4. Identifying of Cost-Effective Opportunity

4.1 FY2020-FY2022 Program Budgets

Table 1: Electric Program Budgets

Program	FY 2020	FY2021	FY2022
C&I Custom Program	$3,919,730	$3,919,730	$3,919,730
C&I Prescriptive Program	$12,706,092	$12,817,031	$12,927,969
Small Business Initiative	$2,682,187	$2,682,187	$2,682,187
Distributor Initiatives	$9,045,598	$9,045,598	$9,045,598
Retail Initiatives	$6,021,126	$5,443,704	$4,946,273
Home Energy Savings Program	$4,933,979	$5,461,295	$5,988,612
Low-Income Initiatives	$6,047,500	$6,047,500	$6,047,500
Total	**$45,356,212**	**$45,417,045**	**$45,557,868**

Table 2: Natural Gas Program Budgets

Program	FY 2020	FY2021	FY2022
C&I Custom Program	$115,791	$115,791	$115,791
C&I Prescriptive Program	$569,756	$569,756	$569,756
Distributor Initiatives	$154,173	$154,173	$154,173
Home Energy Savings Program	$131,147	$128,761	$126,375
Low-Income Initiatives	$97,087	$96,848	$96,610
Total	**$1,067,954**	**$1,065,329**	**$1,062,705**

Table 3: Unregulated Fuel Program Budgets

Program	FY 2020	FY2021	FY2022
C&I Custom Program	$205,069	$2,130,954	$2,130,954
C&I Prescriptive Program	$629,910	$629,910	$629,910
Distributor Initiatives	$1,251,136	$1,251,136	$1,251,136
Retail Initiatives	$1,537,467	$1,537,467	$1,537,467
Home Energy Savings Program	$2,779,018	$1,672,133	$1,672,133
Low-Income Initiatives	$711,400	$802,400	$802,399
Total	**$7,114,000**	**$8,024,000**	**$8,024,000**

For detailed FY2020-FY2022 financial information, see Appendix A: Budgets.

4.2 MACE Quantification Methodology

4.2.1 MACE Definition

The Efficiency Maine Trust Act includes a mandate for the Trust to capture all cost-effective energy efficiency opportunity that is reliable and achievable.[1] The Commission refers to this concept as "MACE" – "maximum achievable cost-effective" energy efficiency:

> In the Commission's dockets relating to the Trust, it has become colloquial to refer to the acronym MACE, which arises from how the Trust's studies have evaluated all cost-effective potential for energy efficiency savings. These studies refer to maximum achievable cost-effective energy efficiency, or MACE. Title 35-A directs the Commission to approve all cost-effective, reliable, and achievable energy efficiency savings. 35-A M.R.S. § 10104(4). The Commission treats and refers to MACE as synonymous with the standard set by Title 35-A. *Efficiency Maine Trust, Request for Approval of Second Triennial Plan*, Docket No. 2012-00449, Order at 12 (March 6, 2013).[2]

MACE potential is the amount of cost-effective energy that can realistically be saved, taking into account the following considerations:

- Real-world barriers to end users' adoption of efficiency measures (e.g., upfront costs, supply chain limitations, lack of customer awareness, unwillingness (or reluctance) to participate in programs, technical constraints);
- Non-measure costs of delivering programs (for administration; marketing; analysis; and evaluation, measurement and verification (EM&V));
- Ability and capacity of programs and administrators to boost program activity over time;
- Policy or regulatory constraints; and
- Other market-specific barriers that the "program intervention" is modeled to overcome.

Achievable potential also screens out certain measures that, while cost-effective, have an incidence and magnitude of free-ridership that cannot be mitigated and, when factored into estimates of future net savings, would render the measure not cost-effective. An example of a measure that is cost-effective but not captured in achievable potential savings is an efficient dehumidifier. While certain models of dehumidifiers save enough energy to be cost-effective, the incremental cost of these models compared to standard efficiency models is negligible and is assumed to lead to high levels of free-ridership that would be very difficult to mitigate.

4.2.2 Benefits and Costs Calculations

The Trust follows the standard practice of energy efficiency programs by estimating benefits and costs based on the difference between two scenarios: (1) the baseline (i.e., what would have happened if not for the program), and (2) an efficient alternative that ultimately happens as a result of the program. The Trust uses the same benefits and costs in calculating MACE as it does in program implementation. All the relevant benefit and cost values are captured in the Trust's Technical Reference Manuals (TRMs). The TRMs serve as a central repository and common point of reference for the methods, formulas,

[1] 35-A MRS §10110(4-A), 35-A MRS §10111(2).

[2] State of Maine Public Utilities Commission, *Efficiency Maine Trust, Request for Approval of Third Triennial Plan*, Docket No. 2015-00175, Order at 3, n.3 (July 6, 2016).

assumptions, and sources that are used to estimate benefits from energy-efficiency measures, and provide a common platform for analyzing energy savings across measures and programs. These TRMs are described in further detail in Chapter 6.1. This section provides a high-level overview of some related considerations and assumptions that go into the Trust's assessment of cost-effective opportunity.

Establishing the Baseline

The baseline represents the starting conditions, or what would have happened if not for the energy efficiency program. Establishing the baseline allows for comparison between energy use with and without an energy efficiency upgrade. Considerations include assumptions about whether the average customer would have installed less efficient equipment or if they would have continued to use existing equipment.

Several sources of information support the Trust's baseline analysis. First, the Trust considers what customers are *required* to do or have done based on regulatory codes and standards. For example, in establishing the baseline for residential boilers, the Trust looks at the federal minimum efficiency standards for residential heating systems. Second, the Trust conducts market research to gain a better understanding of what types of equipment are being sold at Maine's retailers and distributors, and of how customers respond to different promotional conditions. For example, the LED Lighting Price Trial Results (Appendix F) characterized the universe of lighting products for sale at several different stores and analyzed changes in customer behavior in response to price and marketing shifts. Third, the Trust assesses the current universe of installed equipment. For example, as part of Triennial Plan IV, the Trust commissioned a baseline study on the state of commercial and industrial lighting in Maine (see Appendix D). This study inventoried lighting in use at 76 facilities to document the existing baseline and assess the potential opportunity for lighting efficiency upgrades.

Assigning the relevant decision type that characterizes a customer's decision to undertake an energy upgrade is an important consideration in establishing the baseline. Decision types fall into one of two categories: (1) lost opportunity or (2) retrofit.

Lost opportunities cover measures such as those undertaken during new construction projects and planned equipment purchases. Planned equipment purchases include adding new equipment to an existing facility, whether in connection with remodeling, expansion, or otherwise, as well as "replacement on burnout" when equipment fails beyond repair or nears the end of its useful life. In all these cases, if the customer does not choose an efficiency upgrade, there will not be another economical opportunity to upgrade the equipment for many years. The opportunity to influence the adoption of high-efficiency equipment in new construction or expansion scenarios occurs at the point when new equipment is being specified and installed. The potential for upgrades in a given year is determined by the rate of new construction and consumer facility upgrade plans. For "replacement-on-burnout" scenarios, the potential for upgrades in a given year is determined by equipment failure rates and the age of equipment stock.

Retrofits occur when customers are motivated to take action due to Efficiency Maine incentives and outreach. In these cases, the equipment replacement or upgrade occurs before the end of its useful life. In this scenario, savings can theoretically be captured at any time; however, in practice, it takes many years to address an entire stock of buildings, even with the most aggressive energy efficiency programs. Example barriers to retrofits include competing business or contractor priorities, lack of knowledge or expertise, limited pool of qualified vendors, and long decision-making or budget process, among others.

Table 4: Decision Types

Decision Type	Project Type	Scenario	Baseline	Measure Cost
Lost Opportunity	New Construction	Customer is in the market to purchase new equipment for a new construction project	Federal standards or standard market practice for new equipment	Incremental cost: difference between the cost of the baseline and high-efficiency equipment
	Addition of New Equipment	Customer is in the market to add new capacity to an existing facility/renovation or to add controls to improve the performance of new equipment	Federal standards or standard market practice for new equipment	Incremental cost: difference between the cost of the baseline and high-efficiency equipment
	Replacement on Burnout	Customer is in the market to purchase new equipment to replace existing units that have worn out or otherwise need replacing	Federal standards or standard market practice for new equipment	Incremental cost: difference between the cost of the baseline and high-efficiency equipment
Retrofit	Early Replacement	Customer's existing equipment is in working order and has remaining useful life or customer is adding controls to improve the performance of operating equipment in an existing facility	Existing equipment or conditions	Full measure cost: cost of the high-efficiency equipment (including installation)

Load Shape

How a piece of equipment is used over the course of a day and year has implications for the energy and demand costs that the customer will incur when that equipment operates. Generally, electricity used during on-peak, or high-demand, periods is more expensive; certain customers are obligated to pay demand charges that increase during these timeframes. The Trust must therefore understand the coincidence factor, or the degree to which a given measure is likely to be operational during peak hours, as defined by ISO-New England. The higher a measure's coincidence factor, the higher the potential financial savings associated with demand (i.e., kilowatts). The Trust also applies energy period factors to allocate the annual energy (i.e., kilowatt-hour) savings into one of the four energy periods, each with its own specific costs: (1) Winter Peak, (2) Winter Off Peak, (3) Summer Peak, and (4) Summer Off Peak. This allocation is performed in order to apply the appropriate avoided cost values in the calculation of program benefits.

Impact Factors

A series of other factors account for verified measure performance in a cost-effectiveness calculation. These include the following:

- *In-Service rate*: The percentage of efficient units distributed through an energy efficiency program that are actually implemented, rather than left uninstalled for some reason.
- *Realization rate*: The comparison between predicted and actual energy savings, as determined by a program evaluation.

Program Attribution

Program attribution involves isolating savings achieved as a direct or indirect result of the program. The Trust considers the following factors:

- *Free-ridership rate:* The percentage of energy savings achieved by participants who would have implemented the measure or practice in the absence of the program. These savings are not attributable to the program influence. The Trust sets free-ridership rates at the level determined in a given program's most recent evaluation. It uses a default free-ridership rate of 25% for unevaluated measures where comparable evaluated measures do not exist.[3]
- *Spillover rate*: An estimate of energy savings attributable to spillover effects expressed as a percentage of savings from equipment that participants install through an energy efficiency program. Spillover refers to the installation of efficiency measures or adoption of efficiency practices by customers who did not directly participate in an efficiency program, but were nonetheless influenced by the program to make the efficiency improvement.[4]

Secondary Impacts and Interactive Effects

Some energy efficiency measures have impacts beyond the targeted energy savings. For example, a high-efficiency clothes washer saves electricity and also reduces hot water usage. The Trust calculates the additional energy savings associated with this reduction, taking into account the specific fuel type used for water heating.

In some cases, an efficiency measure interacts with other equipment. An example of this interactive effect is the impact that efficient lighting has on a building's heating, ventilation, and air conditioning (HVAC) equipment. When efficient lighting is installed, the amount of waste heat produced by the lights is reduced. This results in additional electricity savings due to lower cooling loads but also leads to increased fuel usage during the heating season to offset the heat lost from the new lighting. While the impact of a single light bulb is negligible on HVAC systems, the Trust includes both the cooling benefit and the heating penalty in its cost-effectiveness calculation of efficient lighting.

---

[3] This value is consistent with the Triennial Plan III Settlement (see State of Maine Public Utilities Commission, Order Approving Stipulation, Docket No. 2015-00175, July 6, 2016).

[4] National Efficiency Screening Project (NESP), *National Standard Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources*, Edition 1 Spring 2017, p. 100.

Other Quantified Impacts

Occasionally, an energy efficiency project has additional benefits and costs beyond the direct energy savings and costs associated with the new measure(s).

Though there are a number of non-energy impacts associated with energy efficiency upgrades, Triennial Plan IV incorporates only the following factors:

- Savings associated with reduced water usage (i.e., water supply and wastewater charges).
- Savings and costs associated with reduced or increased operations and maintenance (O&M) requirements.
- Savings associated with reduced bad debt (for Low-Income Initiatives only).

Achievable Program Participation

The Trust analyzes additional information on program participation to further refine its calculations of what constitutes achievable cost-effective opportunity. Historical performance offers some insight into future performance. For example, if the Trust was able to incentivize 5.7 million LED light bulbs through the Consumer Products Program in the Triennial Plan III period, it is fair to suggest that it could achieve a similar level of program activity in the Triennial Plan IV period. Approximately the same number of bulbs burn out each year, and the cost of inefficient bulbs has remained fairly stable. If the cost of efficient LEDs holds constant, through the application of incentives reassessed every quarter, then it is reasonable to assume that participation in the program will remain at similar levels.

In some cases, a comparison of historical program participants and eligible non-participants can also be helpful. The potential analysis for the C&I Custom Program, for example, cross-referenced the list of Maine's larger energy users with the list of past program participants to identify the untapped market.

The Trust may also consider capacity within the contractor community. If there is a considerable opportunity for a particular measure, but only a limited number of contractors with the appropriate expertise to install it, that measure's potential figure must be limited accordingly. This also applies to the supply chain; the market may not have the immediate capacity to meet new demand resulting from a measure incentive.

Setting Incentives

A measure's incentive level affects the quantity of that measure the Trust is able to incentivize. The Trust uses several strategies in setting appropriate incentive levels. The goal is to find a threshold that is just high enough to motivate participation. Finding this balance can be challenging; while the Trust does not want to pay more incentives than needed, setting them too low will result in a high free-ridership rate. It is important to note that the pool of free-riders is fixed; the only way to drive the free-ridership rate down is to incentivize broader participation, thereby reducing the proportion of free-riders.[5]

Determining the decision type is a key part of setting incentives. For retrofit measures, the incentive is applied to the full project cost, including labor costs for installation. It is meant to encourage the customer to replace a piece of equipment that is otherwise functioning properly. For lost-opportunity

---

[5] This statement does not apply to Low-Income Initiatives, where the customer's income status means that he or she is unlikely to take action without assistance.

measures, however, the incentive is set based on the incremental cost between the efficient equipment and the standard, baseline equivalent. In this case, the incentive is designed to encourage the customer to upgrade to the more efficient choice; the incentive can account for the amount that the customer was already expecting to pay for the equipment and installation.

Beyond this basic consideration, the Trust looks to other sources of information to gather insight into appropriate incentive levels. Price elasticity studies can prove extremely helpful; these studies change incentive levels over a specific period and monitor the impact on program activity. In some cases, the Trust also considers the typical return on investment threshold for a particular customer sector. For example, homeowners might have less aggressive return on investment criteria than a corporate business. Finally, the Trust also looks to energy efficiency programs in other states for insight. This is particularly valuable for new measures, where the Trust can leverage the program administrator experiences in other jurisdictions.

Over the course of a triennial plan period, the Trust constantly monitors program activity and changes incentive levels accordingly.

4.2.3 Monetization of Benefits and Costs

Once the Trust establishes the types of relevant benefits and costs for a given measure, it then monetizes (calculates the dollar values associated with) those savings and costs.

Avoided Costs

The Trust uses the avoided costs laid out in the most recent version of the Avoided Energy Supply Component Study (AESC Study). Synapse and a team of subcontractors developed this study on behalf of a group of regional stakeholders including the Trust, other program administrators, utilities, regulators, and advocates. It is updated periodically; AESC reported new results in 2013, 2015, 2016, and 2018. A copy of the 2018 AESC Study can be found in Appendix L.

To determine the values of energy efficiency, the AESC Study calculates and provides hourly avoided costs for each New England state in a hypothetical future in which no new energy efficiency measures are installed. The study examines avoided costs of energy, capacity, natural gas, fuel oil, other fuels, other environmental costs, and demand reduction induced price effects (DRIPE). It relies on a combination of models to estimate each one of these costs for each future year.

Useful Measure Life

Useful measure life is another key consideration in monetizing savings and costs. How long will the measure be in place and active? The Trust uses product specifications, program evaluations, and measure life studies to determine these values for the TRMs.

Discount Rate

As set forth in its rules, the Trust calculates the present value (PV) of a measure over its expected useful life by taking into account the time value of money. According to Chapter 3 of the Trust's proposed rules, the discount rate used for electric utility procurement-funded measures is 8.5%, adjusted for inflation.[6] According to Chapter 4 of the Trust's proposed rules, the discount rate used for utility procurement-funded natural gas measures is the combined average of all Maine gas utilities' most recently established weighted costs of capital.[7]

Other Quantified Impacts

In monetizing the savings associated with other quantified impacts, the Trust applies the useful measure life and discount rate as defined above.

Reduced water usage is monetized using an average cost of supply water and wastewater utility rates multiplied by the percentage of homes that are connected to the public water supply, plus an assumed avoided cost for homes served by wells.[8]

In Triennial Plan IV, the MACE potential reflects O&M economic impacts, where they can be quantified, for each year over the life of the measure. In addition, the MACE potential accounts for avoided bad debt resulting from the Low-Income Initiatives, following the practice begun in the last Triennial Plan. Specifically, in the last plan the Trust was authorized to "apply default value, representing the benefit of avoided bad debt to electric utility ratepayers, to the lifetime savings of any electricity-saving measure by multiplying 3.8 percent times the statewide retail cost of electricity (as reported by the Governor's Energy Office or Public Utilities Commission), and discounting that amount by applying the real discount rate, and adding the resulting value to the total benefits of the measure."[9] The Trust applies the same monetization methodology in Triennial Plan IV.

Program Delivery

In setting program budgets, the Trust must account not only for incentive costs, but also the costs of delivering (or running) a program. Elements of program delivery include, but are not limited to, rebate processing, program marketing, training and outreach for businesses in the supply chain, customer outreach, and field inspections. Each program has different considerations, depending on the target customer type or program design. Developing a delivery plan entails considering what is required to get achievable cost-effective energy savings. Generally, the more significant the target customers' barriers and the more involved the program design, the higher the delivery costs.

The Small Business Initiative (SBI) serves as a helpful example in illustrating this process. The State of Commercial & Industrial Lighting in Maine Study (Appendix D) finds a significant opportunity for lighting retrofit projects in Maine's small business sector. At the same time, however, these customers are generally less likely than larger businesses to be aware of energy efficiency options and are more likely to face financial and time barriers to undertaking a retrofit. A program delivery mechanism to overcome these obstacles involves direct outreach, a free initial consultation, and considerable ongoing communication between the customers and the Trust. The combination of the technical potential and

---

[6] Chapter 3: Electric Energy Conservation Programs, §4(3).
[7] Chapter 4: Natural Gas Energy Conservation Programs, §4(3).
[8] The avoided cost of water for homes with wells is based on the electricity consumption of the well pump and does not include water treatment costs.
[9] State of Maine Public Utilities Commission, Order Approving Stipulation, Docket No. 2015-00175, July 6, 2016.

these program design considerations determines what is achievable for this sector and how much it will cost to deliver.

4.2.4 Benefit-to-Cost Ratio Calculation

The Trust calculates the benefit-to-cost ratio according to Chapter 3 and Chapter 4 of its rules[10], long-standing practice, and past directives from the Commission. As such, the costs and benefits include those experienced by the participant, the program administrator, and the utilities, as defined above. The formulas for the benefit-to-cost ratio are follows:

Portfolio

$$\sum_{measure\ life} \frac{NTGR \times PV(Energy\&Demand\ Benefits + Water\ Benefits + O\&M\ Benefits + Bad\ Debt\ Benefits)}{Adminstration + Program\ Delivery + NTGR \times PV(Fuel\ Costs + Measure\ Cost + O\&M\ Costs) + (1 - NTGR) \times Incentives}$$

Program

$$\sum_{measure\ life} \frac{NTGR \times PV(Energy\&Demand\ Benefits + Water\ Benefits + O\&M\ Benefits + Bad\ Debt\ Benefits)}{Program\ Delivery + NTGR \times PV(Fuel\ Costs + Measure\ Cost + O\&M\ Costs) + (1 - NTGR) \times Incentives}$$

Measure/Project

$$\sum_{measure\ life} \frac{NTGR \times PV(Energy\&Demand\ Benefits + Water\ Benefits + O\&M\ Benefits + Bad\ Debt\ Benefits)}{NTGR \times PV(Fuel\ Costs + Measure\ Cost + O\&M\ Costs) + (1 - NTGR) \times Incentives}$$

Where:

> NTGR = Net to Gross Ratio;
> PV = Present Value; and
> O&M = Operations and Maintenance.

The Trust screens for eligibility at the project level, rather than the program level. A project is defined as a bundle of related measures installed concurrently. Any project that has a benefit-to-cost ratio greater than or equal to one is eligible for inclusion in the Trust's programs. This screening is conducted at the net level, as opposed to the gross level. This means that the calculation is adjusted for the impact factors and program attribution described in Section 4.2.2.

---

[10] Pending approval as of 8/10/2018.