Starting Energy Efficiency Off on the Right Foot

Regulatory Policies to Support Successful Program Planning and Design

Prepared for Island Regulatory & Appeals Commission, Prince Edward Island

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EXECUTIVE SUMMARY

In 2013, Prince Edward Island (PEI) renewed efforts to regulate energy efficiency within the province's electric sector with amendments to the Electric Power Act. These amendments stipulated the development of electric utility plans for energy efficiency and demand-side management, and charged the Island Regulatory and Appeals Commission (IRAC or Commission) with overseeing the process. In response to the Electric Power Act amendment, in June 2015 the Maritime Electric Company applied to the Commission for approval of its *Efficiency and Demand Side Management Plan* for the years 2015 to 2020.

Maritime Electric's five-year plan includes rebate programs for efficiency technologies as well as a customer outreach program. If approved, the programs are expected to save 13.5 gigawatt-hours of annual energy and provide 9.7 megawatts of peak load reduction by Year 5, at a total program cost of approximately $15 million. Upon its review of the filing, the Commission approved the customer outreach program but rejected the rest of the plan. This rejection came partly because the plan was filed prior to an order of the Commission directing the filing as promulgated in Section 16.1 of the Act, and also because the Commission has not yet established criteria and principles to comprehensively and appropriately evaluate the Company's plan.

To assist the Commission in further responding to the public utility's plan, Commission Staff sought independent advice on various demand-side management program issues. In response, Synapse Energy Economics (Synapse) prepared this report based on its research of best practices in use throughout Canada and the United States.

This report discusses key principles of various energy efficiency program and policy requirements, as well as key principles of rate design for encouraging energy efficiency and conservation. It also provides examples from other jurisdictions and recommendations for how PEI should move forward. More specifically, this report covers the following nine topics: (1) program planning and review processes, (2) program design, (3) cost-effectiveness screening, (4) multi-year planning and savings targets, (5) cost recovery, (6) shareholder incentives, (7) stakeholder input, (8) evaluation, measurement, and verification, and (9) electricity tariffs to encourage energy efficiency and conservation. Below we present our summary recommendations for each of the nine key program and policy requirement areas.

Program planning and review processes

- Institute a continuous four-part cycle encompassing planning, implementation, evaluation, and reporting.
- Develop standardized metrics for plans and reports, as well as data table templates, to enable comparisons of plans to reports and performance from year to year.

Program design

- Implement core energy efficiency programs designed to address the key customer types and end-use markets, including: residential (new construction, single-family retrofits, and products and appliances); low income (new construction, single-family retrofits, and multi-family retrofits); commercial and industrial (new construction, small businesses, large businesses prescriptive, large businesses custom, and multi-family buildings).

- Follow the program design principles discussed in this report; for example, design programs for all customers and market end uses, and ensure programs are consistent with long-term goals.

- Implement a quick-start program right away to start capturing savings while more comprehensive planning is underway.

Cost-effectiveness screening

- Design efficiency programs and portfolios with the goal of achieving all cost-effective energy efficiency savings.

- Use the Resource Value Framework to design an energy efficiency screening test that, among other things, does the following:

  - Explicitly acknowledges that the ultimate objective of efficiency screening is to determine whether a particular energy efficiency resource is in the public interest, and that determinations of the public interest should include consideration of PEI's energy policy goals.

  - Identifies PEI's energy policy goals that are relevant to, and might be affected by, energy efficiency resources. Examples include: ensure fair treatment of low-income programs and customers, promote customer equity, reduce risk, and improve system reliability.

  - Uses the Utility Test as the foundation for the efficiency screening test, because this test includes all of the costs and benefits to the utility system that at a minimum must be included in any screening test.

  - Modifies the Utility Test to account for PEI's energy policy goals.

- Use a low-risk discount rate to reflect the importance to customers of the future benefits of energy efficiency programs.

Multi-year planning and savings targets

- Include three-year efficiency program budgets and savings targets in energy efficiency plans that:

  - Are based upon analysis of the cost-effective energy efficiency programs included in that plan,

- Are based upon quick-start goals and practices, and ramp-up over time to reach savings levels consistent with achieving all cost-effective energy efficiency in PEI, and
- Are set to achieve at least 0.4 percent of retail electricity sales in the first year, with at least an additional 0.4 percent of sales saved each subsequent year.

Cost recovery

- Establish separate system benefits charges (SBC) for residential and business customers to collect the costs associated with the energy efficiency programs in PEI.
- Allow the fund from SBC be fully reconciled at the end of each year, where any over- or under-spending in one year should be carried forward for collection or crediting in the following year.
- Allow some of the SBC funds to shift across programs within a sector as needed to meet the needs of customers in a timely manner.
- Open a separate docket to investigate revenue regulation in PEI.

Shareholder incentives

- Adopt an energy efficiency performance incentive mechanism in which:
  - The magnitude of the potential incentive is based on a portion of the efficiency program budget;
  - The magnitude of the earned incentive is based on targets for energy savings, capacity savings, and net benefits from the programs;
  - The incentive threshold is set at 80 percent of target levels, and the cap is set at 140 percent of target levels; and
  - The magnitude of the earned incentive ranges from a threshold of 4 percent of total energy efficiency program budgets to a cap of 10 percent. A sliding scale approach should be used to determine the earned incentive between these two points.

Stakeholder input

- Establish a permanent energy efficiency collaborative to allow for meaningful stakeholder input and to provide input to the Commission, and fund a consultant with expertise in energy efficiency to facilitate the collaborative process.
- Have broad representation in the collaborative including large commercial and industrial customers, low-income customers, small business customers, consumer advocates, energy efficiency experts, and environmental groups.

- Provide collaborative members with full, unfettered access to information, fair ground rules for deliberations, and recourse to adjudicated proceedings or other regulatory intervention.

Evaluation, measurement, and verification

- Ensure IRAC or an independent consultant manages and oversees all evaluation studies, except for cost-effectiveness analyses.
- Begin evaluation planning when programs are being designed so that the program budget, schedule, and resources can properly take into account evaluation requirements and opportunities.
- Where sensible, conduct joint evaluation studies with neighboring utilities, provinces, or regional organizations in order to reduce PEI's program evaluation budget.
- Develop a technical reference manual by reviewing those adopted in neighboring provinces or states, and update annually based on findings from new PEI evaluation studies.

Electricity tariffs to encourage energy efficiency and conservation

- In the next Maritime Electric rate case: (a) eliminate the current declining block rate and replace it with a flat energy rate, and (b) reduce the fixed customer charge and increase the energy rate. Both modifications should be done in a revenue neutral fashion.
- In this same rate case, consider creating new, separate rate classes for residential space heating customers and farm customers.
- In the subsequent Maritime Electric rate case: (a) introduce an inclining block rate; and (b) reduce the fixed customer charge further. Again, both modifications should be done in a revenue neutral fashion.

While we provide the above recommendations for each of the key issue areas, the critical first step for PEI is for the Commission to develop and issue energy efficiency program regulations requiring the utility to ramp up energy efficiency efforts—along with guidance on how to do this. These regulations will provide the utility and key stakeholders with clarity regarding Commission expectations, cost recovery, timeframe, and process.

Our recommendations are based on the lessons and best practices learned in other jurisdictions throughout North America and provide a firm foundation for effective energy efficiency programs. By building on them from the very beginning, IRAC and other PEI electric-sector stakeholders have the opportunity to create a regulatory framework and efficiency programs that can help the province tap into its vast energy efficiency potential in a way that benefits the population as a whole.

1. INTRODUCTION

1.1. Background

Energy efficiency legislation

On December 6, 2013, Prince Edward Island (PEI) enacted an *Act to Amend the Electric Power Act* (the "2013 Amendment") with a renewed focus on energy efficiency within the province's electric sector. This amendment requires electric utilities to develop plans for energy efficiency and demand-side management under the direction of the Island Regulatory and Appeals Commission (IRAC or Commission). As an overarching goal, the amendment mandated that "public utilities should utilize energy efficiency and demand-side resource measures whenever it is cost-effective to do so" (the Preamble of the 2013 Amendment). The core of the 2013 amendment was incorporated into Section 16.1 of the Electric Power Act.

In addition to giving authority to the Commission to direct the public utility to develop an energy efficiency and demand-side management (DSM) plan, Section 16.1 stipulated at a high level what specific information an order by the Commission shall require the utility to include in the plan. For example, Section 16.1 requires a plan to include the term of the plan, program and measure descriptions, and a reasonable estimate of program costs and benefits. Section 16.1 also allows the Commission to issue a further order for a better plan in the event that the Commission is not satisfied with the plan submitted by the public utility.

Maritime Electric's energy efficiency filing

One June 3, 2015, Maritime Electric filed an application with IRAC for its *Efficiency and Demand-Side Management Plan* for the years 2015 to 2020. The plan included four programs, consisting of three incentive-based programs and one customer outreach program. The three proposed incentive programs offer rebates for LED bulbs, cold climate heat pumps, and thermostat shut-off devices for heat pumps. If approved, the Company projected its plan would save 13.5 gigawatt-hours (GWh) of annual energy and provide 9.7 megawatts (MW) of peak load reduction in Year 5 with total program costs of approximately $15 million.

On November 2, 2015, the Commission approved in its Order UE15-12 the customer outreach program but rejected the rest of the plan. This rejection occurred in part because the plan was filed prior to an order of the Commission directing the filing as promulgated in Section 16.1 of the Act, and because the Commission has not yet established criteria and principles to comprehensively and appropriately evaluate the Company's plan.

1.2. Objective of This Report

To ensure a full and comprehensive review of this matter and to assist with the preparation of an order to the utility, Commission staff sought independent advice on various demand-side management program issues. Consequently, Synapse Energy Economics (Synapse) researched best practices in energy efficiency program regulations, processes, design, and evaluation throughout North America. This report describes our findings and provides recommendations for ensuring robust and continuously improving energy efficiency programs.

More specifically, this report (a) discusses key principles of various program and policy requirements for energy efficiency as well as critical features of rate design for encouraging energy efficiency and conservation, (b) provides examples from other jurisdictions, and (c) provides short- and long-term recommendations for how PEI should move forward.

Experience in many jurisdictions has shown that certain regulatory policy features are particularly valuable in promoting energy efficiency. These include the following:

- Clear, stable, and long-term regulatory support
- Meaningful stakeholder engagement, e.g., through a collaborative process or an energy efficiency advisory council
- A mandate to implement all cost-effective energy efficiency, and a clear definition of what this means
- Timely and predictable recovery by regulated utilities of all prudently incurred energy efficiency costs
- A mechanism to allow regulated utilities to recover a reasonable portion of lost revenues (revenue regulation)
- Well-designed, reasonable shareholder incentives or performance incentives
- Proper cost-effectiveness test(s) for screening efficiency programs, and regulatory guidance on which costs and benefits to include in the tests
- Proper estimation of avoided costs, including avoided energy, capacity, transmission, distribution, costs of compliance with environmental regulations, and price suppression effects where appropriate
- Sound integrated resource planning practices, where appropriate
- Proper analysis and management of bill impacts, particularly in situations where efficiency budgets are constrained due to rate impact concerns

Throughout this report, we discuss these policy areas in detail and offer our recommendations for each. While all of these policy areas are important, a critical first step for PEI is for the Commission to develop and issue energy efficiency program regulations requiring the utility to ramp up energy efficiency efforts. In addition, the Commission should provide guidance on how to do this so that utilities and stakeholders have clarity regarding Commission expectations, cost recovery, timeframe, and process.

Recent regulations from other jurisdictions can provide valuable guidance for utilities that are new to energy efficiency, as they capture best practices that have emerged from decades of regulation. Energy efficiency regulations from Massachusetts,[1] Rhode Island,[2] Arkansas,[3] and Puerto Rico,[4] provide useful language to guide the Commission in its order to the utility. These regulations also strive to achieve an optimal balance between Commission guidance and utility flexibility in developing program details with stakeholders. As these regulations represent jurisdictions with a range of utility structures, a range of Commission and utility experience with energy efficiency, and a range of broader state energy policies and goals, careful review is required to determine the elements are most applicable and relevant to PEI.

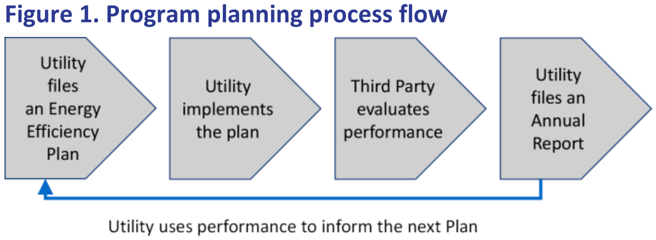
2. Program Planning and Review Process

2.1. Program Planning Process Flow

The program planning process as described here is a continuous cycle consisting of four stages: planning, implementation, evaluation, and reporting. While each energy efficiency program year begins with a plan and ends with a report of the year's performance, the evaluation of the year's performance informs the planning for the next program year.

Figure 1 below presents a high-level diagram of this process.

Figure 1. Program planning process flow



[1] Massachusetts, the top ranked U.S. state on energy efficiency, has been updating its energy efficiency regulations since the initial version in 1990. The Commission has released a number of orders containing updates since the state adopted the Green Communities Act in 2008 requiring a significant ramp up of energy efficiency efforts. The orders are available here: http://www.mass.gov/eea/energy-utilities-clean-tech/energy-efficiency/utility-regs/energy-efficiency-activities/

[2] Rhode Island's Commission updated its Least Cost Procurement Standards in 2014, including updates to energy efficiency requirements. The order including the updates is available here: http://www.ripuc.org/eventsactions/docket/4443-EERMC-Ord21767_12-31-14.pdf

[3] The Arkansas Commission released energy efficiency regulations in 2014, with a focus on quick start programs. The regulations are available here: http://www.apscservices.info/Rules/energy_conservation_rules_06-004-R.pdf

[4] It 2015, the Puerto Rico Commission released energy efficiency regulations with assistance from the Regulatory Assistance Project and Synapse Energy Economics. The English version of the regulations are available here: http://app.estado.gobierno.pr/ReglamentosOnLine/Reglamentos/8594ING.pdf

2.2. Energy Efficiency Plans

Energy efficiency plans provide detailed descriptions and data for the programs the utility is proposing to implement in a given year. The plans can take a variety of forms and present the data in multiple ways, although they always provide detailed descriptions of the proposed program designs. Key information often presented in efficiency plans includes costs, savings, participation, benefits, and an assessment of cost-effectiveness.

Efficiency plans provide a record of what the program administrator intended to do. As such, they provide a benchmark for assessing actual, after-the-fact program performance. They also provide much of the information that regulatory commissions and other stakeholders need to make decisions about program funding, cost allocation, and costs and benefits relative to alternative energy resources.

Many jurisdictions provide a Technical Reference Manual (TRM) detailing how they plan to calculate savings and identifying the sources they are using to make these calculations. In addition, TRMs typically document how to adjust expected performance to account for results from evaluations conducted in previous years.

2.3. Evaluation, Measurement, and Verification

The main purpose of evaluation, measurement, and verification (EM&V) is to assess the performance of energy efficiency programs. EM&V practices ensure that: (a) program savings are accurate and credible to support achievement of utility or state energy savings goals; (b) programs use ratepayer funding judiciously (i.e., are cost-effective and well spent); and (c) program designs improve over time to reach all customers, and increase customer participation and energy savings.

The evaluation studies should be conducted by third-party entities, using a small portion of ratepayer funds (e.g., 3 to 4 percent per year). Third-party evaluators provide a non-biased review of program efforts, along with recommendations for future improvements.

EM&V studies can provide both qualitative and quantitative assessments and recommendations. For example, they can characterize the market opportunity, confirm program impacts, or review the effectiveness of the implementation process. More specifically, such EM&V studies include impact evaluations and process evaluations.[5]

Impact and process evaluation studies come out after the program implementation, but the preparation of such studies should ideally start at the program planning stage. More specifically, this evaluation

[5] A cost-effectiveness analysis is another evaluation study. This study is conducted for energy efficiency plans and annual reports and is often conducted by utilities or program administrators and reviewed by regulators. Other evaluation studies such as market characterization studies and energy efficiency potential studies do not have to follow the planning process flow discussed above, but are most useful when conducted prior to preparing energy efficiency plans.

study planning should begin when programs are being designed so that the program budget, schedule, and resources can properly take into account evaluation requirements and opportunities.

Please refer to Chapter 9 for a more detailed description of evaluation requirements, and Chapter 4 for detailed discussions of cost-effectiveness analyses.

2.4. Energy Efficiency Annual Reports

Energy efficiency annual reports summarize the actual performance of the existing and new programs implemented in a given program year. Program administrators file these reports every year along with the results of the program evaluations completed in that year, and they commonly adjust performance to account for program evaluations conducted over the course of the year. Annual reports contain similar information to that provided in the plans. This is advantageous as having similar metrics, tables, and templates in the plans and reports facilitates review, understanding, and comparisons to goals. Many times, program administrators include plan data in the report, further facilitating direct comparisons between the planned and actual results.

To fully assess programs each year and over time, annual reports must contain all key performance data. Annual reports are also useful for comparing results to programs in other jurisdictions, considering changes in the design of the programs, projecting future program performance, and assessing electricity resource needs. In the United States, efforts are underway to standardize reporting across states so results can be aggregated into regional, national, or even international databases.[6]

2.5. Regulatory Review

Regulators generally review energy efficiency plans prior to the commencement of the relevant year. This is the most useful point in time for regulators to provide guidance on a variety of key energy efficiency program elements, such as program budgets, savings targets, cost-effectiveness, performance standards, and more.

EM&V studies are usually filed with regulators as they become available throughout the year, and if not, with the release of energy efficiency annual reports. Regulators should ensure that independent third-parties conduct the EM&V studies, and that the studies are sufficiently frequent, address the appropriate programs, properly consider current and emerging energy efficiency market issues, and generally provide reliable analysis of the savings achieved by efficiency programs.

Program administrators typically file energy efficiency annual reports with regulators as soon as is practical after the completion of the relevant year and any relevant EM&V studies for that year. While it

[6] As an example, see recent activities by Lawrence Berkeley National Laboratory and its report called "Flexible and Consistent Reporting for Energy Efficiency Programs: Introducing a New Tool for Reporting Spending and Savings for Programs Funded by Utility Customers" available at https://emp.lbl.gov/publications/flexible-and-consistent-reporting.

is important that these reports are comprehensive and contain all the necessary information, there is less need for regulators to review and approve these reports, relative to the energy efficiency plans. The exception would be if a stakeholder raises an issue with regard to historical performance information, in which case a commission might choose to open a docket to review these reports and their implications.

2.6. Recommendations

First, we recommend that PEI use the process flow described in

Figure 1 for planning, evaluating, and reporting on energy efficiency efforts. This process should include the following milestones:

- By September 30 of each year, the Company files the Energy Efficiency Plan for the upcoming calendar year with the Commission. The Commission opens a docket to review and make findings on the Plan.
- By December 31 of each year, the Commission issues an order approving, modifying, or rejecting the Energy Efficiency Plan.
- By June 30 of each year, the Company files the Energy Efficiency Annual Report for the previous calendar year. This filing includes all of the EM&V reports that are completed for that same period of time.

Second, we recommend developing standardized plan and report metrics and standardized data table templates to enable comparisons of plans to reports and performance from year to year. These metrics and data table templates should be developed with an awareness of regional and national energy efficiency data standardization efforts, and should be adjusted to align with standardized templates and tables as they become available.

3. PROGRAM DESIGN

3.1. Objective and Principles

Energy efficiency program design is important because it can influence customer participation, the amount of savings achieved, and energy efficiency cost-effectiveness. Well-designed programs can overcome the barriers customers face to installing energy efficiency on their own, can increase customer participation rates, and can allow customers to achieve higher levels of savings.

When designing efficiency programs, it is important to consider the following key principles:

- Develop and offer efficiency programs to all types of customers to promote equity and to help achieve all cost-effective energy efficiency.

- Develop and offer efficiency programs to address all key end-use markets, such as new construction, building renovations, building retrofits, point-of-purchase products and services, and manufacturing and distribution channels.
- Design programs to overcome the specific market barriers of different customer types (e.g., low-income, multi-family buildings, small commercial, and agricultural) and different end-use markets.
- Design programs to achieve both goals of procuring cost-effective resources and transforming the efficiency markets over the long term.
- Minimize "lost opportunities," which occur when efficiency measures are not installed when it is most cost-effective to do so (e.g., during the construction or renovation of a building, and the purchase of new appliances or equipment).
- Minimize "cream skimming," where only the most cost-effective efficiency measures are installed, even though additional, higher-cost measures are also cost-effective. Cream-skimming can lead to lost opportunities, as revisiting a customer to install the remaining measures may involve prohibitive transaction costs.
- Involve a broad spectrum of stakeholders in the design of the program, including architects, engineers, designers, contractors, manufacturers, suppliers, retailers, and government agencies.
- Competitively bid some key elements of the program in order to harness market forces, lower costs, and help develop the market for efficiency vendors and service companies.

The following sub-sections provide detail on examples of program mix and best practice program designs from other jurisdictions, as well as program design recommendations for PEI.

3.2. Examples of Program Types and Mix from Other Jurisdictions

A key goal of the design of the program mix is to reach all customers and serve as many customers as possible over time. This includes addressing new and existing homes and buildings, as well as the efficiency of industrial processes at producing goods. Homes can hold one family or many families, and can be inhabited by customers with varying levels of income who either own or rent. Businesses owners can include municipalities or individual commercial or industrial customers. Business properties can be mixed use, including some homes and some businesses. And some businesses operate across multiple sites, like chain restaurants, grocery stores, or buildings on large industrial sites. Some customers only use electricity, and others use both electricity and various types of fuel for heating. It is important to understand the customers, businesses and industries, building stock and equipment, and fuels used in the jurisdiction when setting up a suite of programs.

In order to present a breadth of energy efficiency programs, Synapse has conducted a survey of energy efficiency program types and mix across the New England states and Atlantic Canadian provinces. Table

1 shows the results of this survey. Actual program names are provided for each jurisdiction in Appendix 1.

For the residential sector, most jurisdictions offer programs that target:

- existing single-family buildings (many jurisdictions consider buildings with fewer than five units to be eligible for single-family programs),
- lighting,
- products (including heating and cooling equipment such as heat pumps and central air conditioners),
- appliances (including refrigerators, clothes washers, dishwashers, humidifiers, and room air conditioners), and
- home electronics (including advanced power strips, computers, monitors, and televisions).

Five to seven of the nine jurisdictions offer new construction, multi-family, and behavior programs. Five of the jurisdictions offer programs that promote recycling of inefficient appliances (such as secondary refrigerators).

Most jurisdictions also offer programs targeting low-income customers. For example, all jurisdictions except Newfoundland offer low-income single-family retrofit programs. Four jurisdictions offer low-income multi-family retrofit programs in addition to low-income single-family retrofit programs. And two states, Massachusetts and Vermont, offer low-income-specific new construction programs in addition to low-income single- and multi-family retrofit programs.

For the commercial and industrial sector, all jurisdictions offer programs targeting small commercial building retrofits in addition to building retrofits for large commercial buildings.[7] Most of the jurisdictions offer programs promoting efficient industrial processes. Six of the jurisdictions offer business new construction programs. A handful of jurisdictions offer programs for retro-commissioning and strategic energy management. Retro-commissioning involves re-optimizing the operation of energy equipment in existing buildings. Strategic energy management, or SEM, is an emerging energy efficiency strategy that helps large customers develop a more systematic, strategic approach to energy management. With it, they can achieve greater energy savings through operations and maintenance improvements in addition to investment in efficient energy equipment (Kolwey 2013). Finally, a few jurisdictions have industrial self-direct programs, which allow large industrial customers to implement

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[7] Most small businesses have limited time, budget, and staff for doing energy efficiency upgrades. Thus, small business programs tend to take a turn-key, direct install delivery approach in which selected vendors undertake or assist all retrofit processes from auditing, program applications, and installation.

efficiency projects on their own using the funds they already have paid or expect to pay into the ratepayer funded programs through the system benefit charges.[8]

Lastly, five of the jurisdictions have programs or initiatives to support state building codes and appliance standards. The program administrator's role in this type of program is either to enhance the adoption rate of building codes or to help develop new building codes and appliance standards. Since California launched its codes and standards (C&S) program in 2001, a growing number of U.S. states have examined the role of utilities in supporting C&S. More jurisdictions in the United States now focus on exploring the role of building energy codes in utility energy efficiency programs rather than that of appliance standards, partly due to the fact that many states adopted new building codes in order to receive federal funding under the American Recovery and Reinvestment Act (ARRA). (Stellberg et al. 2012)

[8] In many cases, self-direct funding is based on what a customer has already paid through system benefit charge (SBC) contributions for ratepayer-funded energy efficiency programs. Some states escrow the customer's SBC contributions and make periodic payments from the escrow account for investments that are larger than the customer's total contributions over a single year.

Table 1. Summary of energy efficiency program types and mix in New England and Atlantic Canada

	US States						Canadian Provinces		
Program Type	**MA**	**ME**	**CT**	**VT**	**NH**	**RI**	**NS**	**NB**	**NF**
Residential									
New Homes	X		X	X	X	X	X		
Existing Homes									
Single Family	X	X	X	X	X	X	X	X	X
Multi-family	X	X	X	X		X	X	X	
Lighting	X	X	X	X	X	X	X	X	X
Products									
Product Replacement	X	X	X	X	X	X	X	X	X
Product Recycling	X			X	X	X	X		
Behavior	X		X	X		X	X	X	
Low Income									
New Homes	X			X					
Existing Homes									
Single Family	X	X	X	X	X	X	X	X	
Multi-family	X		X	X		X			
Commercial and Industrial									
New Buildings	X		X	X	X	X	X		
Existing Buildings/Processes									
Small Buildings	X	X	X	X	X	X	X	X	X
Large Buildings	X	X	X	X	X	X	X	X	X
Large Customer Self-Direct	X			X					
Strategic Energy Management	X		X	X		X	X	X	
Retrocommissioning	X		X			X	X		
Industrial Processes	X	X	X	X		X	X	X	X
Products	X	X	X			X	X	X	X
Cross Sector									
Building Code and Appliance Standard Support	X			X		X	X	X	

Though the customers, businesses and industries, building stock and equipment, and fuels used in each jurisdiction are different, there are many commonalities across jurisdictions. The concept of "core programs" represents a standard suite of programs that can address such commonalities across all jurisdictions. If a jurisdiction has a unique group of customers, it can design an additional program to serve its specialized needs.

Further, jurisdictions that are in the early stages of developing and implementing energy efficiency programs could initially implement a limited set of key programs called "quick start" programs. Quick-start programs use simple, proven program models to help utilities begin capturing energy savings early in the process. The idea is to reap some of the savings that are easier to implement and obtain, while running a parallel process to design more comprehensive programs and develop expertise. Several U.S. states, including Arkansas, Louisiana, and Mississippi, have successfully jump-started energy efficiency programming using quick-start programs.

3.3. Best Practices

Below, we list several best practices of energy efficiency program design. We also provide references to best practice reports for further review and discussion.[9] Examples of specific energy efficiency programs are provided in Appendix 2.

Comprehensive measure mix. Programs should address as many cost-effective end uses as possible. Often, end uses that are less expensive (i.e., lighting) can enable end uses that are more expensive to install. By packaging various measures together, program administrators can achieve more energy savings. For instance, a new heating or cooling system is best sized for a well-sealed and insulated space. The following are examples of key end uses to include in the measure mix:

- For residential customers: space heating; air conditioning; HVAC air sealing; water heating; lighting; refrigeration; clothes washing and drying; weatherization, insulation and other building shell measures; and building design measures, such as daylighting, cool roofs, and shade trees
- For commercial customers: many of the same end uses as residential, but also task lighting, street and traffic lighting; commercial refrigeration measures; other food service equipment measures; office equipment measures; and energy management systems
- For industrial customers: many of the end uses listed above, but also efficient motors and motor drives; industrial process improvements; compressed air; and industrial energy management systems

Streamlined, tailored delivery mechanisms. Delivery mechanisms should minimize customer transaction costs as much as possible. This can be done, for example, by directly installing measures at the time of an audit; providing "one-stop" shopping for both electric and gas incentives and audits; simplifying and streamlining contractor processes; and providing "upstream" incentives to efficiency equipment manufacturers and retailers so that efficiency rebates will be included in the retail price.

Delivery mechanisms should also be tailored to the customer and products types. Appropriate pairings of delivery mechanisms and customer/product types include the following:

- Audit and direct install for low-income, multi-family, and small business customers
- Mail-in rebates for end-use customers and contractors
- Upstream incentives for retailers and manufacturers
- Prescriptive incentives for commercial and industrial customers

[9] It is beyond the scope of this effort to include detailed best practices for each core program in this report.

- Custom incentives and support for whole-systems approaches to integrate energy management practices into a company's culture and standard operating procedures for large energy users (ACEEE 2013)

Targeted, tiered incentives. Incentive designs should target the appropriate recipient and be tiered to encourage higher energy savings. The following are some examples of targeted incentive designs:

- Incentives can be provided for both a building owner and a building design team under commercial new construction programs (York et al. 2013).
- Low-income customers and small business customers have limited or no time and money to engage in energy efficiency projects. Thus, incentives are often set at a higher level (e.g., 50 to 75 percent of installation costs for small businesses, and 100 percent for low-income customers) along with the direct install delivery method discussed above.
- Innovative financing (e.g., on-bill financing) could be effective to implement comprehensive energy retrofits (Geers et al. 2014).
- Upstream incentives that provide incentives to retailers and distributors have succeeded in increasing customer adoption of energy efficiency measures not just for lighting, but also for HVAC equipment (York et al. 2013; Sondhi, Strong, and Arnold 2014; Neme and Grevatt 2016).
- Incentives can be a tiered using a sliding scale to encourage higher performance with higher incentive levels. This approach is often recommended for comprehensive commercial building retrofits (York et al. 2013).

We provide additional resources for best practices in program design in the References section.

3.4. Recommendations

We recommend that the Commission require Maritime Electric to implement core energy efficiency programs designed to address the key customer types and end-use markets. The core programs should include the following:

- Residential: new construction, single-family retrofits, and products and appliances
- Low Income: new construction, single-family retrofits, and multi-family retrofits
- Commercial and Industrial: new construction, small businesses, large businesses prescriptive, large businesses custom, and multi-family buildings

We further recommend that the Commission require Maritime Electric to follow program design principles discussed above when designing its energy efficiency programs.

4. COST-EFFECTIVENESS SCREENING

4.1. Objective and Principles

The cost of energy efficiency measures is typically significantly less than the cost of generating, transmitting, and distributing electricity. Thus, energy efficiency programs offer a significant potential for lowering system-wide electricity costs and reducing customers' electricity bills.

Since the inception of ratepayer-funded energy efficiency programs, cost-effectiveness screening practices have helped to ensure that the use of ratepayer funds results in sufficient benefits. In general, energy efficiency programs have proven highly cost-effective, saving a tremendous amount of energy and reducing customers' bills. This also has led to additional investment in energy efficiency resources (Dan York et al. 2015, p. v).

In designing an energy efficiency screening test, jurisdictions should adhere to the following principles (The National Efficiency Screening Project 2014, p. 2):

- **The Public Interest.** The ultimate objective of efficiency screening is to determine whether or not a particular energy efficiency program, or portfolio of programs, is in the public interest.
- **Energy Policy Goals.** Efficiency screening practices should account for the energy policy goals of each jurisdiction, as articulated in legislation, commission orders, regulations, guidelines, and other policy directives. These policy goals provide guidance as to which efficiency programs are in the public interest.
- **Symmetry.** Efficiency screening practices should ensure that tests are applied symmetrically, where both relevant costs and relevant benefits are included in the screening analysis. For example, a jurisdiction that chooses to include participant costs in its screening test should also account for participant benefits, including non-energy benefits. Otherwise, the test will be skewed against energy efficiency resources.
- **Hard-to-Quantify Benefits.** Efficiency screening practices should not exclude relevant benefits on the grounds that they are difficult to quantify and monetize. Several methods are available to approximate the magnitude of relevant benefits, as described below.
- **Transparency.** Efficiency program administrators should use a standard template to explicitly identify their jurisdiction's energy policy goals and to document their assumptions and methodologies.

These principles provide a common framework for addressing decisions about cost-effectiveness screening. They also ensure that these decisions are transparent and clearly understood by all stakeholders.

The rest of this section covers four main topics related to cost-effectiveness tests, namely the five standard tests, the Resource Value Framework, avoided costs, and discount rates.

4.2. Five Standard Tests

Five standard cost-effectiveness tests have emerged to consider energy efficiency costs and benefits from different perspectives. These tests are summarized in Table 2.

It is important to recognize that the different tests provide different types of information, and that each test is designed to present the costs and benefits from a different point of view. While all of these different perspectives may be considered relevant and important—and warrant consideration—jurisdictions typically choose one of these tests as the primary test to determine whether or not to invest ratepayer funds in energy efficiency programs.

Table 2: Components of the standard cost-effectiveness tests

	Participant Test	RIM Test	Utility Cost Test	Total Resource Cost Test	Societal Cost Test
Energy Efficiency Program Benefits:					
Customer Bill Savings	Yes	---	---	---	---
Avoided Energy Costs	---	Yes	Yes	Yes	Yes
Avoided Capacity Costs	---	Yes	Yes	Yes	Yes
Avoided Transmission and Distribution Costs	---	Yes	Yes	Yes	Yes
Wholesale Market Price Suppression Effects	---	Yes	Yes	Yes	Yes
Avoided Cost of Environmental Compliance	---	Yes	Yes	Yes	Yes
Non-Energy Benefits (utility perspective)	---	Yes	Yes	Yes	Yes
Non-Energy Benefits (participant perspective)	Yes	---	---	Yes	Yes
Non-Energy Benefits (societal perspective)	---	---	---	---	Yes
Energy Efficiency Program Costs:					
Program Administrator Costs	---	Yes	Yes	Yes	Yes
EE Measure Cost: Program Financial Incentive	---	Yes	Yes	Yes	Yes
EE Measure Cost: Participant Contribution	Yes	---	---	Yes	Yes
Lost Revenues to the Utility	---	Yes	---	---	---

The Total Resource Cost test, the Societal Cost test, and the Utility Cost test are the primary tests used in the United States to determine the cost-effectiveness of energy efficiency programs. For this reason, the following analysis focuses only on those tests (Kushler, Nowak, and White 2012).

The Total Resource Cost test assesses the costs and benefits experienced by all utility customers, including both program participants and non-participants. The costs include all the costs incurred by the program administrator and participating customer, including the full incremental cost of the efficiency measure, regardless of whether it was incurred by the program administrator or the participating customers. The benefits include all the avoided utility costs, plus any non-energy benefits experienced by the customers. Examples include avoided water costs, reduced operations and maintenance costs, improved comfort levels, health and safety benefits, and more.

The Societal Cost test includes the costs and benefits experienced by all members of society. The costs include all of the costs incurred by any member of society: the program administrator, the customer, and anyone else. Similarly, the benefits include all of the benefits experienced by any member of society. The costs and benefits are the same as for the Total Resource Cost test, except that they also include externalities such as environmental costs and reduced costs for government services.

The Utility Cost test includes the energy costs and benefits that are experienced by the energy efficiency program administrator. This test is most consistent with the way that supply-side resources are evaluated in integrated resource plans by vertically integrated utilities. The costs include all expenditures by the program administrator to design, plan, administer, deliver, monitor, and evaluate efficiency programs—offset by any revenue from the sale of freed up energy supply. The benefits include all the avoided utility costs, such as avoided energy costs, avoided capacity costs, avoided transmission and distribution costs, and any other costs otherwise incurred by the utility to provide electric services (or gas services in the case of gas energy efficiency programs).

The standard tests presented in Table 2 were originally based on the California Standard Practice Manual, or SPM (California Public Utilities Commission 2001). While the SPM has been instrumental to many U.S. states in the development of energy efficiency screening practices, its treatment of many issues is very general and leaves significant details to interpretation. As a result, these tests are sometimes defined differently across jurisdictions, and some parties disagree with exactly which costs and benefits should be included in each test. Further, the SPM is out of date and does not address several of the key challenges facing states today. Ultimately, what are commonly thought to be "standard" tests are in fact applied inconsistently across states.

One of the challenges in designing an efficiency screening test is that none of the different approaches fully addresses the perspective of utility regulators. The utility system perspective is sometimes considered to be too narrow because it does not account for some key energy policy goals, e.g., promoting customer equity, assisting low-income customers, or promoting economic development. In contrast, the societal perspective is sometimes considered to be too broad because it could, theoretically, include some costs and benefits that are outside the scope of utility regulator's authority.

The utility regulator's primary responsibility is to serve and protect the public interest through oversight of the utility system. In practice, utility regulators frequently make determinations as to whether utility investments or actions are in the public interest. Such determinations typically require weighing many different factors and considerations, some of which require tradeoffs (e.g., cost versus reliability). These public interest determinations require utility regulators to consider those factors that are within the bounds of their authority as economic regulators. This same approach can, and should, be applied to screening energy efficiency resources. As discussed below, the Resource Value Framework can assist regulators in applying this approach to energy efficiency resources.

4.3. Resource Value Framework

The National Efficiency Screening Project (NESP) is a group of organizations and individuals that are working together to improve the way that electricity and natural gas energy efficiency resources are screened for cost-effectiveness. The purpose of this initiative is to improve efficiency screening practices throughout the United States, and to help inform decision-makers regarding which efficiency resources are in the public interest and what level of investment is appropriate.

To encourage more consistent application of energy efficiency screening tests, the NESP has prepared an initial framework and, going forward, intends to design a new Standard Practice Manual to assist states and provinces in improving their efficiency screening.

The NESP recommends that each jurisdiction use the Resource Value Framework for developing and implementing efficiency screening tests. One of the primary concepts underlying the Resource Value Framework is that jurisdictions should not be limited to the five traditional screening tests presented in the California Standard Practice Manual. There are other ways of defining screening tests that are consistent with the principles in the “Objective and Principles” section above, and more in line with a state’s energy policy goals.

Further, the Resource Value Framework is a framework of principles and recommendations to provide guidance for states and provinces to develop and implement tests that are consistent with sound principles and best practices. It is intentionally designed to provide each jurisdiction with the flexibility to ensure that the test they use meets their jurisdiction’s distinct needs and interests, as provided in relevant energy policies and regulatory orders.

4.4. Avoided Costs

Energy efficiency programs result in several types of avoided costs, and it is important that all of them are included in the screening analysis and calculated correctly. Proper estimation of avoided costs requires many essential analytical techniques that are beyond the scope of this report. We encourage readers to refer to the reference documents for more details (Woolf et al. 2012).

The typical approach for quantifying the benefits of energy efficiency is to forecast long-term avoided costs, defined as costs that would have been incurred if the energy efficiency savings measure had not been put in place. The utility may not have to purchase as much system capacity, make as many upgrades to distribution or transmission systems, buy as many emissions offsets, or incur as many other costs. All such cost savings resulting from efficiency are directly counted as avoided-cost benefits (National Action Plan for Energy Efficiency 2008, sec. 4).

There are two main categories of avoided costs: energy-related and capacity-related avoided costs. Energy-related avoided costs involve market prices of energy, losses, fuel commodity prices, and other benefits associated with energy production such as reduced air emissions and water usage. Capacity-related avoided costs involve infrastructure investments such as power plants, transmission and distribution lines, pipelines, and liquefied natural gas (LNG) terminals (National Action Plan for Energy Efficiency 2008, sec. 4).

Jurisdictions use different methodological approaches as the basis for their avoided costs. In the United States, 12 states use essentially fixed values based on an assumed "next power plan," 11 states base them on a more sophisticated modeling of average or marginal system costs, 12 states use some market price based methodology, and three states use some other methodology (Kushler, Nowak, and White 2012, 32).

PEI avoided costs are likely very similar to avoided costs in New Brunswick, since PEI relies heavily on New Brunswick for most of its power supplies, with the exception of wind. PEI's on-island supply is limited to wind energy and oil-fired peaking/backup units that run infrequently. Thus energy efficiency on the island is generally displacing energy and capacity from external sources—New Brunswick being the prime source. It is possible that some of the purchased power (which flows over a few submarine cables connecting PEI with New Brunswick) comes from Quebec and even at times from New England, but it is reasonable to assume New Brunswick as the main source.

4.5. Discount Rate

Discount rates are an essential, yet easily misunderstood, aspect of the cost-effectiveness evaluation of any multi-year project or investment. When costs and benefits do not all occur in the same year, how should present-day and future amounts be compared? Typically, costs occur sooner, while benefits stretch into the future: A power plant takes a few years to build, and then generates electricity for decades. Likewise, a well-insulated house can be built or retrofitted quickly, and then save energy each year thereafter.

Table 3 below presents the discount rates recently used by select states in New England and the Mid-Atlantic regions for energy efficiency benefit-cost analysis. It includes both the real discount rates used, and the rationale for choosing the discount rates. The table also indicates the primary test used by the state for its benefit-cost analysis.

As the table shows, the discount rates used by states vary by rationale, by cost-effectiveness test, and in magnitude. Some states use the same rationale to develop a discount rate (e.g., based on 10-year U.S. Treasury bonds), but come up with different values. The discount rates also vary widely within a specific cost-effectiveness test (e.g., from 0.55 percent to 5.50 percent within the Total Resource Cost test). Across states, rationales, and tests, the discount rates range considerably from 0.55 percent to 7.43 percent.

Table 3. State discount rates used in energy efficiency benefit-cost analysis

	Primary Test							
	UCT	Total Resource Cost Test					Societal Cost Test	
	CT	NY	NH	RI	MA	DE	VT	DC
Basis for Discount Rate	Utility WACC	Utility WACC	Prime Rate	Low-Risk 10 yr Treasury	Low-Risk 10 yr Treasury	Societal Treasury Rate	Societal	Societal 10 yr Treasury
Current Discount Rate (Real)	7.43%	5.50%	2.46%	1.15%	0.55%	TBD	3.00%	1.87%

The discount rate essentially reflects a particular "time preference," i.e., the relative importance of short- versus long-term costs and benefits. A high discount rate implies that short-term costs and benefits are valued more than long-term costs and benefits. In contrast, a low discount rate implies that short-term costs and benefits are valued similarly to long-term costs and benefits.

In general, there are several factors that affect the time preferences of different people and different parties, including the following:

1. **Inflation.** Inflation causes future costs to increase, which makes money more valuable today than in the future.
2. **The cost of capital.** Capital often comes at a cost, and has an opportunity cost as well. If capital is not invested in a particular project, then either (a) the capital does not need to be raised and paid for, or (b) capital that is on hand can be put toward other investments that would be expected to provide a return.
3. **Risk associated with future outcomes.** Future benefits are often subject to risk, and therefore might be less than expected today or might not occur at all. This makes money more valuable today than in the future.
4. **Short-term preference.** People tend to place greater value on benefits they can experience in the short-term, relative to those they can enjoy over the medium- to long-term.
5. **Personal preference.** People tend to place greater value on their own benefits, both short-term and long-term, relative to the benefits that would accrue to other people in the future.

Some of these factors are inter-related. For example, some risk considerations might be factored into a consumer's cost of capital. Short-term preference might be based partly on risk, and partly on other factors. When deciding upon a discount rate to use for energy efficiency screening, it is important to consider how these various factors are relevant and what they suggest about the appropriate discount rate to use.

The choice of discount rate is closely linked to who will be making the investment and experiencing the costs and benefits of that investment. For example, the time preference used by a regulated utility for evaluating the costs and benefits of different resource options can be very different from the time preference used by investors for evaluating their investment options.

The discount rate chosen for a jurisdiction must reflect a time preference that is consistent with energy policy goals. There are two stakeholder groups—all utility customers and society—whose time preferences are very much aligned with energy policy goals. Therefore, the discount rate used for energy efficiency should represent the time preferences of all utility customers and society. Regulators are in the best position to determine such a time preference, as they are driven solely by neither shareholder interests nor customer interests. Instead, they are in charge of representing the public interest. This requires accounting for many different factors and sometimes making tradeoffs between conflicting factors, including tradeoffs between the values of current versus future costs.

The time preference of all utility customers as a whole (i.e., the utility system) should be based on goals defined by regulators, including: reducing electricity costs, increasing electricity system efficiency, maintaining reliability, reducing risk, and achieving the other energy policy goals—both in the short-term and the long-term future.

The societal discount rate tends to be lower than the discount rates of all other parties. One of the interests of society is to help meet the needs of the present without compromising the ability of future generations to meet their needs. Therefore, society has a broader tolerance for incurring costs in the short term in order to experience benefits over the long term. In addition, society, as represented by government agencies, is generally better able to access funds at a relatively low borrowing cost. Societal real discount rates tend to be in the range of 0–3 percent.

The time preference for all customers as a whole is not so easily defined. In determining such a time preference, regulators should consider what value they wish to place on short- versus long-term costs and benefits. Furthermore, in determining the time preference for all customers as a whole, regulators should consider whether and how to account for risk in choosing the discount rate (Woolf, Malone, and Ackerman 2014).

4.6. Recommendations

We recommend that the Commission require Maritime Electric to design efficiency programs and portfolios with the goal of achieving all cost-effective energy efficiency savings. Further, we recommend that PEI provide guidance on determining cost-effectiveness by using the Resource Value Framework to design its primary energy efficiency screening test. This should include the following steps:

1. Explicitly acknowledge that the ultimate objective of efficiency screening is to determine whether or not a particular energy efficiency resource is in the public interest, and that determinations of the public interest should include consideration of PEI's energy policy goals.
2. Identify PEI's energy policy goals that are relevant to, and might be affected by, energy efficiency resources. Examples include: ensure fair treatment of low-income programs and customers, promote customer equity, reduce risk, improve system reliability,

reduce energy price volatility, reduce the environmental impacts of energy, and promote economic development.

3. Begin with the Utility Test as the foundation for the efficiency screening test, because this test includes all of the costs and benefits to the utility system that at a minimum must be included in any screening test.
4. Modify the Utility Test to account for PEI's energy policy goals. This should include developing quantitative and qualitative methods to account for some of the policy goals. This modified version of the Utility Test will be the primary screening test used to screen Maritime Electric's efficiency programs.
5. Use the Resource Value Framework template to explicitly identify the assumptions and methodologies necessary to ensure that the test is balanced, comprehensive, and transparent.

We also recommend that the Commission require Maritime Electric to use a low-risk discount rate, to reflect the importance to customers of the future benefits of energy efficiency programs.

5. Multi-Year Planning and Savings Targets

5.1. Objective and Principles

There are many reasons energy efficiency plans should address multiple years rather than just the subsequent year. First, multi-year energy efficiency plans arise from a need to better align energy efficiency efforts with utility integrated resource and capital expenditure plans with longer planning horizons. Energy efficiency can offset incremental generation, transmission, and distribution expenditures when implemented in the years prior to the emergence of the need for additional expenditures.

Second, utilities and stakeholders generally require time to plan for and discuss energy efficiency spending and savings targets. Early planning provides greater transparency to stakeholders, facilitates adjustments, and enables greater consensus among stakeholders. More lead time in planning also provides greater transparency to utility shareholders and more regulatory certainty to utilities regarding the recovery of future capital investments.

Finally, unlike a single-year plan that gives program administrators an incentive to focus on shorter-lived savings measures or measures with high annual savings and lower costs, multi-year plans allow program administrators to focus on efficiency technologies and strategies with longer measure lives and long-term market transformation efforts (Neme and Grevatt 2016).

5.2. Examples from Other Jurisdictions

Examples of multi-year planning

A multi-year planning approach has been adopted by several leading U.S. states, providing stakeholders with energy efficiency spending and savings targets for future years. For example, National Grid in Rhode Island prepares a three-year, high-level plan roughly six months in advance of the first program year. National Grid provides portfolio-level spending and savings targets, identifies key areas of focus, and highlights new areas for program development. Subsequent annual plans, prepared and approved just before the start of each program year, provide program descriptions along with updated, more detailed sector- and program-level spending and savings information.

In Massachusetts, every three years the energy efficiency program administrators collaborate with the Energy Efficiency Advisory Council to prepare a detailed three-year plan in the year before the first program year. The plan contains sector- and program-level spending and savings information for all three years. Each program administrator is responsible for notifying the commission if modifications to the plan are needed during the three-year timeframe. Further commission approval may be required depending on the impact of the proposed modifications.

While there are many benefits to multi-year planning, states are learning important lessons about the frequency and stringency of regulatory review of future year plans. In the Massachusetts approach, program administrators develop the details of future year plans, including variables that can be highly uncertain and difficult to estimate. As a result, Massachusetts program administrators have historically needed to submit plan modifications for regulatory review and approval in the second and/or third year of the plans. This can result in significant time and money spent on the plan modifications. The Rhode Island approach provides a more appropriate balance between providing detailed information for each plan year close to program implementation and providing stakeholders an advanced opportunity to review and discuss future year plan goals at a high-level.

Examples of energy savings and program costs from other jurisdictions

Energy efficiency spending and savings data is readily available for a number of U.S. and Canadian jurisdictions. New England states and eastern Canadian provinces provide the most relevant comparisons for PEI because they all share similar climate, building stock and age, fuel types, and regulatory regimes. We can compare data using values that are normalized for differences in utility revenue and energy use by jurisdiction.

The energy efficiency program costs as a percent of total revenues metric allows for comparisons across spending levels. Similarly, the levelized cost to achieve a unit of saved energy and the annual savings as a percent of total sales both provide a normalized approach for comparing savings levels.[10] Table 4 below shows these metrics for each jurisdiction for the 2014 program year except Newfoundland, ranked from highest to lowest by the program cost as a percent of total revenue.

Table 4. Program costs and annual savings in 2014 in the U.S. Northeast and Canadian Atlantic regions

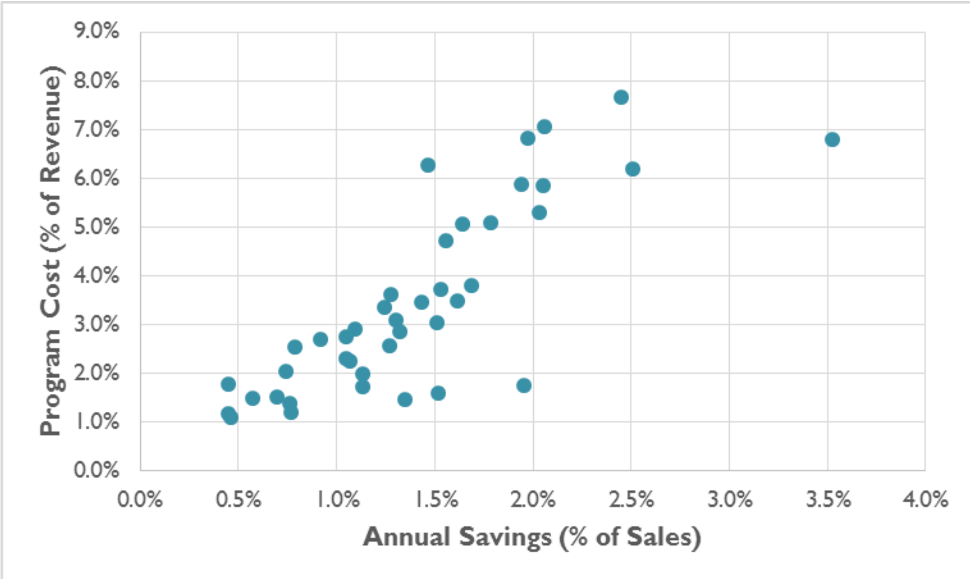
US/ Canada	Jurisdiction	Program Cost % of Revenue	Annual Savings % of Sales	Levelized (CAD 2014 cents per kWh)
US	RI	6.79%	3.53%	3.2
US	MA	6.18%	2.51%	4.7
US	VT	5.06%	1.64%	4.8
US	CT	3.62%	1.27%	5.7
Canada	NS	3.03%	1.51%	2.9
US	NH	1.48%	0.57%	3.8
US	ME	1.45%	1.35%	2.0
Average		**4.60%**	**1.90%**	**4.6**

Source: National Grid. 2015. National Grid Electric and Gas Energy Efficiency Programs 2014 Year-End Report; Mass Save Data, http://masssavedata.com/Public/Home; Efficiency Vermont. 2015. Annual Report 2014; Connecticut Statewide Energy Efficiency Database, http://www.ctenergydashboard.com; EfficiencyOne. Feb. 27 2015. Evidence of EfficiencyOne, Case # M06733; NSPI response to Synapse IR-16, Case # M06733; NH Core Energy Efficiency Programs. 2015. 4th Quarter Report: January 2014 - December 2014, Docket No. DE 12-262; Efficiency Maine. 2015. 2014 Annual Report; Newfoundland and Labrador Hydro and Newfoundland Power. 2015. Five-year Conservation Plan: 2016 – 2020.

Figure 2 below exhibits annual savings (% of annual sales) on the X-axis and program costs (% of annual revenue) on the Y-axis for all New England states and Nova Scotia. The figure includes data from 2008 to 2014 for four New England states (Massachusetts, Rhode Island, Vermont, and Connecticut), from 2011 to 2014 for New Hampshire and Maine, and from 2010 to 2014 for Nova Scotia. As shown in the figure, program costs tend to increase linearly as annual energy savings increase. Figure 3 shows program costs and annual savings from 2008 to 2014 for select jurisdictions.

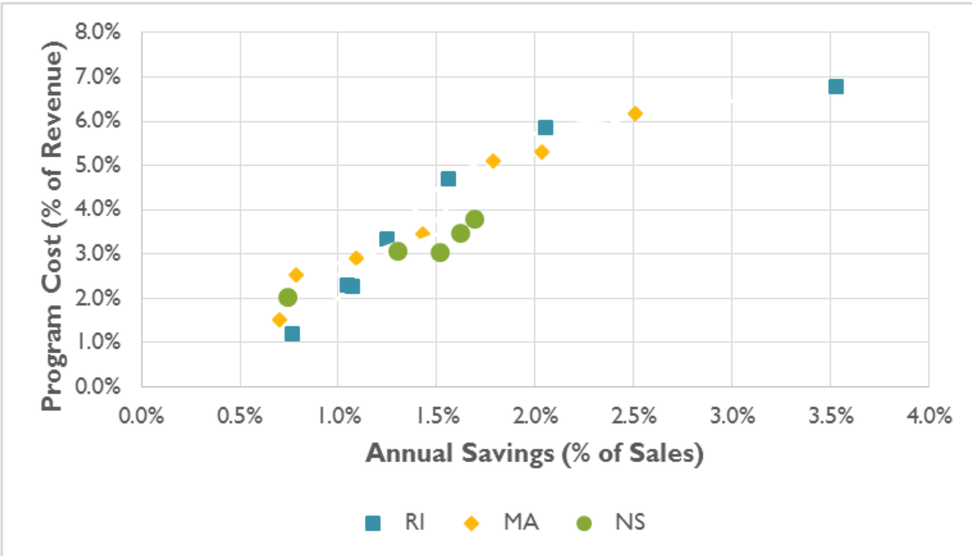
[10] The levelized cost of saved energy was estimated using the average measure life by each jurisdiction and a 2.5 percent real discount rate. For Nova Scotia, the average measure life was assumed to be 10 years, based on the average value of the average measure life among all states/provinces.

Figure 2. Program costs and annual savings from 2008 to 2014 in the U.S. Northeast and Canadian Atlantic regions



Source: Mass Save Data; National Grid Rhode Island "Year-End" annual program reports; Efficiency Vermont annual program reports, https://www.efficiencyvermont.com/about/annual-plans-reports; Efficiency Maine annual program reports, http://www.efficiencymaine.com/about/library/reports; Connecticut Statewide Energy Efficiency Database, http://www.ctenergydashboard.com/Login.aspx; NH Core Energy Efficiency Programs Quarterly Reports, http://www.puc.state.nh.us/electric/coreenergyefficiencyprograms.htm; Energie NB Power. 2015. Annual Report - 2014-2015; Efficiency NB. 2014. 2014/15-2016/17 Electricity Efficiency Plan; Newfoundland and Labrador Hydro and Newfoundland Power. 2015. Five-year Conservation Plan: 2016 – 2020; ENSC annual reports for 2010, 2011, and 2012; NSPI response to Synapse IR-16, case # M06733; E1 response to Synapse IR-1 (2013-2015 DSM Filing), case # M06733; EfficiencyOne. Feb. 27 2015. Evidence of EfficiencyOne, Case # M06733.

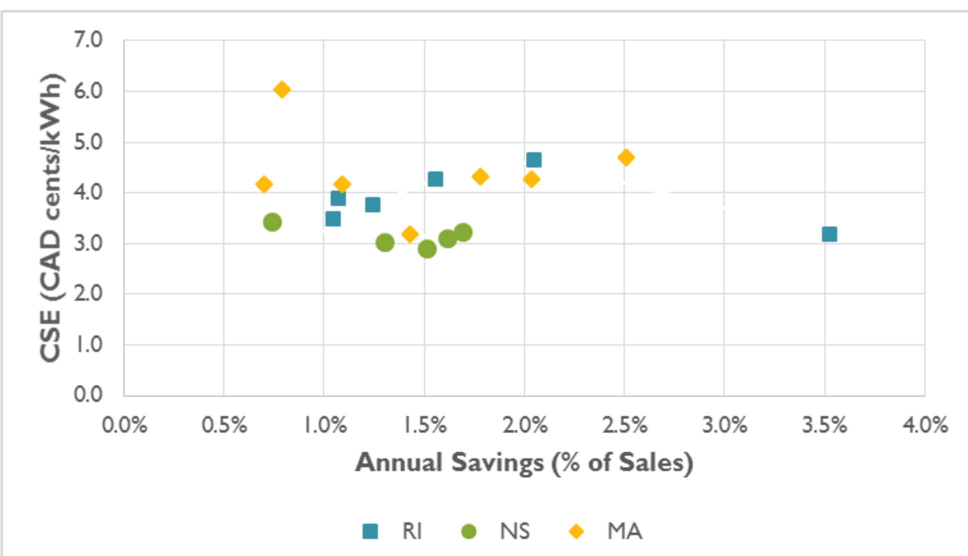
Figure 3. Program costs and annual savings from 2008 to 2014 for select jurisdictions



Source: ENSC annual reports for 2010, 2011, and 2012; NSPI response to Synapse IR-16, case # M06733; E1 response to Synapse IR-1 (2013-2015 DSM Filing), case # M06733; EfficiencyOne. Feb. 27 2015. Evidence of EfficiencyOne, Case # M06733; Mass Save Data; Synapse in-house database for Massachusetts programs; National Grid Rhode Island "Year-End" annual program reports.

Finally, Figure 4 summarizes how the levelized costs of saved energy (CAD cents per kWh) changed at different annual energy savings levels (in percent of retail sales) for the select jurisdictions. Interestingly, these jurisdictions either present flat or slightly decreasing cost trends. In other words, the costs of saved energy for these jurisdictions did not increase with expansions in program scale.

Figure 4. Program costs of saved energy (CSE) and annual savings from 2008 to 2014 for select jurisdictions

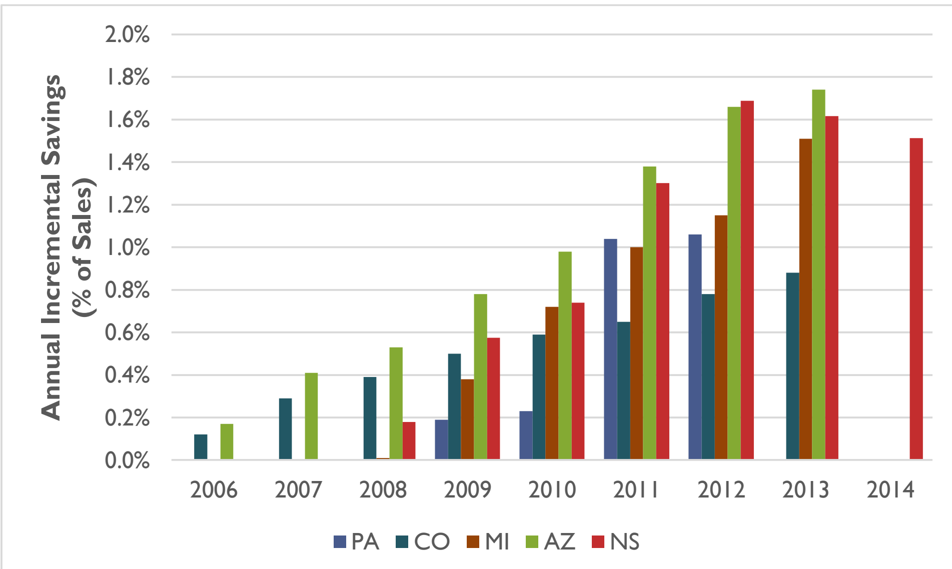


Source: ENSC annual reports for 2010, 2011, and 2012; NSPI response to Synapse IR-16, case # M06733; E1 response to Synapse IR-1 (2013-2015 DSM Filing), case # M06733; EfficiencyOne. Feb. 27 2015. Evidence of EfficiencyOne, Case # M06733; Mass Save Data; Synapse in-house database for Massachusetts programs; National Grid Rhode Island "Year-End" annual program reports.

Examples of energy savings ramp-ups from other jurisdictions

A number of jurisdictions have rapidly expanded their programs in recent years, demonstrating a steady but rapid increase in annual energy savings. Figure 5 summarizes the increase in annual energy savings for five such jurisdictions, including Nova Scotia. These jurisdictions started with limited program activity in 2006 to 2008 but quickly expanded their programs over five to seven years to achieve annual incremental energy savings of 1 percent to 1.7 percent of sales. The average annual ramp-up in energy savings was about 0.2 percent of sales.

Figure 5. Examples of annual incremental energy savings ramp-up experience by jurisdictions with new rapid growth programs



Source: ACEEE's the State Energy Efficiency Scorecard reports, http://aceee.org/state-policy/scorecard.

In the United States, Rhode Island and Massachusetts have been national leaders in energy efficiency program implementation for more than a decade. These states are allaying concerns that implementing energy efficiency can become more difficult or expensive after years of aggressive pursuit. They have demonstrated they could further increase annual incremental energy savings, reaching 2 or 3 percent of sales per year as shown in Figure 6. Over the past seven years, the average annual ramp-up in energy savings for these two states was about 0.4 percent of sales.

Figure 6. Examples of annual incremental energy savings ramp-up experience by Massachusetts and Rhode Island

Source: National Grid Rhode Island annual program reports; Mass Save Data; Synapse in-house database for Massachusetts programs.

These rates of increase in annual savings were supported by a recent national analysis of annual energy savings increases conducted by the U.S. Environmental Protection Agency (EPA). EPA found the average ramp-rate for 26 program administrators that achieved a maximum first year savings level of 1.5 to 3 percent was 0.38 percent of sales per year based on the Energy Information Administration's Form EIA-861 on energy efficiency program electricity savings (U.S. Environmental Protection Agency 2015b). The experience in these states can inform the level of savings that can be achieved in the first few years of energy efficiency implementation in jurisdictions with limited previous experience such as PEI, and also the rate at which these savings targets can increase over time.

5.3. Recommendations for Multi-Year Savings and Budget Targets

We recommend that the Commission require Maritime Electric to include three-year efficiency program budgets and savings targets in its next energy efficiency plan.

- These program budgets and savings targets should be based upon analysis of the cost-effective energy efficiency programs included in that plan.
- These program budgets and savings targets should be based upon quick-start goals and practices, and should ramp-up over time to reach savings levels consistent with achieving all cost-effective energy efficiency in PEI.
- The efficiency savings targets should be set to achieve at least 0.4 percent of retail electricity sales in the first year, with at least an additional 0.4 percent of sales saved each subsequent year.

6. COST RECOVERY

6.1. Funding and Cost Recovery Mechanisms

Objective and Principles

Jurisdictions use various approaches to recover energy efficiency program costs, including system benefit charges (SBC), recovery through base rates, and emission allowance auction proceeds.[11]

SBCs allow the utility to recover energy efficiency program costs in the same or the next period (e.g., quarterly or annually) in which they are incurred. [12] SBCs provide more timely cost recovery but lead to greater fluctuations in rates than rate-based cost recovery.

An SBC is generally determined by a state or provincial legislative body, or by the agency responsible for setting utility rates (i.e., the regulatory commission). This usually involves input from associated interested parties such as utilities, legislators, and other stakeholders. The charge is applied to each kilowatt-hour (kWh) of electricity consumed by customers and collected through local distribution companies.

In the United States, SBCs are used to fund energy efficiency programs in 18 states plus Washington D.C., and are often implemented on a state-wide basis (U.S. Environmental Protection Agency 2015a). As a secure source of funding from all customers for energy efficiency initiatives, an SBC offers a stable means of funding energy efficiency programs and creates certainty regarding the level of efficiency to be implemented. An SBC can support energy efficiency programs operated by any type of program administrator (vertically integrated utilities, distribution utilities, or third-party administrators).

Some jurisdictions treat energy efficiency program costs in a manner similar to other operating or capital expenditures included in rates. At the time of a rate case, efficiency program costs are included in the capital or operating expenses in the relevant test year, and those costs remain in rates until the following rate case. Efficiency costs that are included as capital costs will increase the utility's rate base and return on equity. A significant disadvantage of this approach is that the energy efficiency budgets remain constant between rate cases, regardless of the cost-effective potential or the customer demand for the energy efficiency.

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[11] Taxes and bonds are also sources of energy efficiency funding in some areas. In general, taxes may be too easily diverted for other purposes, and too vulnerable to changing political and economic climates. Bonds are not commonly used for funding energy efficiency efforts. Where taxes and bonds are used to fund energy efficiency programs for the public, they are usually not the only source of funds. For example, Delaware's Sustainable Energy Utility leverages multiple sources of funding, including tax-exempt bonds and leases, as well as Regional Greenhouse Gas Initiative auction proceeds, fees and interest on financing, and fees for services ("Energize Delaware and the Sustainable Energy Utility" 2016).

[12] SBCs are also known as public benefit fund charges.

As a secondary funding source, a number of U.S. states use the proceeds of their auctions of emissions allowances to provide funding for energy efficiency programs. Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island use the auction proceeds from the sale of their Regional Greenhouse Gas Initiative allowances to provide a portion of energy efficiency program funding needs (Chang et al. 2012). Similarly, some states allow energy efficiency and demand response resource capacity to be bid into regional capacity markets (including the New England Independent System Operator and the PJM Interconnection) and apply the associated revenues to existing or future energy efficiency efforts (U.S. Environmental Protection Agency 2015a).

Whatever the funding source, certain principles should be reflected in the efficiency program funding mechanism. These include the following:

- The amount of energy efficiency program funding should be determined through regulatory review of the periodic energy efficiency plans.
- Energy efficiency program administrators should be provided with timely and predictable recovery of efficiency programs costs.
- The energy efficiency funding mechanism should be fully reconciling, to allow program administrators the flexibility to meet customer demand for energy efficiency services and to respond to program modifications over time.
- Any over- or under-spending in one year should be carried forward for collection or crediting in the following year.
- Energy efficiency program funding should be protected against undue funding reductions, interruptions, or other disruptions. [13] Funding disruptions can create customer and contractor dissatisfaction and lead to significant lost opportunities.
- Energy efficiency funding mechanisms should be large enough to support all cost-effective energy efficiency programs approved by regulators.
- Energy efficiency program funding sources should not have a specific “sunset” date, and should be allowed to persist for an unlimited term, to provide consistency and stability over the long term.

Examples from other jurisdictions

In Massachusetts, energy efficiency program administrators receive ratepayer funds through a fully reconciling funding mechanism. The funding mechanism is specific to each customer sector (residential, low-income, and commercial and industrial) and is intended to better allow the program administrators

[13] Some states have protections against using ratepayer energy efficiency funding to meet budget shortfalls in other areas. In Vermont, legislation indicates that, “Funds collected through an energy efficiency charge shall not be funds of the state, shall not be available to meet the general obligations of the government, and shall not be included in the financial reports of the state” (U.S. Environmental Protection Agency 2015a).

to achieve all available cost-effective energy efficiency. The Massachusetts Department of Public Utilities (DPU) approves the rate-payer funded reconciling mechanism after consideration of (1) the effect of any rate increases on residential and commercial consumers; (2) the availability of other private or public funds, utility administered or otherwise, that may be available for energy efficiency or demand resources; and (3) whether or not past programs have lowered the cost of electricity to residential and commercial consumers (Commonwealth of Massachusetts, n.d.).

At a program level, the DPU allows Massachusetts program administrators to shift funding across programs as needed, provided the overall program spending does not exceed 20 percent of the program's planned budget. Should that occur, the program administrator is then required to seek approval of the increased budget from the Massachusetts Energy Efficiency Advisory Council. Further, if a program administrator's sector-level spending exceeds its approved plan budget such that the increased funding mechanism either (a) would result in a bill increase greater than 2 percent of the approved bill impacts, or (b) would collect greater than 25 percent of the planned collection amount, then the program administrator is required to seek approval of the budget increase from the DPU (Massachusetts Department of Public Utilities 2013).

Recommendations

We recommend that the Commission establish a system benefits charge to collect the costs associated with the energy efficiency programs in PEI.

- The Commission should establish the amount of the SBC for each calendar year when it reviews the Energy Efficiency Plan. The SBC funds should be fully reconciled at the end of each calendar year, where any over- or under-spending in one year should be carried forward for collection or crediting in the following year.
- The SBC should be defined in terms of cents/kWh, to provide the most equitable collection of costs across customers.
- There should be a separate SBC charge for residential and business customers, where the charge for each customer group is sufficient to recover the efficiency program costs associated with that group.
- Program administrators should be allowed to shift some of the SBC funds across programs within a sector as needed to meet the needs of customers in a timely manner.

6.2. Revenue Regulation

Objective and description

Traditional cost of service regulation provides utilities with a financial incentive to increase sales and a corresponding disincentive to reduce sales through energy efficiency or other means. Under this type of regulation, base electricity prices are fixed between rate cases, which means that utilities can increase revenues by increasing sales between rate cases. Increased sales will in turn result in increased profits for the utility, because the marginal cost of providing additional service is typically well below the price of electricity. This effect is sometimes referred to as the "throughput incentive," because utilities can increase revenues and profits by increasing the amount of electricity they deliver.

Revenue decoupling (also known as decoupling) is a modification to ratemaking designed to eliminate the throughput incentive by weakening or severing the link between utility sales and revenues. Revenue decoupling helps a utility recover its allowed level of revenues each year, regardless of electricity consumption. This is accomplished with the following steps:

a) The utility's revenue requirements for the test year are set in a general rate case, using the same practices and principles that are used under traditional cost-of-service ratemaking.

b) A certain amount of "allowed revenues" are determined for the years following the test year. In theory, these allowed revenues could be held constant at the level of revenue requirements determined for the test year. In practice, the allowed revenues are typically adjusted each year to account for the expectation that utility system costs will change in the years between rate cases due, for example, to input price inflation and growth in the number of customers served.

c) On a periodic basis between rate cases (e.g., each year), the utility's revenues are reconciled to ensure that the actual revenues recovered equal the allowed revenues. This is often accomplished with a separate reconciling rate rider. In those periods where the utility's actual revenues exceed the allowed revenues, customers will be refunded the difference, and vice versa.

In this way, actual revenue collected will track the allowed revenue more closely. Note that under this approach, the utility's revenues will be unaffected by all factors that could increase or reduce sales, including energy efficiency and demand response programs administered by the utility and third parties, more stringent building codes and appliance efficiency standards, naturally occurring energy efficiency, new rate designs, increases in non-utility-owned distributed generation, the impacts of weather, and the impacts of the economy on customer consumption patterns. There is no need to estimate load impacts.

Key design considerations

Revenue decoupling mechanisms can be designed in many different ways, with significant implications for utility cost recovery and for customers. Revenue decoupling mechanisms should achieve three primary goals: (1) eliminate the throughput incentive; (2) improve the alignment of utility revenues and costs; and (3) ensure that customers are protected and are in fact better off than they were prior to revenue regulation.

Revenue decoupling mechanisms should include at least the following key provisions to help protect customers:

- The initial test year rates should be set in the course of a full rate case, applying traditional ratemaking practices and principles, and with meaningful input from consumer advocates and other stakeholders.

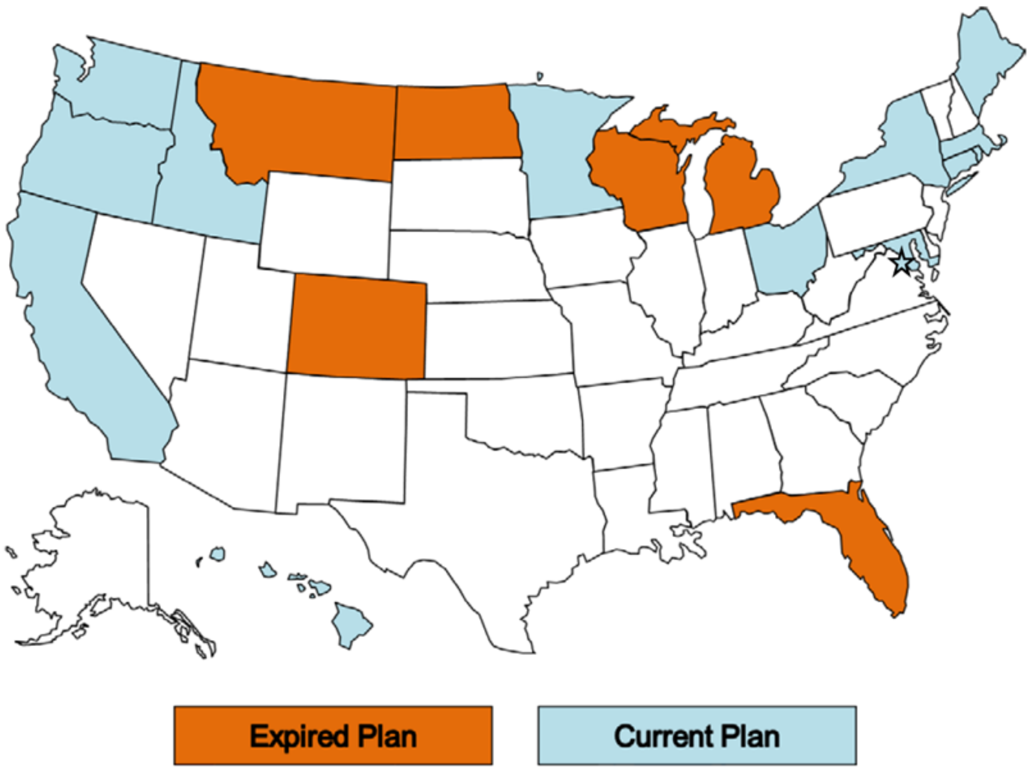
- If allowed revenues are modified over time, they should be modified in a way that is simple, transparent, and best reflects expected changes in cost pressures that may occur between rate cases.
- Reconciling rate adjustments should occur on a relatively frequent basis, at least once a year, to avoid any large impact on rates at the time of the adjustments.
- Reconciliations should be capped to limit the amount that rates can be increased at any one point in time—e.g., 1 percent of annual utility revenues.
- Regulators can consider whether the utility's allowed return on equity should reflect the fact that utility revenues, and therefore profits, will be less volatile under revenue regulation.

One other important design issue is the choice to apply revenue decoupling to all utility customers or to only a portion of them. Some jurisdictions have chosen to exclude large commercial and industrial customers. One reason for this is to avoid having to reassign large revenue shortfalls if customers of this kind sharply reduce their service requests. Another reason is a concern that utilities should maintain some incentives to retain such customers, encourage expansion of their local operations, and attract new customers to the service territory.

Examples from other jurisdictions

Revenue decoupling is currently in place for electric utilities in 14 jurisdictions across the United States and is being actively considered in several other states. Figure 7 below summarizes the states that currently have revenue decoupling mechanisms in place or had such mechanisms that have expired. In British Columbia, both BC Hydro and FortisBC have revenue decoupling mechanisms in place (Lowry, Makos, and Waschbusch 2015, p. 21-28).

Figure 7. Electric revenue decoupling by state



Source: Lowry, M., Makos, M., and Waschbusch, G.. 2015. Alternative Regulation for Emerging Utility Challenges 2015 Update, p 22.

Lost Revenue Adjustment Mechanisms

Lost revenue adjustment mechanisms (LRAMs) are sometimes used as an alternative to revenue decoupling. Under this approach, utilities are compensated for the estimated loss of base revenue that results from their energy efficiency programs, and possibly also from distributed generation.

However, the LRAM approach can be problematic and challenging for several reasons. First, LRAMs significantly increase the need for accurate estimates of energy savings from energy efficiency programs. With large dollars riding on the outcome, proceedings to estimate lost revenues can be extremely contentious, distracting, and resource intensive. For this reason, LRAMs tend to focus on utility energy efficiency programs with savings that are easy to estimate. This means that they neither fully eliminate the financial disincentive to promote sales nor offset the financial disincentive for other initiatives that could reduce sales and costs, such as tighter building energy codes, appliance standards, and time-varying rates.

An added complication is that LRAMs should allow utilities to recover only a portion of lost revenues—the portion that is necessary to cover fixed costs that are embedded in rates. It can be difficult to properly isolate this portion of rates. If not done appropriately, the utility might recover more or less than necessary to be made whole.

Furthermore, LRAMs should not allow utilities to recover revenues that the utilities can recover by alternative means. For example, some vertically integrated utilities can offset lost revenues from efficiency programs by increasing off-system sales. The portion of off-system sales that are not passed through to customers can offset lost revenues from efficiency programs. It can be difficult to identify and quantify all of the ways in which lost revenues are offset.

Finally, LRAMs often result in automatic, escalating annual increases in rates, which can become significant as customers adopt increasing levels of energy efficiency and distributed generation resources. Decoupling, on the other hand, typically results in modest adjustments to rates, and these adjustments can reduce rates as often as they increase rates.

Recommendations

We recommend that the Commission open a separate docket to investigate revenue regulation in PEI.

7. Shareholder Incentives

7.1. Objective and Principles

Utilities frequently seek some form of performance incentive to help offset the financial disincentives associated with efficiency programs, arguing that they should be able to earn as much profit from efficiency as they do from investments in supply-side facilities.

If efficiency programs are implemented by a third-party administrator, there is no need to provide the program administrator or the local utilities with performance incentives. Nevertheless, it may be effective to provide some form of performance incentive to the third-party administrator in order to encourage them to implement successful efficiency programs.

If the efficiency programs are implemented by a utility, it may be appropriate to allow utilities a reasonable amount of performance incentives for successful, well-designed programs. The primary rationale for the incentive is to encourage utility upper management to provide the institutional support necessary for effective efficiency programs.

Performance incentives should only apply to well-designed and well-executed efficiency programs. In addition, it is important that performance incentives be properly designed so that they have the intended effect of supporting utility energy efficiency activities and achievements. Regulators should apply the following principles in designing any performance incentive policy:

- Design incentives to encourage energy efficiency programs that will best achieve the jurisdiction’s energy goals (Whited, Woolf, and Napoleon 2015).
- Base incentives on desired outcomes (e.g., energy savings), not just expenditures (Nowak et al. 2015).

- Provide incentives only for activities in which the utility company plays a distinct, clear, and necessary role in bringing about the desired outcome (Whited, Woolf, and Napoleon 2015).
- Base incentives on clearly defined outcomes that can be sufficiently monitored, quantified, and verified (Whited, Woolf, and Napoleon 2015).
- Minimize the magnitude of performance incentives, in order to avoid unnecessary increases in electric and gas customer costs (Nowak et al. 2015).
- Cap incentives at a predetermined not-to-exceed portion of program budgets.
- Provide incentives only for programs that have been subject to proper monitoring and evaluation studies, and base the incentive amount on post-evaluation estimates of actual efficiency measure installations.
- Provide incentives only for utility programs that receive sufficient regulatory oversight and stakeholder input.
- Avoid creating perverse incentives, such as the incentive to increase costs without comparable increases in savings, or the incentive to cream-skim (i.e., targeting the least expensive efficiency resources, while leaving other viable and cost-effective opportunities behind).

7.2. Overall Structure

Energy efficiency performance incentives are relatively common in the United States (Nowak et al. 2015). Often, these structures are defined in terms of a threshold requirement, a target, and a cap.

- The "threshold" level of performance is the point below which no incentives are earned. If utilities cannot meet this threshold level, they do not earn any reward.
- The "target" level of performance is based on the achievement of efficiency program goals (e.g., megawatt-hour [MWh] savings or net benefits) in the most recent energy efficiency plan approved by the public service commission.
- Incentives are provided up to a "cap," which limits rate impacts associated with the performance incentive, and may act as a check against utilities understating savings opportunities in order to reap large incentives later.

The amount of money made available for performance incentives can be determined in several ways. The most common ways include: as a percentage of program costs, as a share of total net benefits, or as a rate of return on efficiency expenditures. These options are discussed briefly below.

Incentives based on efficiency program cost

Several U.S. states base performance incentives on program spending, coupled with achievement of energy or capacity savings targets (Nowak et al. 2015). For example, Connecticut has a sliding scale incentive starting at 2 percent of spending, when savings exceed 75 percent of the target. The maximum incentive is set at 8 percent of program spending, when savings reach 135 percent of the goal (Nowak et al. 2015).

Where program spending is the basis of the incentive, it is explicitly tied to attainment of established energy savings targets; without this link, incentives may encourage spending without a corresponding increase in savings.

The magnitude of the performance incentives should be large enough to capture utility management attention but small enough to ensure that customers do not pay more than necessary for successful efficiency programs. In our view, a target shareholder incentive of roughly 5 percent of demand-side management program budgets should provide a reasonable balance between utility management incentives and customer protection. Performance incentive caps that exceed 10 percent are likely to be unnecessarily high.

Incentives based on share of net benefits

Performance incentives are often based on shared net benefits, where the utility is allowed to keep a portion of the difference between program benefits and program costs (Nowak et al. 2015). This approach is appealing to many because it provides the utility with an incentive to both reduce program costs and increase program benefits.

However, this approach suffers from a significant problem. The efficiency program benefits are based on avoided costs—typically avoided energy, capacity, transmission, and distribution costs. These avoided costs can swing substantially over time, especially the avoided energy costs that are often driven by fossil fuel prices. When avoided costs increase dramatically, then the utility will earn significantly higher incentives, and vice versa. This can be a problem because (a) the utility incentive is driven by an external event that the utility has no control over, and (b) the utility incentive can ultimately be unnecessarily high or unnecessarily low. For this reason we do not recommend performance incentives that are based on a share of net benefits alone.

Incentives based on rate of return

Another frequently considered approach is to allow utilities to earn a rate of return on some or all of the efficiency expenditures, either by placing the efficiency expenditures in the utility's rate base or by making a comparable calculation to determine the size of the shareholder incentive. This approach is appealing to many because it creates an incentive for energy efficiency investments that is comparable to, or equal to, the incentive for investments in supply-side alternatives (Nowak et al. 2015). It is also appealing because it is based on the investment/return model that is familiar to utility management and shareholders.

This approach also suffers from problems. First, it rewards the utility for simply spending energy efficiency funds, without necessarily implementing successful programs or achieving significant efficiency savings (Nowak et al. 2015). Second, it is inconsistent with general ratemaking practices to allow a return on expenses that are recovered immediately from customers. Third, placing a cost into rate base without a corresponding asset that can act as collateral can cause the utility problems with regard to accounting and financing requirements. For these reasons, we do not recommend performance incentives that are based on the utility's rate of return.

7.3. Setting Potential and Earned Incentives

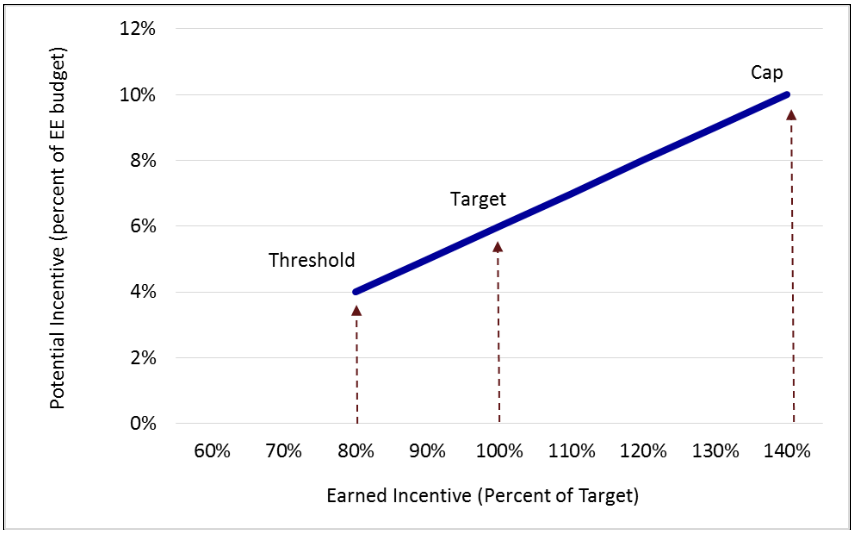
It is possible to combine some of the concepts above to design a performance incentive that achieves several key goals at once. In our view, the magnitude of the potential incentives (i.e., the total amount of incentives that the utility could potentially earn), should be based on a portion of efficiency program budgets. In this way, the amount of incentive that the utility actually earns will always be in proportion to the magnitude of the efficiency program themselves. This will ensure that (a) the utility incentive is proportional to its level of activity, and (b) customer payments will also be proportional to the level of efficiency activities. In other words, the energy efficiency program budgets provide very useful benchmarks to ensure that the amount of the incentive remains reasonable.

Furthermore, the magnitude of the earned incentives (i.e., the amount of incentives that the utility actually earns) should be based on utility performance. Utility performance can be defined in several different ways, including achieved energy savings (in MWh), achieved capacity savings (in MW), achieved net benefits, or more specific outcomes that are determined to warrant performance incentives.

Figure 8 provides a relatively simple example of the relationship between potential and earned incentives. The y-axis indicates the amount of incentive that the utility could potentially earn. In this example, the potential incentive ranges from 4 percent of the efficiency program budget to a maximum of 10 percent of the program budget.

The x-axis indicates the amount of the incentive that the utility actually earns, based on performance relative to efficiency targets. The efficiency targets can be based on energy savings, capacity savings, net benefits, or a combination of these. In this case, if the utility achieves 100 percent of the efficiency targets, it will earn an incentive equal to 6 percent of the efficiency program budget. If the utility achieves results between 80 percent and 140 percent of the target, it will earn an incentive based on the line between these two points. This is referred to as a sliding scale incentive.

Figure 8. Example of a sliding scale performance incentive



7.4. Examples from Other Jurisdictions

ACEEE recently asked U.S. states to submit qualitative information on energy efficiency performance incentives, as well as quantitative information on incentives in the two most recent program years. ACEEE analyzed data across all of these states, and its findings include the following:

- In total, 27 states have adopted incentives based on cost-effective achievement of energy savings targets. Of these, 25 are currently implementing incentives and two are preparing to do so.
- Regulated utilities and third-party administrators have achieved savings goals and earned incentive payments in all the states currently implementing incentive mechanisms for which ACEEE obtained complete data.
- States with performance incentives in place in 2013 spent significantly more on energy efficiency programs. The average per capita expenditure for electric energy efficiency programs in states with performance incentives was 50 percent more than in states with no incentive policy.
- States with energy efficiency performance incentives averaged higher levels of energy efficiency savings, relative to states without energy efficiency performance incentives.
- Interviewees indicated that performance incentives influence utility behavior and decision-making regarding energy efficiency programs (Nowak et al. 2015).

7.5. Recommendations

We recommend that PEI adopt an energy efficiency performance incentive mechanism. Figure 8 above provides an illustration of how such a mechanism should work. It should include the following elements:

- The magnitude of the potential incentive should be based on a portion of the efficiency program budget.
- The magnitude of the earned incentive should be based on three targets: energy savings, capacity savings, and net benefits from the programs.
- The incentive threshold should be set at 80 percent of target levels, and the cap should be set at 140 percent of target levels.
- The magnitude of the earned incentive should range from a threshold of 4 percent of total energy efficiency program budgets to a cap of 10 percent. A sliding scale approach should be used to determine the earned incentive between these two points.

8. STAKEHOLDER INPUT

8.1. Objectives and Principles

Advisory councils, boards, and collaboratives—referred to collectively as stakeholder groups—have proven effective for gathering stakeholder input and feedback, and for implementing successful energy efficiency programs. Such stakeholder groups advise and assist in developing, implementing, and evaluating cost-effective efficiency programs designed to meet aggressive savings goals.

In doing so, the stakeholder groups serve to provide consistency among jurisdiction-wide efficiency offerings by bringing all program administrators and interested parties together at one table to discuss program design, implementation, and evaluation. Such an approach reduces ratepayer dollars spent on proceedings or settlement negotiations, and streamlines and focuses commission review of proposals. While there are a few different types of stakeholder groups, this section will focus on a common type of stakeholder group referred to as a collaborative.

Collaboratives are typically composed of members that represent various sectors with expertise in energy efficiency or are potential interveners in energy efficiency proceedings. Such sectors include: residential, low income, and business customers; the environmental community; the manufacturing industry; organized labor; consumer advocacy groups; housing and economic development organizations; and other energy and environment departments. Some collaboratives also retain consultants with energy efficiency expertise to assist with a more detailed review of program design, implementation, and evaluation.

Collaboratives debate and resolve issues and/or plans in working group-style meetings that occur outside of a formal commission proceeding. In this more casual setting, stakeholders can exchange information and debate freely with one another, be more transparent about their positions, evolve their positions over the course of the working group process, and develop deeper relationships with other stakeholders. Once the group achieves consensus, a group settlement or position paper can replace briefs filed by each party in a docket. While the structure and operations of energy efficiency collaboratives vary quite a bit, there are a few overarching principles to observe when establishing a collaborative (State and Local Energy Efficiency Action Network 2015).

- **Clear objective.** The objective should clarify the duration of the collaborative (i.e., short- or long-term) and scope (single issue or ongoing utility program review). The commission should also ensure that collaborative members understand that the purpose of the collaborative is to bridge differences.
- **Ground rules.** Processes should be clear and transparent, and ensure balanced participation from many types of stakeholders.
- **Public, transparent, and inclusive.** Meetings and meeting materials should be freely accessible.
- **Evaluation of efforts.** A periodic assessment of the collaborative helps to validate its continuation, refine its mission, redesign its operating practices, and assess its progress toward objectives.
- **Strong, experienced facilitator.** An experienced, independent facilitator can ensure all attendees have a chance to express their views.
- **Influence with commission.** A collaborative is most useful if the commission gives weight to the findings and conclusions of the collaborative.

For a collaborative to be effective, stakeholders should be:[14]

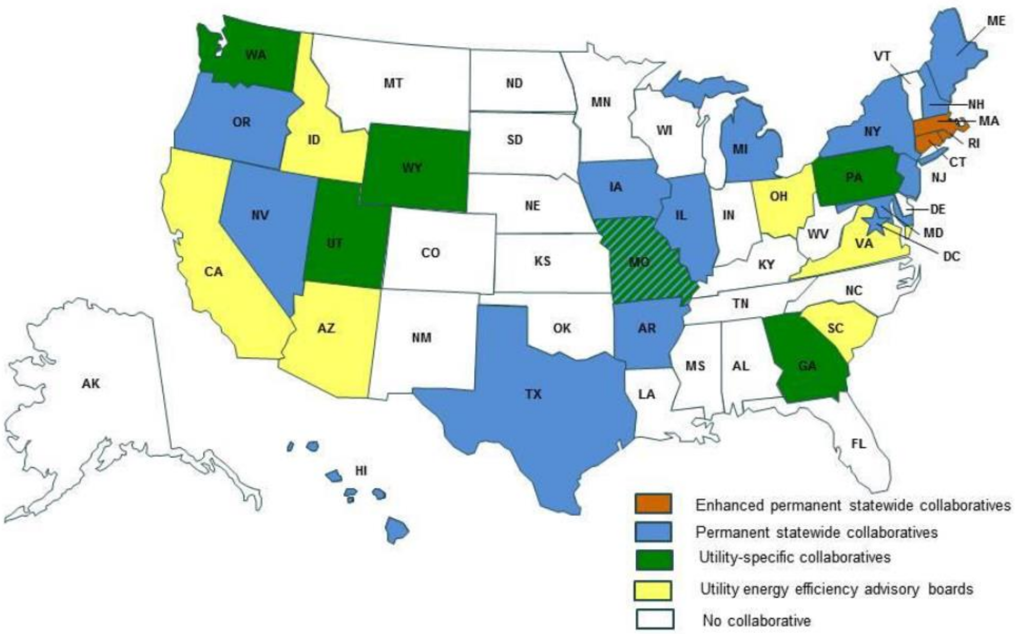
- Knowledgeable, with expertise regarding a customer group or energy efficiency issues and practices;
- Committed, with a single representative that is consistently engaged over a period of time;
- Representative, expressing a position for a group of customers instead of for a single customer;
- A party to the proceeding, with the ability to formally intervene in the proceeding if consensus is not reached; and
- In a position of authority, with the ability to sign a settlement or joint position paper on behalf of their organization or group.

[14] Based on a discussion at a Rhode Island Energy Efficiency Collaborative meeting on 1/14/16. The Collaborative is a subcommittee of the Energy Efficiency and Resource Management Council (EERMC).

8.2. Examples from Other Jurisdictions

More than half of U.S. states have some form of permanent collaborative.[15] According to a recent report entitled *Energy Efficiency Collaboratives*, collaboratives are generally categorized into (a) utility energy efficiency advisory boards, (b) utility-specific collaboratives,[16] (c) permanent statewide collaboratives, and (d) enhanced permanent statewide collaboratives.

Figure 9. U.S. states with energy efficiency collaboratives (as of January 2015)



Source: Reproduced from State & Local Energy Efficiency Action Network. 2015. Energy Efficiency Collaboratives – Driving Ratepayer-Funded Efficiency through Regulatory Policies Working Group.

Figure 9 presents a map of the United States with these types of stakeholder collaborative initiatives. As shown in this map, six states have energy efficiency utility advisory boards—which are entities created either by the utility or the commission but operating under the direction of the utility—that provide input to the utility.[17]

[15] Temporary collaboratives are not discussed or reflected in the map, but are created to examine a specific issue and disbanded afterwards. States that have had temporary collaboratives include Kentucky, Minnesota, Mississippi, and Vermont.

[16] Utility-specific collaboratives provide stakeholder input for a single utility but otherwise operate similarly to permanent statewide collaboratives.

[17] Including Arizona, California, Idaho, Ohio, South Carolina, and Virginia.

Twenty-one states have permanent collaboratives, which are entities made permanent by statute, commission order, or track record—and have some budget for dedicated staff to complete tasks.

Arkansas is a good example of a permanent collaborative. In 2006, the Arkansas Public Utility Commission issued an order creating a statewide collaborative, known as Parties Working Collaboratively (PWC), to help utilities develop and implement their energy efficiency programs. The objective of the group is to forge consensus around issues. The process is staffed by the general staff of the Commission, which are separate from the Commission staff. To maintain transparency and to ensure progress, the PWC has developed a set of procedural guidelines (State and Local Energy Efficiency Action Network 2015).

Three states, including Massachusetts, Rhode Island, and Connecticut, have enhanced collaboratives. Enhanced collaboratives have a larger budget, dedicated staff (typically with energy efficiency expertise), and thus broader responsibility than permanent collaboratives.

Rhode Island's collaborative, known as the Energy Efficiency and Resource Management Council (EERMC), originated in the Comprehensive Energy Conservation, Efficiency, and Affordability Act of 2006 (State and Local Energy Efficiency Action Network 2015). One of the major purposes of the EERMC, stated in the legislation, is to "provide consistent, comprehensive, informed and publicly accountable stakeholder involvement in energy efficiency, conservation and resource development." The EERMC prepares an analysis of the energy efficiency plans proposed by the utilities and submits this to the Commission. The EERMC also monitors the progress of program administrators in achieving their goals and submits an annual report to the Commission. The EERMC has a set number of members that are appointed by the governor. The 13 members include nine voting members, four non-voting members, and representation by the utility. EERMC activities are facilitated by the Rhode Island Office of Energy Resources (OER), whose director also serves as the EERMC's executive director. The EERMC has a budget (roughly $1.2 million or 1.2 percent of the electric and gas system benefits charge) that is used to retain consultants who are experts in energy efficiency to assist in the program review and evaluation process.

In Canada, Nova Scotia has a permanent collaborative known as the DSM Advisory Group (DSMAG). The DSMAG advises the energy efficiency program administrator regarding, among other things, development of energy efficiency programs, plans, investments, and evaluation (Nova Scotia Utility and Review Board 2014). New Brunswick used a temporary collaborative, known as the Steering Committee, to define the first multi-year electricity efficiency plan. The Steering Committee was comprised of senior officials from utility and governmental organizations including Efficiency New Brunswick, the Department of Energy and Mines, and the Department of Environment and Local Government. A consulting firm assisted the Steering Committee (Dunsky Energy Consulting 2014).

8.3. Recommendations

We recommend that the Commission establish a permanent energy efficiency collaborative to allow for meaningful stakeholder input and to provide input to the Commission. The collaborative should have broad representation including large commercial and industrial customers, low-income customers, small business customers, consumer advocates, energy efficiency experts, and environmental groups. The utility should participate in the collaborative, but should not be a voting member. The regulations should allow energy efficiency dollars from ratepayers to fund a consultant with expertise in energy efficiency. The funding for this consultant should not exceed 1 percent of total efficiency funding.

Additionally, members are likely to participate fully only if they are guaranteed full, unfettered access to information, fair ground rules for deliberations, and recourse to adjudicated proceedings or other regulatory intervention if their concerns are not addressed properly. Therefore, regulators should establish such provisions ahead of time and in a binding, enforceable manner.

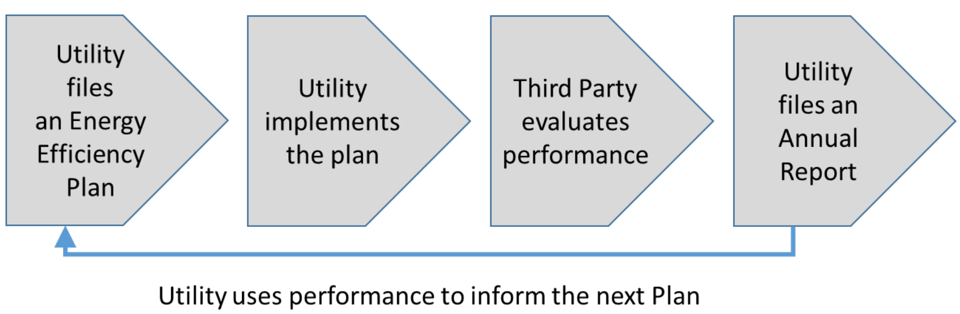
9. Evaluation, Measurement, and Verification

9.1. Overview of EM&V

EM&V is a critical component of energy efficiency programs. EM&V assesses the performance of energy efficiency programs and ensures that: (a) program savings are accurate and credible to support achievement of utility or state energy savings goals, energy demand forecasts, and resource planning; (b) programs use ratepayer funding judiciously (i.e., are cost-effective); and (c) program administrators find areas for improvements in program designs in order increase customer participation rates and energy savings.

EM&V consists of various types of evaluation activities. These include cost-effectiveness analysis, impact evaluation, process evaluation, baseline and market characterization assessment, and potential studies. Cost-effectiveness analyses are conducted for energy efficiency plans ("Utility files an Energy Efficiency Plan" in Figure 10) and annual reports ("Utility files an Annual Report" in Figure 10 below), as described in Section 4. Impact evaluations, defined below, provide additional support for cost-effectiveness analyses. While utilities and program administrators conduct cost-effectiveness analyses, third-party entities often conduct all other evaluation studies. Third-party evaluation serves to provide a non-biased, independent review of program efforts, along with recommendations for future improvements.

Figure 10. Program planning process flow



Among the rest of the evaluation studies, impact and process evaluation studies start prior to or during the implementation of a program cycle (e.g., one to three years), and are completed during or right after the end of the program cycle, which is shown as "Third party evaluates performance" in Figure 10 above. Impact evaluation and process evaluation are integral parts of a program portfolio cycle, and are defined as follows:

- **Impact evaluation** identifies and helps improve the accuracy and credibility of projected energy savings. Impact evaluation consists of a program level performance evaluation (which is simply referred to as "evaluation") and project or site level performance measurement and verification (M&V) activities. Measurement and verification (M&V) are core activities of the impact evaluation, and typically determine and document energy and peak savings for a measure, project, end use or facility. Evaluators use site surveys, metering of energy consumption, monitoring of independent variable, and analysis. In contrast, the evaluation activity uses the result of M&V activities and assess the performance of programs (or collections of projects) (Michals and Titus 2015).

- **Process evaluation** is a system assessment of an energy efficiency program and consists of in-depth examination of the design, delivery, and operations of energy programs. Its aim is to improve the ability of the program to achieve energy savings and accomplish other program goals. Process evaluation also provides a vehicle for sharing program design and operational improvements with other professionals in the field so that they can assess the relevance of the evaluation findings and recommendations to their policies, programs, and program portfolios (TechMarket Works 2004, p. 206).

Other evaluation studies include market characterization studies and energy efficiency potential studies, both of which are categorized as market evaluation studies. These studies do not have to follow the planning process flow discussed above, but are most useful when conducted prior to preparing energy efficiency plans. The section below focuses on impact and process evaluation activities.

9.2. Evaluation Process and Budget

Evaluation oversight

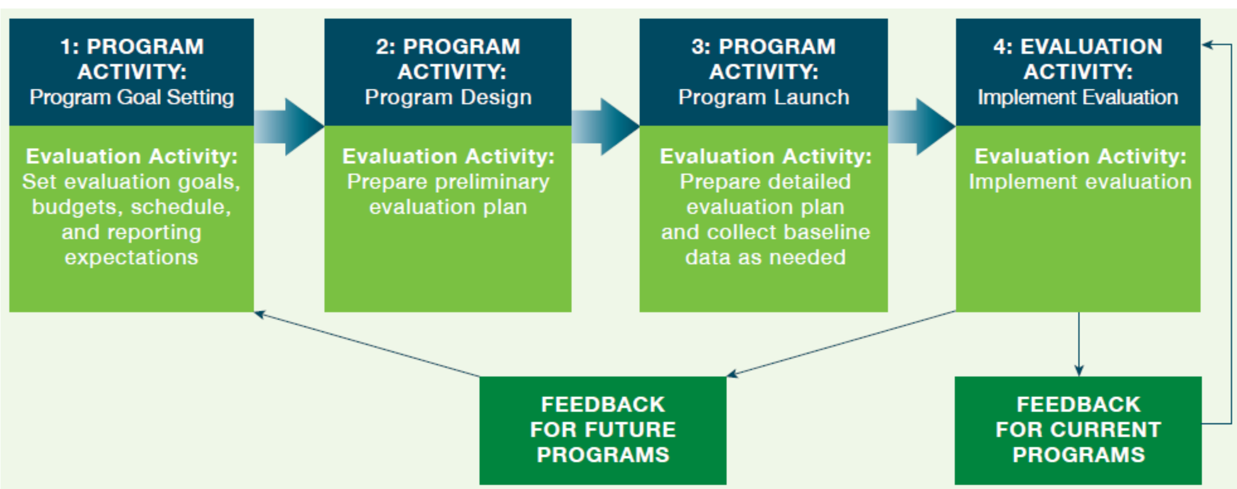
Transparency, independence, and proper oversight by regulators are necessary for selecting evaluation vendors, and for reviewing and applying study results. This will ensure that study results are unbiased and robust. As an example of the joint management approach, the EEAC consultants in Massachusetts work corroboratively with the program administrators to hire contractors, plan and implement the evaluations, and determine how results are applied to energy savings, incentive payments, and future program assumptions (Energy Futures Group, Cx Associates, and Wirtshafter Associates 2016, p. 55).

Evaluation planning and timing

Program evaluation timeframes are often determined by the funding and contracting schedules for a program portfolio cycle (e.g., 1–3 years). The evaluation planning should ideally begin when programs are being designed so that the program budget, schedule, and resources can properly take into account evaluation requirements and opportunities. In addition, when evaluation is an integral part of the program portfolio process, evaluation can fully support the portfolio's success through an assessment of the program impacts. This type of integral assessment can also provide a useful comparison to gauge the success of the program's approach to achieving savings and reinforce the pivotal role that evaluation plays in the process. Finally, early consideration of the evaluation process—prior to program implementation—helps ensure that the necessary data will start to be collected once implementation begins (Schiller 2012, p. 8–1).

According to the State and Local Energy Efficiency Action Network (SEE Action), there are various crucial evaluation activities that should start prior to, and during, program implementation. These activities are presented in Figure 11 below along with the four program implementation activities: (1) program goal setting, (2) program design, (3) program launch, and (4) evaluation activity. Evaluation activities required prior to program launch include setting evaluation goals, budgets, schedule and reporting expectations, and preparing preliminary evaluation plans.

Figure 11. Program implementation cycle with high-level evaluation activities



Source: Reproduced from Schiller, Steven. 2012. Energy Efficiency Program Impact Evaluation Guide, Figure 8.1, prepared for the State and Local Energy Efficiency Action Network.

SEE Action recommends that evaluation activities be carried out and results be produced in a timely manner as follows:

> Evaluations should be produced within a portfolio cycle or very soon after the completion of a cycle. This is so evaluation results can document the operations and effects of the programs in a timely manner and provide feedback for ongoing program improvement, provide information to support energy efficiency portfolio assessments (including market assessments and potential studies), and help support the planning of future portfolio cycles, load forecasts, and energy resource plans (Schiller 2012, p. 8-1).

For detailed discussions on the timing of evaluation activities, see Chapter 8 of the SEE Action paper titled *Energy Efficiency Program Impact Evaluation Guide* for conducting impact evaluation, and see Chapter 8 of a TechMarket Works paper titled *The California Evaluation Framework* for conducting process evaluation.

Evaluation budget

SEE Action states that "[w]hile it is difficult to generalize, common practice suggests that a reasonable spending range for evaluation (impact, process, and market) is 3% to 6% of a portfolio budget" (Schiller 2012, p. 7-14). Generally an ideal evaluation budget can be set at the lower side of this range when program size is large. For example, Massachusetts, with an annual program cost of about $22 million (USD), spends about 3.7 percent of the total program cost on program evaluation. Examples of evaluation budget amounts are presented in Table 5 below.

Table 5. Survey of evaluation budget and expenditures

	ME (2014)	CT (2014)	NH (2016 Plan)	MA (2016 plan)	OR (2013 Plan)	RI (2015 plan)	VT (2014)	WI (2013)
% of Total Budget Spent on Evaluation	2.80%	1.70%	4.90%	3.70%	1.60%	1.20%	1.40%	4.70%
Budget/expenditures (USD)	$1.1M	$2.5M	$1.61M	$22.65M	$3.0M	$1.05M	$.76M	$4.74M

Source: Energy Futures Group, Cx Associates, and Wirtshafter Associates. 2016. Review of Efficiency Maine Trust's 2017 - 2019 Third Triennial Plan.

When the program size is small, such as the programs proposed by Maritime Electric, the evaluation budget should be at the higher end of the recommended budget range in terms of percentage of the program cost. This is mainly because there are many costs (e.g., work product development, analysis, and report writing) that are fixed independent of program size (Energy Futures Group, Cx Associates, and Wirtshafter Associates 2016). However, Maritime Electric could minimize its program evaluation budget if it could work with neighboring provinces or regional energy efficiency entities to conduct evaluation studies. For example, program administrators in the northeastern U.S. states often share their resources to work with the Northeast Energy Efficiency Partnership (NEEP) to conduct evaluation studies applicable for their jurisdictions.[18] Such studies include evaluation on measure life, load shape, and incremental cost applicable for these states. Staff members from many regional utilities served as the board members of the technical advisory group for such studies.

[18] NEEP also organizes the Regional Evaluation, Measurement and Verification (EM&V) forum. This forum's main objective is to provide a framework for the development and use of common and/or consistent protocols to measure, verify, track, and report energy efficiency and other demand resource savings, costs, and emission impacts. The goal is to support the role and credibility of these resources in current and emerging energy and environmental policies and markets in the Northeast, New York, and Mid-Atlantic region. Detailed information is available at http://www.neep.org/initiatives/emv-forum.

9.3. Savings Estimates for Program Planning and Annual Reports

When utilities and program administrators prepare energy efficiency program plans or annual reports, they typically estimate the majority of energy and demand savings based on a savings database called a "technical reference manual" (TRM). The remainder of the energy savings estimates—for complex projects such as custom projects—are often based on the performance of historical projects and corroborated by past impact evaluation studies.

A TRM is a database of standardized, region-specific stipulated (or deemed) savings values and stipulated (or deemed) calculations for well-documented energy efficiency measures (Schiller 2012, p. 8-4). Deemed savings value or calculations is one of the approaches for estimating savings impacts. Incorporating past impact evaluation results is also part of the deemed savings approach.

A TRM takes different formats depending on jurisdiction, ranging from reports and spreadsheets to online searchable databases. It can include savings values for measures, engineering algorithms to calculate savings, impact factors to be applied to calculated savings (e.g., net-to-gross ratio values), source documentation, specified assumptions, and other relevant material to support the calculation of measure and program savings—and the application of such values and algorithms in appropriate applications (Schiller 2012, p. 4-8). While many jurisdictions use deemed savings estimates or calculation methods developed in other jurisdictions, it is expected that such "borrowed" deemed values be updated based on each jurisdiction's own evaluation study results. In fact, most U.S. states do modify and update deemed values over time (Kushler, Nowak, and White 2012).

9.4. Impact Evaluation Activities

Overview

As mentioned above, impact evaluation assesses the accuracy and credibility of energy and demand savings estimates. More specifically, impact evaluation analyzes gross- and net-energy and demand-savings impacts as well as non-energy benefits, as defined below by NEEP.

- **Gross savings impacts** refer to the change in energy consumption and/or demand that results directly from program-related actions taken by participants in an efficiency program, regardless of why they participated. Gross impact estimates also account for factors associated with actual measure installations and operations verified though evaluation activities (e.g., data errors, installation and persistence rates, and hours of use), and such estimates are also called "adjusted gross savings."

- **Net savings** impacts refers to the total change in energy that is attributable to an energy efficiency program. This change in energy may include, implicitly or explicitly, the effects of free riders, spillover, energy efficiency standards, changes in the level of energy service, and other causes of changes in energy consumption or demand.[19]

- **Non-energy benefits** refers to the identifiable and sometimes quantifiable non-energy results associated with program implementation or participation. Some examples of non-energy benefits include: reduced emissions and environmental benefits, productivity improvements, jobs created, reduced program administrator debt and disconnects, and higher comfort and convenience levels for participants. The effects of an energy efficiency or resource acquisition program that are other than energy saved often have positive values, but may also have negative values. An example would be the cost of additional heating required to replace the residual heat no longer available from incandescent lamps that have been replaced by CFLs (Northeast Energy Efficiency Partnerships 2011).

This section focuses on gross savings impacts, as the majority of impact evaluation activities focus on estimating these impacts. There are three types of gross impact evaluation approaches: deemed savings approach, project-specific measurement and verification (M&V) approach, and large-scale consumption data analysis. These methods are described in SEE Action (2012) in detail, and summarized in the following sections.

Deemed savings approach

As mentioned above, a deemed savings approach is used to estimate savings impacts for well-documented energy efficiency measures, and for developing a TRM.

Project-specific M&V approach

The project-specific M&V approach is used for various types of programs that involve relatively complex retrofits or new construction projects that are subject to more variation in savings than the type of projects or measures suitable for deemed savings. It is generally applied to only a sample of projects in a program, and often used when other approaches are not applicable (e.g., when no deemed savings exist) or when per project savings are needed (Schiller 2012, p. 4-12). This approach uses one or more methods that can involve measurement, engineering calculations, billing regression analyses, and/or computer simulation modeling. These different methods are described in the International Performance Measurement and Verification Protocols (IPMVP). The M&V approach also typically accompanies field activities dedicated to collecting site information, including equipment counts, observations of field conditions, building occupant or operator interviews, measurements of parameters, and metering and monitoring (Schiller 2012, p. 4-12). Information and data collected through field activities are essential for measuring and verifying savings.

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[19] A free rider is a program participant who would have implemented the program measure or practice in the absence of the program. Spillover effects refer to reductions in energy consumption and/or demand caused by the presence of an energy efficiency program, beyond the program-related gross savings of the participants and without financial or technical assistance from the program.

Large-scale consumption data analysis

Lastly, large-scale consumption data analyses are conducted for programs that have many participants sharing common characteristics, such as single-family detached homes in a particular community with residents of similar economic demographics (Schiller 2012, p. 4-13). This approach is often used for evaluating behavior programs with peer comparison feedback mechanisms. This type of analysis can take two different approaches: (1) a randomized controlled trials (RCT) approach and (2) a quasi-experimental approach combined with a panel data model comparing a treatment group's change in energy use to that of a control group. SEE Action recommends the RCT approach over the quasi-experimental approach because RCT will result in robust, unbiased estimates of program energy savings (Schiller 2012, p. 7-24).

9.5. Recommendations

We have the following recommendations on program evaluation activities for PEI and Maritime Electric.

- **Evaluation oversight**: All of the evaluation studies except a cost-effective analysis should be managed and overseen by IRAC or an independent consultant. All work products and the final report would be reviewed by IRAC or an independent consultant, and Maritime Electric. However, IRAC or an independent consultant would have final say on any issue.
- **Evaluation planning and timing**: Evaluation planning should be an integral part of program designs. The evaluation planning should begin when programs are being designed so that the program budget, schedule, and resources can properly take into account evaluation requirements and opportunities.
- **Evaluation budget**: PEI and Maritime Electric should seek collaboration in conducting joint evaluation studies with neighboring utilities, provinces, or regional organizations where it makes sense in order to reduce PEI's program evaluation budget.
- **TRM**: PEI and Maritime Electric should develop a TRM first by reviewing TRMs adopted in neighboring provinces or states. After the first TRM is developed, PEI and Maritime Electric should update its TRM annually based on findings from new evaluation studies.

10. Electricity Tariffs to Encourage Energy Efficiency and Conservation

10.1. Principles of Rate Design

The rate structure defines the manner in which revenues are collected from each customer class for its use of utility service. Rates are typically composed of some combination of the following three types of charges:

- Fixed charge: dollars per customer
- Energy charge: cents per kWh used
- Demand charge: dollars per kW of maximum power used[20]

Many combinations and variations of rates are possible, including time-of-use rates (where the energy charge varies based on the hour of the day), inclining block rates (where the energy charge becomes more expensive as usage increases), and seasonal rates.

Rates are designed to satisfy numerous objectives, some of which may be in competition with others. In *Principles of Public Utility Rates,* Professor James Bonbright enumerated his guiding principles for rate design, which have been subsequently adopted by numerous commissions. These principles can be summarized as follows:

1. Sufficiency: Rates should be designed to yield revenues sufficient to recover utility costs.
2. Fairness: Rates should be designed so that costs are fairly apportioned among different customers, and "undue discrimination" in rate relationships is avoided.
3. Efficiency: Rates should provide efficient price signals and discourage wasteful usage.
4. Customer acceptability: Rates should be relatively stable, predictable, simple, and easily understood.

Rate design is typically addressed in utility rate cases, but public utility commissions and lawmakers have periodically taken up the issue on their own initiative in order to better serve policy goals. In fact, many of the most innovative and successful rate designs for promoting conservation and efficiency stem from public policy directives. Several of these examples are described in the case studies section below.

Current Rate Structure

Maritime Electric's current rate structure is largely a legacy of conditions and practices from past decades. The rate structure was adopted from NB Power in 1994, and reflected the desire to promote additional electricity usage during the early years of electrification.[21] Maritime Electric's residential rates consist of a high monthly fixed charge of $24.57 for urban customers ($26.92 for rural customers) coupled with a declining block rate, whereby the energy charge decreases from 13.16 cents per kWh to 10.38 cents per kWh for usage greater than 2,000 kWh per month.

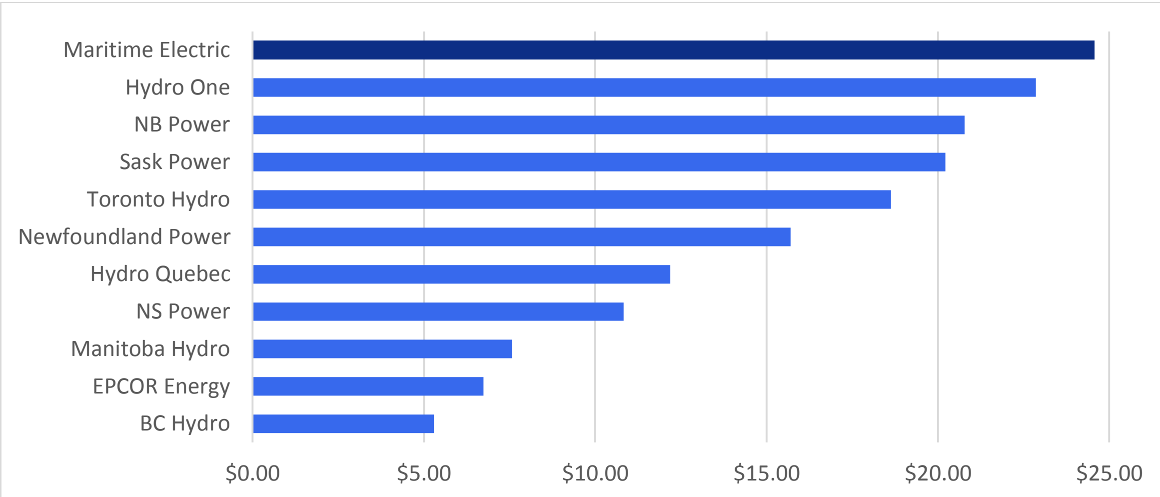
Based on our review of current utility tariffs, Maritime Electric is the only electric utility in Canada that maintains a declining block residential rate structure. The majority of Canadian utilities surveyed have

[20] Demand charges are typically applied only to medium to large commercial and industrial customers.

[21] Maritime Electric, General Rate Case Application and Evidence, October 28, 2015, p. 103.

flat rate structures, while three—BC Hydro, Toronto Hydro, and Hydro Quebec—have inclining block rate structures. PEI's residential customers also face the highest fixed charges in the country, as shown in the graph below.

Figure 12. Survey of residential fixed charges across Canadian provinces



Note: Fixed charges based on urban residential rates. Rural rates are generally higher.
Source: Utility tariff sheets as of March 1, 2016.

10.2. Rate Design's Impacts on Energy Efficiency and Conservation

Electricity rates can play a pivotal role in encouraging energy efficiency and conservation through sending customers strong price signals to reduce excess energy consumption. Because energy efficiency and conservation allow customers to reduce the variable portion of their electricity bills, bills that are based more on variable rates increase the value of energy efficiency investments and the incentive provided to customers to reduce energy consumption. Effective rate designs should communicate to customers the long-run marginal cost associated with their energy consumption. As Professor Bonbright wrote, the timeframe associated with such marginal costs should enable us to treat "even capital costs or capacity costs as variable costs" (Bonbright 1961, 336).

In contrast, high fixed charges reduce the value of conservation and extend the payback period of energy efficiency investments, since energy efficiency and conservation will not help to reduce these charges. Similarly, declining block rates, which charge lower prices for high energy usage, reduce customers' incentives to curtail excess usage. Maritime Energy is well aware of this effect, noting that the declining block rate "communicates inappropriately that the value of energy decreases with each kWh consumed. This runs contrary to a price signal that promotes energy conservation" and causes the utility to incur additional energy and demand costs to meet this load (Maritime Electric 2015, 103–104).

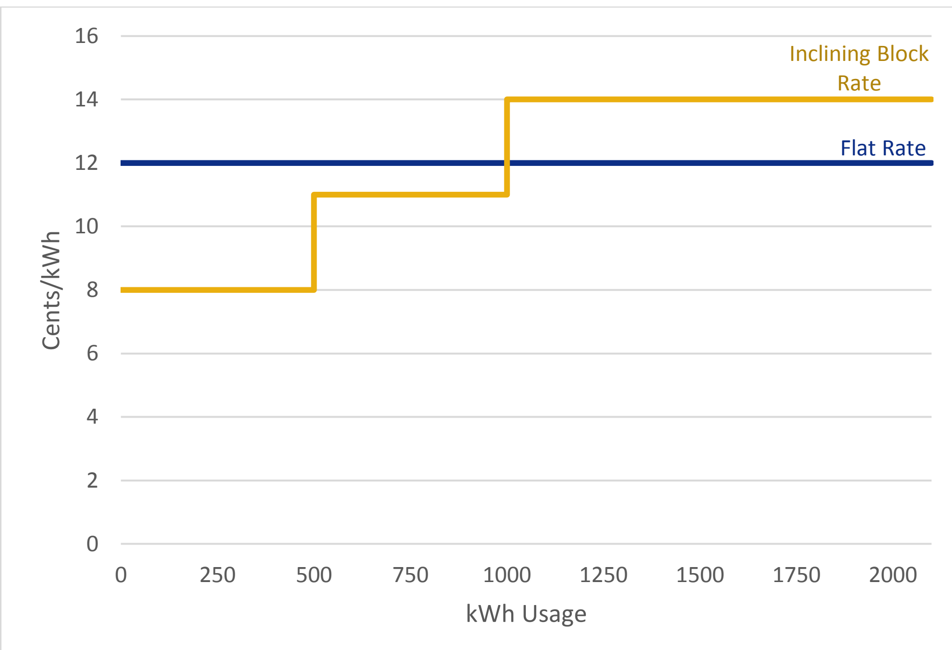
Jurisdictions with advanced metering infrastructure have begun to implement a variety of innovative rate designs that seek to provide customers with more accurate price signals and incentives to reduce their consumption. These rate designs include time-of-use rates, critical peak pricing, and peak time rebates.

However, even without advanced metering, utilities can make two simple changes to their rate structures to encourage efficiency and conservation: adoption of inclining block rates, and reduction (or elimination) of the monthly fixed charge. If a utility desires a mechanism for ensuring that all customers contribute a minimum amount toward the utility's costs each month, a minimum bill (discussed below) offers a good alternative to a fixed charge.

Inclining Block Rates

Inclining block rates (also called "inverted block rates" or "step rates") increase the price of energy as usage increases. For example, Figure 13 below shows a three-step inclining block rate compared to a flat rate. The first block is set at $0.08/kWh for the first 500 kWh, while the next 500 kWh are priced at $0.11, and all remaining usage is priced at $0.14/kWh. Most inclining block rate structures are limited to two or three tiers, although some utilities in the United States have implemented as many as five tiers.

Figure 13. Inclining block rate illustration



The inclining block rate structure has several impacts. First, low-usage customers are rewarded for maintaining their usage at low levels. Second, high-usage customers reap substantial rewards for investments in energy efficiency, since reducing consumption in the tail block translates into far greater savings than reducing consumption in a lower block.

While inclining block rates provide positive conservation signals, there are several factors to consider when designing them:

- The price difference between higher and lower blocks must be great enough to provide a meaningful price signal to customers.

- A review of customer bill impacts is necessary prior to implementing the rate structure, and mitigating measures may be required. For example, customers with electric heat[22] or other end-use categories (such as farms)[23] could be placed into separate rate classes to mitigate negative bill impacts.

- Customer education is essential, and should include information regarding energy efficiency measures and conservation strategies available to help customers move into lower tiers.

Reduction or Elimination of Fixed Charges

Utilities often advocate for high fixed charges, as the more revenue they can collect through a fixed monthly charge, the lower the risk of revenue under-recovery. This can be an important issue for utilities with stagnating or declining sales. However, fixed charges can have a chilling impact on energy efficiency achievements. Under a revenue-neutral rate design, an increase in the fixed charge would be offset by a decrease in the variable energy (or demand) charge. Reducing or eliminating the fixed charge reverses this effect and makes energy efficiency (or distributed generation) investments more valuable to customers.[24]

Where revenue certainty is a concern for a utility, it can be addressed through other means. These include revenue decoupling or minimum bills. Minimum bills are similar to fixed charges, but with one important distinction: minimum bills only apply when a customer's usage is so low that his or her total monthly bill would otherwise be less than this minimum amount.[25] In this way, minimum bills preserve energy price signals for the majority of customers. The threshold that triggers the minimum bill is typically set well below the average electricity usage level, and thus most customers will not be assessed a minimum bill but will instead only see the energy charge (cents per kWh).

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[22] San Diego Gas and Electric's tiered rates vary based on dwelling type, permanent heating method, and location in the state.

[23] BC Hydro's tiered rate structure provides for an exemption for farms.

[24] For example, a 2007 study estimated that if the fixed charge were eliminated by increasing the electric rate in the United States, electricity consumption would be reduced by 6.4%. See: (Pearce and Harris 2007).

[25] Minimum bills are currently used by the California investor-owned utilities, the Hawaii utilities, and many Texas retail electricity providers.

10.3. Examples from Other jurisdictions

BC Hydro

In 2008, BC Hydro implemented a two-tier inclining block rate structure for its residential customers. Currently the rate structure has a low fixed charge of approximately $5.29 per month. Electricity consumption is priced at $0.0797/kWh for the first 675 kWh per month, while additional consumption is $0.1195/kWh. The first tier threshold was set at approximately 90 percent of median residential consumption, and the price for the second tier was established at BC Hydro's estimated cost of new energy supply.[26] A 2014 evaluation of the rate structure concluded that the rate structure had resulted in incremental energy savings ranging from 11 GWh for the low-end estimate in the year of the lowest savings to 202 GWh as the high-end savings in the year of the highest savings from the years 2009 to 2012. In addition, the rate structure was estimated to have resulted in peak demand savings of between 2 MW and 43 MW (BC Hydro 2014, vi).

BC Hydro's rate structure was spurred largely by policy goals of encouraging energy efficiency and conservation. For example, the 2007 Energy Plan set out the goal of building on a "culture of conservation" through exploration and development by utilities of rate designs to encourage efficiency and conservation. It further directed utilities to propose innovative rate designs—including stepped rates—to the Commission to encourage efficiency, conservation and the development of clean or renewable energy.[27]

In early 2008, BC Hydro submitted its residential inclining block rate application, together with results of stakeholder and customer research and an evaluation of bill impacts on various types of customers (BC Hydro 2008). After consideration of several different inclining block rate designs, the Commission accepted an "inclining block rate structure with a specified standard threshold as a suitable design approach to a residential conservation rate and finds it to be in the public interest" (British Columbia Utilities Commission 2008, 51).

Massachusetts

In the United States, those states with the highest levels of energy efficiency attainment tend to also have rate structures that support conservation and energy efficiency. Massachusetts is no exception.

Since 2011, Massachusetts has led the United States in energy efficiency, according to ACEEE's annual state scorecard rankings. State energy efficiency and conservation goals are supported by a rate structure that features a low customer charge and inclining block distribution rates. This rate structure stems from 2009, when the Massachusetts DPU concluded that "the design of distribution rates should be aligned with important state, regional, and national goals to promote the most efficient use of

[26] Grossed up for losses. The first tier price was then set to maintain revenue neutrality. *See* (BC Hydro 2014).

[27] British Columbia 2007 Energy Plan.

society's resources and to lower customers' bills through increased end-use efficiency. To best meet these goals, rates should have an inclining block rate structure…." (Massachusetts Department of Public Utilities 2009, 249).

An example of this rate structure, shown in the table below, is National Grid's current set of residential rates. The customer charge is set at $4.00 per month, and the distribution charge increases slightly after 600 kWh per month. It should be noted, however, that Massachusetts' utilities are distribution-only, and thus supply charges can vary depending on the provider. Currently, basic service for energy supply is billed based on a flat kWh charge, regardless of usage quantity.

Table 6. National Grid residential rates

Customer Charge	$4.00/month
Distribution Charge	
*First 600 kWh**	3.977¢/kWh
*Excess of 600 kWh**	4.639¢/kWh

Source: National Grid Website, March 1, 2016, http://www9.nationalgridus.com/masselectric/home/rates/4_res.asp.

Massachusetts utilities did not always have an inclining block rate structure. In fact, when the DPU concluded that utilities should have inclining block rates, New England Gas Company (NEGC) had a declining block rate structure. To avoid a sudden decline in sales revenue and to promote rate continuity, the DPU decided to phase in the inclining block structure by first moving to a flat rate structure until the next rate case" (Massachusetts Department of Public Utilities 2009, 249).

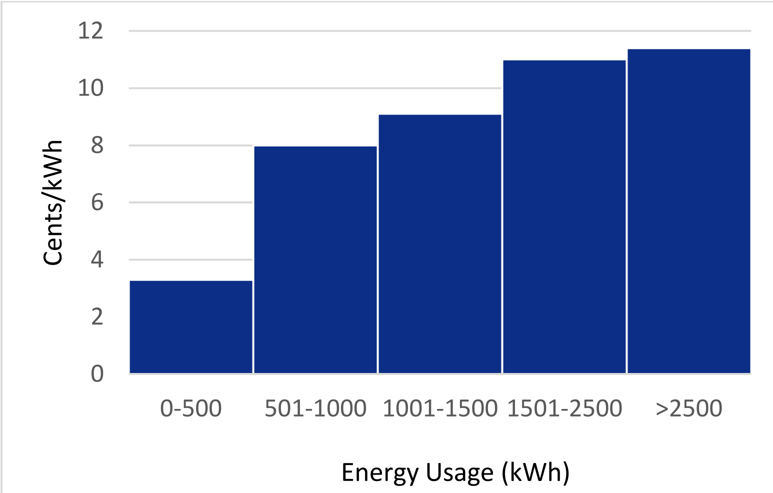
Austin Energy

The City of Austin, Texas, places great emphasis on energy efficiency and protecting the environment. Accordingly, the Austin City Council has established energy efficiency goals and a five-tier residential inclining block rate structure to reward customers who use less electricity (Austin Energy 2016).

For residential customers, the utility's rate structure consists of a $10.00 monthly customer charge, plus steeply inclining energy rates as shown in the chart below.

In addition to adopting an inclining block rate structure, Austin Energy provides its rates, energy efficiency resource links, and policy goals together on its website, helping to make the connection between these elements clear to customers. The utility's website states: "With the five-tier rate structure, you can see how lowering your electric usage can result in lower bills. You can lower your electric usage by modifying your energy use or by making energy-efficiency improvements to your home."

Table 7. Austin residential energy rates



Recommendations

Sound rate design approaches will provide customers with efficient price signals that will ultimately result in the least-cost mix of supply-side and demand-side resources over the long term. Sound rate design is also a no-cost option to encourage customers to adopt energy efficiency and other distributed energy resources. Maritime Electric's residential rate design, with its high fixed charges and declining block rates is a prime candidate for reform.

As noted in the introduction to this chapter, rate design must balance multiple competing objectives. In particular, the principle of gradualism cautions against sudden changes in electricity rates. For this reason, we recommend that the Commission improve rate design in several steps:

- In the next Maritime Electric rate case, the Commission should (a) eliminate the current declining block rate and replace it with a flat energy rate; and (b) reduce the fixed customer charge and increase the energy rate. Both modifications should be done in a revenue neutral fashion.
- In this same rate case, the Commission should consider whether or not it is appropriate to create new, separate rate classes for residential space heating customers and farm customers.
- In the subsequent Maritime Electric rate case, the Commission should (a) introduce an inclining block rate; and (b) reduce the fixed customer charge further. Again, both modifications should be done in a revenue neutral fashion.

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Quick Start Program References

In 2014, the Southeast Energy Efficiency Alliance authored a best practices report, entitled *Energy Efficiency Quick Start Programs: A Guide to Best Practices*, that is specific to quick-start programs (Southeast Energy Efficiency Alliance 2014).

Various Program References

The American Council for an Energy Efficient Economy (ACEEE) is a great resource for best practices in energy efficiency program design. Every five years, ACEEE publishes a national review of exemplary energy efficiency programs in the United States. Please reference the most recent report published in 2013 (Nowak et al. 2013).

Energy efficiency plans and reports from some of the top-ranked northeastern U.S. states—including Massachusetts, Rhode Island, Vermont, and Connecticut—feature program designs that are worth reviewing. Materials for most states can be accessed through their Public Utility Commission websites. Massachusetts energy efficiency plans and reports are available through the Massachusetts Energy Efficiency Advisory Council website at www.ma-eeac.org. Vermont energy efficiency plans and reports are on Efficiency Vermont's website at https://www.efficiencyvermont.com/about/annual-plans-reports.

Appendix 1. Energy Efficiency Programs Implemented in Selected Regions

Northeastern U.S. States

State	MA	ME	CT	VT	NH	RI
Residential Programs						
New Homes	Residential New Construction & Major Renovation		Residential New Construction	Residential New Construction	ENERGY STAR Homes	Residential New Construction
Existing Homes						
Single-Family Retrofit	Residential Home Energy Services	Home Energy Savings	Home Energy Solutions	Existing Market-Rate Homes (Single-Family Homes)	NH Home Performance w/Energy Star	EnergyWise
Multi-Family Retrofit	Residential Multi-Family Retrofit	Home Energy Savings (up to four units)	Home Energy Solutions	Existing Market-Rate Homes (Multi-Family Homes)		EnergyWise Multi-Family
Lighting	Residential Lighting	Consumer Products (Retail Lighting Initiative)	Consumer Products	Retail Efficient Product Services	ENERGY STAR Lighting	ENERGY STAR® Lighting
Products						
Product Replacement	Residential Cooling & Heating Equipment, Residential Consumer Products	Consumer Products	Consumer Products	Retail Efficient Product Services	ENERGY STAR Appliances	ENERGY STAR® HVAC, ENERGY STAR® Products
Appliance Recycling	Residential Home Energy Services, Residential Multi-Family Retrofit			Retail Efficient Product Services	ENERGY STAR Appliances	EnergyWise, EnergyWise Multi-Family
Behavior	Residential Behavior/Feedback		Residential Behavior	Home Energy Reports (HERs)		Home Energy Reports
Commercial and Industrial Programs						
New Construction	C&I New Construction		Energy Conscious Blueprint	Business New Construction	Large Business Energy Solutions, Small Business Energy Solutions	Large Commercial New Construction
Existing Buildings/Processes						

State	MA	ME	CT	VT	NH	RI
Small Commercial Retrofit	C&I Direct Install	Small Business Direct Install Pilot	Small Business	Small- and Medium-Sized Businesses	Small Business Energy Solutions	Small Business Direct Install
Large Commercial Retrofit	C&I Retrofit	Business Incentive Program	Energy Opportunities, O&M	Vermont's Largest Energy Users	Large Business Energy Solutions	Large Commercial Retrofit
Large Customer Self-Direct	Available to the five largest customers in every service territory.			Customer Credit Program		
Strategic Energy Management	Building Operator Certification		Business Sustainability Challenge (BSC); PRIME	Continuous Energy Improvement Pilot		Strategic Energy Management Planning (SEMP), Building Operator Certification, Industrial Initiative
Retrocommissioning	C&I Retrofit		RetroCx			Retro-commissioning (RCx)
Industrial Processes	C&I Retrofit	Large Customer	PRIME	Small and Medium-Sized Businesses, Vermont's Largest Energy Users		Large Commercial Retrofit
Products	part of New Construction and Retrofit programs	Consumer Products	Energy Opportunities program			part of C&I programs
			Cross-Sector Programs			
Building Code and Appliance Standard Support	Codes and Standards Initiative			Codes and Standards Support		Codes and Standards initiative
Data Source	2014 annual energy efficiency program reports by all electric program administrators, http://ma-eeac.org/results-reporting/annual-reports/	Efficiency Maine FY2015 Annual Report, http://www.efficiencymaine.com/docs/2015-Efficiency-Maine-Annual-Report.pdf; Efficiency Maine's website, http://www.efficiencymaine.com/	Connecticut Energy Efficiency Fund. Energy Efficiency Board 2014 Programs and Operations Report, March 1, 2015, http://acadiacenter.org/wp-content/uploads/2015/03/2014-EEB-Annual-Legislative-Report-Final-3-1-15.pdf	Efficiency Vermont. Savings Claim Summary 2015, April 1, 2016, https://www.efficiencyvermont.com/Media/Default/docs/plans-reports-highlights/2015/efficiency-vermont-savings-claim-summary-2015.pdf	NH CORE Utilities. 2013-2014 CORE New Hampshire Energy Efficiency Programs. NHPUC Docket No. DE 12-262. September 17, 2012, revised December 20, 2012; NH Core Energy Efficiency Programs, 4th Quarter Report: January 2014 - December 2014, NHPUC Docket No. DE 12-262. March 2, 2015	2014 National Grid Report, Attachment 1: Electric Summary Tables of Year End Results, Table E-1: Summary of 2012 Target and Year End Results

Atlantic Canadian Provinces

State	NS	NB	NF
Residential Programs			
New Homes	New Residential		
Existing Homes			
Single-Family Retrofit	Residential Direct Install, Home Energy Assessment, Green Heat, Residential Solar	Home Retrofit; Water Saving Devices	takeCHARGE Rebate
Multi-Family Retrofit	Rental Properties and Condos (Existing Residential), Rental Properties and Condos Common Areas services (BNI Direct Installation)	Home Retrofit	
Lighting	Efficient Products Rebates	Mass Market Energy Efficient Products	takeCHARGE Rebate
Products			
Product Replacement	Efficient Products Rebates	Mass Market Energy Efficient Products	takeCHARGE Rebate
Appliance Recycling	Efficient Products Rebates		
Behavior	Energy Savings Actions	Home Energy Report	
Commercial and Industrial Programs			
New Construction	Custom New Construction		
Existing Buildings/Processes			
Small Commercial Retrofit	Business Energy Solutions	Small and Medium Commercial Customers Direct Install Program	takeCHARGE Business Efficiency Program
Large Commercial Retrofit	Custom Retrofit, Business Energy Solutions	Energy Smart	takeCHARGE Business Efficiency Program
Large Customer Self-Direct			
Strategic Energy Management	Energy Management Information Systems	Large Industries Custom	
Retrocommissioning	Custom Existing Building Commissioning		

State	NS	NB	NF
Industrial Processes	Custom Retrofit	Large Industries Custom	takeCHARGE Business Efficiency Program
Products	Efficient Product Rebates	Prescriptive Energy Efficiency Program, LED Street Lighting	takeCHARGE Business Efficiency Program
Cross Sector Programs			
Building Code and Appliance Standard Support	Codes and Standards	part of Enabling Strategies	
Data Source	EfficiencyOne 2015. Evidence of EfficiencyOne as Holder of the Efficiency Nova Scotia Franchise. Filed February 27, 2015. Case No. M06733, http://uarb.novascotia.ca/fmi/iwp/cgi?-db=UARBv12&-loadframes	2014/15-2016/17 Electricity Efficiency Plan, Plan Overview, Prepared for the New Brunswick Department of Energy and Mines with the assistance of Dunsky Energy Consulting, July 2014, http://www2.gnb.ca/content/dam/gnb/Departments/en/pdf/Publications/EfficiencyPlanExecutiveSummary.pdf	takeCHARGE website, https://takechargenl.ca/

Appendix 2. Examples of Best Practice Program Design

Residential Whole-Home Program

Residential whole-home programs are the most comprehensive form of residential retrofit program. These programs are designed to identify and capture most, if not all, of the cost-effective savings over a relatively short period of time. Eligible customers typically include residential customers on standard rates living in single-family detached homes and townhomes of up to four units (Nowak et al. 2013). These programs are generally characterized by a one-stop shopping experience, deep relationships with contractors, and incentive packages to drive greater savings.

- **One-stop shopping**. One-stop shopping streamlines program delivery and simplifies processes. A streamlined, simple process can make it easier for customers to implement measures and thus maximize program participation. Key elements of a one-stop shopping approach include: (1) establishing a single point of contact for the customer throughout project planning and implementation, and (2) coordination across electric program administrators and between electric and gas program administrators. In Massachusetts, lead vendors administer programs, often conduct the initial audit, are the key point of contact for customers through implementation, and provide quality assurance for each project. Lead vendors, who hire and manage the contractors, are selected through a competitive bidding process. This market model is consistent across all electric and gas program administrators in Massachusetts (Nowak et al. 2013). Also, programs that address multiple energy types produce deeper savings per participant and are generally more cost effective than separate, single-fuel programs as they reduce redundant administrative costs.
- **Deep relationships with contractors**. Contractors are also served by programs. Deep relationships with contractors: (1) increase adoption of energy efficiency measures, (2) improve quality and service for customers, and (3) inform improvements to program design. Contractors that are well-educated about program offerings can effectively market energy efficiency to their customers. Conversely, partnerships between contractors and energy efficiency programs often expand contractor business to new customers. Program administrators that know their contractor base can develop sound eligibility standards for contractors to participate in their programs. Contractors who want to participate in delivery of energy efficiency programs may need to improve the quality of their service in order to be eligible. Program administrators that invite top contractors into the program design process can increase contractor involvement in and support of programs, as these individuals have a vested interest in programs and a desire to get other contractors involved (Nowak et al. 2013).
- **Incentive packages to drive deeper savings**. Program administrators combine no-cost measures, tiered incentives (higher rewards for greater savings), and financing to ensure customers can move forward with comprehensive projects that capture all of the available energy savings opportunities. No-cost measures include education during the audit as well as instant savings measures such as lighting, smart strips, low-flow showerheads, faucet aerators, and programmable thermostats. All of these measures

are implemented the day of the audit. Instant savings measures achieve savings that exceed the cost of the audit. Tiered incentives for larger equipment such as heating and cooling systems help customers make the most efficient choice by offsetting the incremental cost to purchase the more efficient piece of equipment. Financing covers all of the remaining upfront cost, leaving the customer with smaller payments over time that are more than offset by their energy savings (Nowak et al. 2013).

Low-Income Program

Eligible customers typically include residential customers on low-income rates living in single-family detached homes and townhomes of up to four units, or in multi-family homes. Customers in single- and multi-family homes are typically served through two separate programs. Low-income customers experience additional barriers to participation in energy efficiency programs, including limited time and money to commit to energy efficiency projects. In some areas, language may be a barrier to program participation. Also, low-income customers may be wary of interacting with utilities that have the ability to shut off service for nonpayment. Low-income programs often have varied eligibility requirements. In the United States, eligibility is often based on a percentage of the federal poverty guidelines (frequently, less than or equal to 200 percent) or a percentage of state or area median income level. Program administrators can increase the reach of their low-income programs by implementing a one-stop shopping program design, improving program coordination and partnerships, and concurrently addressing health and safety issues in homes.

- **One-stop shopping**. In addition to all of the benefits mentioned in the Residential Whole-Home section above, consistent low-income eligibility requirements reduce the administrative burden for participants and program administrators alike (Nowak et al. 2013).

- **Program coordination and partnerships**. Partnerships are important for all programs, but play a special role in low-income program delivery. Partnerships can enable program administrators to leverage multiple funding sources as well as marketing and delivery resources (ratepayer, state, federal, or other). Thus they can achieve more than any single organization could on its own. In collaboration with National Grid of Massachusetts, Action Inc. leverages federal and state funding sources to provide more comprehensive services through the Low-Income Retrofit program than would be possible using ratepayer funding alone. Partnerships also enable program administrators to reach customers who may be more likely to interact with a familiar organization than their utility. In the United States, community action agencies provide services for federally funded weatherization programs. Many low-income programs use these agencies to help identify and qualify potential participants and to provide direct services to low-income customers. These community action agencies are generally well connected with and trusted by the target population (Nowak et al. 2013).

- **Addressing health and safety issues**. Although health and safety issues are common in many residential homes, they are more prevalent and often more serious in low-income properties. Many jurisdictions require health and safety issues to be resolved before energy efficiency measures can be implemented, precluding capture pf energy savings in many homes. Programs like New Jersey's Comfort Partners program, which reviews, tests, and corrects for a wide range of health and safety issues in participants' homes, can achieve greater participation and more energy savings as more homes are eligible for programs. Further, these energy savings offer significant benefits to society: Low-income customers can apply bill savings to other needs and also reduce the health care costs that result from inhabiting poorly insulated and ventilated homes (Nowak et al. 2013).

Commercial & Industrial Retrofit Program

Commercial and industrial retrofit programs provide energy savings for a wide range of existing commercial businesses and industrial buildings and processes. Given the diversity of this customer group, these programs benefit from highly targeted marketing efforts. Additionally, performance-based incentives will help to tap into significant savings opportunities.

- **Targeted marketing.** Commercial businesses include restaurants, office buildings, hospitals, universities, and grocery stores. Each type of industry has vastly different energy uses, equipment, and needs. As a result, program administrators are segmenting customers by industry type and assigning them sales representatives with industry-specific expertise. Using this approach, account executives can serve more customers than just the largest customers and help determine customer needs and priorities. In addition to better marketing, the tailored training of sales representatives on industry-specific energy efficiency solutions leads to an increase in the ability of utilities to capture savings (Kwatra and Essig 2014).
- **Performance-based incentives**. Performance-based incentives are structured as the incentive offered per unit of energy saved. They drive greater savings because the incentive increases as the energy savings increase. The optimal incentive designs (such as California's Savings by Design Program) increase using a step function, which provides a significant increase at certain savings levels. This is in contrast to a linear relationship, which would provide a much more marginal increase. A multi-year energy savings plan can be required in conjunction with the performance-based incentive. In New Jersey's Pay for Performance program, building owners establish a baseline of existing energy use and develop an energy reduction plan, including goals and measures that will be installed to achieve the goals. Incentives are then designed to reward the building owner for achieving or even exceeding the goal. Program administrators can provide incentives at several key milestones during the process to motivate businesses to complete the project. They can also provide bonuses for installation of multiple measures to motive businesses to achieve more savings (Kwatra and Essig 2014; York et al. 2013).

Small Business Program

Small business programs typically target customers with electric demand of up to 100 or 200 kW. Small business customers are difficult to serve and typically cost more to serve due to: (1) diversity of business types, energy use, savings opportunities, financial needs, languages spoken, and culture; (2) constraints in time and money; (3) lack of building managers or operators to address building energy use; and (4) low awareness of energy use and savings potential. Program administrators can increase the reach of their small business programs by implementing a one-stop shopping program design, improving incentive design, better segmenting their customers, and using a sales-focused marketing approach.

- **One-stop shopping**. The most widely adopted strategy to help overcome major barriers unique to this customer segment is to provide a one-stop shopping, full-service program that brings all of the necessary services to small business customers. Small businesses typically do not have the expertise or bandwidth to provide the technical analysis supplied by the program administrators.

- **Incentive design**. A best practice for small businesses is to offer generous incentives along with low- or zero-interest rate loans. For example, the Small Business Energy Advantage program offered by both United Illuminating Company and Connecticut Light and Power packages together an audit, significant incentives, and loans for a range of products. The more comprehensive the project, the greater the incentive offered. The impact of the loans on participation is significant for small businesses, driving 50-67 percent participation for those who qualify for a loan versus 20 percent for those who do not (Nowak et al. 2013).

- **Market segmentation**. A good strategy to encourage higher participation at a lower cost is to target sub-segments of customers with similar needs and equipment, such as convenience stores. Program administrators can better meet the specific needs of this sub-segment through customized marketing and by developing packages of measures that are most applicable to these businesses (Kwatra and Essig 2014; York et al. 2015).

- **Sales-focused marketing**. The best small business programs sell efficiency services and products to customers in a way that meets each potential customer's unique needs and concerns (York et al. 2015). After adopting this marketing approach and hiring auditors with significant sales experience, Minnesota's One-Stop Efficiency Shop program significantly increased participation rates over many years (Funk 2012).