2014 ANNUAL REPORT

Cost-Effective Energy Efficiency for Residents, Businesses and Institutions

MA ENERGY EFFICIENCY ADVISORY COUNCIL

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

Letter from the Chair

As the Chair of the Massachusetts Energy Efficiency Advisory Council (EEAC), I am pleased to share the 2014 Annual Report with the Massachusetts General Court, the Joint Committee on Telecommunications, Utilities and Energy, and the Massachusetts Department of Public Utilities (DPU). This report serves to inform the General Court of the 2014 results of the ratepayer investments in energy efficiency across the Commonwealth of Massachusetts.

In 2014, the Commonwealth's gas and electric distribution companies and municipal aggregators, or program administrators (PAs), that implement the statewide energy efficiency programs under the Mass Save® name, delivered successful results. They oversaw investments of nearly $675 million, primarily from ratepayer funds, and returned more than $3.2 billion in benefits. Reducing energy consumption provides tangible savings accessible to residents, businesses and institutions across the Commonwealth.

Energy efficiency is extremely cost-effective for consumers—instead of supplying electricity at around 15.3 cents/kilowatt hour, the utilities reduced residential and commercial electricity use at the average cost of 3.7 cents/kilowatt hour. Since 2008, Massachusetts' robust energy efficiency investments have delivered more than $13 billion in energy savings and non-energy benefits to the residents, businesses and institutions of the Commonwealth. Energy efficiency is an important way for the Commonwealth to meet its clean energy and environmental goals, while providing short and long term benefits statewide. Energy efficiency is also a powerful economic engine that produces in-state jobs, with efficiency accounting for almost three quarters of the jobs in the clean energy sector.

Two specific results from 2014 are also notable. The electric program administrators planned to save 2.55 percent of retail sales, but exceeded this goal, saving 2.76 percent. The gas program administrators planned to save 1.14 percent of retail sales but also exceeded that goal, delivering 1.33 percent. All of these efforts contributed greatly to the Commonwealth being recognized in 2014 by the American Council for an Energy Efficient Economy (ACEEE) as the #1 state for energy efficiency—recognition Massachusetts has enjoyed consecutively since 2011.

I thank the Legislature for its ongoing support. I also thank the Councilors who volunteer their time to review plans, programs and evaluation reports to ensure that Massachusetts continues to provide innovative, impactful and nation-leading energy efficiency programs. Finally, all who implement energy efficiency services and incentives deserve our thanks for continuing to deliver significant benefits to all who live and work in the Commonwealth.

Judith F. Judson

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

Cover photo: Architerra Inc., architecture, and Chuck Choi, photography.

2014 Summary

This report to the Massachusetts Legislature presents a summary of Massachusetts' accomplishments and results for 2014, the second year of the Joint Statewide Three-Year Energy Efficiency Plan ("Three-Year Plan") covering 2013 through 2015.

The Three-Year Plans are driven by the requirement of the Green Communities Act of 2008 to capture all cost-effective energy efficiency opportunities. The previous Three-Year Plan (2010–2012) generated nearly $5.5 billion in cumulative benefits to the Commonwealth. In 2013, the Program Administrators (PAs) began implementing the second Three-Year Plan with goals to deliver even greater benefits and continued improvement in all areas of program delivery.

The table below summarizes many of the key quantitative outcomes from 2014. The PAs increased overall savings while staying close to the budget. The electricity, natural gas and heating oil savings created through the Mass Save and other energy efficiency programs in 2014 were equal to the power used annually by more than 176,000 households, more power than is used by all households in Chelsea, Fall River, Lowell, Pittsfield and Worcester combined. These savings also represent greenhouse gas emission reductions equal to removing more than 144,000 cars from the road.

2014 ANNUAL ENERGY SAVINGS CAN BE UNDERSTOOD WITH THESE COMPARISONS

OVER 176,000 HOMES POWERED

NEARLY 35,000 HOMES HEATED FROM OIL AND GAS SAVINGS

MORE THAN 144,000 CARS OFF THE ROAD

2014 YEAR-END RESULTS

2014	Achievements	% of Goal	2013 & 2014 total progress towards 2013–2015 3-Year Goal
Total Benefits (million $)	3,208	115%	66%
Annual Electricity Savings (MWh)	1,339,026	108%	66%
Annual Gas Savings (million therms)	28.6	117%	74%
Annual Oil Savings (million gallons)	3.4	134%	88%
Participants*	4,177,268	146%	n/a
Program Spending (million $)	675	101%	62%
Annual GHG Reductions (metric tons)	664,071	111%	n/a
Annual NO_x Reductions (metric tons)	235	159%	n/a
Annual SO_2 Reductions (metric tons)	267	92%	n/a

* A customer who installs any measure through regular program channels and receives any benefit (e.g., incentive) that is available through participation in the program.

The table below provides additional detail by sector for key metrics

2014 Detailed Results	Residential	C&I	Low Income	Total
Program Spending (million $)	306	273	97	675
Total Benefits (million $)	1,365	1,610	234	3,208
Annual Electric Savings (MWh)	520,010	773,144	45,872	1,339,026
Annual Gas Savings (million therms)	15.7	10.3	2.6	28.6
Annual Oil Savings (million gallons)	3.5	-0.6	0.5	3.4

These results were essential factors in Massachusetts achieving its fourth straight #1 ranking from the American Council for an Energy Efficient Economy (ACEEE) in the 2014 State Energy Efficiency Scorecard.

Program Highlights

The Massachusetts PAs and the Mass Save programs continue to advance the state-of-the-art in energy efficiency programs and have repeatedly delivered highly cost-effective savings. In 2014, the PAs exceeded fuel-specific savings goals for electricity, gas, and fuel oil by between 8 and 34 percent, with program spending just a half-percent over budget. Program cost-effectiveness was high, with total benefits exceeding program spending by more than a four-to-one margin.

The biggest challenge in 2014, maintaining high savings in the commercial and industrial (C&I) sector, was not new. Savings for electricity and natural gas in this sector were 92 and 90 percent of plan, respectively. The savings achieved, however, were at a lower cost per unit of energy than planned.

One of the key planning issues for the Mass Save C&I programs is the significant positive or negative impact on total savings that a small number of very large projects can have. A single comprehensive facility retrofit or combined heat and power (CHP) system installation can be the difference in meeting or not meeting goals in any given year. However, the PAs have flexibility and time to bring these impactful projects to fruition, as they are ultimately responsible for reaching cumulative goals over a three-year period, rather than on an annual goal basis. This has reduced the pressure to complete large projects by the end of each calendar year. Going into 2015, the C&I pipeline appears robust and should support the achievement of the Three-Year Plan's C&I goals across all fuels.

Below are highlights of some new and noteworthy aspects and activities of the programs in 2014.

RESIDENTIAL & LOW INCOME

- The PAs launched new programs and initiatives, including expanded behavioral savings programs and an online audit tool for residential customers.
- Savings initiated by whole-house audits, a cornerstone residential energy efficiency offering, increased by 43 percent and 22 percent over 2013 for electric and gas improvements respectively. Whole-house audits provide a key entry point for consumers to engage with all the residential programs.
- Demand for the Mass Save HEAT Loan program increased 23 percent from 2013; the loan program supports the installation of energy efficiency improvements using zero percent financing.

- Low income programs exceeded savings targets in 2014 by as much as 83 percent (gas) and 66 percent (electricity), with benefits valued at more than double the costs.
- Comprehensive whole-house energy efficiency services for low-income households provide 40 percent or greater energy savings per household.
- Programs for low income households have pioneered adoption of new energy efficiency technologies, including air source heat pumps and LED lights.

COMMERCIAL & INDUSTRIAL

- At the fall GasNetworks® Conference, the PAs provided training for over 60 staff members of small business program delivery firms on the opportunities and measures available to help increase electric and gas efficiency in qualifying buildings.
- The PAs increased their focus on and capability to deliver services to specific C&I market segments, using strategies and offers tailored to unique customer needs. For example, the PAs and EEAC Consultants collaborated on a best practices study on retrocommissioning in 2014.
- Because large energy efficiency projects can span multiple years, the PAs worked with their largest customers to develop projects that will be completed in 2015 and therefore contribute to the overall Three-Year Plan goal. This includes several CHP projects which can contribute significantly to meeting goals.
- The PAs realized significant growth (a 50 percent increase) in electric savings from commercial new construction savings, driven by increased completion of buildings within the 495 beltway and adoption of energy efficient lighting through the PAs' upstream programs. In the upstream programs, incentives are given directly to distributors, so the sales price of the equipment is reduced.

STATE

- The Commonwealth and the PAs worked on a multitude of energy efficiency projects under the Accelerated Energy Program (AEP), which was launched in 2012 to speed up the implementation of energy and water savings projects at state facilities across the Commonwealth and help meet the goals of Executive Order 484, Leading by Example.

  As part of the AEP:

  - The Division of Capital Asset Management and Maintenance (DCAMM), in coordination with the Department of Energy Resources (DOER) and partner state agencies, are retrofitting 700 sites throughout the Commonwealth, encompassing thousands of buildings.
  - The Commonwealth received over $2.77 million in utility incentives for 22 different projects. These projects are projected to save over 21.6 million kWh and over 196,468 MMBTUs as well as over $6.78 million in cost savings annually.
  - Projects receiving utility incentives included three trial courts, three Department of Developmental Service facilities, three Department of Conservation and Recreation sites, two military facilities, five state university and community college sites, two state office buildings, one MassDOT site, one Department of Corrections facility, and two Sheriff Department sites. Typical energy efficiency measures installed included lighting, building controls and insulation.
- In addition to the AEP projects, DCAMM has also partnered with the PAs on many other energy efficiency projects. Eleven projects received over $1.1 million in utility incentives. These projects range from the new Division of Fisheries and Wildlife Headquarters Zero Net Energy Building in Westborough (featured on report cover) to academic buildings at UMass Amherst.

Case Studies

Case Study:

GOMES FAMILY HOME
ACUSHNET, MA

Program: Home Energy Services
Partner: Eversource

"After hearing about Mass Save, we made an appointment and found out we did not have adequate insulation in our home. With incentives, we only paid a fraction of the cost to fix the problem. We are very happy we gave Mass Save a call!"

— The Gomes Family

The Need

The Gomes family's 1,896 square foot home was built in 1990, with an addition put on in the early 2000s. The thought that their home was not well insulated never occurred to them. However, during the winter months, the Gomes family noticed that their home was not as comfortable as they would expect. After hearing about Mass Save on the radio and having a friend recommend the program, the family decided to schedule a no-cost home energy assessment with Mass Save.

The Solution

During the assessment, the energy specialist discovered that the home was not adequately insulated and identified many drafty areas in the house. Through the Mass Save Home Energy Services Program, the Gomes received no-cost air leak sealing throughout their house as well as rebates for 75 percent of the cost of insulation improvements, equal to $1,854. The family also received $455 worth of energy efficient products, including energy efficient light bulbs, advanced power strips, faucet aerators and water saving showerheads.

With these energy efficient upgrades, the Gomes Family has seen a huge improvement in the comfort of their home and is also saving an estimated $375 in energy costs each year.

This family is just one example of the more than 30,000 residential customers across the state who received an energy assessment and weatherized their homes in 2014 with the help of the Mass Save Home Energy Services Program.

Savings Summary

Project Cost:	$2,326
Incentive Payment:	$1,854
Actual Customer Cost:	$472
Estimated Annual Energy Savings:	1,915 kWh 12 gallons of oil
Estimated Annual Cost Savings:	$375

Case Study:

CONWAY STREET SCHOOL APARTMENTS
GREENFIELD, MA

Program: Residential New Construction
Partner: Eversource

The Need

In 2014, Olive Street Development redeveloped the Conway Street School, a former school house in Greenfield, into twelve units ranging in size from 625 to 1,300 square feet. The developer wanted to build to the highest efficiency level offered, with the goal of achieving zero net energy use. So, to maximize energy efficiency and sustainable design, the developer chose to participate in the Massachusetts Residential New Construction program.

The Solution

The Residential New Construction program encourages builders and developers to use a whole house approach, which looks at buildings as energy systems with interdependent parts. The program offers incentives for reducing energy use beyond a defined baseline reference home. Olive Street Development worked with a Mass Save-approved Home Energy Rating System (HERS)* rater who completed an initial plans analysis of the project with the developer. In addition to the plans analysis, the HERS Rater also performed the Program required first and final inspections which were crucial to ensuring the project's high performance.

All twelve Conway Street School units reached the Tier III efficiency level. Tier III is the most efficient level achievable through the Residential New Construction initiative; it requires new construction projects to be at least 45 percent more efficient than the Massachusetts User Defined Reference Home (a baseline determined by assessing the efficiency of hundreds of homes across the state).

Efficiency measures addressed all building systems: heating and cooling equipment, water heating equipment, building envelope, lighting, and appliances. Specific efficient technologies incorporated included occupancy sensors with remote dimmers to maximize lighting savings, Mitsubishi Hyper-Heat mini-split systems with 26 SEER rating, a highly efficient condensing backup boiler, triple-pane windows,as well as ENERGY STAR® appliances and highly insulated walls, roof and floors. Other features included south-facing orientation to maximize solar exposure, a seven car solar PV parking canopy (pictured), a drain water heat recovery system, dual flush toilets, and low-flow shower heads.

By achieving the Tier III efficiency level, the project received an incentive of $4,000 per unit, totaling $48,000. The project also received no-cost high-efficiency lighting provided through the program. As a result, the building will achieve approximately 18,500 MWh and 1,440 therms in energy savings and cost savings of over $2,200 annually. Exceeding the state's energy code and maximizing efficiency opportunities throughout the building will provide Conway Street School residents with lower energy bills and improved comfort throughout the life of the building.

Conway Street School Energy Savings Information

Heating Fuel:	Natural Gas
Master Metered Gas:	Yes
Average HERS Score:	7.91
Total Electric Savings:	184,921 kWh
Total Natural Gas Savings:	1,437 therms
Total CFLs and LEDs Installed:	206

* The Home Energy Rating System (HERS) Index is a national standard for measuring a home's energy efficiency. The U.S. Department of Energy has determined that a standard new home is awarded a HERS rating of 100. According to ResNet, the average HERS score in 2013 in Massachusetts was 59.

Case Study:

TREAT FAMILY HOME
SALISBURY, MA

Program: Residential New Construction
Partner: National Grid

Project Summary
When Tom and Natalie Treat decided to build a home in Salisbury, Mass., they knew that a super-efficient home was the goal. The 2,400 sq. ft. modular, all-electric home was designed by Brightbuilt Home to be net-zero energy—using about as much energy as the 8.83 kW solar array generates over the course of a year. When approached by Boston magazine to serve as the Design Home 2014, the couple decided this was a great way to show the public that going "green" can be beautiful as well as attainable.

As a way to increase exposure and awareness of the Mass Save efficiency programs, National Grid partnered with Boston magazine to host "Design Fridays," a series of events held during September and October where the public could tour the home and learn about energy efficiency opportunities and the benefits of green construction. More than 1,000 people visited the home during the month of Design Home tours.

While the home has many features that could have been individually submitted through the Mass Save programs, the Treats took a whole-building approach and participated in the Massachusetts Residential New Construction Program. Approved HERS rater Advanced Building Analysis conducted an initial review of architectural plans and onsite inspections including a blower door test and infrared imaging during and after project completion—crucial to ensuring the home's high performance. As constructed, the home is about 66 percent more efficient than a typical new home. This level of energy efficiency allowed the home to achieve "Tier III" status—the highest level under the Residential New Construction Program—and thus qualify for $7,000 in program incentives. The incentive helped defray the upfront costs of added insulation and high-efficiency heating and cooling equipment.

The home was also equipped with a PowerWise energy management system and since moving into the house in November 2014, electric circuit monitoring has allowed the Treats to gather specific data on the electricity consumption behind their bills. They learned, for example, that their two heat pump condensers use, on average, 11.8 and 12.1 kWh a day. Over the course of a year, the two condensers together will consume approximately 8,724 kWh—less than half of the 19,431 kWh the average Massachusetts household uses on average annually, according to the U.S. Energy Information Administration's most recent energy survey.

"We're grateful for the Mass Save incentives and other assistance from National Grid, as well as the incentives from the Massachusetts Clean Energy Center that helped us install the solar panels. We are enjoying the home's comfort and low operating expenses, and glad to know we're also reducing our environmental impact as well as serving as a model for our neighbors."

— Natalie Treat

Green Features

- 8.83 kW rooftop solar photovoltaic system
- South-facing orientation to maximize solar exposure
- High efficiency Mitsubishi Electric heat pumps for heating and cooling
- Domestic hot water provided by an A.O. Smith heat pump water heater
- ENERGY STAR kitchen appliances by Whirlpool, and super-efficient Samsung washer & dryer
- Energy Recovery Ventilation system
- High efficiency LED lighting
- Natural daylight and fresh air from the triple pane casement windows
- Green flooring choices, such as reclaimed wood and locally-made cabinets
- Radiant electric NuHeat floor mats in the bathrooms
- Water-saving fixtures including dual flush toilet and a touch-free sink by Kohler
- High levels of insulation including blown cellulose, rigid foam and high density spray foam Double 2x4 exterior walls framed at 24″ offset to avoid thermal breaks

Case Study:

LED STREET LIGHTING
CAPE COD AND MARTHA'S VINEYARD, MA

Program: C&I Retrofit
Partner: Cape Light Compact

The Need
The municipalities on the Cape and Martha's Vineyard saw an opportunity to demonstrate their fiscal and sustainability commitment to their residents and seized upon a proposal by Cape Light Compact to retrofit their inefficient street lights with new LED technology to reduce street lighting energy use and costs.

The Solution
The Cape Light Compact proposed to retrofit all eligible municipally-owned roadway street lights in Cape Cod and Martha's Vineyard to LEDs to help municipalities reduce costs and achieve significant electric savings. The Compact provided both a dedicated project manager/community liaison and financial incentives through the C&I Retrofit program. The communities participated in a pilot phase to evaluate new LED fixtures and gain public feedback. They successfully retrofitted over 15,700 municipally owned roadway street lights to LED, implemented in phases to avoid disruption during the busy summer tourist season. These retrofits resulted in energy, operation and maintenance cost savings of nearly 70 percent, larger savings than originally planned. The project also included a GIS GPS-based field audit of every street light to create an accurate inventory. Through collaboration with the Cape Light Compact, the towns of Cape Cod and Martha's Vineyard have reduced costs, electricity use and greenhouse gas emissions, improved night time lighting and enabled citizen input to public infrastructure projects, as well as visibly demonstrated their commitment to energy efficiency.

Savings Summary

Project Cost:	$5.9 million*
Annual energy savings (kWh and therms):	3,310,000 kWh/yr
Annual cost savings:	$868,000

* As an aggregator of municipal utilities, the Cape Light Compact provides 100% incentives for qualifying municipal efficiency projects.

Legislative Background

HISTORY

The current framework for energy efficiency delivery was developed in response to the mandate of the Green Communities Act of 2008 to deliver all cost-effective energy efficiency. The 2013–2015 Three-Year Plan stands on the foundation of the nation-leading results achieved between 2010 and 2012, through the first Three-Year Plan. The 2013–2015 Three-Year Plan is the result of collaboration between the Commonwealth's gas and electric distribution companies and municipal aggregators (the PAs), the Energy Efficiency Advisory Council (EEAC), the Massachusetts Department of Energy Resources (DOER), 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:

- **The Green Communities Act (GCA)** 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.
- **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.
- **The Green Jobs Act** provides a funding source for the green technology industry, facilitating economic development and job growth in the clean energy sector. This law established the Massachusetts Clean Energy Center (CEC).

Massachusetts' energy efficiency programs continue to support key goals including: reducing energy costs for consumers, increasing the stability and reliability of fuel sources, continuing to drive innovation and develop the Commonwealth's robust clean energy economy and capturing all available cost-effective energy savings opportunities and the associated lifetime benefits.

GOVERNANCE: THE ENERGY EFFICIENCY ADVISORY COUNCIL (EEAC)

The Massachusetts EEAC was created by the GCA to guide the development of comprehensive, integrated statewide energy efficiency plans and monitor their implementation. Its primary role is to fulfill the efficiency requirements, goals and obligations of the GCA. The EEAC has fifteen voting members that represent a variety of energy efficiency stakeholders and twelve non-voting members that represent the PAs from the investor-owned electric and gas utilities and energy efficiency service providers and other stakeholder groups. The EEAC is chaired by the Commissioner of the Massachusetts DOER. Whereas the EEAC is responsible for guiding the PAs in carrying out the requirements of the GCA, the PAs are responsible for delivering the programs and taking the actions that result in measurable, verifiable energy savings that meet the three-year goals approved by the DPU. As regulated entities, the PAs must receive approval from the DPU for their efficiency program spending and related cost recovery. The goals and costs in the current Three-Year Plan, covering the period from January 1, 2013, to December 31, 2015, were approved by the DPU on January 31, 2013.

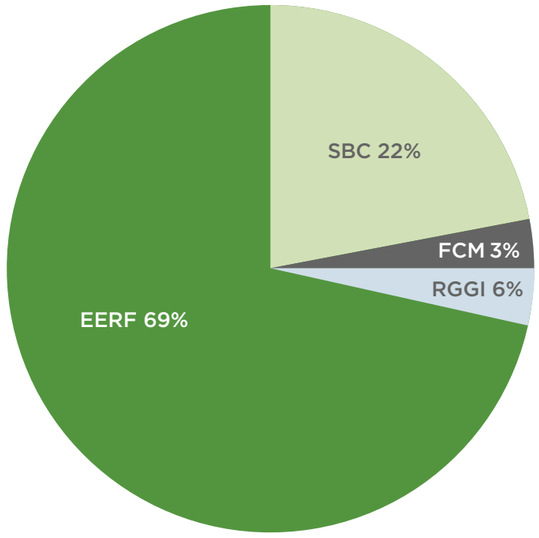
FUNDING SOURCES

The electric energy efficiency programs are funded by a variety of sources, the largest of which are a historical System Benefit Charge (SBC) and the Energy Efficiency Reconciliation Factor (EERF) created by the Green Communities Act. The percentage of the 2013–2015 Plan's total funding that come from each source is listed in parentheses below.

- The legislatively mandated SBC of 2.5 mills ($0.0025) per kilowatt-hour for all electric consumers, except those served by a municipal lighting plant (22 percent)
- The EERF, which recovers additional program costs from electric customers in proportion to the costs of programs directed at each sector (i.e., residential, commercial & industrial), with low-income programs receiving subsidies from other sectors (69 percent)
- Regional Greenhouse Gas Initiative (RGGI) auction proceeds (6 percent)
- Forward Capacity Market (FCM) payments from ISO-NE (3 percent)

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

2014 FUNDING MIX: ELECTRIC ENERGY EFFICIENCY PROGRAM



MASSACHUSETTS ENERGY EFFICIENCY ADVISORY COUNCIL

The information below is correct as of December, 2014

VOTING MEMBERS

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Acadia Center
Environmental Community

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Massachusetts Department of Environmental Protection
Environmental Protection

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