Optimal ENERGY *Integrated Energy Resources*

# "Strawman" Stakeholder Input Facilitation Tool

## January 2010

**Prepared for:**

The Efficiency Maine Trust

State House Station 19
Augusta, ME 04333-0019
www.efficiencymainetrust.org

**Prepared by:**
Optimal Energy Inc
14 School St.
Bristol, VT 05443
(802) 453-5100

# Executive Summary: Stakeholder Input "Strawman" January 2010

## Purpose

This "Strawman" seeks to stimulate input from stakeholders interested in how the Efficiency Maine Trust (or "Trust") can start planning for a sustainable energy future for Maine. The Trust seeks stakeholder reaction to key questions that EMT Trustees confront in finalizing a Triennial Plan for the Public Utilities Commission and the Maine Legislature in April through June 2010. The Strawman was prepared by Optimal Energy, Inc. and Dunsky Energy Consulting, Inc. to:

- Present the Legislature's energy-related, long-term goals primarily in four areas;
- Identify necessary energy savings in the 2010 to 2030 period to achieve these legislative targets;
- Present projections of necessary energy savings by fuel type both in gallons/therms/Gigawatt-hours and in equivalent Trillion British thermal units (TBtus); and
- Account for projected changes in consumption over the 2010 to 2030 period in all sectors other than transportation and wholesale electric generation and with respect to each fuel type, other than wood, commonly used in Maine.

## Wedge Analysis

The Analysis section of the Strawman includes a "Wedge Analysis" that identifies the contribution that each of six Trust-funded programs can make in reducing Maine's energy consumption to achieve the Legislature's energy goals by 2030. The following aspects of this analysis are noteworthy:

- To get to the targeted reductions, major efforts must begin right away. It is much harder to achieve a 30% reduction in electricity or natural gas use by 2020 if program start-up is pushed off to 2015.
- Fortunately, current economic conditions have themselves already restrained energy consumption to a significant extent so that the legislative targets for the first three-year period and beyond will be easier to reach.
- The goals are aggressive but technically feasible and, in the words of the Strawman's authors, "…the benefits of achieving the legislatively-mandated goals far exceed the costs of reaching them".
- Any degree of success in implementing Trust-funded programs will represent a reduction in total dollars spent in Maine for energy and an increase in dollars staying in Maine's economy, not to be transferred out-of-state to distant energy suppliers.

## Program Budgets

The Strawman's estimates of expenditures are ambitious but faithful to the Legislature's directives. These estimates anticipate the direction in the Triennial Plan for program components and budgets in the three-year period ending 2012. Spending in program dollars will necessarily pay for broader and deeper effort because many easy energy efficiency opportunities have already been captured, such as compact fluorescent lighting replacements. Expanding program participation will therefore require larger incentives for customers than we have seen in past efficiency programs. The Trust's approach is a multi-fuel strategy, not focusing on any single sector or end-use. However, it will be important to find sustainable sources of funding for first-time fossil fuel programs. The so-called "Stimulus" funding from federal ARRA programs will cease in 2012, making new sources of funding for fossil fuel programs critical. Finally, there is legislative authority for the Trust's adoption of increased funding for electricity and natural gas programs but the Trust currently lacks such authority in the case of fossil fuels. By legislative mandate, the Trust is required to make a recommendation in January of 2011 concerning the creation of a funding source for heating-fuel-related efficiency programs.

## Individual Programs for each Customer Sector

The Strawman presents information for each program sector on a preliminary basis for discussion, in broad terms.

- Programs for **Residential Customers** include three basic proposals:
  - A **home retrofit program** focused on tightening and insulating the building envelope, improving the efficiency of water and space heating and changing out inefficient appliances and lighting systems.
  - A **products program** that is sub-divided into mass-market products aimed at lighting, appliances and consumer electronics and the so-called niche market for replacement of heating/cooling systems with on-site renewable resources such as geothermal, solar, wind and high-efficiency furnaces.
  - A **new construction program** targeted at new homes built each year in Maine. This program will rely on training and incentives for home-builders to construct more efficient homes and "branding" of homes built to the Energy Star standard or better.
- Programs for **Commercial/Institutional Customers** require a more customized approach that identifies savings opportunities on a customer-by-customer basis in conjunction with an "Advanced Building Code" for municipalities adopting improved energy minimums for new construction projects. The Strawman proposes:
  - a **retrofit program** focusing on lights, heating/air conditioning, pumps, motors, controls, cooking and heating equipment; and

  - a **new construction program** that will involve architects, engineers, vendors, as well as building owners and managers.
- A proposal for an **Industrial Program** is focused on improvements in on-site industrial processes involving, for example, hydraulic presses, pulping operations, cooling systems. These **industrial process projects** may involve flexible, cash flow-based incentives that bring a project's payback to less than two years.

## Projected Budgets and Savings Targets

- **Residential Home Retrofit:** by 2012, $44 million in annual program funding that will save nearly 2,000,000 gallons of fossil fuel,10,000 therms of natural gas and 35 Gigawatt-hours of electricity in that year;
- **Residential Products Program:** by 2012, $25 million in annual program funding that will save nearly 1,600,000 gallons of fossil fuel, 8,000 therms of natural gas and nearly 30 Gigawatt-hours of electricity in that year;
- **Residential New Construction Program:** by 2012, nearly $2 million in annual program funding that will save 195,000 gallons of fossil fuel, 1,000 therms of natural gas and 4 Gigawatt-hours of electricity in that year;
- **Commercial/Institutional Retrofit:** by 2012, $26 million in annual funding that will save nearly 790,000 gallons of fossil fuel, 60,000 therms of natural gas and 65 Gigawatt-hours of electricity in that year;
- **Commercial/Institutional New Construction Program:** By 2012, more than $4 million in annual program funding that will save 260,000 gallons of fossil fuel, 18,000 therms of natural gas and 20 Gigawatt-hours of electricity in that year.
- **Industrial Process Program:** By 2012, $18 million in annual program funding that will save nearly 690,000 gallons of fossil fuel, 120,000 therms of natural gas and more than 80 Gigawatt-hours of electricity in that year.

## Summary

The Strawman seeks stakeholder reaction to a portfolio of six programs that could form the core of the Trust's efforts, on an "all fuels" basis, over the 2010 to 2030 period. The prospect of reducing the export of dollars paid for energy by Maine homeowners and businesses each year requires a set of programs as ambitious as these. Current funding levels can only scratch the surface. The Strawman illustrates the type of efforts that are necessary to meet the Legislature's goals for achieving a sustainable energy future by 2030.

# Table of Contents

## Figures and Tables

# Introduction

This document is a planning tool to support the Stakeholder process of identifying key issues, procedures, and definitions for the Trustees of the Efficiency Maine Trust. The Efficiency Maine Trust will utilize the stakeholder input to develop a fully actionable Triennial Plan as called for in the Efficiency Maine Trust Act.

The document begins with an overview of the Efficiency Maine Trust and its legislatively mandated goals. The document then provides preliminary analysis of the energy efficiency penetrations needed to meet legislative goals, the resources needed to achieve projected reductions, and the areas of programmatic focus where these reductions are likely to be found. The document also explains how program efforts will overlap and affect each other.

The underlying analysis will be refined over the coming months by further research, stakeholder input, and by decisions made by the Trustees with regard to priorities, strategies, and investment levels. The preliminary analysis indicates that the task is achievable and the benefits of achieving the legislatively-mandated goals far exceed the costs of reaching them.

The Trustees are keenly interested in Stakeholder input. The Efficiency Maine Trust has scheduled public meeting to solicit comments on this outline at the following dates and times:

- **Friday, January 15, 1:30 p.m. to 4:30 p.m.**, Room 105, D.P. Corbett Hall, University of Maine, Orono. Free parking is reserved in the Corbett lot for attendees. For campus location, see http://www.umaine.edu/locator/files/2009/05/MapSide2009-2010v2.pdf).
- **Friday, January 22, 9:30 a.m. to 12:30 p.m.**, Rooms 109 and 110, Abromson Community Education Center, University of Southern Maine, Portland with parking at $2 per day in Bedford Street garage, with coupons for attendees' use. For directions, see http://www.usm.maine.edu/conferences/.
- **Friday, January 29, 9:30 a.m. to 12:30 p.m.**, Room 211 (Utilities and Energy Hearing Room), Cross Office Building, State House Complex, Augusta.

For updated information visit www.efficiencymainetrust.org.

The Trust also welcomes comments submitted in writing. Send email to info@efficiencymainetrust.org, or mail comments to the following address:

Efficiency Maine Trust
State House Station 19
Augusta, ME 04333-0019

# Background on the Efficiency Maine Trust

The Efficiency Maine Trust is charged by statute with developing a three-year plan for Maine's energy efficiency programs. The plan is intended to set the state of Maine on a course for a sustainable energy future. The legislation provides broad guidance on 10 and 20 year goals which are the foundation of this planning exercise. The Efficiency Maine Trust has set as a goal the development of an actionable Triennial Plan that connects the three year (2010-2012) goals and activities to the larger ten (2020) and twenty (2030) year goals of the authorizing legislation. The Board has further asked for a robust stakeholder input process to support a rigorous technical analysis.

The Efficiency Maine Trust was established to develop, plan, coordinate and implement energy efficiency and alternative energy programs in Maine. Its legislative charge is to (Efficiency Maine Trust Act at MSRA 35-A § 10103):

> A. Provide uniform, integrated planning, program design and administration of programs pursuant to this chapter and any other provisions of law administered by the trust;
>
> B. Reduce energy costs and improve security of the state and local economies. The trust shall administer cost-effective energy efficiency programs consistent with applicable requirements of this chapter or other law to help individuals and businesses meet their energy needs at the lowest cost and generally to improve the economic security of the State by:
>
> > (1) Maximizing the use of cost-effective weatherization and energy efficiency measures, including measures that improve the energy efficiency of energy-using systems, such as heating and cooling systems and system upgrades to energy efficient systems that rely on alternative energy resources;
> >
> > (2) Reducing economic insecurity from overdependence on price-volatile fossil fuels;
> >
> > (3) Increasing new jobs and business development to deliver energy efficiency and alternative energy resources products and services;
> >
> > (4) Enhancing heating benefits for households of all income levels through implementation of cost-effective efficiency programs, including weatherization programs, that will produce comfort, improve indoor air quality, reduce energy costs for those households and reduce the need for future fuel assistance;

(5) Simplifying and enhancing consumer access to technical assistance and financial incentives relating to energy efficiency and the use of alternative energy resources by merging or coordinating dispersed programs under a single administrative unit possessing independent management and expertise; and

(6) Using cost-effective energy efficiency investments to reduce greenhouse gas emissions;

C. Ensure that all expenditures of the trust are cost-effective in terms of avoided energy costs; and

D. Actively promote investment in cost-effective energy efficiency measures and systems that use alternative energy resources that reduce overall energy costs for consumers in the State.

## Legislative Targets

The statute authorizing the Efficiency Maine Trust requires that the Triennial Plan advance eight targets (MSRA 35-A § 10104 (4)(F)). For the purposes of developing this Strawman, Optimal Energy has focused on the following four quantifiable goals:

- Weatherizing 100% of residences and 50% of businesses by 2030
- Reducing peak-load electric energy consumption by 100 MW by 2020
- Reducing consumption of liquid fossil fuels by at least 30% by 2030
- Achieving electric and natural gas savings of at least 30% and heating fuel savings of at least 20% by 2020

The remaining four goals are as follows:

- Capturing all cost-effective energy efficiency resources available for electric and natural gas utility ratepayers
- Building stable private sector jobs
- Saving consumers $3 for every $1 of program funds invested in heating and cooling measures
- Reducing greenhouse gas emissions consistent with the goals of 38 MRSA 576

The final draft Triennial Plan will respond to each of the targets stated in law. This analysis will be more robust when Plan specifics are more fully developed and stakeholder input is gathered.

# Analysis

This section highlights the interaction between the Trust's targets. It describes the baseline, determines the projected usage through 2030, and illustrates the relative magnitude of several of the inputs (both strategies and funds). Baselines, unless explicitly stated in the legislation (e.g. for greenhouse gas emissions), are set at the projected levels of consumption at the target date. The focus of this presentation is on heating fuel and electric energy. Savings in these areas advance targets for the other metrics in the law.

For the purposes of evaluating all fuels on a comparable basis, energy values have been converted to trillion Btus (TBtu) based on the amount of energy contained in a unit of each fuel type. The methodology for this conversion is included in Appendix A.

The analysis and data provided in this document provide a preliminary set of inputs to the planning framework. They provide a gauge of the relative magnitude of costs and potential efficiency gains. As the plan progresses, the analysis and data will benefit from increased detail and precision.

## Baseline

The Efficiency Maine Trust, consistent with the legislation, will base energy reduction goals in reference to historic levels of consumption. To avoid biasing the baseline by using a recessionary year, the analysis starts with 2007 consumption levels. The analysis then sets savings targets as a reduction from those levels and calculates energy use reductions through 2020 for electric, natural gas and heating fuels and through 2030 for all fossil fuels. Table 1: 2007 Baselines and 2020/2030 Savings Targets (TBtu), summarizes the baselines and legislative targets in reference to energy usage forecasts.

**Table 1: 2007 Baselines and 2020/2030 Savings Targets (TBtu)**

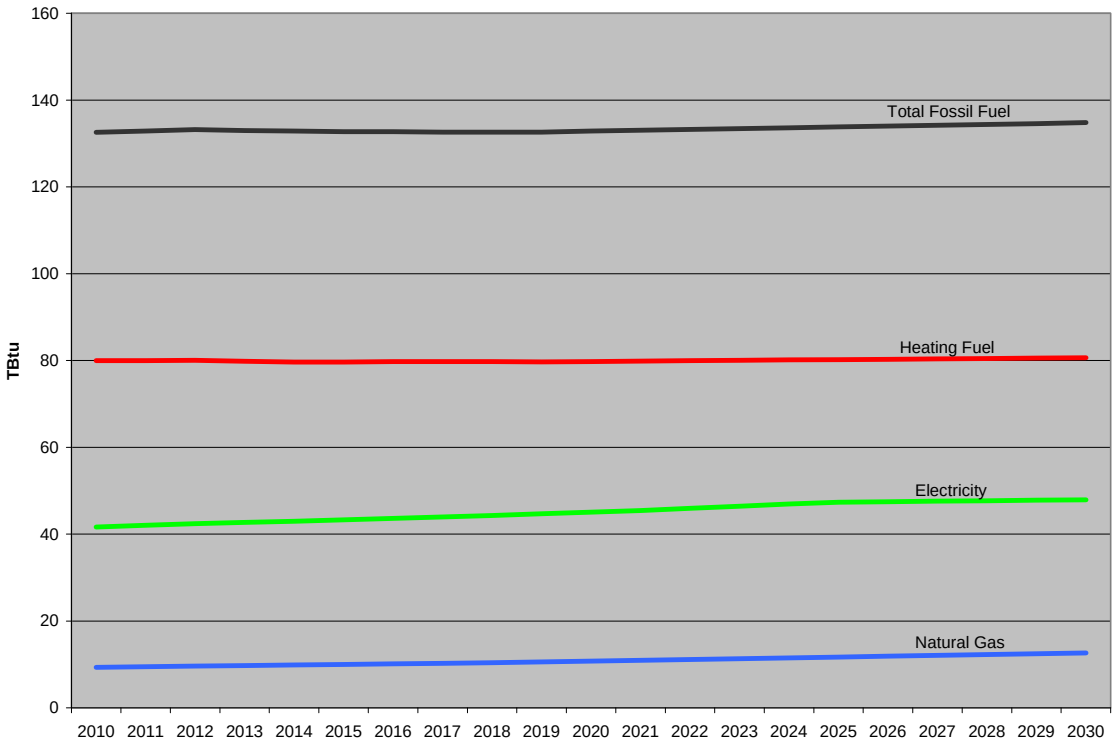
| **Baselines** | **2007 Electric** | **2007 Nat Gas** | **2007 Heating Fuel** | **2007 Fossil Fuel** |
|---|---|---|---|---|
| Residential | 15.1 | 1.1 | 56.2 | 56.2 |
| Commercial/Institutional | 14.3 | 3.4 | 17.8 | 18.8 |
| Industrial | 11.1 | 4.4 | 5.8 | 55.8 |
| **Reduction Target** | | | | |
| Residential | 30% | 30% | 20% | 30% |
| Commercial/Institutional | 30% | 30% | 20% | 30% |
| Industrial | 30% | 30% | 20% | 30% |
| **Forecast w/ Savings** | **2020 Electric** | **2020 Nat Gas** | **2020 Heating Fuel** | **2030 Fossil Fuel** |
| Residential | 10.3 | 0.8 | 39.7 | 39.7 |
| Commercial/Institutional | 8.3 | 1.8 | 13.0 | 13.2 |
| Industrial | 5.2 | 1.9 | 3.2 | 39.1 |

Because there is an overlap between heating fuel and fossil fuels (which covers all un-regulated fossil fuels), the columns of this table are not additive; summing across the fuel types returns baselines and targets that are too high. Later sections will address this overlap.

# Projections

The targets are significant, even without growth in usage. Figure 1: Forecast by Fuel Category shows the projected growth in energy demand for electricity and natural gas through 2020 for all sectors in Maine. Heating oil and total fossil fuel consumption is forecast to be flat through 2020, with increases of approximately 15% in electricity and approximately 25% in natural gas consumption.

**Figure 1: Forecast by Fuel Category**




Where Annual Energy Outlook (AEO) and other federal government data were not available, the projections rely on professional judgment informed by data from other sources[1]. The data underlying these projections will be bolstered throughout the planning process.

Energy use, as a whole, is projected to increase over time absent additional efficiency efforts. By scaling targets relative to projected load, the absolute targets set by the Board will include this increment.

[1] The projection for electric energy is the sum of AEO projections for the residential, commercial and industrial sectors through 2025, the end date of its analysis, extended with an average annual increase through 2030. The projection for natural gas is based on 2007 SEDS data and projected out with an average annual increase excluding use in electric generation. The liquid fossil and heating energy projections are also based on AEO projections summed from the three sectors.

# Contributions To Savings (Wedge Analysis)

The following charts show the impacts of the various program strategies, which will be explained in the following sections. Figure 2: Necessary Program Savings to Achieve Legislative Goals, shows the energy reductions necessary to achieve the first four goals outlined in the Legislative Targets section. Each wedge refers to a program effort and shows its relative contribution to the overall savings goal. The majority of savings will need to come from retrofit projects and the industrial sector. Figure 3: Necessary Annual Program Spending to Achieve Legislative Goals, shows the spending necessary in each program to achieve the savings goals, based on analysis of several other Energy Efficiency Programs throughout New England. Maine will need to pursue a wide variety of program strategies to achieve its energy reduction goals. As noted earlier, this is only a preliminary estimate for purposes of framing future discussion.

**Figure 2: Necessary Program Savings to Achieve Legislative Goals**

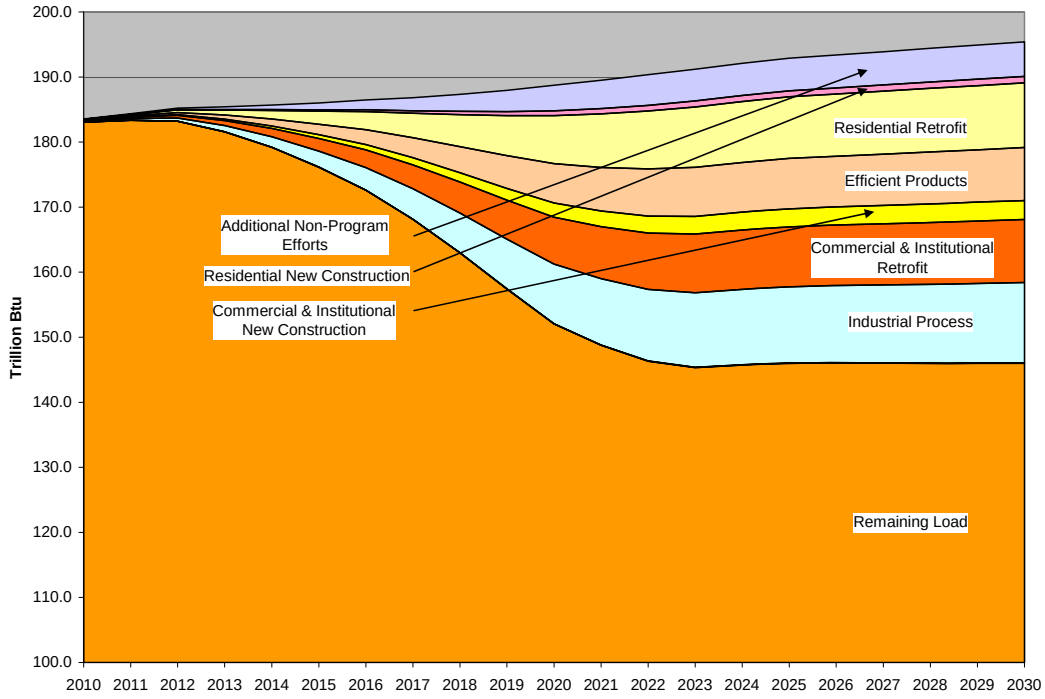
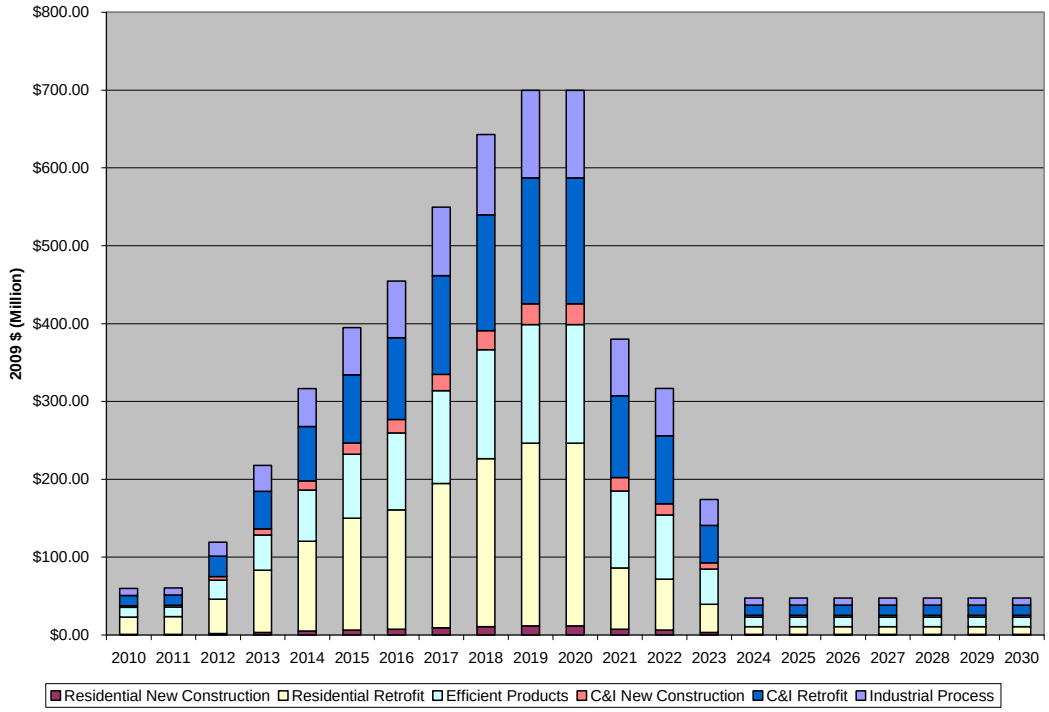


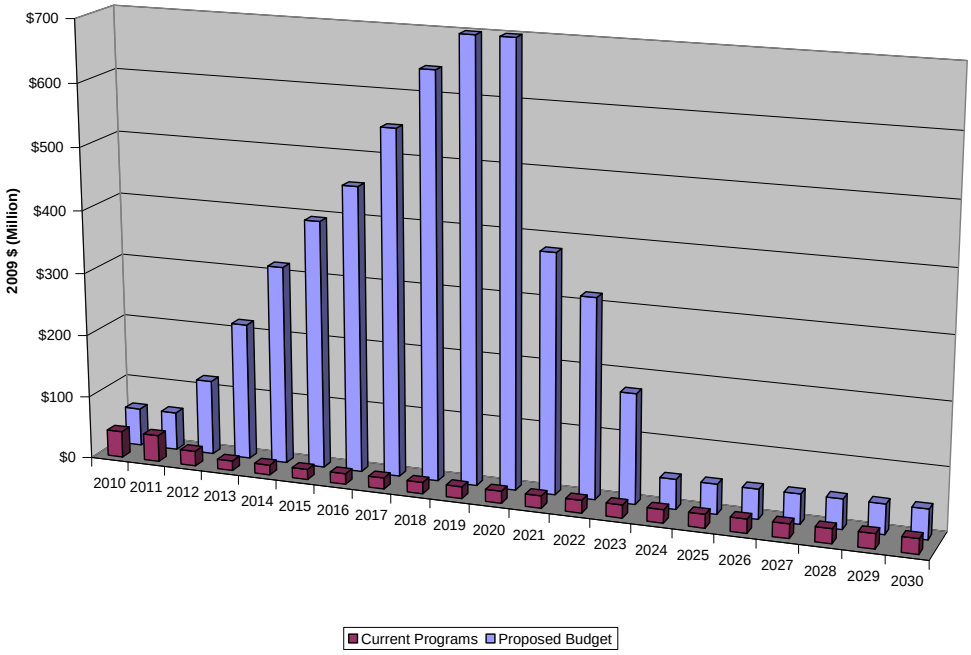
**Figure 3: Necessary Annual Program Spending to Achieve Legislative Goals**




We have compared current program activity and spending to the projected program activity necessary to meet legislative goals. Figure 4: Comparison of Annual Existing Program Spending and Necessary Program Spending Needed to Achieve Legislative Goals, presents the estimated cost of pursuing the necessary strategies compared to current spending levels. This represents a very conservative scenario based on historical program costs per unit savings. It includes estimates of Efficiency Maine, Maine Housing, Maine Energy and Carbon Savings Trust, ISO New England's Forward Capacity Market, and the American Relief and Recoveries Act funds. Efficiency Maine is primarily an electric program, so its spending has a diminished impact when applied to Maine's total energy consumption. The charts show all program spending against all goals. It does not incorporate increased efficiencies scaled from a vastly expanded program, the benefits of integrated and comprehensive program offerings, or significant technological improvements. We assumed that investment in residual fuel, a significant source of liquid fossil fuel consumption, would not begin until 2011.

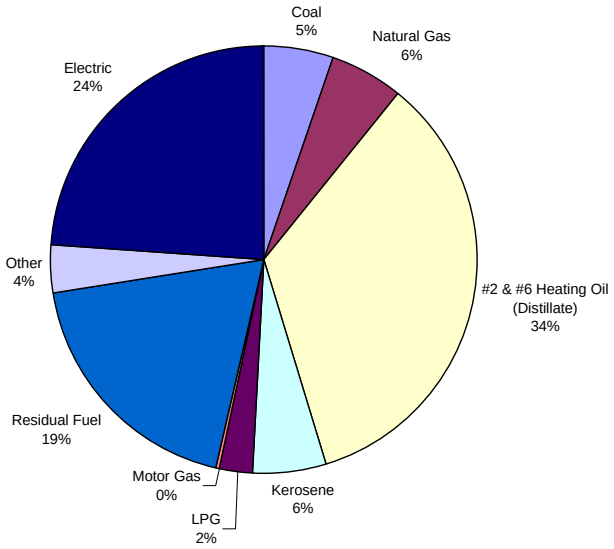
The anticipated cumulative program spending required to meet the legislative goals by 2030 is $5.4 billion.

**Figure 4: Comparison of Annual Existing Program Spending and Necessary Program Spending Needed to Achieve Legislative Goals**




To put the following discussions into context, Figure 5: Total Forecast by Fuel Type (2010-2030 Weighted Average) illustrates the portion of the total energy needs of the state's residential, commercial and institutional, and industrial sectors met by each fuel type.

**Figure 5: Total Forecast by Fuel Type (2010-2030 Weighted Average)**



# Residential Programs

## Residential Overview

We present a portfolio of comprehensive residential programs designed to achieve the Efficiency Maine Trust's ambitious long-term efficiency goals. These programs address three opportunity categories: i) the retrofit of existing homes; ii) the replacement of equipment, principally at the end of its useful life; and iii) the construction of new residential buildings. We estimate that half of the long-term energy savings potential will come from retrofits, followed by equipment replacement with approximately 40 % and new construction with 5 %.

Compared to the commercial and industrial sectors, the residential market equipment has a relatively large number of energy users and is more homogeneous. Given these market characteristics, cost-effective strategies to capture energy savings opportunities in each of the three categories are mostly based on mass-market approaches, with the exception of low income households. This latter market segment, representing 40 % of Maine households, requires a more tailored approach to meet their specific needs.

Based on energy efficiency best practices, successful strategies must not only target end-users, but also all players involved in bringing energy-efficient equipment and services to end-users, such as manufacturers, distributors, retailers, trade allies and contractors.

## Home Retrofit

Maine's home retrofit market includes approximately 506,000 single-family homes and buildings with 1 to 4 units. Customers from all income levels will have access to the program. Buildings of 5 units and more, representing about 10% of residential building stock, are excluded from this program as they will be covered by the Commercial and Institutional Retrofit Program.

Retrofit opportunities include primarily envelope (insulation, air sealing, windows and doors), HVAC (equipment and ducts), domestic water heating (DHW), lighting and appliances. Implementation of these measures involves two key market actors: contractors and suppliers. Licensed contractors help to identify the best opportunities and install them, while suppliers ensure that the contractors and consumers alike have access to energy-efficient equipment. Tapping the substantial energy savings potential associated with the retrofit of existing homes represents by far the biggest challenge for the residential sector.

A comprehensive retrofit program treats the home as a whole and encourages discretionary, efficiency-driven renovations and early replacement of equipment. Under a "one-stop-shop" model, the homeowners hire pre-approved contractors to undertake all of the following tasks: i) identify the opportunities (i.e. perform an energy audit); ii) recommend energy efficiency measures and assess their costs and financial benefits; iii) install the measures; and, iv) conduct

a post-installation audit. Under this approach, the customers would have the flexibility to install the retrofit measures by themselves.

Generally cost-effective measures (e.g. light air sealing, light DHW measures, electronic thermostats, CFLs) will be installed free of charge automatically during the first audit.

The contractors will also assist customers in applying for the program's incentives and low-interest financing, as well for the Product Program, which includes energy-efficient appliances and renewable resources (geothermal, wind, solar and biomass).

The program will be adjusted in the mid- to long-term to reflect the market's ability to independently sustain retrofit efforts. The ultimate long-term goal is that a mandatory labeling scheme will create a sustainable retrofit market, thus reducing -though not eliminating-the need for retrofit incentives.

## Market Barriers & Strategies – Unique Features

### Barriers

In this market building owners face specific barriers of uncertainty regarding the value-added to building resale prices, access to financing, and a limited number of well-trained, effective contractors, a potentially longer than preferred payback period. Contractors and suppliers may not see a clear business case from selling and installing energy efficiency equipment compared to standard ones.

### Key Program Strategies

- Market actor certification: The quality of all audit and installation work is an important aspect for the program's success. To that end, the program will require that contractors be i) accredited by the Building Performance Institute (BPI) as an evaluator based on the Home Performance with Energy Star Initiative, and ii) certified installers. Training will be offered in cooperation with Maine technical colleges and/or BPI to meet stringent standards for measure installation. Contractors will be offered opportunities for certification and accreditation.
- Audits/Rating/Studies: A post-retrofit building rating system suitable for compliance with an eventual mandatory labeling policy should be implemented in the mid-term.
- Customer incentives: As a general guiding principle, subsidies for audits and retrofit measures will cover 100 % of the total costs for low income households (0-200% of poverty line) and a portion of the total costs for moderate to high income households.
- Upstream incentives: In order to ensure deep energy savings, contractors will receive financial incentives, based on two factors: i) number of audits realized; and ii) the depth of energy savings (absolute and % energy saved).

- 3rd party financing: Subsidies may be complemented by attractive financing through various tools, such as energy efficiency mortgage and municipal property tax roll financing.

## Metrics

Table 2: Residential Retrofit Cumulative Savings Targets, shows the program's annual energy savings estimates by fuel type in order to meet the long-term goals. The bulk of the savings are from liquid fossil fuels since Maine is highly dependent on heating oil. To achieve these savings, an estimated investment totaling $1.5 billion over the period would be required as is shown in Table 3: Annual Residential Retrofit Program Cost Estimate (Million $).

**Table 2: Residential Retrofit Cumulative Savings Targets**

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Electric (GWh) | 9 | 18 | 35 | 68 | 115 | 173 | 244 | 329 | 429 | 538 | 647 |
| Electric (MW) | 2 | 4 | 7 | 14 | 23 | 35 | 49 | 66 | 86 | 108 | 129 |
| Natural Gas (Thousand Therms) | 2 | 5 | 10 | 19 | 32 | 48 | 68 | 92 | 119 | 150 | 180 |
| Fossil Fuel (Thousand Gallons) | 489 | 979 | 1,957 | 3,751 | 6,361 | 9,623 | 13,537 | 18,267 | 23,812 | 29,846 | 35,881 |

**Table 3: Annual Residential Retrofit Program Cost Estimate (Million $)**

| 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|
| $22.28 | $22.78 | $44.07 | $79.79 | $115.51 | $143.64 | $153.23 | $185.45 | $215.78 | $234.81 | $234.81 |

## Existing Program Integration

Program implementation will require a transition period mainly for two reasons. First, from a customer perspective, the integration of existing programs from Efficiency Maine and MaineHousing, dealing with retrofit measures and efficient products for low to moderate income family, will be needed in order to have an efficient delivery process and to minimize program's costs. Second, the current capacity of qualified contractors falls short of what is needed to retrofit a large volume of homes.

# Products

Products can be classified in two categories: i) mass market products; and ii) niche market products. In the mass market group, products are easily accessible by customers to retailers and cover for example: lighting, appliances, and consumer electronics.

The replacement of heating and cooling systems and domestic hot water heaters falls into the niche market category since consumers can only buy these products mostly through trade allies and other professionals. The use of on-site renewable resources (i.e. biomass, geothermal, active and passive solar and wind turbine systems) also falls into this category.

The players involved in the supply chain (manufacturers, distributors, retailers, trade allies and contractors) constitute the key actors since together they bring the energy-efficient and renewable resources products to the market.

Based on their market penetration, products progress through a stage sequence from introduction to growth, maturity and decline. A flexible approach is needed to reflect these life cycle stages, as well as the market specifies for each product. A mix of strategies will be used to capture all potential opportunities and, ultimately, to transform markets in the long run.

## Market Barriers & Strategies – Unique Features

### Barriers

The perception that efficient products may not offer the same quality of services or reliability as standard products is frequently found among customers. Supply chain actors often face irregular and limited stock of efficient product and the institutional impediment of pay structures that do not acknowledge the additional barriers to the sale of efficiency.

### Strategies

Table 4: Importance of Program Delivery Strategies, provides an overview of the potential relative importance of various strategies at each stage of the product life cycle. Most of the strategies (e.g. incentive and education) are important throughout this cycle, but their relative importance varies at each stage.

**Table 4: Importance of Program Delivery Strategies**

| | Stage of Program Delivery Cycle | | | |
|---|---|---|---|---|
| | **Introduction** | **Growth** | **Maturity** | **Decline** |
| **Product Categories** | | | | |
| Sample Mass Market Products | Interior LED | Energy Star set-top box; energy monitor | CFL; LED holiday lights | Water heater tank wrap |
| Sample Niche Market Products | Solar, Wind | Geothermal | High-efficiency oil furnace | Mid-efficiency oil furnace |
| **Program Delivery Strategy** | | | | |
| Demonstration | High | Low | - | - |
| Education/Awareness | High | Mid to High | High | High |
| Incentive (up-stream and/or downstream) | Mid to Low | High | Mid | Low |
| Cooperative/Joint Marketing | Low | High | Mid | - |
| Training | Low | High | Mid | - |
| Market Outreach/Experience | Low | Mid | Low | Low |
| Mandatory Standards | - | - | - | High |
| State Procurement | - | Mid | Low | - |

Distinct program strategies - for both mass and niche market products - need to pinpoint the most significant energy savings opportunities and take into account their relative stages of development.

## Metrics

The energy savings by fuel type estimated over the 2010-2020 period are presented in Table 5: Efficient Products Cumulative Savings Targets. Program costs, estimated in Table 6: Annual Efficient Products Program Cost Estimate (Million $), will amount to $905 million over the period, with a maximum annual expenditure reaching $152 million in 2019 and 2020.

**Table 5: Efficient Products Cumulative Savings Targets**

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Electric (GWh) | 7 | 14 | 29 | 55 | 94 | 142 | 199 | 269 | 350 | 439 | 528 |
| Electric (MW) | 1 | 3 | 6 | 11 | 19 | 28 | 40 | 54 | 70 | 88 | 106 |
| Natural Gas (Thousand Therms) | 2 | 4 | 8 | 15 | 26 | 39 | 55 | 75 | 97 | 122 | 147 |
| Fossil Fuel (Thousand Gallons) | 399 | 799 | 1,597 | 3,061 | 5,191 | 7,853 | 11,048 | 14,908 | 19,433 | 24,358 | 29,283 |

**Table 6: Annual Efficient Products Program Cost Estimate (Million $)**

| 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|
| $12.35 | $12.35 | $24.69 | $45.27 | $65.84 | $82.31 | $98.77 | $119.34 | $139.92 | $152.26 | $152.26 |

## Existing Program Integration

The Product Program will build upon existing programs managed by Efficiency Maine and Maine State Housing Authority, which address the following products: CFL, Energy Star appliances (fridges, freezers, clothes washers, room air conditioners, dehumidifiers), and solar and wind systems.

# New Construction

Maine typically sees six to eight thousand new homes and small multifamily units built each year, although this number is currently lower due to economic conditions. The state has relatively few large developers and a significant number of custom builders. Energy codes currently vary by municipality but as of 2010 Maine will adopt a state-wide code based on the 2009 International Energy Conservation Code (IECC). A 2008 new construction baseline study found that less than 20% of new homes could have passed the state model energy code in place at that time, principally due to insulation installation issues and practices.

The new homes program will aim to transform the market using a combination of subsidized builder training and support, builder incentives, home certification and branding, and a marketing campaign targeting home buyers. It will be built around multiple tiers of home certification: i) the EPA's successful national Energy Star New Homes brand; ii) a "High Performance" tier requiring savings significantly above the Energy Star New Homes; and iii) a "Micro Load" tier aimed at achieving close to net zero energy requirements.

The program will be complemented by additional, optional a la carte incentives for high-efficiency appliances and other products. It will also be supported by cross-cutting training,

financing, building labeling and building code enforcement strategies. Specific program strategies will be developed for manufactured housing (~25% of new homes) and small multifamily buildings.

## Market Barriers & Strategies – Unique Features

### Barriers

Energy Star homes typically cost 1% - 4% more to build than to-code buildings. Higher performance levels can cost significantly more: 10-15% more than building to code. In on-spec markets, builders are making design choices while facing only the initial cost of building. All operation and management costs and savings are passed on to the home buyers.

### Strategies

This market can benefit from coordination with municipalities that may offer incentives including priority processing for participating builder permits and property tax incentives.

## Metrics

Table 7: Residential New Construction Cumulative Savings Goals, shows the program's annual energy savings estimates by fuel type, while Table 8: Annual Residential New Construction Program Cost Estimate (Million $), illustrates estimated annual spending requirements, which amount to $69 million in total over the period.

**Table 7: Residential New Construction Cumulative Savings Goals**

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Electric (GWh) | 1 | 2 | 4 | 7 | 11 | 17 | 24 | 33 | 43 | 53 | 64 |
| Electric (MW) | 0 | 0 | 1 | 1 | 2 | 3 | 5 | 7 | 9 | 11 | 13 |
| Natural Gas (Thousand Therms) | 0 | 0 | 1 | 2 | 3 | 5 | 7 | 9 | 12 | 15 | 18 |
| Fossil Fuel (Thousand Gallons) | 49 | 97 | 195 | 373 | 633 | 957 | 1,346 | 1,816 | 2,368 | 2,968 | 3,568 |

**Table 8: Annual Residential New Construction Program Cost Estimate (Million $)**

| 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|
| $.95 | $.95 | $1.85 | $3.47 | $5.04 | $6.32 | $7.58 | $9.16 | $10.74 | $11.68 | $11.68 |

## Existing Program Integration

The program will build on recent Efficiency Maine efforts to develop a Maine New Homes program, which included a thorough baseline study. It will also work with existing energy efficient mortgage providers and the State Planning Office code enforcement program.

# Commercial/Institutional Sector

## Commercial/Institutional Overview

Businesses and government customers require an approach to program design and delivery similar to that for residential customers, one built on relationships with the objective of achieving deep energy savings from every interaction. Program delivery staff are most effective when they have developed strong and trusting relationships with these customers prior to project initiation. This relationship offers program staff the opportunity to integrate energy efficiency projects into a wide variety of business decisions, expands the range of tools these customers have to address issues critical to the bottom line, and helps customers overcome information and analytic barriers.

Beyond this general approach, certain segments within the commercial and institutional market require a more nuanced approach. The underlying strategy remains the same: build relationships when it is feasible; offer turn-key services when it is not.

### Customer Size and Operational Requirements

The commercial and institutional sectors can be divided into two major segments – large and small customers.

**Large** customers, while fewer in number, offer significant, and in many cases more accessible, savings opportunities. These customers present the following challenges to capturing energy efficiency savings:

- Because they are fewer in number, it is important to put forth a comprehensive plan to capture deep savings from each customer. This type of individual account management requires a coordinated effort on the part of account managers and other outreach staff, which is both logistically difficult and expensive.
- Because of their size, there is often a disconnect between the capital planning branch of the company and the technical operations and maintenance staff; they may not have an obviously accountable person who can make a decision to invest in efficiency.
- Large chain, or "big box" type stores may require approval from a central office making it difficult to determine the proper approach to promote investments in energy efficiency.

**Small** customers constitute the majority of savings opportunities. However, small Commercial/Institutional customers face several barriers to investment in energy efficiency:

- They are more dispersed geographically, which can make them harder to reach directly, especially in a rural state like Maine.
- While program costs can be similar to those for large customers, the savings potential is usually less on a per site basis.
- Many small businesses and institutional departments lease space, making it difficult to identify the correct decision-maker to engage with regarding efficiency projects.
- Small businesses tend to be more volatile in general, especially in certain sectors like restaurants and retail stores. As such, they may view the long-term potential rewards of efficiency investments with greater skepticism than larger, more stable customers.

## Key Strategies

### Outreach Based on Customer Size

For the large customer segment, the Efficiency Maine Trust will need to recruit a substantial number of outreach professionals, either as in-house staff or through contractors. For purposes of this document we will call these professionals 'Energy Efficiency Solution Providers' (EESP). EESPs assemble a top-tier group of technical experts – including design professionals from the private sector – whose expertise can be utilized to address the needs identified by project design teams. EESPs will need to devote the resources to conduct direct and deliberate customer outreach and to provide customized, comprehensive solutions for individual customers.

For smaller customers, individual account management is not always cost effective relative to the amount of savings available per customer. In order to conserve program resources, many program administrators offer a prescriptive incentive program, and in some cases a direct install program, to cover the more common technologies for smaller customers. For more comprehensive project opportunities (renovation, expansion), EESPs can explore options, often with custom financing and incentives to improve the customer's ROI to an acceptable level. EESPs and program staff will need to work with upstream market actors (vendors, distributors, contractors, etc.) to make sure that efficient products are stocked and sold.

### Building Codes

Maine can simultaneously build market readiness by adding a technical appendix to the state building energy code. This appendix should serve as an optional "advanced commercial building energy code" that sets a common technical standard for above-code design across the state. The advanced code can also serve as a guideline for municipalities that choose to adopt higher minimum energy requirements for new construction projects.

### Incentive Structure

Each component of the market will need financing or incentives to entice market actors to participate in the program. This may require incentives to upstream actors to stock products or cover technical certification costs. For customers, this may require covering some or all of the incremental cost or full installed cost (depending on the project type) of efficient equipment.

## Commercial/Institutional New Construction

The goal of any new construction program is to acquire long term savings through improved building performance while achieving a high level of market participation and leading ultimately to market transformation. For new construction in particular, **efficiency is sold through relationships** – owners, architects, engineers, designers, and vendors all play a role. The primary difference between new construction and existing buildings is that in the concept stage a building retains 100% of its potential to maximize efficiency. Once built, cost-effectiveness considerations reduce the achievable potential.

This program's target market is Commercial/Institutional customers of any size planning a new construction project or a significant renovation. Market actors include Commercial/Institutional customers, architecture and engineering firms, manufacturers, wholesalers and equipment vendors, developers and contractors. The key effort made is in providing up-stream actors (engineers, architects, building consultants, wholesalers and vendors) with education, training, and financial incentives to promote and specify energy saving technologies and systems.

## Barriers and Strategies – Unique Features

### Barriers

There are a host of specific permutations to the generic barriers previously discussed including:

- Private Sector - Most of the development process occurs outside the public view. Site selection and planning, financing, real estate purchase, design and construction, and ultimately sale or rental, are all facets of a *private* business.
- Disconnected Process - Development tends to be a process with periods of activity followed by periods of dormancy, and it is often hard to tell which projects will be completed and which will not, especially in the early planning phase. It is early on, when plans are most fluid, that the greatest, most cost effective opportunity exists to push the project in the direction of comprehensive, integrated energy efficient design.
- Timing - The first appearance of intent to build, for example, a fast food restaurant may be an application that arrives at the town planning office. Because these buildings are typically simpler to design or even pre-manufactured, the opportunity to influence decisions about efficiency levels may

### Strategies

The point of leverage in this market is the design and delivery community. These market actors can be discovered, approached through a variety of means, and can transform the market at a lower program cost than trying to reach each individual decision maker.

## Metrics

**Table 9: Commercial/Institutional New Construction Savings Targets, shows the program's annual energy savings estimates by fuel type, while**

Table 10: Annual Commercial and Institutional New Construction Program Cost Estimate (Million $), illustrates annual budget requirements, which amount to $159 million in total over the period.

**Table 9: Commercial/Institutional New Construction Savings Targets**

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Electric (GWh) | 5 | 10 | 20 | 38 | 64 | 97 | 136 | 184 | 239 | 300 | 361 |
| Electric (MW) | 1 | 2 | 5 | 9 | 16 | 24 | 34 | 46 | 60 | 75 | 90 |
| Natural Gas (Thousand Therms) | 5 | 9 | 18 | 35 | 59 | 89 | 125 | 168 | 219 | 275 | 331 |
| Fossil Fuel (Thousand Gallons) | 65 | 131 | 262 | 502 | 851 | 1,287 | 1,811 | 2,443 | 3,185 | 3,992 | 4,800 |

**Table 10: Annual Commercial and Institutional New Construction Program Cost Estimate (Million $)**

| 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|
| $2.16 | $2.16 | $4.33 | $7.93 | $11.54 | $14.42 | $17.31 | $20.91 | $24.52 | $26.68 | $26.68 |

## Existing Program Integration

Maine does not have an existing commercial new construction program. In 2009, Efficiency Maine planned to pilot test a national commercial new construction program, the results of which are pending.

# Commercial/Institutional Retrofit

This program category helps customers exchange or modify existing inefficient equipment—lighting, HVAC, motors, pumps, controls, water equipment, heating equipment, electronics and data management, and commercial cooking equipment—with high efficiency alternatives. Retrofit is typically defined as the replacement of existing equipment that is both **operational** and has **at least 25% of its engineered useful life remaining**.

## Barriers & Strategies – Unique Features

### Barriers

High employee turn-over, a common feature of this market, often leads to incorrect maintenance and operation of efficient equipment. This in turn can negate the anticipated gains from efficient equipment. Furthermore, for this market, the relatively small improvements in gross margins may not appear to justify the extra work and cost associated with efficiency investments.

### Strategies

The size of the customer will usually determine the program approach. Larger customers typically present opportunities for more comprehensive and complex projects, although not exclusively. Smaller customers often need a simplified approach typified by a prescriptive direct install program. Market actors are similar throughout the C&I sector starting with building owners and spreading outward to the businesses that provide them equipment and services: energy service companies (ESCOs); architecture, engineering and other design firms; manufacturers, wholesalers and equipment vendors; and contractors.

## Metrics

The existing building market represents the vast majority of energy efficiency potential in the commercial and institutional sector. New construction activity may vary from year to year but existing buildings represent a consistent reservoir of savings waiting to be tapped. Table 11: Commercial/Institutional Retrofit Savings Targets reflects the current estimate required of the existing building sector to reach Maine's energy efficiency goals.

Table 12: Commercial/Institutional Retrofit Program Cost Estimate (Million $) indicates the budget necessary to achieve those goals.

**Table 11: Commercial/Institutional Retrofit Savings Targets**

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Electric (GWh) | 16 | 33 | 65 | 125 | 212 | 321 | 452 | 610 | 795 | 997 | 1,198 |
| Electric (MW) | 4 | 8 | 16 | 31 | 53 | 80 | 113 | 152 | 199 | 249 | 300 |
| Natural Gas (Thousand Therms) | 15 | 30 | 60 | 115 | 195 | 294 | 414 | 559 | 729 | 913 | 1,098 |
| Fossil Fuel (Thousand Gallons) | 197 | 395 | 789 | 1,512 | 2,564 | 3,880 | 5,458 | 7,365 | 9,600 | 12,033 | 14,466 |

**Table 12: Commercial/Institutional Retrofit Program Cost Estimate (Million $)**

| 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|
| $13.12 | $13.12 | $26.24 | $48.10 | $69.97 | $87.46 | $104.95 | $126.81 | $148.68 | $161.80 | $161.80 |

## Existing Program Integration

This program should build upon the efforts that Efficiency Maine is already making in this market through the Business Program. This program offers incentives and expertise to business owners across the state to help them reduce their energy consumption. In 2008, roughly 700 businesses and 600 trade allies completed nearly 940 efficiency projects. This activity amounted to roughly 34,000 MWh (0.1 Trillion Btu) of savings at a cost of $6.2 million. Small businesses (fewer than 50 employees or less than $50 million in annual sales) accounted for 78% of program participants and roughly 50% of program costs. There is a print and radio marketing campaign as well as a monthly newsletter that informs both market allies and the general public of program opportunities.

Efficiency Maine also offers the Building Operator Certification program. This program offers an 8-day course to facility managers delivered over a period of 2 to 4 months. The course trains managers in a variety of energy saving management techniques as well as advanced controls and equipment use. In 2008, 82 managers obtained a certification from this program. Managers reported a combined savings of 11,905 MWh (0.04 Trillion Btu) as a result of this training.

# Industrial Sector

The Industrial sector shares many of the same end-uses as the commercial and institutional sectors, but these typically represent only a small fraction of the savings potential. The dominant load in the industrial sector is **process**.

## Industrial Process

Process loads tend to vary significantly, and while many center on the forestry and forest products industries, they still take a variety of forms, from the heating and cooling needs of hydraulic presses to electric loads from pulping blades used in paper manufacturing. The opportunities are very individualized, but in many cases, production needs can be met more efficiently. As in the Commercial/Institutional sector, industrial customers must be convinced that the EESP knows not just their energy needs, but their business and economic drivers as well. However, the necessary level of industry-specific engineering expertise typically goes well beyond what is required in the Commercial/Institutional sector.

Experience with other programs indicates that it can take years to prove to industrial customers that an EESP and program staff members can be a valuable part of the team that provides trustworthy advice on process upgrades. It usually takes several non-process related projects (lighting, space heating, etc.) at an industrial facility before a customer is willing to entertain the idea of a process upgrade.

### Barriers & Strategies – Unique Features

**Barriers**

From the program administrator's perspective, project identification is a critical barrier to achieving savings. In the absence of a dedicated account manager/EESP, customers must bring projects to the attention of the utility. Many savings opportunities go unnoticed for this reason, sometimes for many years. Also, even customers who appreciate the benefits of investing in efficiency upgrades are often unable to distinguish between industrial process services and other utility program offerings.

**Strategies**

It is critical that project funding constraints do not discriminate against large projects. Packages can include such features as flexible ROI- or cash flow-based incentives, partnering with productivity consultants, and facility manager training and certification in process productivity, energy throughput, and cost management. Often, incentives can reduce the customer's required investment to a point where the efficiency upgrade generates a positive cash flow, with the savings on energy bills exceeding the amortized cost of the investment. At specified intervals

for both project scoping and project completion, a third party measurement and verification contractor is called upon to verify the correct installation of measures and the savings potential.

Industrial customers typically have a more intense and complicated decision making process than Commercial/Institutional customers. Because process is fundamentally connected to the viability of an industrial facility, industrial customers are often very skeptical of proposed process changes. As a result, process expertise must be the cornerstone of successful industrial efficiency program delivery. The successful efficiency team for industrial customers is the one that comprehensively assembles experts. The team should seamlessly be able to, for example, address the process concerns of the paper industry as well as understand the application nuances of the cutting edge lighting measures for the individual paper plant.

## Metrics

The industrial process program will be integral to the success of the efforts of the Efficiency Maine Trust. It is one of the largest pools of potential savings and poses some of the most unique and technically demanding challenges in any potential market. In order to meet it's goals, the Efficiency Maine Trust will need to strive to hit the targets listed in Table 13: Industrial Process Savings Targets. Those targets will require a program spending as outlined in Table 14: Industrial Process Budget (Million $).

**Table 13: Industrial Process Savings Targets**

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Electric (GWh) | 21 | 42 | 83 | 160 | 271 | 410 | 577 | 778 | 1,015 | 1,272 | 1,529 |
| Electric (MW) | 5 | 10 | 21 | 40 | 68 | 102 | 144 | 195 | 254 | 318 | 382 |
| Natural Gas (Thousand Therms) | 30 | 60 | 120 | 230 | 389 | 589 | 829 | 1,118 | 1,458 | 1,827 | 2,196 |
| Fossil Fuel (Thousand Gallons) | 172 | 344 | 687 | 1,318 | 2,234 | 3,380 | 4,755 | 6,417 | 8,365 | 10,484 | 12,604 |

**Table 14: Industrial Process Budget (Million $)**

| 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|
| $9.11 | $9.11 | $18.22 | $33.41 | $48.59 | $60.74 | $72.89 | $88.08 | $103.26 | $112.37 | $112.37 |

## Existing Program Integration

Efficiency Maine does not currently offer a program specifically to Industrial customers. It is too early to judge the results of the Energy and Carbon Savings Trust's efforts for these customers.

# Next Steps

This document provides a starting point for a broad-based discussion on the shape of Maine's energy efficiency programs for the future. It is neither the final word nor does it contain definitive analysis. Rather, it is a preliminary representation of the complete and comprehensive energy efficiency design effort that will be presented in the form of the Triennial Plan during the spring of 2010.

The Efficiency Maine Trust has scheduled public meetings to solicit comments on this outline at the following dates and times:

- **Friday, January 15, 1:30 p.m. to 4:30 p.m.**, Room 105, D.P. Corbett Hall, University of Maine, Orono. Free parking is reserved in the Corbett lot for attendees. For campus location, see http://www.umaine.edu/locator/files/2009/05/MapSide2009-2010v2.pdf).
- **Friday, January 22, 9:30 a.m. to 12:30 p.m.**, Rooms 109 and 110, Abromson Community Education Center, University of Southern Maine, Portland with parking at $2 per day in Bedford Street garage, with coupons for attendees' use. For directions, see http://www.usm.maine.edu/conferences/.
- **Friday, January 29, 9:30 a.m. to 12:30 p.m.**, Room 211 (Utilities and Energy Hearing Room), Cross Office Building, State House Complex, Augusta.

For updated information visit www.efficiencymainetrust.org.

The Trust also welcomes comments submitted in writing. Send email to info@efficiencymainetrust.org, or mail comments to the following address:

Efficiency Maine Trust
State House Station 19
Augusta, ME 04333-0019

# Appendix A – Units

## Units of Energy

The amount of energy released from a common unit of a particular type of fuel, (e.g. a gallon of #2 fuel oil) is not directly comparable to that of another fuel type, (e.g. Therm of natural gas). To facilitate comparisons across fuels types, all quantities are converted into their energy content in British thermal units, or Btu's. Due to the sheer scale of the numbers being analyzed, the common units are expressed in trillion Btu (TBtu). The table below provides a sense of scale of the amount of fuel with an energy content of one TBtu. Note that the analysis does not incorporate transportation energy use; the Efficiency Maine Trust interprets its authority as excluding this sector.

**Table 15: Fuel Unit Conversions**

| Fuel Type | Btu/Common Unit |
|---|---|
| #2 Fuel Oil | 138,900 Btu/gal |
| Electricity | 3,412,000 Btu/MWh |
| Natural Gas | 100,000 Btu/Therm |

In terms of services provided, one TBtu can:

- Heat 8,000 Maine homes for one winter[2]
- Fuel 8,600 Maine F-150s for one year[3]
- Meet the electricity needs of 46,000 Maine homes for one year[4]

[2] Average usage 900 gallons #2 Fuel Oil per winter
[3] Average per capita 11,298 miles per year and 2009 F-150 at 14 MPG
[4] Average annual electricity usage 6,349 kWh/year per EIA-form 861-2007

# Appendix B - Common Program Threads

This section provides a cursory overview of the methodology of efficiency program design. It is intended to provide the reader with a basic understanding of key considerations and to solicit preliminary comments.

## Typology – Breaking Down the Programs

### Sectors

Comprehensive efficiency programs maximize the savings they capture through providing services to all sectors and markets. The sections that follow describe programs for three basic sectors, residential, commercial and institutional, and industrial process. Markets are typically defined by opportunity presented to the program administrator to influence decisions.

### Markets - Opportunities and Investment Decisions

**New Construction, Remodel/Replacement (Market Driven):** In this market, building owners install new equipment because of equipment failure, expansion, performance concerns, aesthetic issues, or other drivers. Typically, the window of opportunity (in terms of time) to influence the purchasing decision is very narrow. Success in this market relies heavily upon the work of retailers (for retail products), design professionals (particularly engineers), trade allies (*e.g.*, contractors, vendors, suppliers), and procurement officers. The costs associated with efficiency improvements in this market reflect the *incremental* cost over and above the cost to purchase and install standard efficiency equipment. Efficiency savings are measured as the *incremental* efficiency improvement over standard new equipment.

**Retrofit (Discretionary):** In this "market," building owners or tenants have existing equipment that is functioning adequately. While it may be inefficient or have other disadvantages (*e.g.*, age, reliability, product quality), the owner has the option of continuing to use this equipment. When considering energy efficiency, a building owner must compare the benefits of new equipment against the full cost to purchase and install the equipment. Short term energy savings tend to be fairly large, based on the difference between the new efficient equipment and the older, inefficient equipment. Long term savings eventually decrease because at some future time customers would have replaced the old equipment due to failure or renovation with new equipment of at least standard efficiency.

This typology applies broadly regardless of sector. For some programs it is beneficial to subdivide the market or sector to achieve targeted results or to address specific barriers.

## Barriers

As noted in the section above, the benefits of energy efficiency are numerous. Program development postulates that efficiency measures are not installed due to a variety of barriers. This section provides an overview of the barriers that apply across the entire range of sectors and markets. Subsequent sections address barriers that are targeted by specific programs.

- First Cost - This is usually the most common barrier to efficiency projects. Consumers tend not to pay attention to efficiency opportunities, especially when energy costs represent a consistent and often times overlooked portion of expenses. As a result, owners often invest in inefficient equipment (typically less than baseline) to help decrease up-front costs.
- Split Incentives – This occurs when decision are not made by all of the parties affected. For example while owners pay the cost of construction, tenants generally pay the utility bills and are typically not present during most of the construction process. As a result, the builder may see little or no incentive to pursue energy efficiency which is perceived to add construction costs. This may apply equally to commercial or residential facilities.
- Lack of Knowledge (Search and Information Costs) - Lack of knowledge is a barrier that prevails throughout the supply chain, from design for building to retail sales for consumer products. Consumers and the supply chain often are not aware of the true costs and benefits of their decisions with regard to energy use. They may be unfamiliar with or distrust "new" technologies. They may fear that other performance features will be lost or compromised. They may not understand the benefits to their businesses from promoting energy efficiency or to their bottom line from utilizing it.
- Lack of Reliable & Credible Sources – Directly related to lack of knowledge is a lack of reliable sources of information and analysis. Even if a customer were aware of energy efficiency and interested in implementing efficiency measures, they may be at a loss for advice and analysis. In these cases, the standard practice, doing what has always been done, becomes the default decision.
- Institutional Impediments – Perverse incentives exist in a variety of market transactions. For mass market products, e.g. refrigerators, pay structures (commission) of sales representatives may not make any distinction between inefficient and efficient products, which may be more difficult to sell due to barriers noted above. A comparable dynamic may apply in the design process for the largest energy using facilities. Design firms generally base their rates on the total project cost. This can cause two problems. First, they may be discouraged from doing the research and design work necessary to adapt to new technologies and systems without compensation. Second, without a track record to attest to the efficacy of efficient design, promoting efficiency can appear to customers that

This is a broad overview of the barriers to efficiency commonly found. The next section provides an overview of how these barriers will be addressed by Maine's efficiency program.

## Strategies

Maine's proposed efficiency program will overcome the barriers through a variety of strategies, briefly described below.

**Customer Education** – Educating customers about investments in efficiency, especially in cases where the building owner is also the developer, can have positive market transformation effects. Creating an understanding of the benefits of efficiency among building owners and rate payers will help to drive the demand for efficient equipment and systems into the marketplace.

**Market Actor Training/Certification** – Offering a certification in efficient design or product standards and practices is an effective way to differentiate program efforts from standard building practice. It gives the market actor a point to differentiate themselves from the competition and at the same time promotes the program to customers.

**Audits/Rating/Studies** – Rating buildings on a scale of efficiency helps building owners better understand how efficiency will impact their operations. This goes hand in hand with customer education, but more than just explaining the general benefits of efficiency, it will give them a tangible result of what an investment in efficiency will mean to them or their organization. This can come in the form of an audit of an existing building or the rating of a new construction project.

**Technical Support – Customer** – Offering expertise to customers not only builds trust between the program administrators and the customer, but it creates a vector to make design recommendations when a new construction project is proposed.

**Technical Support – Contractor** – This strategy is closely tied to market actor training and certification. By offering technical expertise to upstream market actors, it provides an opportunity to create a relationship with them. By developing that relationship it promotes utility efficiency programs as well as establishing credentials for utility program staff.

**Incentives** – Offering incentives to customers, building owners, or upstream market actors to choose more efficient equipment is a direct way to change consumer behavior. Incentives can take the form of direct customer subsidies, inventory stocking incentives, design incentives for the A&E community, or buy-downs to reduce equipment cost at the vendor level.

**On-bill Financing** – Allowing the customer to finance all or part of a retrofit project through the utility company is often preferable for the customer for a number of reasons. Because the utility gets the demand reduction, they have an added incentive to promote the project and as a result often offer low or no interest financing. It also removes the hassle of involving a third party in the financing process and payment is made on the utility bill, which is convenient.

**3rd Party Financing** – It is better for the utility company to leverage the capital of a lending institution. It mitigates risk and allows for a larger pool of capital to be used for investment in efficiency projects. Sometimes there are creative hybrid arrangements made between lending institutions and utilities so that the financing has the appearance and convenience of on-bill, but the backing of a 3rd party.

**Co-marketing with Market Actors** - Getting engineers, design professionals, contractors and vendors to promote efficiency can have a noticeable effect on market transformation. By offering incentives to market actors to stock efficient products and promote efficient designs, they can directly promote the program whenever they come into contact with a customer. This is a crucial strategy for small commercial and institutional customers because it alleviates some of the difficult and expensive leg work involved in trying to reach out to each individual customer to promote smaller, marginally cost effective projects.

These strategies are tailored for specific markets and sub-markets based on program specifications. The next sections provide detail at the programmatic level on markets, strategies, barriers, and integration with current offerings where applicable. For the purposes of this document, the overviews remain at a high level. Residential programs are presented first, followed by commercial and institutional, and finally industrial.

## Labeling

Mandatory building energy performance labeling is a powerful and increasingly prevalent tool for transforming both residential and commercial building markets. The Efficiency Maine Trust will need to work with state legislators and other stakeholders to advocate new legislation requiring time of sale labeling for both residential and commercial buildings, and scheduled public disclosure for commercial buildings as well.

Under a time of sale labeling policy, home and building owners are required to include a valid energy performance label in all advertising of the sale of the building. This allows potential purchasers to easily compare buildings on their energy performance at all stages of their decision-making. Before putting a property on the market, the owner obtains an energy rating from an independent evaluator, who models the building's energy consumption under standardized conditions. Experience from other jurisdictions has shown that, once well established, mandatory time of sale labeling can cause purchasers to give greater considerations and value to efficient buildings. This can create a powerful financial incentive for high

performance construction and building retrofits, and increases the certainty of owner payback for longer-term efficiency investments. Over time, time of sale labeling can be extended to rental markets as well.

Under a scheduled public disclosure policy, designed commercial building owners are required to obtain an energy rating annually and post it to a publicly available database. Ratings in this case are "operational" and reflect the building's actual energy consumption in the past year. Mandatory annual ratings create multiple benefits: building owners and managers gain information about their building's performance and potential energy savings; the Efficiency Maine Trust and energy service companies can use this information to more efficiently and effectively market their value-added services to those who need them most; and stakeholders can support (or pressure) owners to improve performance over time.

The Efficiency Maine Trust would support the development of mandatory energy labeling in Maine by: working with legislators and stakeholders on legislation; working with regional and national organizations on the development of a low-cost, accurate and consistent rating system; and ensuring that other Efficiency Maine Trust programs complement an eventual labeling requirement – for example by ensuring consistency between energy audit formats and tools.

## Codes and Standards

**Building codes**

Building energy codes set the floor for energy efficiency in new construction by establishing minimum energy efficiency requirements for all new and substantially renovated residential and commercial buildings. Improving energy codes generates significant energy savings since they affect energy consumption across all building types and sizes. In addition, these substantial savings are inexpensive to implement and will remain over a long period of time, i.e. throughout the buildings' lifespan.

The ACEEE has recently released a study5 in which Maine was ranked 8th in the country with respect to building energy codes. On one hand, the State received high marks for having mandatory statewide codes based on the latest national model energy codes. The adoption of these national codes was made possible by the *Maine Uniform Building and Energy Code Act*, which came into force in 2008. They will become effective in 2010 to 2012 and replace all state and locally adopted building codes. On the other hand, the State scored very low on building code enforcement efforts.

In 2010 the State Planning Office, in consultation with the Technical Building Codes and Standards Board, will develop a training program for municipal building officials, local

[5] *The 2009 State Energy Efficiency Scoreboard*, American Council for an Energy-Efficient Economy (ACEEE), October 2009.

enforcement officers and 3rd-party inspectors, providing them the knowledge and skills to properly implement the new codes. Although this training will be a step in the right direction in addressing the compliance issue, this will not be enough. Adequate and stable long term funding must be provided at the local and state level to enforce these codes, an issue that should be addressed in the short-term by the Efficiency Maine Trust.

A long-term financial commitment will also be necessary to undertake a regular code update (every 3-5 years) to reflect the latest national model energy code. This will ensure that building regulation does not fall behind construction practice, which will be improved through the proposed residential and commercial new construction programs and mandatory labeling scheme. Financial resources will also be needed to undertake key regulatory tasks, such as participation on regional (NEEP) and national technical support committees.

An "information appendix" that constitutes "above code" building standard is not currently included in the current codes. Such an appendix provides a guide to building professionals wishing to construct more advanced energy efficient buildings, and should be included in future codes.

**Standards**

The introduction of energy efficiency standards is a highly cost-effective opportunity, as in the case for building codes. Efficiency standards remove from the market place the most wasteful products and ensure that all new products include minimum energy efficiency improvements.

In order to maximize its energy savings impact, an effective standard policy should be coordinated with energy efficiency programs since the programs' primary objectives are to remove the market barriers that prevent the introduction of energy efficiency measures. In sum, efficiency programs prepare the grounds for market acceptance of efficiency standards

Maine has not updated its efficiency standards in a decade or more. Furthermore, new standards, including most notably on televisions, offer significant energy savings opportunities that will contribute to achieving Maine's new energy efficiency goals.

These strategies are tailored for specific markets and sub-markets in the program descriptions below.