STAYING ON TOP

Energy Efficiency Continues to Deliver Benefits to Massachusetts Residents and Businesses

2012

The Report of the Massachusetts Energy Efficiency Advisory Council

Prepared for the Massachusetts General Court,
the Joint Committee on Telecommunications,
Utilities and Energy, and the Department of Public Utilities

November 2013

Letter from Chair

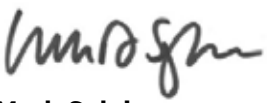
We are pleased to submit this Energy Efficiency Advisory Council (EEAC) report to the Massachusetts Legislature as a reflection of the activities, evolution, and accomplishments that occurred in 2012, and throughout the three years of Massachusetts' first three-year, statewide energy efficiency plan. Thanks to the ongoing commitment of the legislature, Governor Deval Patrick and Secretary Rick Sullivan to implement the Green Communities Act and deliver all available cost-effective energy efficiency, Massachusetts has experienced unprecedented results from the comprehensive, integrated plan, including $5.5 billon in benefits.

Massachusetts continues to lead the nation in clean energy policies, and its commitment to energy efficiency is no exception. Not only are we enabling significant energy efficiency investments across all customer types and income levels, we are validating these accomplishments with some of the most rigorous evaluation and verification practices in the nation.

In 2012, Massachusetts was named the #1 state for energy efficiency in the American Council for an Energy Efficient Economy's (ACEEE's) State Energy Efficiency Scorecard for the second year in a row, in large part due to ongoing implementation of the Green Communities Act. The Act has provided an opportunity to prove the value of energy efficiency to individuals, businesses, cities and towns, and stakeholder and community groups as both an economic and an environmental resource for the Commonwealth and the region.

The EEAC guides the progress of the Massachusetts Joint Statewide Three-Year Electric and Gas Energy Efficiency Plans (Three-Year Plans) and continues to push for more energy savings for each participant as well as broader reach of the programs. The Mass Save® Program Administrators (PAs) continue to evolve to serve their customers better and bring advanced technological and programmatic innovations for improved energy management. One important element of our success is the engagement of stakeholders, including local governments and state agencies that have embraced energy efficiency and worked collaboratively with the PAs and the EEAC to contribute to our collective, ongoing achievements.

The Three-Year Plans are a model of success, but they also lay the groundwork for sophisticated approaches to business markets, and diverse audiences with mixed cultural backgrounds and language barriers. The PAs have delivered on aggressive goals and impressive customer participation levels. The Home Energy Services program served more than 75,000 households in 2012 and an additional 37,000 low-income residents. Since 2010, Massachusetts' energy efficiency programs, under the statewide Mass Save brand, helped participants save 2,390 gigawatt-hours of electricity — enough to power 314,427 homes for a year. They saved more than 49 million therms of natural gas — enough to heat nearly 52,017 homes for a year. In addition, this drop in energy consumption reduced greenhouse gas emissions by nearly 1.4 million tons — the equivalent of taking 289,954 cars off our roads for a whole year. We thank the councilors, the PAs, the EEAC consultants, and the many stakeholders for their leadership, their partnership, and their dedication to realizing energy efficiency as our first fuel.



Mark Sylvia
Commissioner, Massachusetts
Department of Energy Resources
Chair, Massachusetts Energy Efficiency
Advisory Council

Christina Halfpenny
Director, DOER Division of Energy Efficiency
Designated Chairperson, Massachusetts
Energy Efficiency Advisory Council

Executive Summary

This report presents a summary of Massachusetts' energy efficiency accomplishments and the results of the first Joint Statewide Three-Year Energy Efficiency Plans ("Three-Year Plans"), covering 2010 through 2012. Driven by the requirements of the Green Communities Act of 2008, including a mandate to capture all cost-effective energy efficiency opportunities, the Three-Year Plans generated $5.5 billion in economic benefits to the Commonwealth. In 2012, Massachusetts' gas and electric utilities and energy efficiency service providers, or Program Administrators (PAs), continued to build momentum in all areas of program delivery and across the Mass Save® brand. The Plans' robust evaluation framework brought forward actionable intelligence regarding opportunities for program enhancements, as well as measured results in the outcomes of all programs and initiatives. The collective efforts of the PAs, the efficiency industry in Massachusetts, and valuable partners and stakeholders contributed greatly to Massachusetts retaining its #1 ranking in the annual ACEEE State Energy Efficiency Scorecard. The table below summarizes some of the key quantitative outcomes of the Plans.

THE ANNUAL ENERGY SAVINGS ARE REPRESENTED BY THESE ICONS THROUGHOUT THE REPORT

HOMES POWERED FOR A YEAR THROUGH ELECTRIC SAVINGS

HOMES POWERED FOR A YEAR THROUGH GAS SAVINGS

CARS EMISSIONS REMOVED FOR A YEAR THROUGH ELECTRIC AND GAS SAVINGS

THREE-YEAR PLAN ACHIEVEMENT

	2010	2011	2012	2012 % of Goal	2010-2012 TOTAL	2010-2012 % of Goal
Total Benefits (Million $)	1,312	1,820	2,333	94%	5,465	92%
Annual Electric Savings (GWh)	620	790	980	89%	2,390	91%
Annual Gas Savings (million therms)	11	15	23	96%	49	88%
Annual Oil Savings (million gallons)	1.6	2.5	3.1	132%	7.3	94%
Participants (thousands)	1,131	1,902	2,168	144%	n/a	n/a
Program Spending (millions $)	299	369	522	84%	1,190	80%
Annual GHG Reductions (metric tons)	362,235	433,457	594,085	90%	1,391,777	87%
Annual NOx Reductions (metric tons)	135	172	214	90%	521	91%
Annual SO2 Reductions (metric tons)	355	453	562	90%	1,370	91%

2010-2012 TOTAL

314,427

52,018

289,954

2012 ONLY

128,962

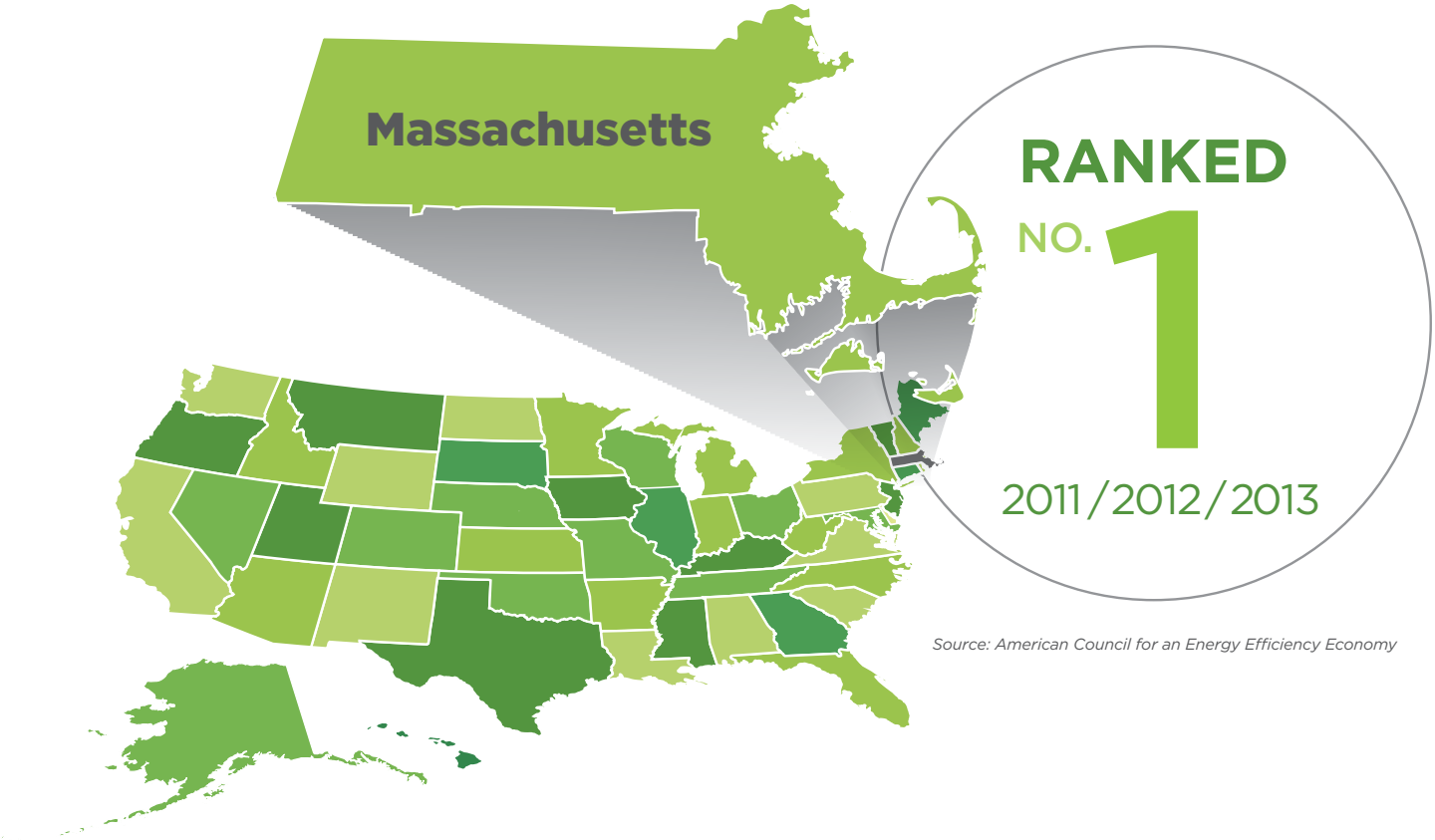
23,993

123,768

2010-2012 Highlights:

- Achieving 90 percent of the three-year energy savings, climate, and economic benefits goals, representing the most aggressive sustained efficiency achievements in the country, despite continued challenges such as a sluggish economy and dramatic reductions in the price of natural gas.
- Reinforcing the statewide Mass Save brand as the "go-to" source for energy efficiency information, incentives, and technical support.
- Delivering tens of thousands of home energy assessments.
- Implementing an industry-leading upstream lighting initiative that dramatically increased the use of state-of-the-art LED lighting technologies in both the residential and commercial sectors.
- Continuing to leverage a rigorous and comprehensive evaluation framework as an integral part of a plan-do-check-act cycle of program development and evolution.

ACEEE STATE ENERGY EFFICIENCY SCORECARD



Source: American Council for an Energy Efficiency Economy

LOOKING FORWARD

As Massachusetts looks to build on the successes of the first Three-Year Plan, it continues to press for new and innovative approaches to energy efficiency. The Three-Year Plans for 2013–2015 are ambitious, continuing the trajectory of increasing energy savings and benefits and identifying new ways to engage consumers and businesses throughout the Commonwealth. Massachusetts will continue to deliver on the aggressive savings year after year and support them with robust analysis and evaluation to demonstrate that the savings are attained in a cost-effective and sustainable manner.

2012 **Report**

Three-Year Plans - Background

HISTORY

The current framework for energy efficiency delivery was developed in response to the mandates of the Green Communities Act. The Massachusetts Joint Statewide Three-Year Energy Efficiency Plans (2010–2012) stand on the foundation of 25 years of delivering well-established, highly regarded energy efficiency programs, and are the result of several years of effort by the Commonwealth's gas and electric distribution companies and municipal aggregators (the PAs), the EEAC chaired by the Department of Energy Resources (DOER), the Department of Public Utilities, and many interested stakeholders in the public, private, and nonprofit sectors.

Three acts signed into law in 2008 guide the continued evolution of efficiency programs in Massachusetts.

1. The **Green Communities Act** requires the PAs to develop energy efficiency plans that will "provide for the acquisition of all available energy efficiency and demand reduction resources that are cost-effective or less expensive than supply." In connection with these energy efficiency plans, the act established the EEAC to oversee and advise the PAs on all aspects of efficiency planning and program execution.
2. The **Global Warming Solutions Act** (GWSA) mandates the reduction of greenhouse gas emissions in the Commonwealth, establishing a schedule of emissions reduction goals designed to spur innovation and promote research and development in the area of clean energy.
3. The **Green Jobs Act** provides a funding source for the clean technology industry, facilitating economic development and job growth in the clean energy sector. This law established the Massachusetts Clean Energy Center.

These legislative efforts were driven by a number of factors, including concerns over Massachusetts' high energy costs, vulnerability to volatility in these markets, significant cost-saving options created by energy efficiency investments, and opportunities to develop a robust clean energy economy.

Massachusetts is at the end of the energy pipeline, figuratively and literally, importing all of its fossil-based energy sources — oil, natural gas, and coal — from other regions of the country or other parts of the world. More than 80 percent of the money spent on energy each year in Massachusetts leaves the state. This represents a huge opportunity to grow the Commonwealth's economy through local investments in energy efficiency, renewable energy, and other business and consumer needs.

In addition to this economic drain, energy consumers have experienced both dramatic price swings and long-term energy price increases over the last decade. By investing in energy use reduction, Massachusetts can keep energy dollars in the Commonwealth and reduce the impact of external price shocks on its citizens, thus sustaining more jobs and businesses.

GOVERNANCE: THE ENERGY EFFICIENCY ADVISORY COUNCIL

The Massachusetts EEAC was created by the Green Communities Act to guide the development of comprehensive, integrated, statewide energy efficiency plans and monitor their implementation. Its primary role is to achieve and fulfill the efficiency requirements, goals, and obligations of the Act. Fifteen voting members represent a variety of energy efficiency stakeholders. Fifteen non-voting members include the PAs and other stakeholder groups. The EEAC is chaired by the commissioner of the Massachusetts Department of Energy Resources (DOER).

Whereas the EEAC is responsible for reviewing and approving plans, and offering guidance and advice, the PAs are responsible for delivering the programs and taking the actions that result in measurable, verifiable energy savings that meet the goals. As regulated entities, the PAs must receive approval from the DPU on various aspects of their plans, including efficiency program spending and related issues of cost recovery. The Three-Year Plans covering the period from January 1, 2010, to December 31, 2012 were unanimously approved by the EEAC and then the DPU on January 28, 2010.

FUNDING SOURCES

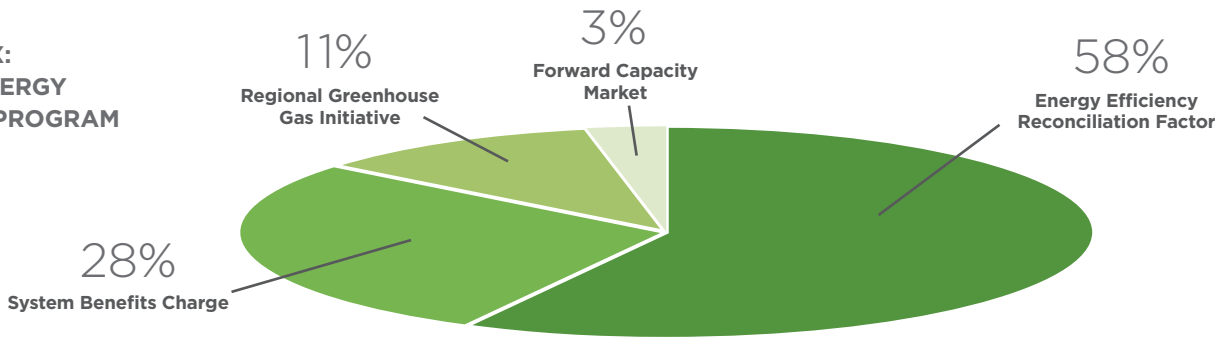
The electric energy efficiency programs are funded by a variety of sources, including the Energy Efficiency Reconciliation Factor (EERF), which was created by the Green Communities Act (percentages below represent total funding planned for 2010-2012, based on the 2012 Mid-Term Modifications):

- The legislatively mandated SBC of 2.5 mills (0.25 cents) per kilowatt-hour for all electric customers, except those served by a municipal lighting plant (28 percent).
- The EERF, which recovers additional program costs from electric customers in proportion to the costs of programs directed at their sector (i.e., residential, commercial & industrial), with low-income programs receiving subsidies from other sectors (58 percent).
- Regional Greenhouse Gas Initiative (RGGI) auction proceeds (11 percent).
- Forward Capacity Market (FCM) payments from ISO-New England (3 percent).

The natural gas efficiency programs are funded by an Energy Efficiency Surcharge (EES) on gas customers' bills.

These designated funds were not the only energy efficiency dollars at work in the Massachusetts economy in 2010-2012. Grants to cities and towns from DOER's Green Communities Designation and Grant Program (funded by RGGI proceeds) and the robust clean energy investments from the American Recovery and Reinvestment Act (ARRA) added investments in energy efficiency beyond the funding from the Three-Year Plans. The Mass Save programs were leveraged in city, town, and state buildings, as well as residential and business buildings, to achieve deeper energy savings and greater participant benefits than any would have produced on their own.

FUNDING MIX: ELECTRIC ENERGY EFFICIENCY PROGRAM



IMPROVEMENTS IN MASS SAVE BRAND RECOGNITION

During the past three-year cycle, the PAs have devoted marketing efforts to the Mass Save brand. A recent survey of residential and commercial customers demonstrates some successes from these efforts. For example, commercial and industrial (C&I) customers were 40 percent more likely to have seen or heard the term Mass Save when surveyed in March 2013 than they were in February 2012, just over one year earlier. And although residential customers' recognition of the brand did not improve over that time period, the survey did find that two-thirds of residential respondents were aware that rebates and incentives for energy-efficient appliances or home improvements were available from their utility or energy efficiency service provider.

ENSURING REAL SAVINGS: EVALUATION, MEASUREMENT, AND VERIFICATION (EM&V)

EM&V is the systematic collection and analysis of data to verify, document, and improve program performance and to enhance the program offers and services for all participants. EM&V analysis helps ensure that participants benefit from the energy efficiency investments that are made, and that the reported savings and benefits are fully realized for residents and businesses.

For its energy efficiency initiatives, Massachusetts maintains a vigorous and far-reaching EM&V program in which virtually all studies are performed at a statewide level. EM&V studies are administered jointly by the PAs and in collaboration with the EEAC, with decision-making authority ultimately resting with the EEAC. In 2012, the PAs completed 45 EM&V studies, including impact and process evaluations of major programs and studies of special issues such as the effectiveness of branding efforts, the non-energy benefits attributable to C&I programs, the current status of residential lighting markets, and compliance with non-residential new construction codes.

HOW EVALUATION WAS USED TO MODIFY PROGRAMS THROUGH 2010–2012

EM&V efforts conducted over the past three program years have provided a wealth of information that has increased confidence in the efficiency resource and led to a wide variety of improvements in program delivery and accomplishments. For example, early evaluation for the High Efficiency Heating Equipment program (HEHE) showed relatively low net-to-gross (NTG) ratios. In response, the PAs refined the program with new measure offerings. As a result, a more recent evaluation found that NTG ratios have increased, thus improving both the cost-effectiveness of the program and our confidence in the claimed energy savings. In non-residential programs, evaluations led to many improvements in engineering estimation methods, and processes have led to improved reliability of the savings. Evaluations have also improved the quality of program delivery. For example, non-residential programs experienced the restructuring of account management and customer segmentation efforts, partially in response to information gathered from evaluation activities. Last, industry-leading research efforts supported by the EM&V budget have allowed for more comprehensive valuation of non-energy benefits, which in turn led to improvements in measure cost-effectiveness and the expansion of measures offered in existing programs.

ASSESSING GREEN JOBS

The creation of local jobs is an important benefit of investments in energy efficiency. Research indicates that each $1 million spent on residential weatherization supports 12 direct in-the-field full-time jobs. Across all program spending, energy efficiency has been adding jobs to the Commonwealth at a 10 percent growth rate since 2011, according to the 2012 Massachusetts Clean Energy Industry Report.

Residential Programs

In 2012 the PAs built on the successes of 2010 and 2011 and offered new services and incentives, enhanced customer education and outreach, and expanded the ability of homeowners and renters to work with independent contractors. The portfolio of residential programs continued to expand the breadth and depth of participant savings by taking a comprehensive approach to program delivery, capturing as much as possible in savings for each participant through a single participant engagement process.

Home energy assessments by energy specialists are the starting point for a whole-house approach to savings. Several instant savings measures, including installing efficient lighting, low-flow showerheads, and faucet aerators, are offered to the customer during the initial visit. The value of these measures and the associated energy savings are intended to, on average, exceed the value of the assessment. The assessment identifies opportunities (and related incentives) for further upgrades to the building envelope, heating and cooling equipment, and appliances and lighting. The residential sector programs also offer incentives for upstream stakeholders (retailers and manufacturers, contractors, design professionals, etc.) to offer information and services related to energy-saving technologies for residential participants. This has increased the availability and visibility of high-efficiency technologies in the residential participant marketplace and raised awareness of the benefits of those technologies.

2012 Residential Highlights

- 121 communities had adopted the "stretch code" (a voluntary building code to promote additional energy savings) by 2012, and PAs supported the more stringent energy efficiency requirements through technical assistance and financial incentives. Market penetration increased for the residential new construction program and the PAs conducted pilots to identify the next generation of savings opportunities.
- 2012 was the first full year of the market model for delivery of home energy services. Ninety home performance and insulation installation contractors statewide provided services to customers in addition to those provided by the PAs' lead vendors. This workforce supporting the program provided home energy assessments to 32,728 gas and 42,060 electric participants (there is some overlap between the numbers of gas and electric participants).
- The HEAT loan program (discussed in greater detail later in the report), through which customers can apply for a 0 percent loan from participating lenders to assist with the installation of qualified energy-efficient improvements in their home, saw an increase in the average loan amount and the number of customers financing multiple energy efficiency improvements. The program also expanded to include central air conditioners and became available to residential electric customers in individually metered condo units.
- Product availability for a relatively new lighting technology, light-emitting diodes, or LEDs, increased, and the PAs surpassed their LED bulb goal by 362 percent and LED fixture goal by 98 percent. All PAs met or exceeded their savings goals for the lighting program overall.
- The ENERGY STAR® appliances program offered incentives for purchases of qualified refrigerators, freezers, advanced power strips, LCD monitors, pool pumps, computers, and televisions as well as for recycling of second refrigerators and freezers. Program results were mixed, and shifting federal minimum standards for many consumer products and ENERGY STAR voluntary performance specifications present an ongoing challenge.
- Building on past and ongoing community engagement efforts, PAs conceived the Efficient Neighborhoods + initiative to target lower-income to moderate-income consumers in designated communities and neighborhoods. The new initiative will be tested in 2013 as an extension of the Home Energy Services initiative and is intended to provide significant energy savings benefits to customers who live in neighborhoods with older housing stock and who are often financially unable to make energy efficiency investments.

RESIDENTIAL RESULTS

2012	Program Spending (million $)	Participants (thousands)	Annual GWh	Lifetime GWh	Annual Therms (million)	Lifetime Therms (million)	Annual GHG (metric Tons)
Actual	218	2,112	317	2,219	11	139	235,743
Goal	210	1,846	291	1,762	11	145	226,147

41,723

11,443

49,113

Case Study:

HOME ENERGY SERVICES PROGRAM SINGLE-FAMILY HOME — ABINGTON, MA

Mass Save Partners: National Grid

E. Walls had a Home Energy Assessment completed at her 1,040 square foot single-family home in Abington, MA. The home was built in 1983. At the Assessment it was determined that the homeowner could benefit from insulation in the attic and air sealing measures. E. Walls received over $2,000 towards the cost of energy efficiency improvements and may save over $300 annually on energy costs.

> *" Everyone connected with the Program was excellent – professional, knowledgeable, polite. I cannot say enough about the Energy Specialist that completed the Assessment and the contractor that completed the recommended work. Mass Save is a wonderful program and I found everyone associated with it to be wonderful as well. "*
>
> *— E. Walls*

The Need

Improve efficiency and reduce energy costs.

The Solution

Installed insulation in the attic, a programmable thermostat, and sealed air leaks throughout the home with the help of rebates and incentives from National Grid.

Savings Summary

Project Cost:	$2,411
Incentives Paid:	$2,009
Annual Cost Savings:	$325
Customer Payback:	Less than two years

MASS SAVE HOME ENERGY SERVICES: CONTRACTORS RAMP UP BUSINESSES

When the Mass Save Home Energy Services program expanded after passage of the Green Communities Act and during implementation of the 2010–2012 Three-Year Plans, Massachusetts insulation contractors responded to new requirements and an unprecedented business opportunity.

With new stakeholder expectations that customers would receive consistent statewide programs from regulated electric and natural gas providers, gas insulation programs began to get the same rigorous scrutiny and evaluation required of the electric programs. As the need for statewide standards for contractor qualifications, delivery, services, and pricing became clear to contractors and the program administrators (PAs), all parties agreed that contractors needed to be involved in a new way. The contractors' Best Practices Working Group (BPWG) was formed in 2011 to ensure that the contractors, who were asked to adapt to significant market changes over the course of a year, could provide continuous feedback on program changes and in-field perspective on policy decisions. Representatives of the 80 contractors working in the program participated in the BPWG along with implementation vendors and PA representatives.

Some issues addressed by the BPWG during its first year were changes to price structures, changes to payment terms, and consumer-focused improvements in the quality assurance process. One insulation contractor, who also performs insulation work in a neighboring state, noted at a recent contractor meeting that Massachusetts' attention to contractor needs and commitment to collaboration between program administrators and installers sets it apart.

Residential customers have benefited from this collaborative process and the marked increase in energy efficiency services. Between 2010 and 2012, the number of Massachusetts customers saving money and energy through Mass Save increased by more than 60 percent annually. Contractors have benefited as well, as there are now 116 independent insulation contractors and 25 home performance contracting companies qualified as Mass Save vendors.

CHRISTINE MCEACHERN

OF MCEACHERN INSULATION, INC.

A BPWG representative, salutes the changes developed with insulation contractor input.

" We have a constant workflow coming from Mass Save, which means we can offer steady employment to our crews and invest in our workforce," said McEachern.

" I have found a great sense of accomplishment working together with the [program administrators] and lead vendors and the contractors to make positive change happen within the program."

RICK TAGLIENTI

TREASURER OF ROGERS INSULATION SPECIALISTS, INC.

Sits on the BPWG. His company has expanded by 75 percent to 25 full-time employees since Mass Save was governed by a Green Communities Act–mandated plan. He credits Mass Save with supporting his business by offering generous financial incentives for custom efficiency solutions that do not require customers to fill out rebate forms.

" I am most proud of being available to the other contractors in the program," said Taglienti.

MASS SAVE HEAT LOAN PROGRAM 2012

The Mass Save Residential HEAT loan program uses a local, distributed lending model to help residential customers finance energy efficiency projects for their home that they might otherwise forgo because of up-front costs. The PAs provide incentives for projects; these incentives go to pay down the interest of loans issued by lending institutions. The approval process is streamlined, and the result is a 0 percent loan of up to $25,000 that the residential customer can use for a wide range of energy efficiency projects.

The HEAT loan program has experienced tremendous growth since its creation in 2006. Through 2012, the total amount loaned was approximately $155 million, representing more than 18,000 loans. Loan default rates continue to be low (less than 1 percent) in comparison with other unsecured loan types.

Low-Income Programs

Low-income programs serve homeowners and renters of single and multifamily homes whose income qualifies them for comprehensive improvements at no cost to the individual. This approach makes it easier and more efficient to capture all available savings through a single participant engagement. The focus is on reaching as many low-income residents as possible with the greatest number of cost-effective services. Projects for this target market may involve new construction, existing single-family dwellings, or existing multifamily buildings.

The new construction program offers builders four tiers of incentives to construct homes up to 60 percent more efficient than code and achieve significant energy savings levels over a baseline home. The goal for the program is to build more homes to higher efficiency levels while increasing the number of participating builders each year. The existing buildings programs work to provide information on energy-saving behaviors to low-income participants and landlords. They also install efficient weatherization, lighting, and heating and cooling improvements and appliances at no cost. This approach addresses the reluctance landlords may feel about making efficiency investments that yield lower bills for their tenants, but that do not directly benefit the landlords themselves. The program is coordinated with the low-income energy efficiency programs of the state Department of Housing and Community Development.

2012 Low-Income Highlights

- About 28,000 low-income housing units were upgraded in 2012 with more than $96 million in funding from multiple sources: $73 million delivered by members of the Low-Income Weatherization and Fuel Assistance Program Network from Mass Save funds; $13 million in federal Weatherization Assistance Program/ARRA funds; $8.5 million in federal funding for heating systems; and $2 million for innovative measures funded by the Massachusetts Clean Energy Center.
- The Low-Income Energy Affordability Network (LEAN), a central coordinating body for income-eligible weatherization and fuel assistance programs, maintained a strong infrastructure of auditors, contractors, and quality control inspectors. While LEAN and its contractors were very busy completing work under significant federal stimulus funding, they were still able to provide assistance to low-income clients through the Mass Save programs. More low-income residents received efficiency services as a result of the ARRA funding, but not all of those results are reflected in the statewide program performance data.
- The innovative low-income multifamily retrofit program began with the Three-Year Plans and continued to evolve and expand in 2012, serving more than 10,500 units with weatherization and almost 13,000 with electric improvements such as efficient lighting and refrigeration.
- LEAN continued to serve as a research and development lab for the Massachusetts Clean Energy Center, developing, for example, systems to make solar domestic hot water cost-effective.

LOW INCOME RESULTS

2012	Program Spending (million $)	Participants (thousands)	Annual GWh	Lifetime GWh	Annual Therms (million)	Lifetime Therms (million)	Annual GHG (metric Tons)
Actual	81	37	32	323	2.3	44	33,974
Goal	83	40	34	308	1.2	25	28,186

4,242

2,397

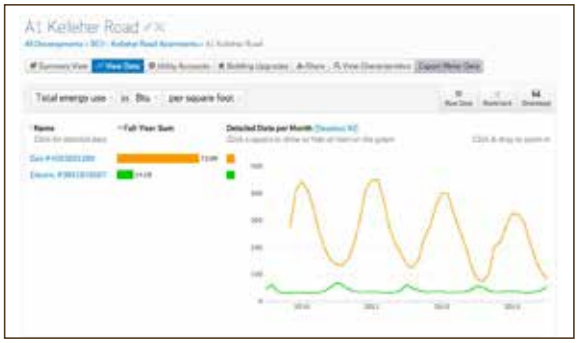
7,078

Case Study:

LOW-INCOME MULTIFAMILY RENOVATION BEVERLY HOUSING AUTHORITY

Mass Save Partners:
Low-Income Affordability Network (LEAN)
Massachusetts Department of Housing
Community Development (DHCD) and National Grid

One of the innovative features of the Low-Income Multifamily (LIMF) retrofit program is use of web-based energy benchmarking software called WegoWise, which monitors single- and multifamily building performance. Since 2010, free WegoWise memberships have been made available to public and nonprofit affordable housing owners. The software helps housing authorities identify areas for improvement and track the results.



WEGO = WATER, ELECTRICITY, GAS, and OIL

One of the success stories of the Massachusetts clean energy economy, WegoWise software was developed in Boston and has attracted nearly $5 million in venture capital investment since its founding in 2010.

WegoWise is an online tool that monitors buildings' energy use. It requires a one-time entry of basic information about the building and its utility accounts. Each month, WegoWise downloads current energy use information directly from the utility company and organizes that information in a way that makes it easy to see trends and patterns in usage. WegoWise also easily allows a building owner or manager to compare his or her building's energy use to that of similar buildings.

" WegoWise enables public housing directors to automatically track, understand, and benchmark multifamily building performance in a much more user-friendly way. [It includes] options for how to look at total energy or carbon footprint, controls for weather variability with heating degree days, and shows bottom-line savings. "

— Beverly Housing Authority

The Need

WegoWise analysis revealed that the Beverly Housing Authority's (BHA's) 54-unit Kelleher Road development was using far too much energy as compared to other similar properties. But the housing authority had scarce capital resources to make improvements.

The Solution

DHCD, the capital funding and technical assistance agency for housing authorities operating 45,000 state-assisted and 30,000 federally assisted apartments, provided federal stimulus funds from the U.S. Department of Energy for a heating system replacement, and helped the BHA apply for LIMF services. Action Inc., funded by National Grid, then completed energy upgrades such as air-sealing, insulation, and weather- stripping in the Kelleher Road development. The BHA's limited capital bond funds are being used for important longer-payback energy upgrades such as replacement windows.

Savings Summary

Project Cost:	$108,398
Incentives Paid:	$108,398
Annual Energy Savings:	1,450 MMBtu
Annual Cost Savings:	$20,000
Customer Payback:	N/A

Small Commercial and Industrial (C&I) Programs

The Small Business Services program targets small and medium-sized commercial and industrial customers, providing turnkey energy efficiency solutions to businesses that generally have few technical or financial resources to devote to efficiency improvements. The program employs contractors who are responsible for outreach, audits, and installation. Equipment vendors and trade allies also inform participants of program services. Participants can select from a standard list of predetermined improvements that cover multiple electric and gas efficiency opportunities. They can also install measures unique to their energy usage pattern through a custom approach.

2012 Small C&I Highlights

- The PAs completed more than 6,000 energy efficiency projects with small businesses in 2012.
- The PAs offer special zero percent interest financing to small businesses for efficiency upgrades that allows repayment of financing through the businesses' electric bill. Through this method, small businesses do not require any out-of-pocket capital to complete an efficiency project, and they benefit from positive cash flow immediately once the project is completed. From 2010 to 2012, PAs provided more than $29 million in financing to more than 10,000 small businesses.

SMALL C&I RESULTS

2012	Program Spending (million $)	Participants (thousands)	Annual GWh	Lifetime GWh	Annual Therms (million)	Lifetime Therms (million)	Annual GHG (metric Tons)
Actual	116	14	295	3,850	2.5	46	141,618
Goal	144	16	291	3,965	3.7	72	147,704

38,752

2,603

29,504

Case Study:

PIONEER VALLEY CONDOMINIUMS — CHICOPEE, MASS.

MASS SAVE PARTNER: COLUMBIA GAS

PVC Pioneer Valley Condominiums (PVC) was established in 1981 in a development originally built as apartments in 1957; the development is now made up of 100 one-and two-bedroom units.

In early 2012, PVC contacted Columbia Gas for an energy assessment. Columbia Gas's energy specialist reviewed everything from the attics to the boiler rooms in four buildings and identified several energy improvements. Based on the recommendations, PVC installed three high-efficiency boilers, three indirect domestic hot water tanks, attic insulation, low-flow showerheads, low-flow faucet aerators, programmable thermostats, and air-sealing measures.

As a strategic partner, Columbia Gas contributed nearly half the cost of the natural gas energy improvements. These improvements should save more than 15,370 therms per year.

The Need
Improve energy efficiency, reduce operating costs, and increase residents' comfort.

The Solution
Installation of high-efficiency heating equipment, building shell improvements, and energy-saving showerheads and aerators.

Savings Summary

Project Cost:	$130,240
Incentive Paid:	$61,190
Estimated Annual Cost Savings:	$16,890
Customer Payback:	Less than five years

" The Columbia Gas team provided us with a variety of programs to help our facility realize a substantial cost savings, reduce waste, and offer residents a more comfortable and healthy environment. At the time of the inspection, they thoroughly reviewed the energy assessment and educated us on the benefits to our facility. In the end, it was clear that it would be beneficial to take advantage of what the program had to offer"

— Teri Lee, PVC property manager

Large Commercial and Industrial (C&I) Programs

The program portfolio that serves large businesses and institutions consists of two programs: new construction and retrofit. The new construction program captures efficiency opportunities at the time of building design or during substantial renovations when basic building systems can be upgraded or replaced. The program offers incentives and financing, technical and commissioning services, and a comprehensive set of standard improvements representing cost-effective, high-efficiency technologies that have not yet become common practice. Customized solutions specific to participants' needs are also available. The program continually adjusts efficiency criteria as codes and standards advance.

The Large C&I retrofit program focuses on opportunities to reduce energy consumption in working, but outdated and inefficient, equipment and systems. Like the new construction program, the retrofit program provides an array of financial, technical, and project management services that help overcome barriers to participant adoption of high-efficiency equipment and systems, and offers both standard and custom approaches.

Larger facilities benefit from the "whole building assessment" (WBA) approach, which helps them attain maximum savings through a comprehensive technical review of the entire facility, and a prioritized action plan that addresses identified opportunities. This approach also helps facility leaders overcome institutional barriers and provides technical and financial assistance to support implementation of the plan. Certain facilities, such as large industrial enterprises, hospitals, and others with high year-round thermal use, are eligible for combined heat and power (CHP) installations that efficiently produce both electricity and thermal energy for industrial processes or other uses.

2012 Large C&I Highlights

- The PAs began development work in 2012 to expand the highly successful upstream approach to lighting has proven to be a very effective way to serve customers, increase participation, and reduce costs of program delivery. Massachusetts is the third state in the country, after California and Nevada, employing this innovative new approach. A full-scale program RFP was issued in November 2012 and awarded to a Massachusetts firm to implement the new program which began in April 2013.
- PAs continue to expand the successful model of customized, comprehensive, multiyear agreements with large businesses. These agreements have primarily been with institutional facilities such as colleges and universities, but increasingly include other key Massachusetts industries such as manufacturers and hospitals. Commitments involve significant mutual capital investments over the term of the agreement. The multiyear aspect gives businesses long-term planning and budgeting certainty and provides the PAs with a continuing stream of predictable savings over the longer time horizon. This model has been recognized and is being replicated around the country.
- In 2012, National Grid and NSTAR completed a large study identifying the key Massachusetts industries and market segments representing greater energy efficiency opportunities and thus warranting greater attention and allocation of resources. Marketing approaches, delivery systems, value propositions, and offerings are being customized to better meet the needs and interests of each market segment. For example, the PAs began developing a targeted offering and marketing collateral to serve the needs of grocers. This market segmentation approach will be used increasingly to better meet the needs of the PAs' program customers.

2012	Program Spending (million $)	Participants (thousands)	Annual GWh	Lifetime GWh	Annual Therms (million)	Lifetime Therms (million)	Annual GHG (metric Tons)
Actual	107	6	336	4,332	7.1	83	182,749
Goal	184	8	480	6,039	7.5	90	255,788

44,244

7,549

38,073

Case Study:

PARTNERS HEALTHCARE — BOSTON

Mass Save Partner: NSTAR

Partners HealthCare is a not-for-profit, integrated health-care system in Boston with approximately 60,000 employees, the largest private employer in Massachusetts. Partners HealthCare includes Brigham and Women's Hospital and Massachusetts General Hospital, along with many other hospitals and community health-care centers throughout the state. Partners recognized that the health-care sector uses energy at a far greater rate than many others do and that this consumption is not sustainable. In 2009, Partners HealthCare initiated a 10-year strategic energy master plan for all of the hospitals and facilities within its system and committed to reducing its overall energy consumption by 25 percent from a 2008 energy consumption baseline. NSTAR's energy efficiency programs are a vital component of that master plan.

During 2010–2012, more than 40 energy efficiency projects were completed utilizing NSTAR's new construction and retrofit incentive programs. New construction of Massachusetts General Hospital's Lunder building and the Spaulding Rehabilitation Hospital incorporated high-efficiency lighting and HVAC equipment, along with a combined heat and power (CHP) system at Spaulding. In Partners HealthCare's existing buildings, building automation systems have been expanded and optimized to synchronize HVAC and lighting usage to building and department occupancy. Laboratory airflow optimization has also been a key area for savings, due to the high operating costs for lab HVAC systems. Lighting and lighting controls, compressed air and vacuum systems, refrigeration upgrades, and PC power management have also played key roles in Partners Healthcare's drive for efficiency, as has the organization's emphasis on using premium efficiency HVAC and lighting equipment during renovation projects.

The annual savings of more than 527,908 million BTU is the equivalent of powering nearly 3,300 homes for a year. The projects resulted in the avoided annual emissions of more than 36,500 metric tons of CO2 — the equivalent of taking approximately 7,600 cars off the roads for a year.

" Energy is essential to the delivery of Partners HealthCare services. It also impacts the cost of delivery, it must have a high level of reliability, and its use should be sustainable to support Partners HealthCare's concern for environmental impact and climate change. Utilizing utility company energy efficiency incentive programs, the firm was able to implement many more energy-saving projects and reduce its energy consumption 16 percent from 2009 to 2012, compared to the 2008 baseline."

— Teerachai Srisirikul, Partners HealthCare Director of Utility and Engineering

The Need
Reduce overall energy consumption by 25 percent.

The Solution
Strategic energy management and a whole-building approach to energy efficiency design and improvements.

Savings Summary

Incentives from Utility Company from 2009 to 2012:	$6.2 million
Estimated Annual kWh Savings in 2012:	34.3 Million
Estimated Annual Therm Savings in 2012:	4.1 Million
Estimated Annual Savings in 2012:	$14 Million

Case Study:

BERKSHIRE BANK

Mass Save Partners: Berkshire Gas and Western Massachusetts Electric Company (WMECO)

In 2012, Berkshire Gas and Western Massachusetts Electric Company worked with Berkshire Bank to substantially increase the energy efficiency of the Berkshire Bank building in Pittsfield. The building is a 73,200-square-foot, six-floor (including basement) structure built in 1999, which primarily serves as office space.

> *" Berkshire Gas and WMECO made this energy conversion process seamless for us. Both organizations helped the bank access more than $200,000 in credits and financial incentives, which enabled us to pursue and complete this project. "*
>
> *— Peter Merwin, vice president, facilities, Berkshire Bank*

The Need

Increase the energy efficiency and reliability of the mechanical and electrical systems and reduce operating costs. Obsolete controllers for variable air volume (VAV) units, limited building management system (most of the building management functions were applied manually), two cast-iron boilers, a ventilation system with outside air at a fixed percentage of total airflow, air handling units (AHU) operated on timers, and a heating system that had an operating schedule based on 24/7 operation at fixed temperature set points with manually adjustable thermostats.

The Solution

Variable speed pumping, a high-efficiency condensing boiler, temperature and occupancy heating controls, airside controls (VAV box replacement), lighting occupancy controls, and a new high-performance data center featuring heat recovery and free cooling.

Savings Summary

Project Cost:	$388,000
Incentives Paid:	
(WMECO)	$141,000
(Berkshire Gas)	$75,000
Annual Energy Savings:	252,000 kWh and 24,000 therms
Annual Cost Savings:	$70,000
Customer Payback:	2.5 years

Municipal Program

The PAs' approach to municipal programs has evolved over the first Three-Year Plan period from highly variable service offerings by the different PAs to a much more consistent process utilized across the Commonwealth. Much of this progress is a result of the collaboration between the PAs' and DOER's Green Communities Division.

The Green Communities Division and the PAs include each other, as well as relevant vendors, in frequent outreach and education meetings with municipalities to further build the relationships necessary to move municipal efficiency projects forward. The Green Communities Division has also worked to educate municipalities about the Mass Save programs and to ensure that its efficiency grant programs integrate with the Mass Save program offerings. The PAs have worked to offer more comprehensive efficiency services and integrate electric and gas services; this work will continue into the second set of Three-Year Plans with a common direct install municipal initiative which started in the first quarter of 2013.

Municipal Highlights

- Energy assessments delivered to more than 100 cities and towns through the DOER's Energy Audit Program.
- The PAs worked to improve coordination with DOER's Green Communities Designation and Grant Program, including educating the vendor community about the requirements and opportunities of the program.
- To continue to engage municipal professionals involved in treatment of drinking water and wastewater, the PAs sponsored a nationally acclaimed energy efficiency seminar on the efficiency opportunities in these processes.
- In cooperation with the DOER, the PAs applied their upstream lighting model to the municipal sector by supplying high-efficiency, no-cost lighting products to 59 municipalities and 14 regional school districts.

Case Study:

TOWN OF PLYMOUTH

Mass Save Partner: NSTAR

One municipality that has taken full advantage of the Mass Save municipal program available through NSTAR electric and gas is the Town of Plymouth. One major project was the conversion of the Plymouth South High School heating system from electric to natural gas. Three additional heating, ventilation, and air conditioning projects; installation of variable speed drives; and a lighting project rounded out the 2012 retrofit portfolio. In 2010–2011, Plymouth implemented an additional 18 projects through Mass Save. The energy savings from these projects equate to the energy used to heat and power 76 Massachusetts homes for a year, and the greenhouse gas reductions equate to the removal of 251 vehicles from the roads for a year. For Plymouth, the savings equate to less budgets spent on energy and more on town services. The PAs encourage all communities in Massachusetts to pursue similar savings through the Mass Save municipal efficiency program.

The Need
Reduce annual energy costs to avoid budget cutbacks in student services.

The Solution
Various heating, ventilation, and air conditioning projects; variable speed drive installation; lighting upgrades.

Savings Summary

Incentives Paid:	$149,814
Annual Energy Savings:	More than 1,512,387 kWh and 6,754 therms

Looking Forward

APPRECIATIVE INQUIRY

On May 15–16 at Gillette Stadium in Foxborough, MA, the Massachusetts energy efficiency program administrators welcomed a diverse group of more than 250 business and civic leaders, policymakers, advocates, and residents to participate in "Massachusetts: Leading the Nation in the Energy Savings Revolution — Building a Better Tomorrow Through Energy Efficiency Today," an Appreciative Inquiry (AI) summit.

Participants, chosen because of their skills, expertise, experience, and valuable contributions to the community, came together in this interactive session to generate ideas for shaping the next Three-Year Energy Efficiency Plans, as well as longer-term plans that ultimately form a road map for Massachusetts' energy efficiency future. Over the course of the summit, participants discussed a wide array of issues related to energy efficiency.

At its conclusion, participants addressed common challenges and found common solutions. They were able to produce a range of insights, recommendations, and commitments to action on a number of critical fronts. Major thematic recommendations included fostering education both for children and for working professionals; improving the customer experience by simplifying processes and providing more customer-centric offerings; creating a culture of sustainability so the vast majority rather than the progressive minority recognize efficiency as the "first fuel"; and building knowledge through marketing and outreach to create widespread awareness of the availability and benefits of energy efficiency.

Much has been achieved, but much more has yet to be done. In many important respects, the journey to capture all available cost-effective energy efficiency has just begun. As Governor Deval Patrick said during his keynote speech, "Massachusetts may lead the nation, but leading the world is where we can be and where we ought to be."

2013-2015 THREE-YEAR PLAN DEVELOPMENT

We will continue to pursue our current areas of excellence, including EM&V, sharing of best practices, development of a statewide data management and analytics system, and a comprehensive marketing approach. And as Massachusetts looks to build on the successes of the first Three-Year Plan, it will continue to press for new and innovative approaches to energy efficiency. The new Three-Year Plan for 2013–2015 is ambitious, continuing the trajectory of increasing energy savings and benefits, particularly for natural gas savings. Massachusetts will continue to deliver on the promised savings year after year, supported by robust analysis and evaluation that demonstrates that the savings are attained in a cost-effective and sustainable manner.

Accomplishing higher energy savings goals through 2015 will also keep the Commonwealth on the path to achieve its energy, economic, and environmental goals as spelled out in the Massachusetts Clean Energy and Climate Plan for 2020 (adopted in December 2010). The energy savings delivered through the energy efficiency programs are the strongest single contributor to the strategies outlined in the Clean Energy and Climate Plan.

Over the coming three years, the EEAC and the PAs will focus on new initiatives and outreach strategies that identify and respond to important market segments. These include:

- Bold new initiatives like Efficient Neighborhoods+ that serve lower-income and working-class communities, incorporate extensive public feedback, target economically challenged neighborhoods, and explore target communities such as the Commonwealth's "Gateway Cities" and Green Communities.
- Industry-leading efforts to drive a revolution in lighting: new technologies, more savings, better lighting quality, and more satisfied customers.
- State-of-the-art approaches to serving the specific needs of industries such as healthcare, manufacturing and commercial real estate.
- Expanded services to municipalities, such as new approaches to proactively engaging with cities and towns, including Green Communities; an effort focused on wastewater and drinking water treatment facilities; and a new commitment to schools that will include developing curricula and driving a culture of sustainability.
- Enhanced use of market segmentation studies and sector-focused "go-to-market" approaches.

GLOSSARY

Term	Description
Benefits	The economic and non-economic effects from investments in energy efficiency. Economic benefits include the value of avoided energy purchases, reductions in operations and maintenance costs, and other resource savings (e.g., water or raw materials). Non-economic benefits include reduced pollutant emissions and increased comfort or worker productivity.
Cost-Effective	In general terms, a measure indicating that an investment's benefits exceed its costs. When applying this term to investments in energy efficiency, it is important to consider the following parameters: • The stakeholder perspective of the test, whether program participant, utility, ratepayer, or society in general. • The key elements included in the costs and benefits, including avoided energy use, incentives, avoided need for new generation sources and new transmission and distribution, and avoided environmental impacts. • The baseline against which the costs and benefits are measured; that is, what costs and benefits would have been realized without investment in energy efficiency.
Kilowatt-hour	A unit of electrical energy. One kilowatt-hour is approximately equal to the amount of energy by an office computer running for one work day, or a large-screen TV running for 6 hours.
Lifetime Savings	The sum total of savings over the entire life of an efficiency measure. For example, a CFL that saves 50 kWh per year and lasts five years will have lifetime savings of 250 kWh.
Lost Opportunity	A measure being installed at the time of planned investment in new equipment or systems. Often this reflects new construction, renovation, remodeling, planned expansion or replacement, or replacement upon failure.
Measure	A product (piece of equipment), combination of products, or process designed to provide energy and/or demand savings. Measure can also refer to a service or a practice that provides savings. It can also refer to a specific combination of technology and market/customer/practice/strategy (e.g., direct install low-income CFL).
Measure Life	The number of years that an efficiency measure is expected to garner savings. It is generally based on engineering life, but sometimes adjusted in response to observations of market conditions.
Participant	A customer who installs a measure through regular program channels and receives any benefit (i.e. incentive) that is available through the program because of his or her participation.
Prescriptive Measure	A product or process generally offered by use of a prescriptive form with a prescribed incentive based on the parameters of the efficient equipment or practice.
Program Administrator (PA)	An entity that oversees public benefit funds in the implementation of energy efficiency programs. This generally includes regulated utilities, other organizations chosen to implement such programs, and state energy offices. The Massachusetts electric PAs include Cape Light Compact, National Grid, NSTAR, Western Massachusetts Electric Company (WMECO), and Unitil. The Massachusetts natural gas PAs include Berkshire Gas, Blackstone Gas Company, Columbia Gas of Massachusetts, National Grid, New England Gas Company, NSTAR, & Unitil.
Retrofit	The replacement of a piece of equipment or device before the end of its useful or planned life for the purpose of achieving energy savings. Retrofit measures are sometimes referred to as early retirement when the removal of the old equipment is aggressively pursued. May also refer to improvements made to an existing building's shell, such as insulation and air-sealing.
Sector	A system for grouping customers with similar characteristics. For the purpose of this report, the sectors are Commercial and Industrial (C&I), Small Business, Municipal, Residential, and Low-Income.
Therm	A unit of thermal (heat) energy. One therm is approximately equal to the amount of energy contained in slightly less than a gallon of gasoline.

MASSACHUSETTS ENERGY EFFICIENCY ADVISORY COUNCIL*

* As of Summer 2013

Member	Voting Members	Non-Voting Members	Organization	Representing
Penn Loh	X		Tufts University	Residential Consumers
Elliot Jacobson	X		Low Income Energy Affordability Network	Low Income Weatherization & Fuel Assistance Network
Christina Dietrich	X		Environment Northeast	Environmental Community
Rick Mattila	X		Genzyme	Businesses (including. large Commercial & Industrial End Users)
Robert Rio	X		Associated Industries of Massachusetts	Manufacturing Industry
Deirdre Manning	X		Smith College	Energy Efficiency Experts
Charlie Harak	X		Local 369 of the Utility Worker Union of American	Organized Labor
Nancy Seidman	X		Massachusetts Department of Environmental Protection	Environmental Protection
Martha Coakley — designee: Matt Saunders	X		Massachusetts Office of the Attorney General	Attorney General
Debra Hall	X		Massachusetts Department of Housing and Community Development	Housing and Community Development
Mark Sylvia — designee: Christina Halfpenny	X		Massachusetts Department of Energy Resources	EEAC Chairperson
Paul Johnson	X		Greentek	Energy Efficiency Small Businesses
Brian Swett — designee: Brad Swing	X		City of Boston	Commonwealth Cities and Towns
Michael McDonagh	X		The Massachusetts Association of Realtors®	Massachusetts Realtors
Larry Chretien	X		Energy Consumers Alliance of New England	Massachusetts Non-Profits
Paul Gromer		X	Peregrine Energy	Energy Efficiency Businesses
Mike Ferrante		X	Massachusetts Oilheat Council	Heating Oil Industry
John Ghiloni		X	Town of Marlborough	Municipal Aggregators
Eric Winkler		X	ISO New England	Regional Electric Transmission Organization
Maggie Downey		X	Cape Light Compact	Utility Energy Efficiency Program Administrator (PA)
Tilak Subrahmanian		X	Northeast Utilities (NSTAR Electric, NSTAR Gas and Western Massachusetts Electric Company)	PA
Carol White		X	National Grid	PA
Cindy Carroll		X	Unitil	PA
Elizabeth Cellucci		X	Bay State Gas	PA
Andrew Newman		X	Blackstone Gas	PA
Michael Sommer		X	Berkshire Gas	PA
James Carey		X	New England Gas Company	PA

Massachusetts Department of Energy Resources
100 Cambridge Street, Boston, MA 02114
www.mass.gov/doer 617.626.7300