWh. Additional bonus incentives on super-efficient chillers. Gas incentive also available at $1-

Initiatives	Target Market	Incentive Setting Methodology
Performance Based Incentives (Electric and Gas)	upgrade their equipment that are not listed on prescriptive measures.	2 per therm. http://cdn.platform.honestbuildings.com/wp-content/uploads/sites/5/2016/03/Custom_v7.pdf All C&I projects capped at 50% or $250,000, whichever is less. TRC test is required and the benefit must be greater than costs.
Commercial and Industrial Energy Study (Electric and Gas)	C&I customers looking for energy saving opportunities.	Energy efficiency studies funded at $50,000 maximum or up to 50% for electric or gas. Incentive at $67,000 maximum for combined studies. Pre-approval is required. http://cdn.platform.honestbuildings.com/wp-content/uploads/sites/5/2015/12/EE-Study_v4.pdf

APPENDIX A-7: NEW YORK (NYSERDA)

SUMMARY

Jurisdictional Scan	
State/Province	New York
Utility/Agency	New York State Energy Research and Development Authority (NYSERDA)
Fuel	Electricity
Key Contact/Interviewee	Matthew Brown
Consultant	Mayuran Srikantha

JURISDICTION OVERVIEW

Electricity Market

The following entities are the key players in the electricity system in Ontario.

- New York Department of Public Service (Public Service Commission)
- New York State Energy Research and Development Authority (NYSERDA)
- New York Independent System Operator (NY-ISO)
- Electricity Utilities

New York Public Service Commission

The New York Public Service Commission regulates and oversees the electric, gas, water and telecommunication industries, as part of the Department of Public Service. In 2015, the Public Service Commission released the Reforming Energy Vision (REV) strategy. The REV initiative will promote more efficient use of energy, deeper penetration of renewable energy resources, wider deployment of distributed energy resources and energy storage. The REV is intended to encourage markets to achieve greater use of advanced energy management products, which will empower customers by providing them more choice in how they manage their electricity usage.

The Public Service Commission reviews and approves NYSERDA's plans and budgets for energy conservation programs.

New York –Independent System Operator

The NY-ISO operates the competitive wholesale markets that mange the flow of electricity across the state of New York. In addition to operating the markets, the NY-ISO prepares analyses, evaluations and forecasts to assist with system planning. This includes the assessment of reliability thresholds, identification of resource needs, evaluation of proposed projects and provision of objective market planning data.

Electric Utilities

The following electric utilities operate in the state of New York. Customers of these utilities are eligible for their own utility programs as well as NYSERDA programs. Double-dipping of incentives by customers is not allowed.

- Central Hudson (Central Hudson Gas & Electric Corporation)
- Con Edison (Consolidated Edison Company of New York, Inc.)

- National Grid (Niagara Mohawk Power Corporation)
- NYSEG (New York State Electric and Gas Corporation)
- Orange and Rockland Utilities, Inc.
- RG&E (Rochester Gas and Electric Corporation)

Electricity Generation

In 2013, electricity in New York was generated by the following resources:

Resource	Contribution
Petroleum	1%
Natural Gas	36%
Coal	1%
Nuclear	33%
Hydroelectric	22%
Other Renewables	6%

NYSERDA OVERVIEW

NYSERDA`s mandate is to promote energy efficiency and the use of renewable energy sources. The objectives are to reduce greenhouse gas emissions, accelerate economic growth and reduce customer energy bills. NYSERDA operates multi-fuel programs, though this document primarily focuses on electricity.

A key element of NYSERDA`s strategy is to work with stakeholders throughout New York including residents, business owners, developers, community leaders, local government officials, university researchers, utility representatives, investors, and entrepreneurs. These interactions ideally provide the conditions that help expand New York`s clean energy economy, allow communities, residents and businesses to benefit from energy efficiency and renewable energy, and to overcome barriers for large-scale clean energy usage.

NYSERDA is governed by a 13-member board. It was created in 1975. Recently, there has been a shift to not compete with the utility programs, but to move toward a market transformation approach.

Sources of Funding

The Systems Benefit Charge (SBC) is the primary source of NYSERDA`s funding for energy conservation programs. It was established on May 20, 1996. The funds collected from the SBC are allocated towards energy efficiency programs, research and development activities, low-income energy programs, and environmental disclosure activities. The SBC was recently extended on December 31, 2016. The SBC is used to fund the Energy Efficiency Portfolio Standard (EEPS). Recently, the EEPS has been replaced by the Clean Energy Fund (CEF).

Other sources of funding include:

- Regional Greenhouse Gas Initiative (RGGI)
- Renewable Portfolio Standard (RPS)

The RGGI is focused on energy efficiency, renewable energy and carbon abatement projects. The funding comes from the sale of carbon emission allowances. The amount of funding available is dependent on the auction price for the allowances. The RGGI covers nine Northeast and Mid-Atlantic states.

The RPS is focused on acquiring renewable energy and/or renewable energy attributes. The funds are approved by the Public Service Commission and derived from an assessment of the intrastate sales of electricity by the utilities in the state of New York.

Retail Prices of Electricity

For a representative number, the following are the retail prices for Con Edison customers in 2014:

- Residential: $0.2885/kWh
- Commercial: $0.2216/kWh
- Industrial: $0.2018/kWh

NYSERDA ENERGY EFFICIENCY PROGRAM INCENTIVE AND COST EFFECTIVENESS POLICY

Cost Effectiveness Testing

Under the EEPS, NYSEDRA was required to conduct cost effectiveness testing at the project level. The TRC is used as the cost effectiveness test. Prior to the implementation of the EEPS, the TRC was applied at the program level. Under the CEF, the TRC will again be applied at the program level.

Avoided Costs

The benefits calculated in the TRC are the avoided supply costs. For NYSERDA, the avoided supply costs include the reduction in costs of electric energy, natural gas, generation and transmission, and distribution capacity, valued at marginal cost for the periods when there is a load reduction. The avoided costs are provided by the NY-ISO.

ENERGY EFFICIENCY PROGRAMMING

Energy efficiency programs are typically set on three year funding cycles, approved by the Public Services Commission. Programs cover both the residential and commercial sectors, and cover various fuel types. The numbers below are only for the electricity conservation programs.

Previous Results (Savings, Expenditure, Cost Effectiveness)

Year	Electricity Savings	Expenditure	Cost Effectiveness
2013	Not Available	Not Available	Not Available
2014	Not Available	Not Available	Not Available
2015	Not Available	Not Available	Not Available

Future Targets

Year	Electricity Savings	Expenditure	Cost Effectiveness
2016	Not Available	Not Available	Not Available
2017	Not Available	Not Available	Not Available
2018	Not Available	Not Available	Not Available

Incentive Level Setting Methodology

One of the key considerations for incentive level setting is to match the incentive to program design. If the program design has certain objectives or uses a specific delivery structure, the incentives should match these considerations.

In the commercial program, smaller projects usually feature a prescriptive incentive that is based on a percentage cost of the measure/project. Usually, the incentives are capped at 50 percent. If a measure is being “jump-started”, there may be consideration to increase the incentive. For example, for agricultural customers, the incentive can go up to 70 percent of the cost.

For larger projects in the commercial program, there has been a move to a performance based incentive, set using a $/kWh structure. Some incentive structures are developed to reward peak load congestion in certain areas, there may be a usage of a $/kW structure, or a blended approach is used.

In the commercial programs, project costs are always recorded to track the contribution of incentives.

Incentive levels are based on historical experience. The end use is identified and the incentives are based on the experience in that area.

Incentive levels are reviewed every year for residential programs. For commercial programs, the goal is to have a review once a year, but if the measures are less used, this may not happen. Certain measures are reviewed multiple times a year. For example, LED lighting has been a challenge. The initial incentives were set at 50 percent of the cost, but prices changed so quickly that incentives ended up being much higher as a percentage of costs.

A key part of the program management and incentive setting process is to talk to customers, the supply chain and stakeholders to identify barriers. Communication is ongoing through typical program management activity. There are also program evaluations every year, which provide a formal platform for customer, supply chain and stakeholder communication.

For incentive changes, cost effectiveness is checked. Typically, incentive changes feature reductions, so cost effectiveness impact is usually positive.

During the incentive setting process, a formal document is not required to be submitted. Instead, the regular program change process is followed. If cost effectiveness is impacted negatively through a change in incentive, there would be a discussion with the Public Service Commission.

To support the incentive setting process, a measures list has been created that documents measure savings and costs. It is owned by the program evaluation group. This activity is supported by research to gauge penetration levels, and further understand savings assumptions.

- For incentive changes, do check cost effectiveness, most incentives are coming down so it is more based on product price
- Program evaluation talk to supply chain
- Not required to submit any formal document, just do regular program changes if benefit cost is better
- If benefit cost gets worse, we would discuss
- Have built measures list, owned by evaluation group, do penetration and savings level research

APPENDIX A-8: VERMONT (EFFICIENCY VERMONT)

SUMMARY

Jurisdictional Scan	
State/Province	Vermont
Utility/Agency	Efficiency Vermont (Vermont Energy Investment Corporation)
Fuel	Electricity, Gas, Heating Fuels
Key Contact/Interviewee	Robert Stephenson, Chris Gordon
Consultant	Mayuran Srikantha

JURISDICTION OVERVIEW

Electricity Market

The following entities make up the electricity system in Vermont.

- Efficiency Vermont (Vermont Energy Investment Corporation – VEIC)
- Vermont Public Services Board (PSB)
- ISO New England (ISO-NE)
- Vermont Electric Power Company (VELCO) → transmission company state owned
- 17 Electric Utilities

Efficiency Vermont was the first state-wide energy efficiency utility of its kind in North America. It was established in 1999 through regulation from the PSB. Efficiency Vermont runs through a contract between the PSB and VEIC, the current owner and operator of Efficiency Vermont. VEIC is an independent, not-for-profit organization that was started in 1986.

In 1999, the PSB decided to create a state-wide energy efficiency utility to administer electricity conservation programs for the whole state. It was believed that electric utilities have a split incentive to administer these programs since their revenue came from electricity sales, not reduction. A volumetric charge was established on electric customers' bills in Vermont to support these programs, and was to be collected by utilities who offered Efficiency Vermont's programs to their customers. Burlington Electric Department, one of the municipally owned electric utilities, chose to administer their own electricity conservation programs, which are funded through a separate agreement with the PSB. Most of Burlington Electric Department's programs are identical to Efficiency Vermont.

The PSB is a quasi-judicial board that supervises the rates, quality of service and overall financial management of Vermont's utilities (cable television, electricity, gas, telecommunications, water and large waste water companies). The board oversees Vermont's Energy Efficiency Utility (EEU) Program. It sets the Energy Efficiency Charge (EEC) that appears on utility customers' bills that fund the EEU Program. The PSB is responsible for procuring the resources to support the EEU Program, and to manage and review the performance of those resources. For the current cycle, the electricity efficiency is provided by Efficiency Vermont and Burlington Electric Department.

ISO New England (ISO-NE) is the Regional Transmission Organization (RTO) that manages New England's bulk power generation and transmission system. ISO-NE has three main objectives:

1. Ensure daily reliable operation of New England's bulk power generation and transmission system
2. Oversee and ensure fair administration of region's wholesale electricity market
3. Manage a comprehensive regional planning process

Vermont Electric Power Company (VELCO) operates Vermont's bulk transmission system and represents the utilities in power pool discussions with ISO-NE. VELCO was set up in 1956 to develop an integrated transmission system to interconnect the different electric utilities in Vermont. VELCO is regulated, and is owned and controlled by the state's electric utilities and the

Vermont Low-Income Trust for Electricity (VLITE). VELCO takes part in the regional planning process by performing and directing planning, design and construction efforts for Vermont's bulk transmission system.

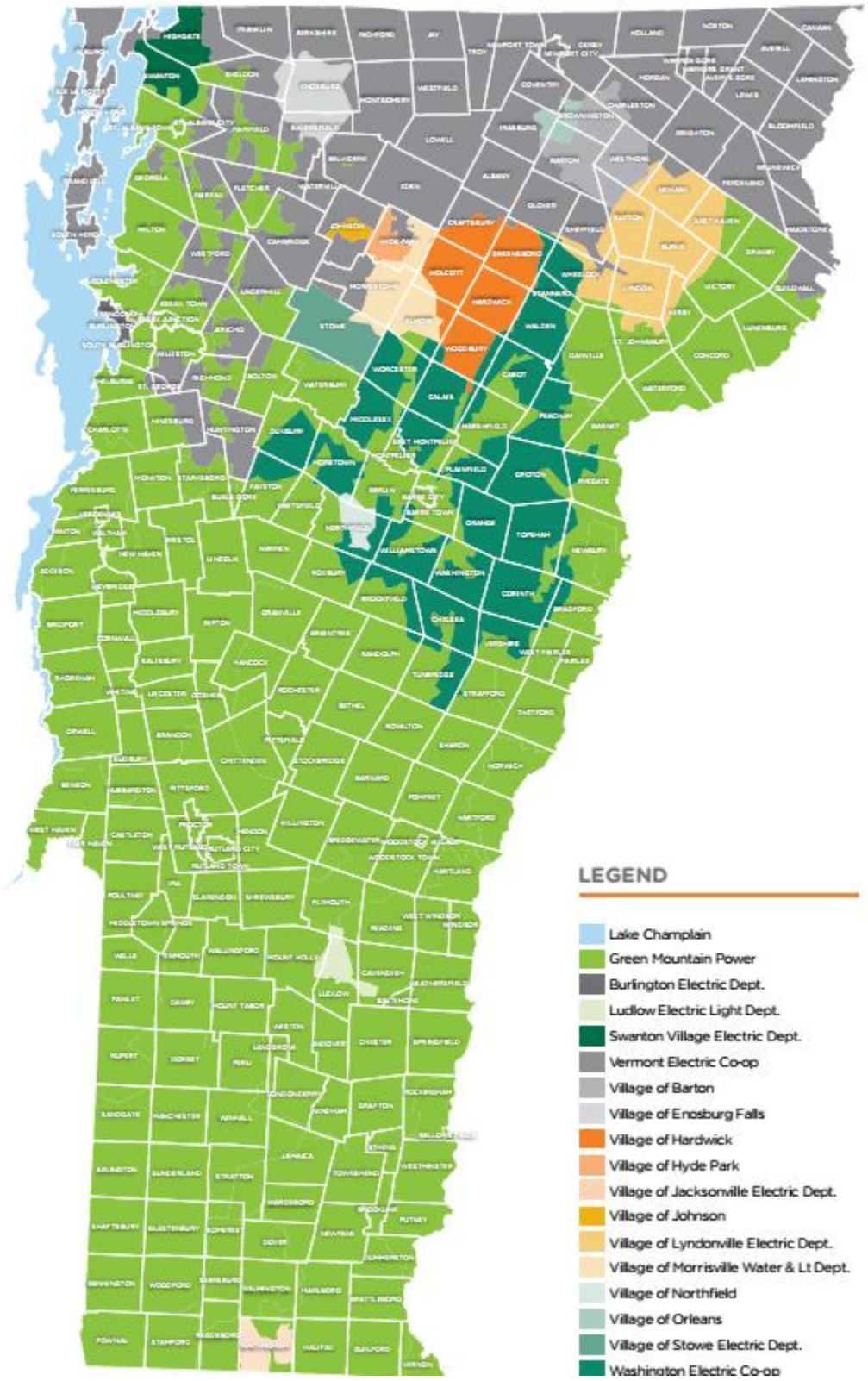
Electric Utilities

Vermont has 17 electric utilities.

- 14 municipal electric utilities
- 1 investor owned utility (IOU)
- 2 cooperatives

Vermont's utilities range in size. The smallest is Village of Orleans Electric Department with 700 customers, and the largest is Green Mountain Power with 256,000 customers. Green Mountain Power is the only investor owned utility in the state. The 2 cooperatives are Vermont Electric Cooperative and Washington Electric Cooperative. The following map illustrates their service territories[1]:

[1] http://www.greenmountainpower.com/upload/photos/201ServiceMapLarge.jpg


LEGEND
Lake Champlain
Green Mountain Power
Burlington Electric Dept.
Ludlow Electric Light Dept.
Swanton Village Electric Dept.
Vermont Electric Co-op
Village of Barton
Village of Enosburg Falls
Village of Hardwick
Village of Hyde Park
Village of Jacksonville Electric Dept.
Village of Johnson
Village of Lyndonville Electric Dept.
Village of Morrisville Water & Lt Dept.
Village of Northfield
Village of Orleans
Village of Stowe Electric Dept.
Washington Electric Co-op

Electricity Generation

In 2014, Vermont was dominated by two types of generation sources; nuclear power and hydroelectric. Nuclear power made up about 70 perent of generated electricity, with hydroelectric making up another 20 percent. The next two largest resources were wood burning and wind generation, which make up the majority of the remaining 10 percent. From its electricity generation activities, Vermont does not have a large greenhouse gas commitment from coal, oil or natural gas. The state's only nuclear power plant closed at the end of 2014.

Total Energy Production (MWh)	**6,884,910**
Hydroelectric	1,285,912
Natural gas	3,029
Nuclear	4,846,327
Other biomass	25,698
Petroleum	5,103
Solar	17,293
Wind	236,034
Wood	465,513

Vermont is summer peaking with a load of 1,255 MW. Of the 6,900 GWh of generation, over 85 percent comes from large scale generators and CHP units, while the rest comes from electric utilities. The majority of generators participate in ISO- NE's forward capacity market.

VERMONT ENERGY EFFICIENCY PROGRAM INCENTIVE AND COST EFFECTIVENESS POLICY

Vermont is viewed as one of the leading jurisdictions for promoting conservation in North America. Vermont Energy Investment Corporation (VEIC) has won multiple awards during the past twenty years from industry associations such as ENERGY STAR®, American Council for an Energy Efficient Economy (ACEEE) and Association of Energy Service Professionals (AESP).

Vermont does not have state legislation that sets energy efficiency targets for each year. Instead, it follows a policy of setting energy efficiency budgets that achieve "all reasonably available, cost effective energy efficiency". The specific budgets and targets are negotiated between the PSB and VEIC, which operates Efficiency Vermont. There is no explicit penalty for not meeting the targets, but a portion of the payments are contingent upon performance, which is subject to an Evaluation, Measurement and Verification (EM&V) process.

The budgets and targets are established in three year cycles. The current cycle, 2015-2017 has a savings target of 321,800 MWh for VEIC. This is measured in annual, incremental net savings. Efficiency Vermont is also held to a total resource benefits target of $336.3 million as indicated by the present value of the benefits of the TRC test. For scale purposes, in 2014, Efficiency Vermont achieved 91,000 MWh of savings, meaning the new cycle is more aggressive than recent results.

In addition to Burlington Electric Department's targets, the total energy savings target for Vermont for the 2015-2017 is equivalent to about 2.1 percent of sales each year.

Every three year cycle is determined through a Demand Resource Plan (DRP) process that has a 20 year horizon. This process sets the three year energy conservation savings and budget targets.

According to the latest update to the 2015-2017 Triennial Plan submitted by Efficiency Vermont, the resource acquisition budgets for electricity are as follows for 2015, 2016 and 2017 respectively: $42.35M, $39.46M and $45.56M.

The total budget for all of Efficiency Vermont's portfolio from 2015-2017, including the performance award is indicated below:

5.1.2 2015-2017 Budget by Market and Initiative

	2015 [1]	2016	2017	2015-2017
RESOURCE ACQUISITION				
Electric Efficiency				
Business Sector				
Business Existing Facilities	$ 18,420,756	$ 17,193,540	$ 21,641,426	$ 57,255,722
Customer Credit	$ 312,309	$ 1,686,279	$ 1,029,372	$ 3,027,960
Business New Construction	$ 3,207,177	$ 2,954,285	$ 3,046,426	$ 9,207,888
Sub-Total Business Sector	**$ 21,940,243**	**$ 21,834,103**	**$ 25,717,224**	**$ 69,491,570**
Residential Sector				
Efficient Products	$ 13,941,148	$ 12,525,075	$ 13,495,259	$ 39,961,481
Existing Homes	$ 3,949,947	$ 3,794,029	$ 4,284,024	$ 12,028,000
Residential New Construction	$ 2,832,331	$ 2,993,140	$ 3,088,289	$ 8,913,759
Sub-Total Residential Sector	**$ 20,723,425**	**$ 19,312,244**	**$ 20,867,571**	$ 60,903,240
Research & Development	**$ 1,228,855**	**$ 2,568,977**	**$ 1,206,235**	$ 5,004,067
Total Electric Efficiency	**$ 43,892,523**	**$ 43,715,324**	**$ 47,791,030**	**$ 135,398,877**
Thermal Energy and Process Fuels Efficiency				
Business Sector	$ 565,997	$ 1,417,372	$ 1,417,372	$ 3,400,741
Residential Sector	$ 5,103,491	$ 4,252,116	$ 4,252,116	$ 13,607,723
Total Thermal Energy and Process Fuels Efficiency	$ 5,669,488	$ 5,669,488	$ 5,669,488	$ 17,008,464
TOTAL RESOURCE ACQUISITION ACTIVITIES	**$ 49,562,011**	**$ 49,384,812**	**$ 53,460,518**	**$ 152,407,341**
NON RESOURCE ACQUISITION				
Education and Training	$ 837,950	$ 854,700	$ 871,810	$ 2,564,460
Applied Research and Development	$ 403,725	$ 411,800	$ 420,040	$ 1,235,565
Planning and Reporting	$ 415,000	$ 614,270	$ 626,570	$ 1,655,840
Evaluation, Measurement and Verification	$ 880,000	$ 897,600	$ 915,560	$ 2,693,160
Policy and Public Affairs	$ 493,025	$ 502,880	$ 512,950	$ 1,508,855
Information Technology	$ 1,501,000	$ 1,199,020	$ 1,222,500	$ 3,922,520
General Administration	$ 261,400	$ 266,630	$ 271,970	$ 800,000
TOTAL NON-RESOURCE ACQUISITION	$ 4,792,100	$ 4,746,900	$ 4,841,400	$ 14,380,400
Operations Fee	$ 972,752	$ 944,018	$ 1,030,906	$ 2,947,676
Sub-Total Prior to Performance-Based Fee	**$ 55,326,863**	**$ 55,075,730**	**$ 59,332,824**	**$ 169,735,417**
Performance-Based Fee (set-aside)	$ 1,459,129	$ 1,416,027	$ 1,546,359	$ 4,421,514
TOTAL BUDGET INCLUDING PERFORMANCE-BASED FEE	$ 56,785,992	$ 56,491,757	$ 60,879,183	$ 174,156,931

[1] The 2015 NRA budgets were modified in the digital version on 12/2/2015 and will therefore not align with the printed versions.

Cost Effectiveness Testing

Efficiency Vermont is responsible for achieving “all reasonable available, cost effective energy efficiency” within the provided budget.

The PSB conducts an annual savings verification process to compare achievement against the initial plan.

The Technical Advisory Group (TAG) contains members from Efficiency Vermont, PSB, Burlington Electric Department and other stakeholders to resolve any issues with the annual savings verification process and to track implementation of any recommendations that arise from the annual verification process.

The TRM contains a list for the prescriptive measures, which represent about 2/3 of overall electricity savings in the portfolio. It indicates the methodology for how energy savings can be calculated for each measure, along with the supporting assumptions such as ~~incremental costs~~Incremental Equipment Costs, and free ridership rates. The TRM uses deemed savings for the majority of measure contained; however the deemed savings have the algorithms and assumptions to help improve accuracy. For some measures, there are calculation-based savings that use specific input parameters such as hours of operation or efficiency level.

For the 2011-2013 period, an independent audit of Efficiency Vermont's and Burlington Electric Department's program cost effective was conducted. This review was completed in September, 2015. The findings show that the portfolio had a Societal Cost Test (SCT) of 2.66 and a Program Administrator Cost (PAC) test of 3.05. These numbers seem to be in alignment with the savings, budget and benefits targets from the 2015-2017, though they do support the premise that the 2015-2017 is more aggressive for obtaining savings, with a resulting decrease in cost effectiveness.

Efficiency Vermont uses the SCT, not the TRC, for determining cost effectiveness at the measure level and the portfolio level. PAC is only used at the portfolio level. In general, measures must pass the SCT screening, but exceptions do occur for a variety of reasons. For example, low income programs have an additional 15 percent adder for benefits to reflect the societal value of efficiency in the low income market.

Avoided Costs[2]

Any updates to the avoided costs for Vermont are led by the PSB. Periodically, the avoided costs are updated. The last update occurred in 2015, based on a report by Synapse Energy Economics, which investigated the avoided energy supply costs for New England. Before any changes are implemented, they must be reviewed and approved by the board. The avoided costs are calculated for the entire New England Region, and then separated into different geographic areas, of which Vermont is one area.

For electricity, the major categories of benefit are:

- Avoided Capacity Costs
- Avoided Energy Costs
    - These costs include the reduction in cost of renewable energy that needs to be acquired to comply with Renewable Portfolio Standards (RPS).
- Transmission and Distribution Costs
    - These are assumed at the local level.
- Capacity Demand Reduction Induced Price Effect (DRIPE)
- Energy DRIPE
- Electricity Cross-Fuel DRIPE
- Avoided Non-Embedded CO_2 Costs

EFFICIENCY VERMONT –OVERVIEW

Utility Facts

- Serves all of Vermont, other than Burlington Electric Department customers
- Over 9,500 square miles
- Services population of 500,000

[2] Avoided Costs - http://psb.vermont.gov/sites/psb/files/projects/EEU/2013avoidedcosts/AESCReport-WithAppendicesAttached.pdf

- Funded through energy efficiency charge collected by participating electric utilities.

Customer Class Breakdown

There are three types of customers:

- Residential
- Commercial – Without Demand Charge
- Commercial – With Demand Charge

Retail Prices of Electricity

In Vermont, the bundled retail prices for electricity are as follows for the different utilities[3]:

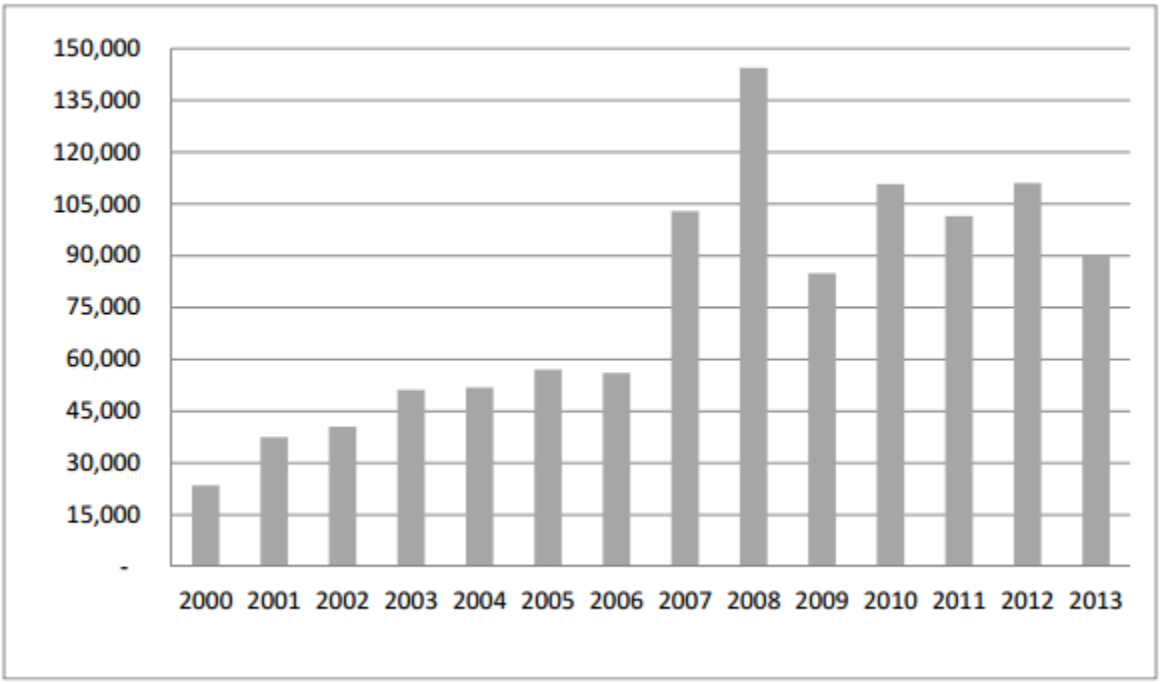
Entity	State	Ownership	Customers (Count)	Sales (MWh)	Revenues (Thousands Dollars)	Average Price (cents/kWh)
City of Burlington Electric - (VT)	VT	Municipal	20,557	338,421	47,086.0	13.91
Green Mountain Power Corp	VT	Investor Owned	258,928	4,281,682	609,832.0	14.24
Town of Hardwick	VT	Municipal	4,492	32,763	5,856.0	17.87
Town of Stowe- (VT)	VT	Municipal	4,033	74,414	11,366.5	15.27
Vermont Electric Cooperative, Inc	VT	Cooperative	38,542	446,870	74,409.5	16.65
Village of Ludlow - (VT)	VT	Municipal	3,758	47,118	7,439.0	15.79
Village of Lyndonville - (VT)	VT	Municipal	5,675	64,937	9,848.0	15.17
Village of Morrisville - (VT)	VT	Municipal	3,986	44,827	7,119.0	15.88
Village of Northfield - (VT)	VT	Municipal	1,866	29,570	3,998.8	13.52
Village of Swanton - (VT)	VT	Municipal	3,632	53,710	6,791.0	12.64
Washington Electric Coop - (VT)	VT	Cooperative	10,836	69,993	13,566.0	19.38

EFFICIENCY VERMONT - ENERGY EFFICIENCY PROGRAMMING

Vermont Energy Investment Corporation (VEIC) has been delivering energy efficiency programs since 1987. In 1999, Efficiency Vermont was created through the award of a contract from the Public Services Board to create North America's first energy efficiency utility. Programs began for customers in March, 2000. Since then, Efficiency Vermont has delivered 12.7 million MWhs in savings.

[3] http://www.eia.gov/electricity/data.cfm#sales

Figure 1. Efficiency Vermont annualized megawatt-hour savings



Savings

Efficiency Vermont programs have proven very successful at reducing energy consumption and incentivizing energy efficient behaviours and investment decisions. In the 2012-2014 period, Efficiency Vermont had the following results:

Table 1. Key results for 2012–2014

	2012	2013	2014	2012–2014 Total
Energy savings in megawatt-hours (MWh)	110,179	85,582	91,146	286,907
Total Resource Benefits[2]	$118,358,445	$83,830,177	$82,101,439	$284,290,061
U.S. tons of carbon dioxide emissions avoided through efficiency	800,000	690,000	700,000	2,190,000

Table 2. Selected QPI results for the 2012–2014 performance period[4]

Key Quantifiable Performance Indicators (QPIs)	Funding Pool	2012–2014 Goals	2012–2014 Results	% of Goal Achieved
Electric savings (MWh)	Electric Efficiency Charge	274,000	286,907	105%
Total Resource Benefits	Electric Efficiency Charge	$305,984,352	$284,290,061	93%
Statewide summer peak kilowatt (kW) demand reduction	Electric Efficiency Charge	41,920	35,979	86%
Summer peak kW demand reduction in Geographic Targeting areas—Susie Wilson Road	Electric Efficiency Charge	1,570	1,626	104%
Summer peak kW demand reduction in Geographic Targeting areas—Saint Albans	Electric Efficiency Charge	1,800	2,086	116%
Ratio of gross electric benefits to spending	Electric Efficiency Charge	1.2	2.0	163%
Million British thermal unit (MMBtu) savings	Thermal Energy and Process Fuels Revenues	155,000	168,795	109%

Budget & Spending

Efficiency Vermont's spending for 2013 and 2014 is provided below:

	Prior Year	Current Year 2014	Cumulative starting 1/1/12	Cumulative starting 1/1/12
# participants with installations	37,483	54,135	131,094	131,094
Operating Costs				
Administration	$1,440,935	$3,345,878	$6,107,129	$6,107,129
Operations and Implementation	$4,944,156	$5,077,234	$14,289,871	$14,289,871
Strategy and Planning	$1,735,071	$1,537,498	$4,652,934	$4,652,934
Subtotal Operating Costs	**$8,120,163**	**$9,960,610**	**$25,049,934**	**$25,049,934**
Technical Assistance Costs				
Services to Participants	$4,924,708	$3,987,615	$13,596,176	$13,596,176
Services to Trade Allies	$392,440	$1,559,789	$2,296,467	$2,296,467
Subtotal Technical Assistance Costs	**$5,317,148**	**$5,547,404**	**$15,892,643**	**$15,892,643**
Support Services				
Transportation	$369	$4,255	$4,623	$4,623
Targeted Implementation	$4,584	$1,407	$5,991	$5,991
Consulting	$315,962	$490,162	$911,282	$911,282
Marketing	$2,507,460	$2,177,538	$5,973,105	$5,973,105
EM&V	$146,611	$183,942	$516,438	$516,438
Policy	$35,328	$61,712	$199,017	$199,017
Information Technology	$1,218	$80,913	$82,411	$82,411
Customer Support	$207,074	$400,744	$787,512	$787,512
Business Development	$24,833	$19,090	$51,065	$51,065
Subtotal Support Services Costs	**$3,243,439**	**$3,419,764**	**$8,531,443**	**$8,531,443**
Incentive Costs				
Incentives to Participants	$15,634,949	$22,831,035	$56,723,746	$56,723,746
Incentives to Trade Allies	$36,917	$53,428	$164,974	$164,974
Subtotal Incentive Costs	**$15,671,866**	**$22,884,463**	**$56,888,720**	**$56,888,720**
Total Efficiency Vermont Costs	**$32,352,615**	**$41,812,241**	**$106,362,740**	**$106,362,740**
Total Participant Costs	$23,822,816	$22,482,896	$47,632,567	$47,632,567
Total Third Party Costs	$855,513	$963,025	$3,122,038	$3,122,038
Total Resource Acquisition Costs	**$57,030,944**	**$65,258,162**	**$157,117,345**	**$157,117,345**

Annualized MWh Savings	89,679	91,159	292,063	292,063
Lifetime MWh Savings	1,041,327	1,101,613	3,388,175	3,388,175
TRB Savings (2012 $)	$88,029,132	$82,129,788	$289,655,512	289,655,512
Winter Coincident Peak kW Savings	16,656	16,519	55,261	55,261
Summer Coincident Peak kW Savings	11,222	10,326	36,762	36,762
Annualized MWh Savings/Participant	2.393	1.684	2.228	2.228
Weighted Lifetime	11.6	12.1	11.6	11.6

Vermont 2013-2014 Incentive vs. Total Program Spending and Spending per kWh Ratios		
2013	48%	$0.36/kWh
2014	55%	$0.46/kWh

Cost Effectiveness

Efficiency Vermont is not held to a direct cost effectiveness metric, but the plan must meet associated savings, spending and total resource benefit targets. The annual savings verification process captures program to these targets. The latest independent audit of Vermont's energy efficiency portfolio for the 2011-2013 period provided the following results:

Vermont 2013-2015 Cost Effectiveness Results	
SCT	2.66
PAC	3.05

Based on analysis of the 2015-2017 program targets and budgets, it is assumed that the cost effectiveness projections will be slightly decreased, compared to historical performance.

FUTURE TARGETS

The 2015-2017 period has a savings target of 321,800 MWh, with an associated electricity savings resource acquisition budget of just over $130 million. The total budget for Efficiency Vermont's budget which included revenues collected from the efficiency charge, the Regional Greenhouse Gas Initiative and the ISO-NE Forward Capacity market as well as the performance fee is $174 million.

INCENTIVE LEVEL SETTING METHODOLOGY

Efficiency Vermont developed a new product development process about a year and a half ago. It involves a customer mapping and an engagement process that covers seven stages:

1. Idea Solicitation
2. Idea Screening
3. Concept Development
4. Market Analysis
5. Prototyping
6. Market Testing
7. Product Development
8. Product Launch
9. Post Launch Review

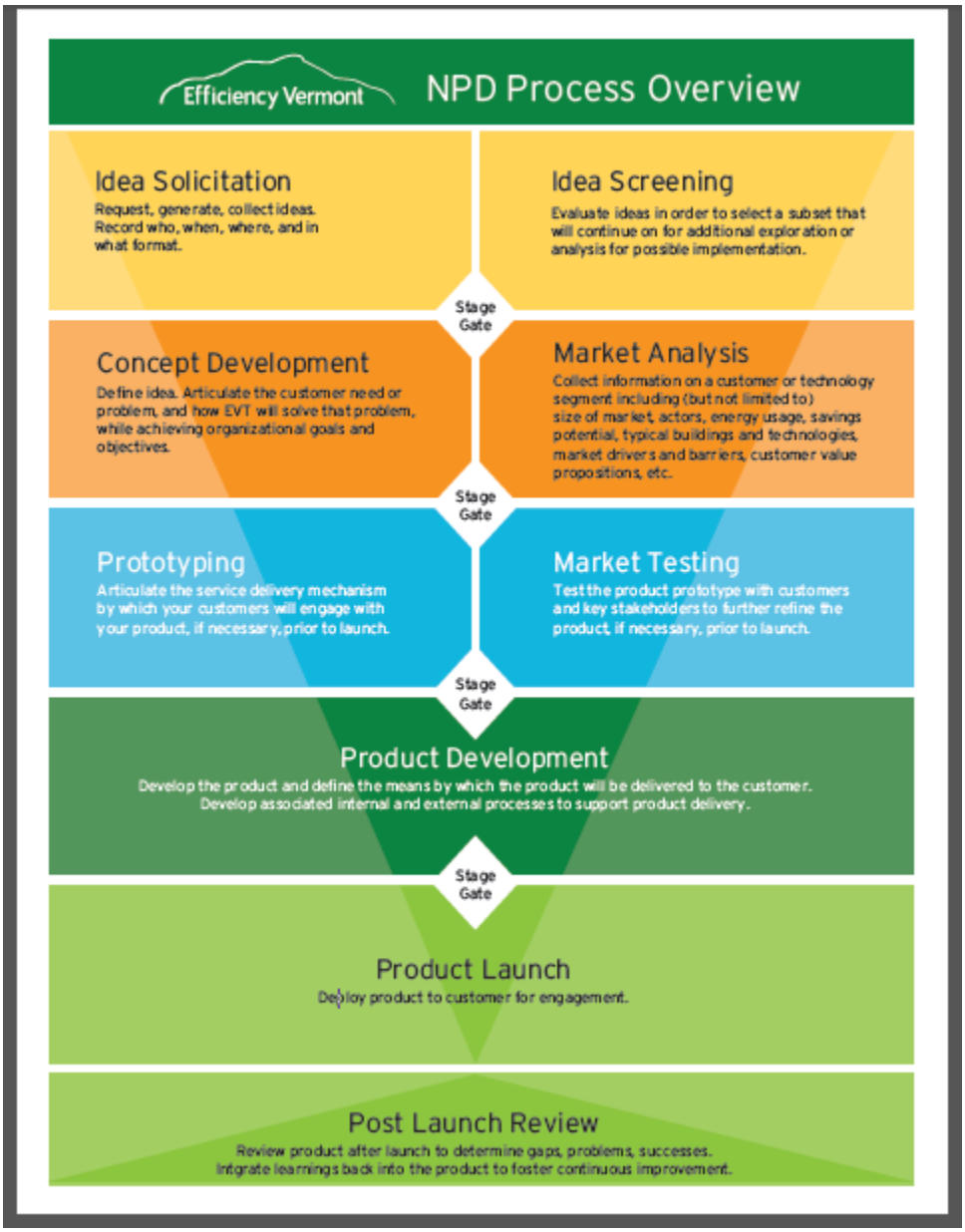


Figure 484748: Efficiency Vermont New Product Development Process

If a new incentive offer or program is being designed, this process is used. If the incentive has been in place for a while, and program delivery is not changing, the process is not necessarily followed.

If there is a need for an expedited change, the process can be shortened by reducing some of the check list items.

Ideally, the NPD process is consistent between the residential and commercial markets. Usually, if there are changes to the program design, they occur on a six months to a year cycle.

Efficiency Vermont uses a strong data tracking approach for performance and opportunities. Program managers are required to provide forecast and actual data every month for the year ahead.

Cost effectiveness is performed using the societal test. There are different adders for different factors.

Incentives are typically changed based on customer behaviour; not cost effectiveness. Free-ridership is assessed for incentive levels.

Efficiency Vermont conducts market research on a project basis, but the findings are leveraged for the annual planning process as required.

Every measure has its energy savings assumptions evaluated every three years at a minimum. Usually, measures are reviewed for their savings assumptions every year or every two years.

EFFICIENCY VERMONT CORE PROGRAM OFFERINGS (RESIDENTIAL AND BUSINESS)

Program Name	Program Area	Program Measures (Prescriptive Incentives)	Links
Agricultural Equipment Rebates	Agricultural (Commercial)	• Lighting • Equipment Rebates are paid after purchase and submission of rebate form. Certain products are qualified through a qualifying product list or through provided specifications. Incentives are either prescriptive or quasi-prescriptive based on equipment characteristics.	https://www.efficiencyvermont.com/Media/Default/docs/rebates/forms/efficiency-vermont-agricultural-lighting-equipment-rebate-form.pdf
Appliances	Residential	• Dehumidifiers • Clothes Dryers • Clothes Washers • Refrigerators Rebates are paid after purchase and submission of rebate form. All rebated products are qualified through a qualifying product list.	https://contractors.efficiencyvermont.com/rebates
Electronics	Residential	• Advanced Power Strips Incentive provided through a coupon at participating retailer. All products are qualified through a qualifying product list.	https://contractors.efficiencyvermont.com/rebates
Heating, Cooling and Ventilation	Residential and Commercial	• Commercial HVAC • Heat Pump Water Heaters • Cold Climate Heat Pump • High Performance Circulator Pump • Residential Heating Systems • Residential Water Heating Rebates are paid after purchase and submission of rebate form. Certain products are qualified through a qualifying product list or through provided specifications. Some of the qualifying lists are upstream, so the incentive is provided instantly, versus through a mail-in form. Incentives are either prescriptive or quasi-prescriptive based on equipment characteristics.	https://contractors.efficiencyvermont.com/rebates
Industrial & Special Equipment		• Compressed Air • Pool Pumps Rebates are paid after purchase and submission of rebate form. Certain products are qualified through a qualifying product list or through provided specifications. Incentives are either prescriptive or quasi-prescriptive	https://contractors.efficiencyvermont.com/rebates

Program Name	Program Area	Program Measures (Prescriptive Incentives)	Links
		based on equipment characteristics.	
Lighting	Residential	• CFLs • LEDs Incentives provided at participating retailers. Minimum prices are $0.99 for CFLs and $3.99 for LED products.	
Lighting	Commercial	• LED Fixtures • Lighting Controls Rebates are paid after purchase and submission of rebate form. Products are qualified through provided specifications. Incentives are either prescriptive or quasi-prescriptive based on equipment characteristics.	https://contractors.efficiencyvermont.com/rebates
Refrigeration and Commercial Kitchens	Commercial	• Commercial Kitchen Equipment • Commercial Refrigeration Rebates are paid after purchase and submission of rebate form. Products are qualified through provided specifications. Incentives are either prescriptive or quasi-prescriptive based on equipment characteristics.	https://contractors.efficiencyvermont.com/rebates
Residential Rental Properties	Commercial	• Refrigerators • Ventilation Systems • Boilers • Furnaces • Free Energy Efficiency Products (Aerators, Showerheads, CFLs) Rebates are paid after purchase and submission of rebate form. Products are qualified through provided specifications. Incentives are either prescriptive or quasi-prescriptive based on equipment characteristics.	https://contractors.efficiencyvermont.com/rebates
Home Performance with ENERGY STAR®	Residential	• Insulation and Building Envelope (Up to $2,000) • Heating System Incentive ($500) Participation requires hiring a trained Home Performance with ENERGY STAR contractor. After the qualifying measures are installed, the contractor reports the completed work for Efficiency Vermont for review. After review, the incentives are paid.	https://www.efficiencyvermont.com/Media/Default/docs/rebates/forms/efficiency-vermont-home-performance-with-energy-star-incentive-overview.pdf
Residential New Construction	Residential/ Commercial	• Insulation and Building Envelope • HVAC Equipment • Lighting • Appliances Up to $2,000 in incentives. The home has to be issued with a Home Energy Rating (HERS) index score.	https://www.efficiencyvermont.com/Media/Default/docs/services/brochures/efficiency-vermont-residential-new-construction-specifications-and-incentives.pdf

APPENDIX A-9: MAINE (EFFICIENCY MAINE)

GEOGRAPHIC DEFINITIONS

Efficiency Maine is the body that incents energy efficiency practices in the state of Maine, USA. They are responsible for developing, planning, coordinating and implementing energy efficiency and alternative energy resource programs in the entire state; this includes electric and gas fuel programs.

LOAD AND CONSUMPTION INFORMATION (ELECTRIC)

Electricity in Maine is distributed by ISO New England. Northern Maine Independent System Operator services northern Maine.

Maine itself has 13 electric utility suppliers. Three of these utilities are the main players in the market serving over 90 percent of the customers in state. Maine has a population of 1.33 million.

Peak Demand (2014): 2,200 MW[1]

Figure 494849: Number of Customer Accounts[2]

Maine				
All sectors	805,178	806,103	806,950	819,638
Residential	709,288	710,160	710,988	721,508
Commercial	92,844	92,884	92,896	95,047
Industrial	3,046	3,059	3,066	3,083
Transportation	0	0	0	0

Figure 504950: Customer Rates (2015) [3]

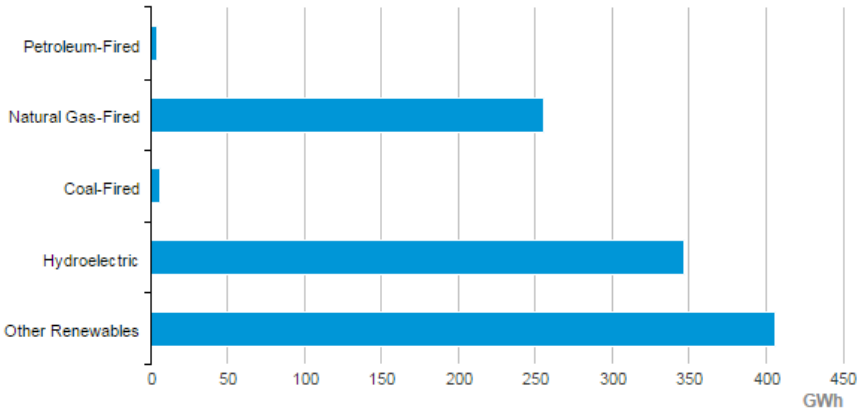
	Residential (Cents/kWh)	Commercial (Cents/kWh)	Industrial (Cents/kWh)	Transportation (Cents/kWh)
Efficiency Maine	15.67	13.15	9.06	-

[1] Maine Public Utilities Commission, "2014 Annual Report," http://www.maine.gov/mpuc/about/annual_report/documents/2014AnnualReportFinaltoPrinter.pdf (February, 2015)
[2] US Energy Information Administration, "Number of customer accounts, monthly," http://www.eia.gov/electricity/data/browser/#/topic/56?agg=0,1&geo=004&endsec=vg&linechart=ELEC.CUSTOMERS.ME-ALL.M&columnchart=ELEC.CUSTOMERS.ME-ALL.M&map=ELEC.CUSTOMERS.ME-ALL.M&freq=M&ctype=linechart&ltype=pin&rtype=s&pin=&rse=0&maptype=0
[3] U.S. Energy Information Administration, "Average retail price of electricity to ultimate customers," http://www.eia.gov/electricity/data.cfm#sales (February 2015)

Figure 515051: Retail Sales of Electricity (Million kilowatt-hours)[4]

	2012	2013	2014	2015
Retail sales of electricity (million kilowatthours)				
New England				
All sectors	120,456	121,357	119,983	119,311
Residential	47,208	48,369	47,212	47,397
Commercial	44,864	44,938	53,107	53,158
Industrial	27,818	27,472	19,107	18,178
Transportation	566	577	557	577
Other	--	--	--	--
Maine				
All sectors	11,561	11,855	12,003	11,955
Residential	4,481	4,662	4,661	4,624
Commercial	4,053	4,016	3,985	3,973
Industrial	3,027	3,177	3,357	3,358
Transportation	0	0	0	0
Other	--	--	--	--

Figure 525152: Maine Net Electricity Generation by Source, Dec. 2015 [5]



[4] U.S. Energy Information Administration, "Retail sales of electricity, annual," http://www.eia.gov/electricity/data/browser/#/topic/5?agg=0,1&geo=o04&freq=A&start=2001&end=2015&ctype=linechart&ltype=pin&rtype=s&rse=0&maptype=0&pin=

[5] U.S. Energy Information Administration, "Maine Net Electricity Generation by Source, Dec. 2015," https://www.eia.gov/state/print.cfm?sid=ME

LOAD AND CONSUMPTION INFORMATION (NAUTRAL GAS)

Maine's gas is serviced by four gas utilities[6]:

- Northern Utilities, d/b/a Unitil
- Bangor Gas Company, L.L.C.
- Maine Natural Gas, Corporation
- Summit Natural Gas of Maine, Inc.

The Maine Public Utilities Commission (MPUC) regulates the natural gas pipelines and gas utilities[7].

Figure 535253: Natural Gas Consumption (Maine) [8]

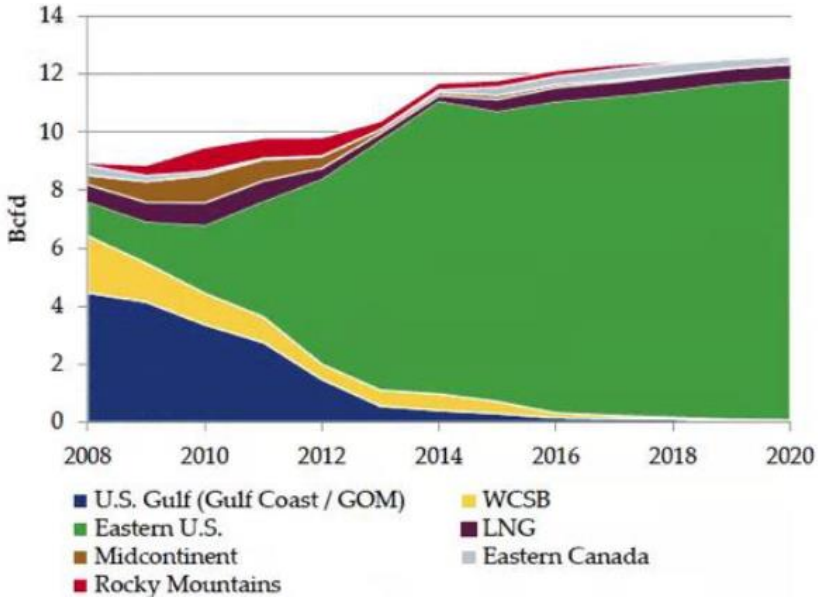
	2010	2011	2012	2013	2014	2015
Total Consumption	77,575	71,690	68,266	64,091	60,661	
Pipeline & Distribution Use	1,753	2,399	762	844	1,300	
Volumes Delivered to Consumers	75,821	69,291	67,504	63,247	59,362	NA
Residential	1,234	1,409	1,487	1,889	2,357	2,605
Commercial	5,830	6,593	7,313	8,146	9,030	9,795
Industrial	28,365	27,734	30,248	32,308	24,121	NA
Vehicle Fuel	1	1	1	*	1	1
Electric Power	40,392	33,555	28,456	20,904	23,853	17,447

Figure 545354: Customer Rates (2014)[9]

	Residential ($/Cubic ft.)	Commercial ($/Cubic ft.)	Industrial ($/Cubic ft.)	Transportation ($/Cubic ft.)
Efficiency Maine	16.90	15.13	11.93	-

[6] Maine Public Utilities Commission, "Natural Gas Distributors," http://www.maine.gov/mpuc/natural_gas/distributors.html (2008)
[7] Office of the Revisor of Statutes Maine, "Title 35-A: Public Utilities," http://legislature.maine.gov/legis/statutes/35-A/title35-Ach0sec0.html (January 2016)
[8] U.S. Energy Information Administration, "Natural Gas Consumption by End Use," https://www.eia.gov/dnav/ng/ng_cons_sum_dcu_SME_a.htm (March 2016)
[9] U.S. Energy Information Administration, "Natural Gas Prices," http://www.eia.gov/dnav/ng/ng_pri_sum_dcu_SME_a.htm (March, 2016)

Figure 555455: Sources of Gas Supply in the U.S. Northeast Region, Including New England



MARKET STRUCTURE OVERVIEW

The Efficiency Maine Trust Act came in effect in 2009 and is responsible for Efficiency Maine's inception as an independent Trust. Their purpose is to develop, plan, coordinate, and implement energy efficiency/alternative energy resource programs across the state of Maine. These purposes are accompanied by 10- and 20-year energy savings aspirations which are integrated into the strategy and budgets of the Triennial Plans[77]. These aspirations include:

- Weatherizing 100 percent of residences and 50 percent of businesses by 2030
- Reducing peak-load electric energy consumption by 100 megawatts by 2020
- Reducing the state's consumption of liquid fossil fuels by at least 30 percent by 2030
- By 2020, achieving electricity and natural gas savings of at least 30 percent and heating fuel savings of at least 20 percent as defined in and determined pursuant to the measures of performance ratified by the commission under section 10120
- Capturing all cost-effective energy efficiency resources available for electric and natural gas utility ratepayers
- Saving residential and commercial heating consumers not less than $3 for every $1 of program funds invested by 2020 in cost-effective heating and cooling measures that cost less than conventional energy supply
- Building stable private sector jobs providing clean energy and energy efficiency products and services in the state by 2020
- Reducing greenhouse gas emissions [10 percent below 1990 levels by 2020] from the heating and cooling of buildings in the state

According to the act[77], Efficiency Maine, in consultation with entities and agencies engaged in delivering efficiency and weatherization programs in the state, is to develop a triennial plan. The triennial plans has to include identification of all achievable cost-effective energy efficiency savings, programs to address these savings potential and the associated costs and benefits with the basis of these costs and benefits presented. It is the

MPUC's responsibility to review and approve or deny triennial plans submitted. Upon approval of the plan, the MPUC orders the state's electric utilities to collect the applicable budget from their customers and remit it to the Trust for its programs.

An independent evaluation of each major program implemented is conducted at least every five years. This evaluation must include an accounting audit and program effectiveness of meeting its goals evaluation. These results are included in the annual report submitted. "Major" programs are defined as programs with annual budgets greater than $500,000.

The amount of funding available is determined by the budget needed to achieve the maximum achievable cost-effective (MACE) energy efficiency potential approved by the MPUC. Efficiency Maine also typically offsets some of funding through a variety of sources such as through Maine ratepayers, revenues from the Forward Capacity Market and a long-term contract with Maine utilities.

Energy efficiency has been determined to be the lowest cost energy resource in the state of Maine. The cost to save electricity through efficiency upgrades averaged 4.3 cents/kWh. The cost of saving heating fuels (heating oil, propane, natural gas, wood, and kerosene) through weatherization and high-efficiency heating equipment averaged $12.96/MMBtu.

PORTFOLIO MATURITY AND HISTORICAL PERFORMANCE

DSM programs were administered by electric utilities before 2002. Efficiency Maine was then established in 2002 to promote electricity efficiency, reduce energy costs and improve the environment statewide. During this time, Efficiency Maine was part of the MPUC. It later became an independent Trust by 2009.

Efficiency Maine Program Impacts 2004-2010[10]:

- 2004-2010 Cumulative Annual MWh Savings: **486,342**
- 2004-2010 Cumulative Lifetime MWh Savings: **4,646,248**
- 2004-2010 Cumulative Benefit to Cost Ratio: **2.92**
- 2004-2010 Cumulative Cost/kWh: **3.6 cents**

CURRENT CYCLE

Efficiency Maine began Triennial Plans in 2011 and is currently in the second triennial cycle that spans 2014-2016. Efficiency Maine also releases performance reports annually. The latest public report is 2015.

Figure 565556: 2011-2015 Electric Savings Result [11]

Year	Total (GWh)
2011	173.5
2012	226
2013	134
2014	162
2015	224
Total	919.5

[10] Efficiency Maine, "2010 Annual Report," http://www.efficiencymaine.com/docs/EMO16444_AnnualReport_2010.pdf
[11] Efficiency Maine, captured from Efficiency Maine's "Annual Reports" between 2011-2015 http://www.efficiencymaine.com/about/library/reports/

Figure 575657: 2011-2015 Gas Savings Result [1111]

Year	Total (MMBtu)
2011	16,115
2012	1,845
2013	12,169
2014	30,839
2015	19,274
Total	80,242

Figure 585758: Gross Electricity Savings [12]

Program	Annual kWh Savings	Lifetime kWh Savings	Efficiency Maine Costs	Participant Cost	Lifetime Energy Benefit	Cost/kWh (Lifetime)	Benefit-to-Cost Ratio
Business Incentive Program Electric Measures	75,285,380	872,772,692	$17,162,905	$16,564,324	$74,374,992	$0.039	2.21
Large Customer Program Electric Measures	30,760,921	438,865,951	$6,983,439	$5,124,783	$25,297,712	$0.028	2.09
Small Business Initiative	5,409,349	70,201,736	$2,732,147	$551,767	$6,330,554	$0.047	1.93
Consumer Products Program	102,318,679	550,577,702	$10,817,327	$20,287,640	$49,871,614	$0.056	1.60
Home Energy Savings Program Electric Measures	9,032,603	162,586,854	$3,564,434	$1,079,128	$16,426,509	$0.029	3.54
Low-Income Direct Install Initiative Electric Measures	1,534,180	14,065,348	$1,232,373	$0	$1,249,631	$0.088	1.01
Cross-Cutting Strategies Electric			$863,415				
Administration - Electric			$2,136,542				
TOTAL	224,341,112	2,109,070,284	$45,492,581	$43,607,642	$173,551,012	$0.042	1.95

[12] Efficiency Maine, "FY2015 Annual Report," http://www.efficiencymaine.com/docs/2015-Efficiency-Maine-Annual-Report.pdf

Figure 595859: Gross Gas Savings [1212]

Program	Annual MMBtu Savings	Lifetime MMBtu Savings	Efficiency Maine Costs	Participant Cost	Lifetime Energy Benefit	Cost/MMBTu (Lifetime)	Benefit-to-Cost Ratio
Business Incentive Program Natural Gas Measures	13,057	260,887	$242,991	$66,294	$1,666,517	$1.19	5.39
Low-Income Direct Install Initiative Natural Gas Measures	636	12,728	$76,138	$0	$95,369	$5.98	1.25
Home Energy Savings Program Natural Gas Measures	5,581	127,018	$307,737	$1,100,862	$2,945,103	$11.09	2.09
Maine Advanced Building Program	1,642	32,833	$113,734	$106,360	$335,424	$6.70	1.52
Multifamily Efficiency Program	15,909	276,179	$1,414,082	$1,762,481	$4,815,091	$11.50	1.52
Business Incentive Program Other Fuels Measures	31,244	409,193	$1,095,388	$6,211,805	$10,017,712	$17.86	1.37
Large Customer Program GHG Measures	26,266	374,124	$1,808,033	$1,272,598	$6,212,210	$8.23	2.02
Low-Income Direct Install Initiative Other Fuels Measures	13,700	246,606	$700,600	$1,270,337	$4,547,475	$7.99	2.31
Home Energy Savings Program Other Fuels Measures	83,224	1,894,231	$6,309,776	$22,334,064	$43,920,697	$15.12	1.53
Renewables-Demonstration Projects			$220,923				
Cross-Cutting Strategies All Fuels			$170,894				
Administration - All Fuels			$496,969				
TOTAL	191,258	3,633,797	$12,957,266	$34,124,801	$74,555,598	$12.96	1.58

Figure 605960: FY2015 Payments [1212]

Use of Funds	Amount ($)
Administration-General	**2,220,441**
Residential Programs	**23,913,161**
– Administration-Res. Program	229,793
– Low Income	4,390,447
– Non-Low Income	19,292,921
Business Programs	**29,865,449**
– Administration-Bus. Program	249,884
– Small/Medium	23,138,575
– Large Custom	6,476,990
Cross-Cutting and Alternative Strategies	**1,119,422**
– Administration-C.C. Program	88,239
– Education and Awareness	27,498
– Evaluation	707,203
– Alternative Energy Program	220,926
– Innovation	75,556
Other Payments	**1,747,101**
Total Use of Funds-EMT	**58,865,574**

COST EFFECTIVENESS TESTING

TRC and PACT

Both TRC and PACT tests are presented in Efficiency Maine's annual reports. However, only TRC is used to evaluate performance. PACT is used for program planning/stakeholder relationships.

TRC and PACT by Efficiency Maine is based on "Understanding Cost effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods, and Emerging Issues for Policy-Makers, A Resource of The

National Action Plan for Energy Efficiency," November 2008, http://www.epa.gov/cleanenergy/documents/suca/cost effectiveness.pdf

TRC is used at the measure level based on net savings for introduction of measures and performance reviews and must be greater than 1.0.

Avoided Costs

TRC: The benefits included are the avoided costs of energy.

Efficiency Maine participated in the AESC Study Group, which partnered with Tabors Caramanis Rudkevich for a study on marginal energy supply costs that are avoided due to electricity, natural gas, and other fuels reductions from energy efficiency programs throughout New England. The avoided costs from the study are used by Efficiency Maine for cost effectiveness testing. The AESC Study is typically revised every three years with a mid-term update.

Major categories of benefits for electricity include reductions in:

- Quantities of resources required to meet electric demand and annual energy
- Local transmission and distribution infrastructure costs
- The quantities of capacity and energy that have to be acquired from wholesale energy and capacity markets which may cause prices in those markets to decline

The following estimates of the subsequent major components of avoided electricity costs were used:

- Avoided retail capacity
- Avoided retail energy
- Avoided RPS compliance costs
- Electricity DRIPE

Major categories of benefits for gas include:

- Reductions in gas production
- Marginal reductions in cost of delivering and distributing gas

Costs

TRC at the Program level:

- Costs incurred by program participants (~~incremental costs~~Incremental Equipment Costs)
- Costs of running the energy efficiency programs (delivery and administration costs)

TRC at the Measure level:

- Costs incurred from the measure (~~incremental costs~~Incremental Equipment Costs)

PACT at the Program Level:

- Costs incurred from the measure (~~incremental costs~~Incremental Equipment Costs)
- Costs of running the energy efficiency programs (delivery and administration costs)
- Incentive costs

PACT at the Measure Level:

- Costs incurred from the measure (~~incremental costs~~Incremental Equipment Costs)
- Incentive costs

Figure 6160~~61~~: Benefit- Cost Ratios: Electric Programs 2015 [12~~12~~]

	Adjusted Gross Benefit-to-Cost-Ratio			Net Benefit-to-Cost-Ratio		
Programs	TRC	PACT	Last Evaluation	Net to Gross Ratio	TRC	PACT
Business Incentive Program Electric Measures	2.21	4.33	Note 2	0.71	1.83	3.08
Large Customer Program Electric Measures	2.09	3.62	Note 2	0.79	1.85	2.86
Small Business Initiative	1.93	2.32	Note 1	1.00	1.93	2.32
Consumer Products Program	1.60	4.61	2015	0.75	1.44	3.47
Home Energy Savings Program Electric Measures	3.54	4.61	Note 1	1.00	3.53	4.61
Low-Income Direct Install Initiative Electric Measures	1.01	1.01	Note 1	1.00	1.01	1.01
Total	**1.95**	**3.81**		**0.78**	**1.70**	**2.96**

Figure 626162: Benefit- Cost Ratios: All Fuels and Natural Gas Programs 2015 [1212]

	Adjusted Gross Benefit-to-Cost-Ratio			Net Benefit-to-Cost-Ratio		
Programs	TRC	PACT	Last Evaluation	Net to Gross Ratio	TRC	PACT
Business Incentive Program Natural Gas Measures	5.39	6.86	Note 3	0.66	3.48	4.51
Low-Income Direct Install Initiative Natural Gas Measures	1.25	1.25	2014	1.00	1.25	1.25
Home Energy Savings Program Natural Gas Measures	2.09	9.57	2011	1.00	2.08	9.57
Maine Advanced Building Program	1.52	2.95	Note 2	1.00	1.52	2.95
Multifamily Efficiency Program	1.52	3.41	Note 3	0.90	1.44	3.06
Maine Advanced Building Program	1.52	2.95	Note 1	1.00	1.52	2.95
Business Incentive Program Other Fuels Measures	1.37	9.15	Note 3	1.00	1.37	9.15
Low Income Direct Install Initiative Other Fuels Measures	2.31	6.49	Note 3	1.00	2.17	6.49
Home Energy Savings Program Other Fuels Measures	1.53	6.96	Note 3	1.00	1.52	6.96
Total	**1.58**	**5.75**		**0.97**	**1.54**	**5.57**

INCENTIVE LEVEL-SETTING

Note the Trust is in the middle of a transition on the process for setting incentives. At the time of writing this report, the MPUC had not yet decided on the process. For the first two Triennial plan periods, one of Efficiency Maine's responsibilities is to include establishing more granular incentive levels to reflect specific product types and efficacies. The goal was to ensure that program budgets are spent invested without market disruptions from prematurely exhausting or underspending budgets. As such, periodic reviews of the appropriateness of incentive levels were conducted and adjustments to financial incentives as needed are made. These decisions were made on a program by program basis as determined by the Trust.

The Trust has proposed a third plan to capture all cost effective electrical and natural gas efficiency however the process for adjusting incentives has not yet been agreed upon. In general the MPUC is concerned with the overall cost effectiveness of the programs by Efficiency Maine. The incentive level setting is at Efficiency Maine's discretion but there appears to be a threshold over which this is not the case.

Below is an overview of the process employed by Efficiency Maine when examining an incentive level for a new measure or proposing a significant change to an existing measure.

1. **Market Research/Stakeholder Engagement**
   The process starts by performing both primary and secondary market research in order to determine the measure performance metrics and costs. This will include data from utilities and consulting stakeholders such as contractors, vendors, customers and advocacy groups.
2. **Technical Reference Manual**

Efficiency Maine has Residential TRMs and Commercial TRMs. These are documentation for energy and demand savings calculations of energy efficiency measures along with all the typically associated technology information and assumptions.

3. **Incremental Equipment Cost Design**
   Based on the market research and technology, Efficiency Maine will attempt to incentivize the ~~incremental cost~~Incremental Equipment Cost based on what is determined as a reasonable return on investment. For "Replace on Burnout" measures the ~~incremental cost~~Incremental Equipment Cost is calculated as the difference between the measure cost and that of the standard measures. For Retrofit/Direct Install measures, the ~~incremental cost~~Incremental Equipment Cost is taken as the full measure cost including the price of labour.
4. **Incentive Rate Finalized**
   Once the incremental measure cost is finalized, Efficiency Maine will set a standard incentive using the above considerations.

INCENTIVE ADMIN SPLIT

Figure 636~~263~~: Electric Program Expenditures 2015 [12~~12~~]

Program	Incentive	Delivery	Total
Business Incentive Program Electric Measures	$15,642,304	$1,520,601	$17,162,905
Large Customer Program Electric Measures	$6,439,194	$544,245	$6,983,439
Small Business Initiative	$2,366,729	$365,418	$2,732,147
Consumer Products Program	$8,809,467	$2,007,860	$10,817,327
Home Energy Savings Program Electric Measures	$3,086,300	$478,134	$3,564,434
Low-Income Direct Install Initiative Electric Measures	$1,105,121	$127,252	$1,232,373
Cross-Cutting Strategies Electric		$863,415	$863,415
Administration - Electric			$2,136,542
Sub Total	**$37,449,114**	**$5,906,924**	**$45,492,581**

Figure 646~~364~~: Natural Gas and All Fuels Program Expenditures 2015 [12~~12~~]

Program	Incentive	Delivery	Total
Business Incentive Program Natural Gas Measures	$170,847	$72,144	$242,991
Low-Income Direct Install Initiative Natural Gas Measures	$62,304	$13,834	$76,138
Home Energy Savings Program Natural Gas Measures	$275,207	$32,530	$307,737
Maine Advanced Building Program	$51,500	$62,234	$113,734
Multifamily Efficiency Program	$1,036,508	$377,574	$1,414,082
Business Incentive Program Other Fuels Measures	$976,200	$119,188	$1,095,388
Large Customer Program GHG Measures	$1,383,469	$424,565	$1,808,033
Low-Income Direct Install Initiative Other Fuels Measures	$650,600	$50,000	$700,600
Home Energy Savings Program Other Fuels Measures	$4,104,196	$2,205,579	$6,309,776
Renewables-Demonstration Projects	$220,923	$0	$220,923
Cross-Cutting Strategies All Fuels		$170,894	$170,894
Administration - All Fuels			$496,969
Sub Total	**$8,931,754**	**$3,528,542**	**$12,957,266**

EXISTING PROGRAMS [13]

Name	Target Market	Incentive Information
Home Energy Savings Program (Residential)	Residential customers who are looking to weatherize, reduce GHG, and improve overall energy efficiency such as equipment and building envelope improvement, as well as room and water heating. http://www.efficiencymaine.com/docs/HESP-Program-Manual.pdf	Air sealing with assessment: $400, a bonus of $100 provided with one envelope or heating system measure performed with an air seal and assessment Insulation: $700 per insulation (attic, wall, and basement), limit of $2,100 per building Supplemental heating system: $500 (Pellet or wood stove, or air source ductless heat pumps) Whole house heating systems: $500 (ducted air source heat pump or furnace/boiler) Ultra-low GHG whole house heating systems: 33 percent, up to $5,000 (eligible biomass boilers/furnaces) Custom projects: Tier 1 incentive: Achieve a minimum of 20 percent projected whole energy savings through any combination of savings measures and receive $1,000 per building, representing no more than 1/3 of total project cost Tier 2 incentive: Achieve a minimum of 40percent projected whole energy savings through any combination of savings measures and receive $1,500 per building, representing no more than 1/3 of total project cost PACE and unsecured energy loans: Available to most home owners, up to 15 year repayment period, fixed rate of 4.99APR, transferrable with property sale, range of loans from $6,500 to $15,000 Additional incentives available for Unitil, Maine NG, Bangor NG customers
Low Income Home Energy Savings Program (Residential)	Residential customers who are currently participating in LIHEAP looking to participate in the Home Energy Savings Program. http://www.efficiencymaine.com/docs/LI	Air sealing with building performance institute (BPI) assessment: $500 Insulation with BPI assessment: $1,000 each for attic, wall, and basement insulation

[13] Efficiency Maine, http://www.efficiencymaine.com/ (2016)

Name	Target Market	Incentive Information
	HESP-Claim-Form.pdf	Other efficiency upgrades: $500 for any of; Insulate box sills, seal mobile home underbelly, repair/insulate/seal door or hatch, seal/insulate heat ducts or pipes, additional six hours of air sealing
Heat Pump Water Heater Program (Residential)	Residential customers who are looking for a new, highly efficient way to heat water. http://www.efficiencymaine.com/at-home/heat-pump-water-heater-program/	Heat pump: $500, $300 tax credit available
Appliance Rebate Program (Residential)	Residential customers who are looking to purchase new ENERGY STAR Certified appliances. http://www.efficiencymaine.com/at-home/appliancerebate-program/	Dehumidifier: $25 Room air purifier: $50 Clothes washer: $50
Lighting Program (Residential)	Customers who are looking to replace their lighting with CFL and LED bulbs.	Efficiency Maine partners with manufacturers and retailers to reduce the price of energy efficient lighting products for Maine consumers. The price vary on the store, currently the cheapest LED blub costs $0.88 for a 9 watt, CFL bulb at $0.10 for a 13 watt. http://www.efficiencymaine.com/docs/EM-lighting-deals.pdf
Business Programs	Businesses looking to upgrade their equipment	Boilers and furnaces: Incentives between $1,250 to 12,500 Boiler controls and ancillary equipment: $0.75 to 1,325 per Mbtu/h Ductless Mini-split heat pump: $500 to 1,250 per system VRF system: $0.50 per sq ft http://www.efficiencymaine.com/docs/embp_HeatingSolutions_rev030316v2.pdf Lighting: Efficiency Maine partners with manufacturers and distributors to discount the price of energy efficient screw-in LED lighting products for Maine businesses Commercial Kitchen Fryer: $1,250 Broiler: $1,550 Convection oven: $750 Combination oven: $1,250 Steamer: $2,500 Griddle: $950

Name	Target Market	Incentive Information
		http://www.efficiencymaine.com/docs/EM-Natural-Gas-Kitchen-Measures.pdf
Commercial Heat Pump Program	For businesses that are looking to upgrade their heating and cooling system with highly efficient products. http://www.efficiencymaine.com/at-work/commercial-heat-pump-program/	Ductless heat pumps: $500 to $1,250
Large Customer Program	For businesses that are looking to achieve significant electricity savings. http://www.efficiencymaine.com/at-work/competitive-program/	Funding range from minimum of $50,000 to a maximum of $1 million per facility, or up to 50 percent of the total project costs. Project should save 350,000 kWh or more to be eligible. Incentive capped at $0.28/kWh. http://www.efficiencymaine.com/docs/All-Programs-Brochure.pdf#page=2
Advanced Building Program	For Maine property owners, developers, architects, and engineers looking to achieve significant energy savings with their new construction.	Prescriptive cash incentive, at $1.50 per square foot to the building owner, and $0.25 per square foot to the lead building design team (capped at $175,000). http://www.efficiencymaine.com/at-work/maine-advance-buildings/

APPENDIX A-10: MASSACHUSETTS (NATIONAL GRID)

OVERVIEW

Jurisdictional Scan	
State/Province	Massachusetts
Utility/Agency	National Grid
Fuel	Electricity, Gas
Key Contact/Interviewee	Ellen Pfeiffer
Consultant	Mayuran Srikantha

JURISDICTION OVERVIEW

Overview of Electricity Market

The following entities make up the electricity system in Massachusetts.

- National Grid
- Massachusetts Government: Office of Energy and Environmental Affairs: Department of Public Utilities (DPU)
- Mass Save®
- ISO New England (ISO-NE)
- Energy Efficiency Advisory Council
- Other Major Electric Utilities
    - Eversource Energy
    - Unitil
    - Cape Light Compact

National Grid is an investor owned utility that operates in the United Kingdom, and in parts of Massachusetts, Rhode Island and New York in the United States. National Grid provides both electricity and natural gas to customers across these three states. In conjunction with other electric utilities and natural gas companies, National Grid submits multi-year energy efficiency plans to the Department of Public Utilities, a division of the Office of Energy and Environmental Affairs in the Massachusetts government. The plans cover National Grid's forecasted activities, and budget and savings targets for the energy efficiency programs in their portfolio.

The Department of Public Utilities is responsible for the oversight of the electric power, natural gas and water utilities in Massachusetts. The oversight includes the following activities: developing alternatives to traditional regulation, monitoring service quality, regulating safety and participating in the siting of energy facilities. The Department's mission is "to ensure that utility customers are provided with the most reliable service at the lowest possible cost; to protect the public safety from transportation and gas pipeline related accidents; and to ensure that residential ratepayers' rights are protected."

Mass Save is the public-facing brand for all of Massachusetts' efficiency programs. It is an initiative that is sponsored by Massachusetts' natural gas and electric utilities and energy efficiency service providers. These sponsors include Berkshire Gas, Blackstone Gas Company, Cape Light Compact, Columbia Gas of Massachusetts, Eversource, Liberty Utilities, Unitil and National Grid. The initiative is also supported by energy efficiency service providers and the Massachusetts Department of Energy Resources. The Mass Save portfolio covers both electricity and natural gas efficiency programs throughout Massachusetts. It helps provide consistency for Massachusetts' residential and business customers.

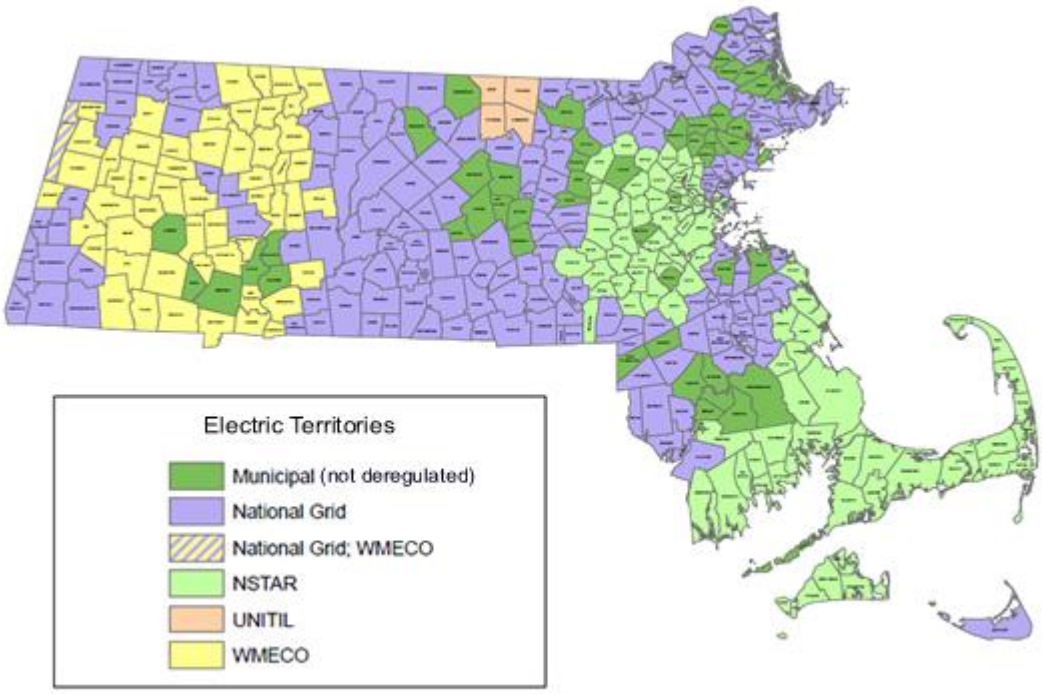
ISO New England (IESO-NE) is the Regional Transmission Organization (RTO) that manages New England's bulk power generation and transmission system. ISO-NE has three main objectives:

1. Ensure daily reliable operation of New England's bulk power generation and transmission system
2. Oversee and ensure fair administration of region's wholesale electricity market
3. Manage a comprehensive regional planning process

The Energy Efficiency Advisory Council (EEAC) is responsible for guiding the progress of energy efficiency in Massachusetts. Key activities include demonstrating continuing leadership in policy and program implementation, integration and innovation, achieving the full potential of the Green Communities Act, and generating significant and sustainable benefits for all Massachusetts' citizens. The EEAC's responsibilities include:

- Collaborating with the utilities on the submission on energy efficiency plans and updates
- Publishing annual results and reports; quarterly reports and monthly dashboards on progress
- Managing the annual EM&V process and other studies through the Evaluation Management Committee
- Holding monthly meetings to discuss progress, results, improvements and current projects

There are several other utilities that work with National Grid in submitting the energy efficiency plan, and in operating the efficiency programs under Mass Save. Each electric and natural gas utility has its own savings targets and budgets. The map below provides a rough demonstration of National Grid's service territory in Massachusetts[99].

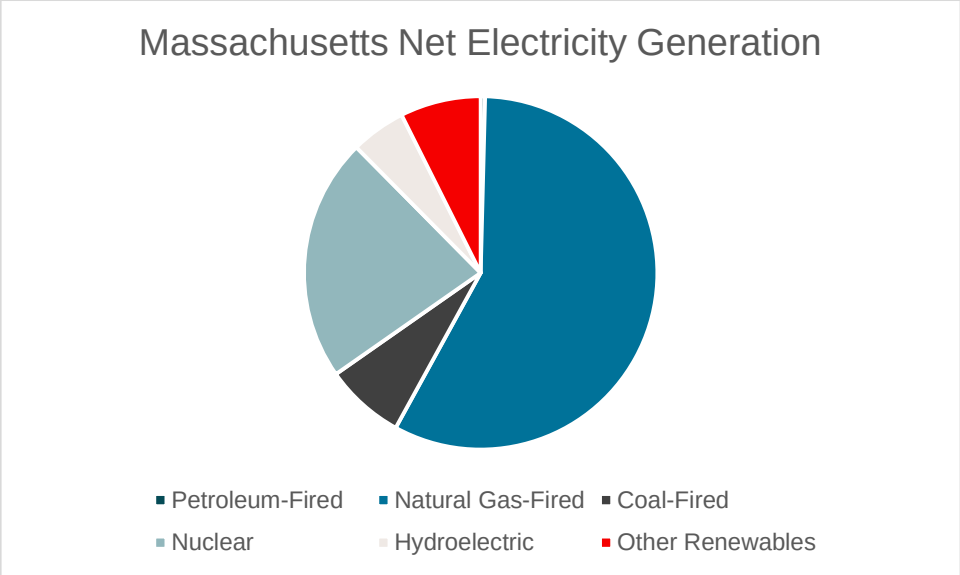


NSTAR and WMECO now operate under Eversource Energy. Cape Light Compact serves customers in Cape Code and Martha's Vineyard.

[99] http://ambitpros.com/wp-content/uploads/ambit-energy-massachusetts-electric-map.png

Electricity Generation

Massachusetts is dominated by natural gas generation[100].



Massachusetts is summer peaking with a load of 13,128 MW. Over 95 percent of the electricity generated comes from large scale generators and CHP units, while the rest comes from electric utilities. The majority of generators participate in ISO-New England's capacity market.

MASSACHUSETTS ENERGY EFFICIENCY PROGRAM INCENTIVE AND COST EFFECTIVENESS POLICY

Massachusetts is viewed as one of the leading jurisdictions for promoting energy efficiency in North America. It is ranked as the #1 jurisdiction in ACEEE's 2015 Scorecard. Massachusetts directs its utilities to design and implement programs through the Green Communities Act. The act requires electric and gas utilities to procure all cost-effective energy efficiency before more expensive supply resources. The act requires a three year planning cycle. The first cycle started in 2010. The most recent cycle (2013-2015) is expected to save 3,703 GWh by the end of 2015.

Massachusetts has the most aggressive efficiency targets in the United States, with the 2015 target being 2.6 percent of retail sales. The 2016-2018 plan calls for 4,122 GWh of savings over the three years, with a budget of $1.96 billion.[101]

National Grid's individual target and budget for 2016-2018 is 1,939 GWh and $897.6 million. The overall target is 2.94 percent of retail electricity sales.

Funding for the programs is provided through the following five sources:

1. Systems Benefit Charge ($0.0025/kWh)
2. Revenues from Forward Capacity market administered by ISO-NE
3. Revenues from cap and trade pollution control programs (Regional Greenhouse Gas Initiative)
4. Other funding sources
5. Energy Efficiency Surcharge (if required and approved by DPU)

For electricity efficiency programs, 10 percent of the total budget should be dedicated to the low income sector.

[100] http://www.eia.gov/state/?sid=MA#tabs-4
[101] http://web1.env.state.ma.us/DPU/FileRoomAPI/api/Attachments/Get/?path=15-168%2fOrder_12816.pdf

Cost Effectiveness Testing

As per the 2016-2018 plan, there are three key elements to cost effectiveness:

1. Each program is supposed to be screened for cost effectiveness. For Massachusetts, the TRC test is used for screening. There is flexibility in what is termed a "program", but there needs to justification provided to include non-cost effective elements and provide direction on how they may be cost-effective in the future.
2. Program administration (program planning and administration costs only, not delivery costs) costs should be minimized to the fullest practicable extent
3. Program administrators will use competitive procurement processes to the fullest practicable extent

Avoided Costs

Periodically, the avoided costs are updated. The last update occurred in 2015, based on a report by Synapse Energy Economics which investigated the avoided energy supply costs for New England. Before any changes are implemented, they must be reviewed and approved by the board. The avoided costs are calculated for the entire New England Region, and then separated into different geographic areas, of which is Massachusetts.

For electricity, the major categories of benefit are[102]:

- Avoided Capacity Costs
- Avoided Energy Costs
    - These costs include the reduction in cost of renewable energy that needs to be acquired to comply with Renewable Portfolio Standards (RPS).
- Transmission and Distribution Costs
    - These are assumed at the local level.
- Capacity DRIPE
- Energy DRIPE
- Electricity Cross-Fuel DRIPE
- Avoided Non-Embedded CO_2 Costs

NATIONAL GRID – UTILITY OVERVIEW

Utility Facts

- Serves portions of Massachusetts, Rhode Island and New York
- Services a population of 3.3 million electricity customers
    - In Massachusetts, it is just under 1.1 million customers

Customer Class Breakdown

There are the following types of customers:

- Residential
- Commercial

[102] Avoided Costs - http://ma-eeac.org/wordpress/wp-content/uploads/2015-Regional-Avoided-Cost-Study-Report.pdf

Retail Price of Electricity[103]

Entity	State	Ownership	Customers (Count)	Sales (Megawatthours)	Revenues (Thousands Dollars)	Average Price (cents/kWh)
City of Chicopee - (MA)	MA	Municipal	26,217	455,823	55,164.7	12.10
City of Hingham - (MA)	MA	Municipal	9,626	199,687	31,215.0	15.63
City of Holyoke - (MA)	MA	Municipal	17,315	356,024	41,924.0	11.78
City of Marblehead - (MA)	MA	Municipal	10,920	105,357	15,727.0	14.93
City of Norwood - (MA)	MA	Municipal	15,414	309,614	44,810.4	14.47
City of Peabody - (MA)	MA	Municipal	26,016	504,179	64,731.5	12.84
City of Taunton	MA	Municipal	36,877	652,064	92,611.0	14.20
City of Westfield - (MA)	MA	Municipal	17,889	366,807	50,689.0	13.82
Fitchburg Gas & Elec Light Co	MA	Investor Owned	23,748	216,304	45,001.9	20.80
Massachusetts Electric Co	MA	Investor Owned	1,078,192	10,602,381	1,762,905.5	16.63
NSTAR Electric Company	MA	Investor Owned	879,498	8,805,023	1,550,537.0	17.61
Nantucket Electric Co	MA	Investor Owned	12,645	130,682	24,821.9	18.99
Town of Belmont - (MA)	MA	Municipal	11,279	125,032	23,582.0	18.86
Town of Braintree - (MA)	MA	Municipal	16,309	361,599	49,846.0	13.78
Town of Concord - (MA)	MA	Municipal	8,092	169,281	25,419.3	15.02
Town of Danvers	MA	Municipal	13,357	310,008	44,505.0	14.36
Town of Hudson - (MA)	MA	Municipal	12,695	348,102	47,133.4	13.54
Town of Ipswich - (MA)	MA	Municipal	7,054	111,088	15,727.8	14.16
Town of Littleton - (MA)	MA	Municipal	6,575	288,532	32,929.1	11.41
Town of Mansfield - (MA)	MA	Municipal	9,773	202,928	26,173.0	12.90
Town of Middleborough - (MA)	MA	Municipal	16,301	264,432	31,789.0	12.02
Town of Middleton	MA	Municipal	3,595	93,511	13,442.0	14.37
Town of North Attleborough - (MA)	MA	Municipal	14,076	229,853	34,228.0	14.89
Town of Reading - (MA)	MA	Municipal	29,641	679,152	69,533.0	10.24
Town of Shrewsbury - (MA)	MA	Municipal	15,868	278,984	31,812.0	11.40
Town of South Hadley - (MA)	MA	Municipal	8,059	111,117	16,161.1	14.54
Town of Sterling - (MA)	MA	Municipal	3,753	60,518	8,298.1	13.71
Town of Wakefield - (MA)	MA	Municipal	12,407	194,441	26,014.0	13.38
Town of Wellesley - (MA)	MA	Municipal	10,032	242,936	31,596.9	13.01
Western Massachusetts Electric Company	MA	Investor Owned	188,299	1,825,087	296,597.3	16.25

[103] http://www.eia.gov/electricity/data.cfm#sales

NATIONAL GRID - ENERGY EFFICIENCY PROGRAMMING

Savings and Expenditure[104]

In the 2013-2015 cycle, National Grid achieved the following savings with the associated expenditures. These savings and expenditures have not been through the full EM&V process yet and have not been finalized.

National Grid 2013-2015 Savings and Expenditure			
Sector	Savings (MWh)	Total Expenditure ($)	Incentive Expenditure ($)
Residential	805,157	$290,842,401	$222,323,354
Low Income	58,040	$85,604,742	$68,824,752
Commercial & Industrial	919,015	$300,079,268	$247,234,173

National Grid 2013-2015 Incentive to Total Program Spending and Spending per kWh Ratios		
Sector	Incentive to Total Program Spending Ratio	Spending per kWh Ratio
Residential	76 percent	$0.361/kWh
Low Income	80 percent	$1.475/kWh
Commercial & Industrial	82 percent	$0.327/kWh

Cost Effectiveness

National Grid's cost effectiveness results for 2013-2015 are as follows:

National Grid 2013-2015 Cost Effectiveness Results	
Expected TRC	3.69[105]
Actual TRC	Not Available

FUTURE TARGETS

The 2016-2018 plan calls for 4,122 GWh of savings over the three years, with a budget of $1.96 billion for all of Massachusetts.[106]

[104] Data from Masssavedata.com

[105] 2013-2015 Plan: http://www.mass.gov/eea/docs/doer/energy-efficiency/statewide-electric-and-gas-three-year-plan.pdf

[106] 2016-2018 Plan: http://web1.env.state.ma.us/DPU/FileRoomAPI/api/Attachments/Get/?path=15-168%2fOrder_12816.pdf

National Grid's individual target and budget for 2016-2018 is 1,939 GWh and $897.6 million. The overall target is 2.94 percent of retail electricity sales.

INCENTIVE LEVEL SETTING METHODOLOGY

National Grid uses the following principles for incentive setting methodology for the electricity efficiency programs:

- Customer market research
- Technology research
- Supply chain and stakeholder discussion
- Top-down potential analysis
- Bottom-up participation and penetration analysis

NATIONAL GRID CORE PROGRAM OFFERINGS (RESIDENTIAL AND BUSINESS)

Program Name	Program Area	Program Measures	Links
No Cost Home Energy Assessments	Residential and Low Income	For homeowners of 1-to-4 unit homes For landlords of 1-to-4 unit homes For multifamily facilities with 5+ units For income eligible customers Online home energy assessment	http://www.masssave.com/en/residential/mass-energy-rebate
Lighting and Appliances	Residential and Low Income	• Instant Price Discounts at Participating Retailers and for Online Catalogue for qualified ENERGY STAR CFL and LED lamps and fixtures • Instant Price Discounts for Online Catalogue for qualifying advanced power strips and shower heads. • Mail-in rebate for ENERGY STAR certified room air cleaners, clothes dryers and dehumidifiers • Secondary Fridge or Freezer Retirement program	
Heating & Cooling	Residential and Low Income	• Mail-in rebate for Central Air Conditioners, Air Source Heat Pumps, Heat Pump Water Heaters and Ductless Mini-Splits • Online or mail-in rebate for wireless enabled thermostat (up to $100) and programmable thermostats (up to $25)	
Deep Energy Retrofit	Residential	• Roof upgrades ($3.00/sqft), exterior walls ($3.50/sqft) and basement insulation ($2.00/sqft) to perform better than current building code • Performance incentive of $1.75 per CFM reduced based on pre- and post- project blower door tests • Access to HEAT Loan Program if eligible (0 percent financing)	http://www.masssave.com/en/residential/offers/der-national-grid
Early Heating and Cooling Equipment Replacement Rebates	Residential	• Schedule Home Energy Assessment • Online or mail-in rebate submission after installation • Incentive details are in the Appendix	http://www.masssave.com/en/residential/heating-and-cooling/equipment-installation/early

Program Name	Program Area	Program Measures	Links
			-heating-and-cooling-equipment-replacement-rebates
Insulation improvements	Residential	• 75 percent on costs of insulation up to $2,000 • Potential to receive no-cost targeted sealing of air leaks	http://www.masssave.com/en/residential/offers/weatherization
Wireless Thermostat and Installation Incentive	Residential	• Select from the qualifying models, purchase up to three units at the discounted price, and have them installed at no cost	http://www.masssave.com/en/residential/offers/wireless%20thermostat%20and%20installation%20incentive
Residential New Construction	Residential	• Provides incentives from $275-$7,000 per unit for energy efficiency upgrades • Have to work with Home Energy Rating System (HERS) rater or qualifying personnel • There are prescriptive incentives and performance path incentives, plus an additional ENERGY STAR incentive if the new home receives that certification • Incentive details are in the appendix	http://www.masssave.com/en/residential/offers/rnc-high-efficiency-heating-and-water-heat-rebates http://www.masssave.com/en/residential/offers/rnc-performance-path
Large Retrofit Program	Commercial	• Provides incentives for lighting and lighting controls, variable speed drives, food service equipment, gas-fired heating and water heating equipment through online or mail-in rebate submission. Provide incentives for custom measures and energy management systems • Lighting and lighting controls are prescriptive incentives • Variable speed drive incentives are quasi-prescriptive (based on hp) • Natural gas heating and water heating incentives are prescriptive/quasi-prescriptive based on size (MBH) or AFUE rating • Food service incentives cover fryers, convection ovens, steam cookers, griddles, combination ovens, rack ovens, conveyor ovens and pre-rinse spray valves. Incentives are prescriptive • Custom incentives are available for measures that don't qualify under the prescriptive stream. Incentives are based on the economics of the project and are typically up to 50 percent of the ~~incremental costs~~Incremental Equipment Costs of the higher efficiency equipment • Engineering studies to assess the savings	http://www.masssave.com/en/business/incentive-programs/energy-efficiency-retrofits http://www.masssave.com/business/incentives/Energy-Management-Systems-Retrofit?p=b330695a-e24c-4929-b278-3bb1692f2612

Program Name	Program Area	Program Measures	Links
		potential are offered, with the participant receiving up to 50 percent of the costs of the study • Incentives are provided for the installation of qualifying energy management systems and vending miser controls	
Small Business Program	Commercial	• For customers with a demand under 300 kW, offer a free audit for identifying energy savings opportunities and up to 70 percent of the total retrofit costs for equipment such as lighting, motors, refrigeration and refrigeration controls. The program also offers a 0 percent financing option.	http://www.masssave.com/en/business/incentive-programs/small-business-energy-efficiency-program
New Construction/Major Renovation and Replacing Failed Equipment Program	Commercial	• Provides incentives for air compressors, chillers, lighting and lighting controls, variable speed drives, food service equipment, gas-fired heating and water heating equipment, and custom measures and sustainable office design. Incentives are provided on a prescriptive, quasi-prescriptive or performance basis. • Custom measures can receive up to 75 percent of the ~~incremental cost~~Incremental Equipment Cost of the installed equipment	http://www.masssave.com/en/business/incentive-programs/new-construction-renovation
Sustainable Office Design	Commercial	• The sustainable office design provides an incentive of $1.00/sqft (leased space net of common areas) for energy efficient lighting and control systems.	http://www.masssave.com/business/incentives/SOD?p=95e5021 7-eb39-4286-9ee3-9756c61b958e
Multi-Family Buildings Program	Commercial	• Eligible if owner or operator of residential building with 5 or more units. An energy assessment is offered that energy savings opportunities for the building envelope, as well as lighting and mechanical systems. • Participants can receive incentives for different upgrades. • Participants are encouraged to take advantage of the EPA's Portfolio Manager tool for benchmarking their building's performance	http://www.masssave.com/en/business/incentive-programs/multi-family-buildings

Appendix B – Consolidated Calculator/Tool Requirements

The requirements for the consolidated calculator/tool are as follows:

High Level Specifications

1. **Measure Library Section (from TRM process recommendation in report)**

This section should include the details of each measure in the portfolio, or measures being considered.

- Efficient Technology Name;
- Efficient Technology Description;
- Efficient Technology Wattage (if available);
- Efficient Technology Penetration Estimate;
- Forecast Efficient Technology Penetration Estimate (in 1 year);
- Efficient Technology Retail Price;
- Forecast Efficient Technology Retail Price (in 1 year);
- Sector;
- Customer;
- Application(s);
- Operating Hours;
- Base Case Technology Name(s);
- Base Case Technology Description(s);
- Base Case Technology Penetration(s);
- Forecast Base Case Technology Penetration(s) (in 1 year);
- Forecast Base Case Technology Retail Price(s) (in 1 year);
- Annual Operating Costs
- Annual Maintenance Costs
- Annual Fuel Costs
- Current Incremental Equipment Cost;
- Forecast Incremental Equipment Cost (in 1 year);
- Energy Savings;
- Expected Energy Savings Persistence;
- Any Program Dependent Parameters (*Should be clearly identified*);
    - Net-to-Gross (NTG) Ratio
- Measure-level TRC and PAC (*can include adders for overhead delivery costs as required*)
- PC test
- Incentive screening threshold in terms of cost to the customer;
- Incentive screening threshold in terms of the program budget and
- Incentive screening threshold in terms of cost effectiveness (From Cost Effectiveness Calculator)

2. **Cost Effectiveness Calculator Section**

This section will take the inputs from the Measure Library section, combine them with the other inputs listed below, and output a cost effectiveness forecast. This will be used to determine the incentive screening threshold in terms of cost effectiveness.

Inputs

- Avoided Supply Costs (energy and capacity);
- Local Avoided Supply Costs (energy and capacity);
- Fixed Program Administration Costs;
- Year of Implementation;
- Measure Participation;
- Variable Costs;
- Annual Operating Costs (From Measure Library);
- Annual Maintenance Costs (From Measure Library);

- Annual Fuel Costs (From Measure Library);
- Measure Energy Savings (From Measure Library);
- Measure Demand Reduction (From Measure Library);
- Measure Energy Savings Persistence (From Measure Library);
- NTG (From Measure Library);
- Measure Incremental Equipment Costs (From Measure Library);
- Discount Rate and
- Inflation Rate

Outputs

- Total Gross Energy Savings;
- Total Gross Demand Reduction;
- Total Net Energy Savings;
- Total Net Demand Reduction;
- TRC Benefits;
- TRC Costs;
- TRC Net Benefits;
- TRC Ratio;
- PAC Benefits;
- PAC Costs;
- PAC Net Benefits;
- PAC Ratio;
- PC Benefits;
- PC Costs;
- PC Test Ratio;
- Levelized Unit Cost of Energy Savings and
- Levelized Unit Cost of Demand Reduction

3. Review Protocol Section

This section will display the considerations for the frequency of review for the incentive, and help set the guidelines for the size of the incentive.

Inputs

- Incentive screening threshold in terms of ~~cost to the customer~~Customer Cost (From Measure Library);
- Incentive screening threshold in terms of the program budget (From Measure Library);
- Incentive screening threshold in terms of cost effectiveness;
- Sector (From Measure Library);
- Program Delivery Channel;
- Financial Motivation and
- Financial Impact (from Cost Effectiveness Calculator)

Outputs

Considerations for magnitude of incentive and review protocol~~;~~