Energy Efficiency in Massachusetts

Optimizing the Electric System and Achieving Consumer and Environmental Benefits

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Acadia Center

Advancing the Clean Energy Future

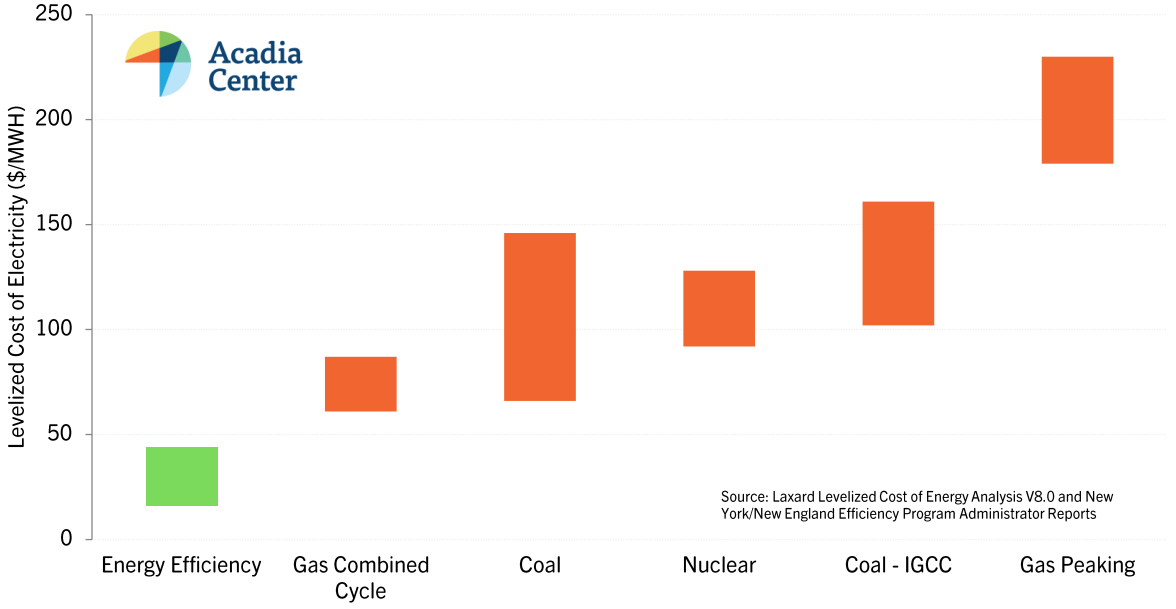
Our electric system can be modernized and optimized through improving capital utilization and minimizing infrastructure costs. In Massachusetts, energy efficiency has already started to relieve stresses on the electric system and reduce the need for construction of expensive power plants and transmission lines. In the most basic terms, energy efficiency is about investing money in ways to help consumers save on electricity. At the large scale, efficiency investments like the ones Massachusetts has made over the last 5 years benefit not only distribution system capital needs, but avoid transmission and generation expenses as well. Cutting demand also generates macroeconomic growth, creates jobs and keeps energy dollars in Massachusetts.

A Proven Solution to the Grid Optimization Challenge: Efficiency Procurement

A fundamental component of making the electric system work with less infrastructure is to find a reliable way to identify and capture all cost-effective efficiency resources. By adopting the principle of Least Cost Procurement, Massachusetts has ensured that utilities first purchase the lowest cost energy resource– energy efficiency. Doing so brings macroeconomic benefits, market penetration and consumer and environmental savings, in addition to maximizing consumer benefits.

Quantified Major Savings

Efficiency Procurement is paying off for Massachusetts. Over the last 5 years, Massachusetts has acquired $11.5 billion in benefits for electric and gas ratepayers, with program costs of $2.4 billion. That means for every $1 that the utilities spend in these programs, the residents and businesses of Massachusetts get $4.79 in benefits. The efficiency plans and investments ushered in by this strategy are also reducing capital investments in traditional grid infrastructure and spending on fossil fuels. Figure 1 (below) shows how much states can save by meeting demand through efficiency, rather than purchasing new supply.



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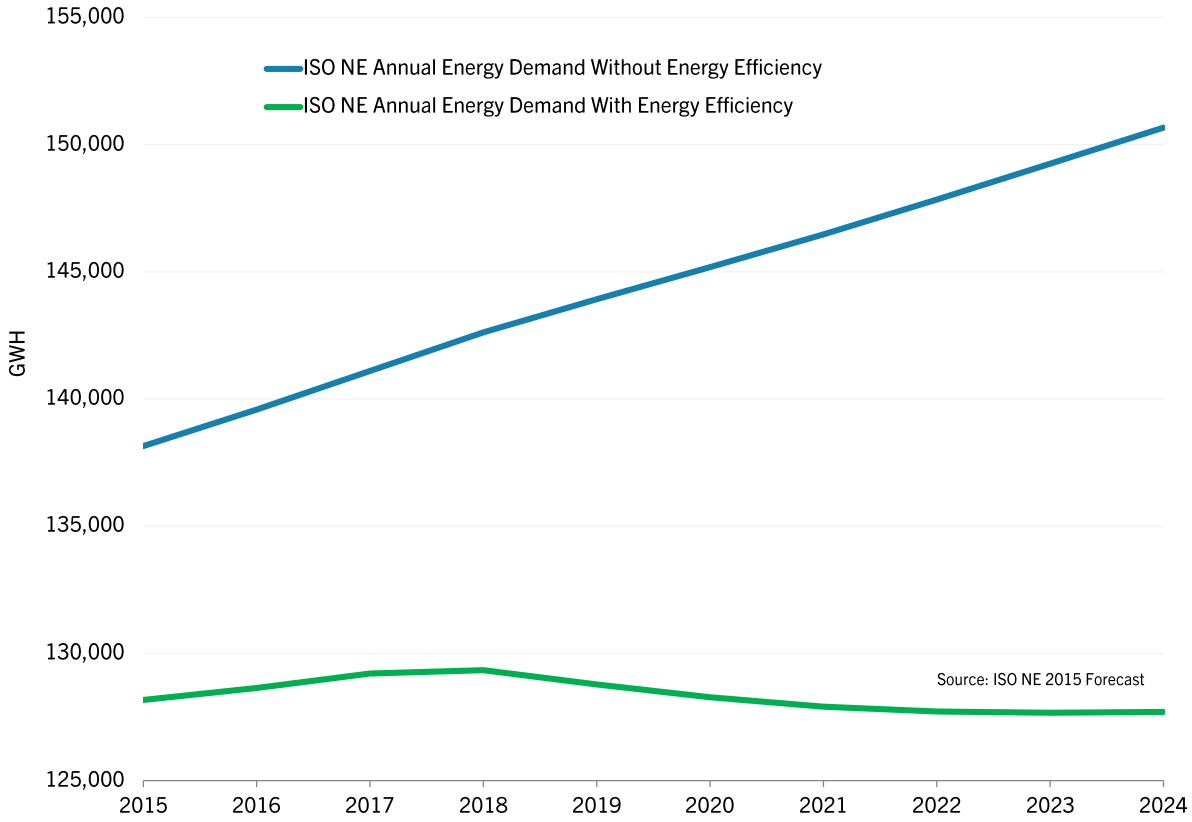
Lowered Overall System Costs

In 2012, ISO-New England began incorporating an annual forecast of the states' existing and planned energy efficiency investments in its evaluation of the need for additional transmission and other reliability requirements. The results show benefits already. Energy efficiency investments in Massachusetts and other states have allowed regulators to **defer indefinitely more than 10 planned transmission upgrades, saving the region an estimated $416 million in transmission costs**. The forecast has led ISO-NE to project near zero growth in annual energy usage across the region, and even negative annual energy usage in several New England states. Figure 2 (below) shows the significant impact that energy efficiency had on ISO-NE's 2015 forecast, and avoided capital investments in lines, substations and power plants.



Significant Demand Reduction Savings at Winter Peak

Acadia Center has analyzed the price and demand benefits of efficiency in ISO-NE.[i] Investments in electric efficiency since 2000 have reduced electric demand in New England by over 2 gigawatts – equivalent to the combined output (2,237 MW) of Pilgrim Nuclear (680 MW) and Brayton Point (1,557 MW) power plants in Massachusetts. These savings provide significant benefits during periods of peak demand, such as the "Polar Vortex" winter of 2014. Without the demand reduction due to electric efficiency programs in New England, during the winter of 2014 (January to March, 2014):

- Demand would have been 13.7% higher
- Wholesale electricity prices 24% higher
- And electricity costs $1.46 billion higher.

This relief during the winter of 2014 complements savings that electric efficiency programs deliver over the entire year, and reinforces the logic of investing in electric efficiency as the "first fuel" to meet the region's energy needs and reduce the risk of fuel price volatility. Saving electricity though measures such as LED lighting, building weatherization and incentives for efficient appliances costs about $0.04/kilowatt hour (kWh), which is **about a quarter of the regional average wholesale price** of $0.16/kWh during the winter of 2014. Efficiency savings are even more cost effective in comparison to the full retail electricity prices that consumers pay, which have recently been as high as $0.30/kWh in Massachusetts.[ii]

As New England states work to meet the region's energy needs while controlling costs, policy makers should prioritize energy efficiency investments. Massachusetts should continue to ramp up programs to procure all cost-effective efficiency, and other New England states should establish policy frameworks to invest in all energy savings that are cost-effective. Further, existing energy efficiency programs should continue to evolve to target savings during periods when they will deliver the most value.

The following figures describe electric demand with and without efficiency in the analyzed winter months, and both the real time (RTLMP) and day-ahead (DALMP) wholesale prices.[iii]

Table 1: Monthly Total Demand and Average Real Time and Day Ahead Locational Marginal Prices

Month	Demand with Efficiency (MWh)	Demand without Efficiency (MWh)	RTLMP with Efficiency ($/MWh)	RTLMP without Efficiency ($/MWh)	DALMP with Efficiency ($/MWh)	DALMP without Efficiency ($/MWh)
January	8,227,891	9,316,147	175	214	184	212
February	7,218,853	8,205,423	164	199	165	197
March	7,633,616	8,724,035	126	170	118	168

Figure 3: Daily Electricity Demand With and Without Efficiency

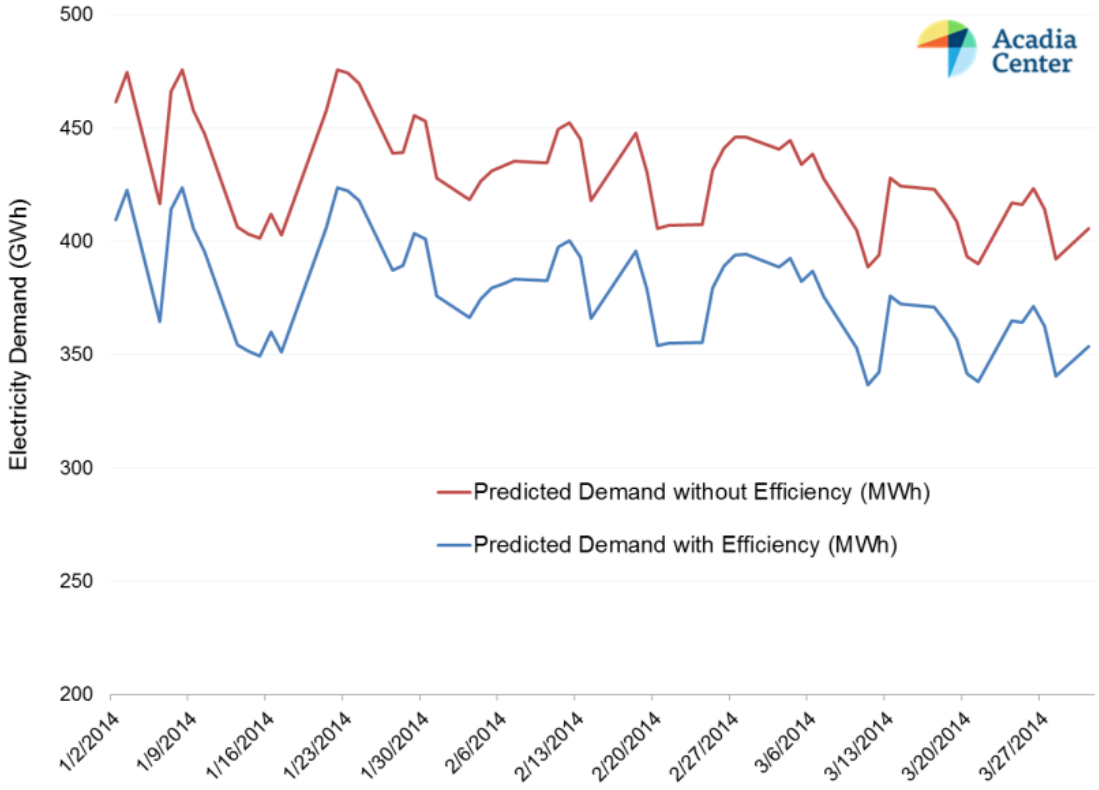
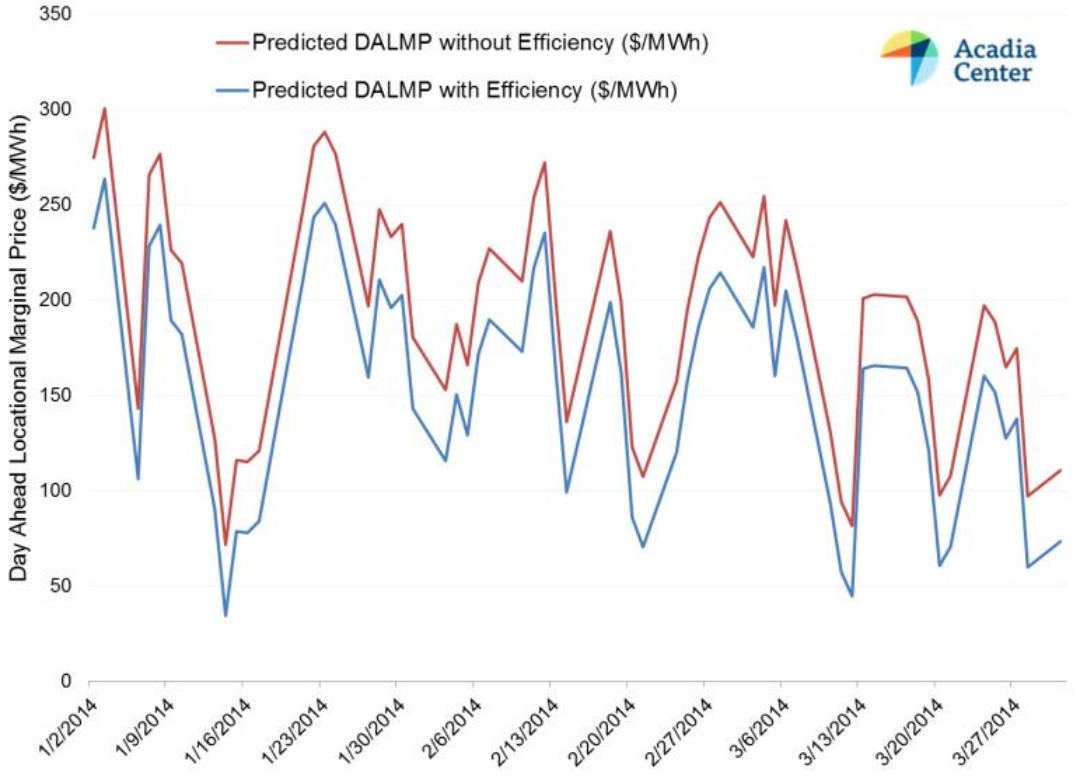


Figure 4: Daily Day Ahead Locational Marginal Prices With and Without Efficiency



Multiplied Benefits for the Economy

In addition to enabling nation-leading levels of energy savings, Massachusetts' investments in cost-effective energy efficiency are creating jobs and boosting economic activity because they keep money in the region instead of spending it on imported fossil fuels for electric generation. Energy efficiency reduces the cost of doing business and lowers residents' energy bills, leaving them with more disposable income to spend on other goods and services. These two effects lead to job creation and economic growth. In New England, every **$1 million invested in energy efficiency leads to the creation of 46 job-years of employment**, and every **$1 invested boosts Gross State Product by $5.90**. The results speak for themselves:

- Since 2010, Massachusetts consumers have realized $11.48 billion in economic benefits from $2.44 billion in energy efficiency.
- The state's energy efficiency investments will create over 109,000 job-years of employment economy-wide and add $16.4 billion to Gross State Product.
- The climate impacts are significant as well -- reducing CO_2 emissions by an estimated 3.61 million tons, the equivalent of removing over 750,000 cars from the road every single year – providing a large part of the state's mandate to reduce GHG under its Global Warming Solutions Act.

Massachusetts' 2014 Energy Efficiency investments alone will deliver:

- $3.2 billion in benefits (115% of planned);
- Almost 25,800 job years of employment and add $3.9 billion to the Gross State Product;

- Summer capacity savings equivalent to building a 180 MW power plant.

In 2014, the MassCEC found that:

- There are 65,000 workers at more than 4,000 firms working in the Massachusetts energy efficiency industry, representing a 35.6% growth in the number of firms since 2013;
- Energy efficiency employment makes up half (50.9%) of jobs at startups working on pre-commercialized technologies;
- 68% of clean energy firms are engaged in energy efficiency, the largest and fastest growing sector.

Consensus and Support through Stakeholder Council

Massachusetts' success with energy efficiency is a direct result of a broad policy buy-in stemming from collaborative and inclusive stakeholder process that demonstrates the value proposition of efficiency as an energy resource. It would have been impossible for Massachusetts to achieve similar funding levels using a legislative or regulatory approach. The stakeholder process offers substantial regulatory benefits. Stakeholder engagement through the Energy Efficiency Advisory Council ("EEAC") resolves or narrows issues in dispute, reduces regulatory burden and litigation, and greatly expedites the Department's review.

The strength of the EEAC comes from the fact that it brings together diverse, key stakeholders representing all types of consumers and interests -- business interests that include the state's largest employers, manufacturers, small businesses and institutions like hospitals, together with consumer advocates, environmental justice advocates, and energy efficiency experts. A consensus position supported by such a broad representation of interests is a powerful signal to regulators, particularly when it is backed by a substantive record and quality of decision-making. Rather than expend effort on contentious litigated proceedings between utilities, intervenor groups, and public agencies, the EEAC can bring all stakeholders into the discussion before policies and program details progress to the point where there is little flexibility to address concerns. Reaching a unified vision can be tough work, but reaching consensus adds significant stability to the efficiency institution and to its programs, and increases political support for the effort.

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[i] For more information, the full report on the Winter Impacts of Energy Efficiency is available at http://www.acadiacenter.org/document/winter-impact-electric-efficiency/

[ii] A National Grid customer on the Residential Basic Service variable rate plan paid 22.067 cents/kWh for the energy portion of electric supply in January 2015 (https://www.nationalgridus.com/masselectric/non_html/MA_Residential_Table.pdf) and 7.827 cents/kWh for electric distribution (https://www.nationalgridus.com/masselectric/home/rates/4_res.asp) for a total of 29.894 cents per kWh.

[iii] Real time locational marginal prices (RTLMP) reflect the price of power purchased during the time period that it is consumed, and day-ahead locational marginal prices reflect the price of power bid into the market one day ahead of time. On average, 98% of power is purchased on the day-ahead market, but real-time prices are also analyzed in this report, as prices on the real-time market can be more volatile during peak periods.