Investing in Energy Efficiency to Optimize the Electric System, Spur Markets and Achieve Consumer and Environmental Benefits

Acadia Center
Advancing the Clean Energy Future

Proven Results & Best Practices

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Optimizing the electric system by improving capital utilization and minimizing infrastructure is one of the key goals of efforts to modernize the electric grid. In the most basic terms, energy efficiency is about investing money in ways to help consumers save on electricity. On a large scale, efficiency investments avoid the need for expensive new generation and infrastructure. Cutting demand generates macroeconomic growth, creates jobs, and keeps energy dollars in the local economy.

A Core Solution to the Grid Optimization Challenge: Procurement of Least Cost Energy Resources to Meet Utility Load

A fundamental challenge in making the electric system work with less infrastructure is to find a reliable way to identify and capture all cost-effective efficiency resources. States that have adopted the principle of ensuring that utilities purchase the lower cost energy resource first – energy efficiency (often referred to as Least Cost Procurement or All Cost-effective Efficiency) are proving that doing so brings macroeconomic and market penetration benefits, and consumer and environmental savings. Because this almost always means investing in efficiency first, we refer to the policy as Efficiency Procurement, a proven strategy based on economics that is flexible to changing market conditions and maximizes consumer benefits.

Quantified Major Savings

Efficiency Procurement is paying off for the states that have adopted this approach. The efficiency plans and investments ushered in by this strategy reap large savings and reduce capital investments in traditional grid infrastructure and spending on fossil fuels.

Figure 1 (on the following page) shows how efficiency procurement is far less expensive than purchasing new supply. Figure 2 (on the following page) shows how acting as an energy resource, efficiency lowers power demand on the grid.

Figure 1: Cost of new electricity supply vs. energy efficiency

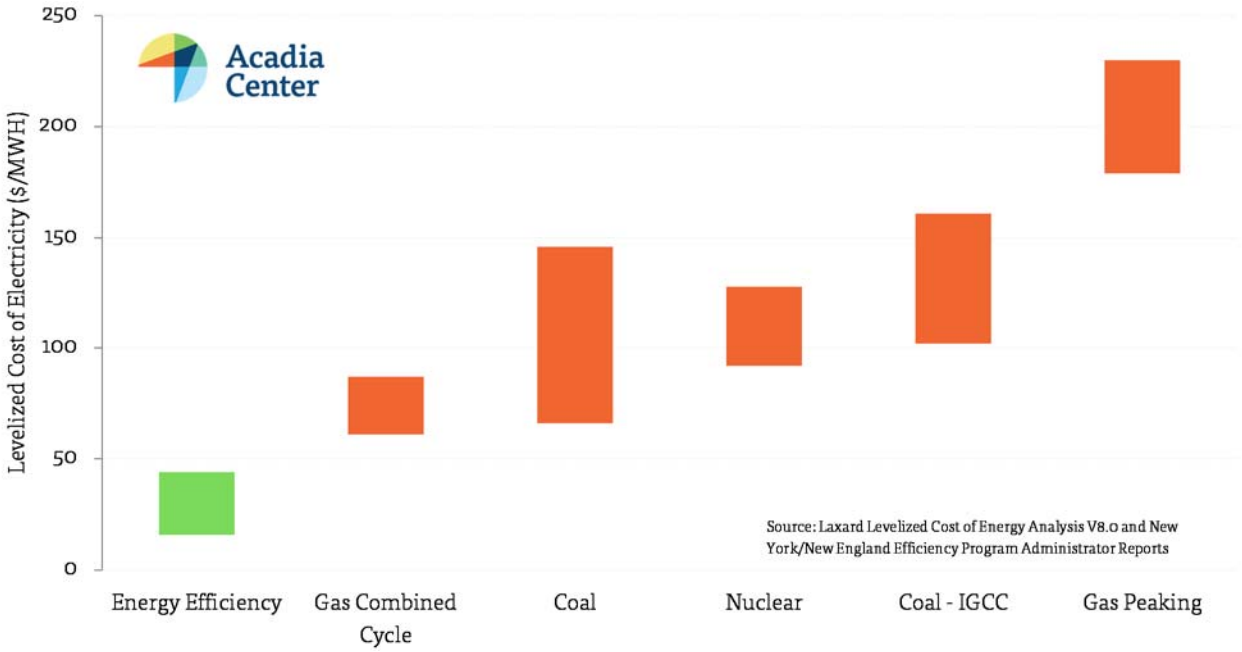
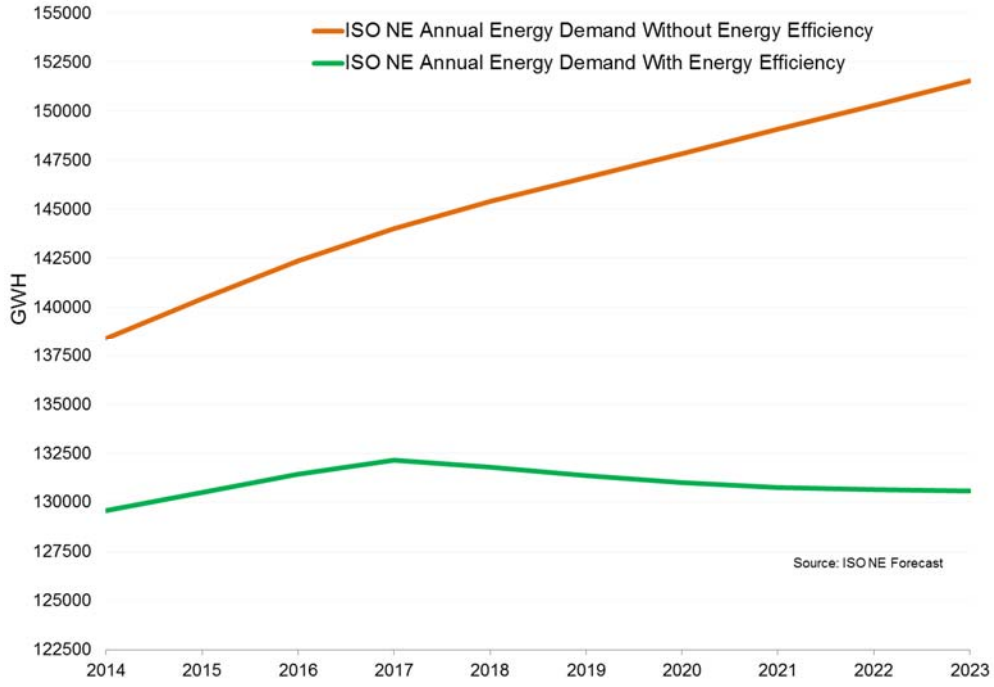


Figure 2. Reducing demand avoids new capital investments in lines, substations and power plants



Lowering Overall System Costs

In 2012, the Independent System Operator for New England (ISO-NE) began conducting an annual forecast of the states' existing and planned energy efficiency investments to determine how they can decrease the need for additional transmission and other reliability requirements. The results show benefits already. Energy efficiency

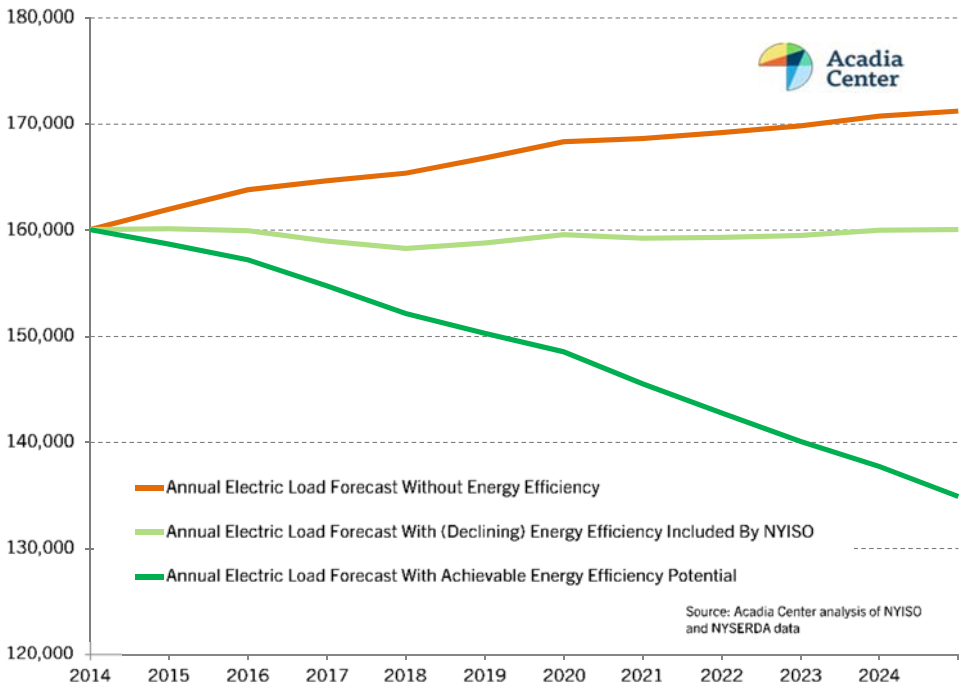
investments through **Efficiency Procurement policies in MA and VT allowed regulators to defer indefinitely more than 10 planned transmission upgrades, saving the region an estimated $416 million in transmission costs**. The forecast has led ISO-NE to project near zero growth in annual energy usage across the region and even negative annual energy usage in several New England states.

Acadia Center has analyzed the **price and demand benefits of efficiency in ISO-NE**. In the winter of 2014, without savings from electric efficiency procurement, demand would have been **13.7% higher**, wholesale electricity prices **24% higher**, and electricity costs **$1.46 billion higher**.

Multiplied Benefits for the Economy

In addition to enabling nation-leading levels of energy savings, these states' investments in cost-effective energy efficiency are creating jobs and boosting economic activity because they are keeping 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**. Acadia Center analysis shows New York has the same or greater potential as neighboring states:

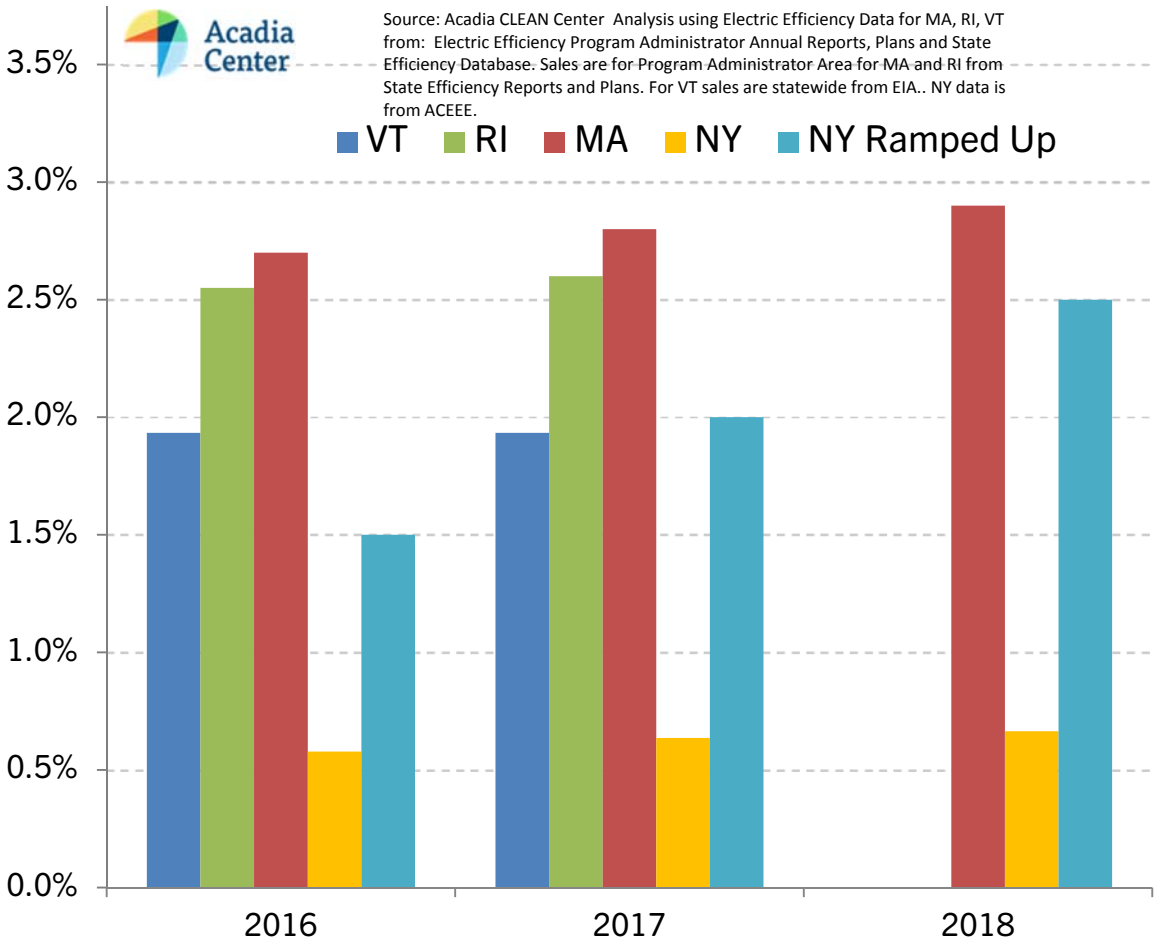
Figure 3. Optimizing New York's Power Grid with Energy Efficiency



(Achievable EE Potential at 1.8% annually derived from a potential study. Note that EE efforts in Massachusetts and RI have achieved 2.7% savings, including in service territories operated by utilities with distribution units in New York State)

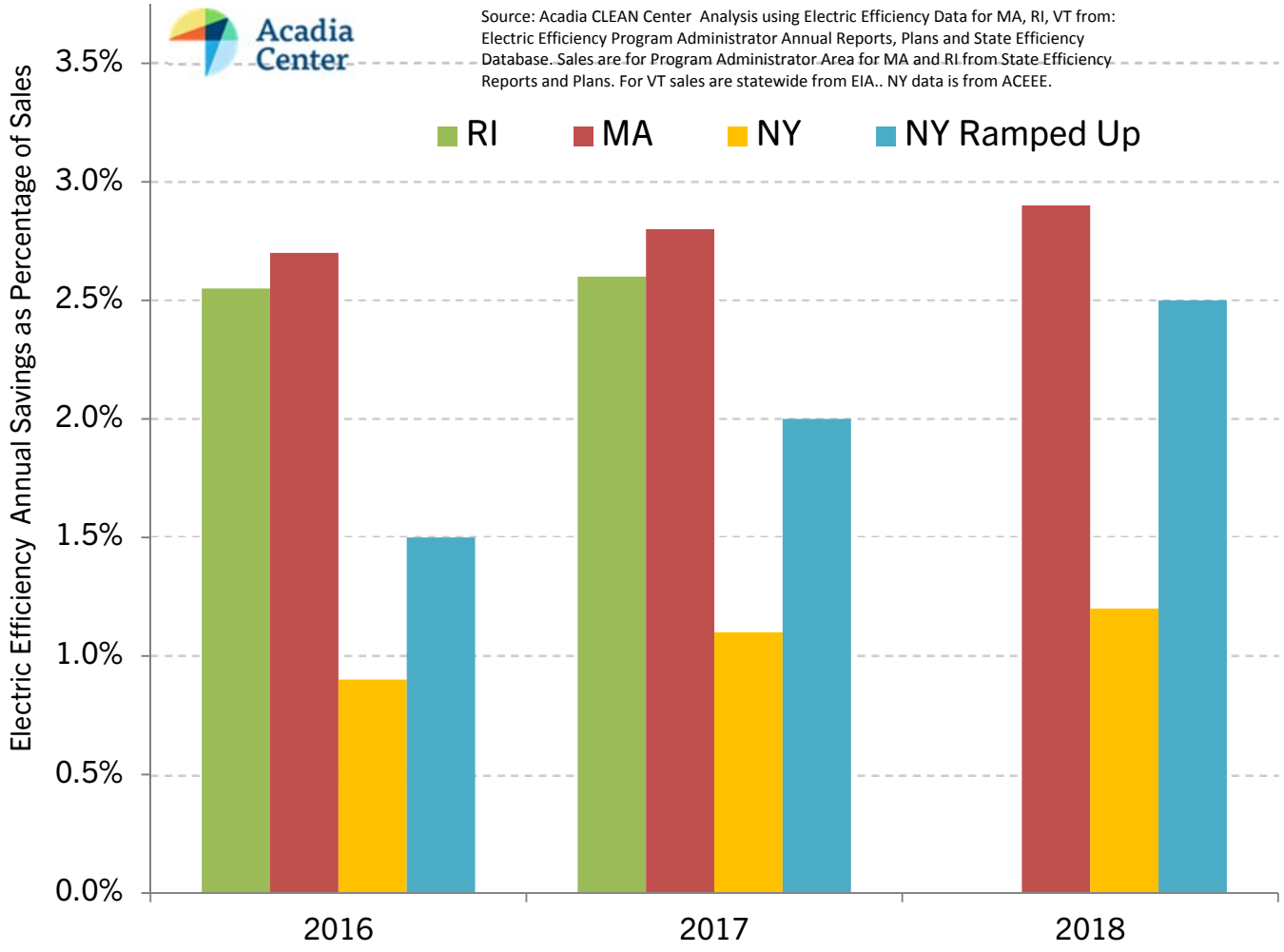
New York savings goals over the 2015-2017 period are far below neighboring states. As a result, consumers will pay more for higher priced power contracts that could be offset with low cost efficiency resources.

Figure 4. Comparative Three Year Efficiency Savings Goals



The higher savings goals achieved outside of New York are being successfully captured by companies operating retail distribution companies in these states. The best example is National Grid. As the following chart shows, National Grid is achieving annual savings levels of over 2.5% in its service territories in Massachusetts and Rhode Island – far above what this utility will obtain in its New York service territory.

Figure 5. National Grid- Efficiency Goals in Each of its Distribution States



Proposed Modified 3 Year Efficiency Savings Goals for New York Utilities

Acadia Center proposes that New York utilities be required to obtain these least cost resources for their customers when contracting for resources to meet their load requirements. Our proposal suggests that over a three year transition period, the following goals be established:

	MA	RI	VT	NY	NY Ramp Up
2015	2.63%	2.50%	1.93%	0.58%	1.50%
2016		2.55%	1.93%	0.64%	2.00%
2017		2.60%	1.93%	0.66%	2.50%

How Efficiency Procurement Can Work

Establish State Law and Core Requirements for Utilities

The Efficiency Procurement models in Connecticut, Massachusetts, and Rhode Island were adopted through legislation featuring three key components:

- **New economic model for efficiency investment:** widely supported, bi-partisan legislative efforts in MA, VT, and RI among others led to the passage of energy efficiency procurement laws that require the states' electric and natural gas distribution utilities to invest in all cost-effective energy efficiency that is less expensive than supply and provide stable funding for such investments.
- **Stakeholder oversight council:** energy efficiency stakeholder councils in MA, RI, and CT have a statutory mandate and financial resources necessary to oversee programs, assess the size and character of the cost-effective efficiency potential, guide planning and budgeting, and conduct evaluation, measurement, and verification. The states with such stakeholder engagement are seeing among the highest market penetration of efficiency goods and services, the largest savings rates in the country, and the largest per capita economic benefits.
- **Short and long-term planning requirements:** Statute and regulations establish a process for implementing Efficiency Procurement that includes: 1) assessing the amount of cost-effective efficiency potential available; 2) developing short- and long- term plans describing how the utility will invest in cost-effective energy efficiency; 3) evaluating, measuring, and verifying energy savings and program implementation; and 4) on-going improvement as technologies and opportunities evolve. All plans are developed with the collaboration of stakeholders and utilities and are subject to approval by the Public Utilities Commission.

Efficiency Procurement Program Design: Tailoring Programs to Address Market Failures and Induce Consumer Investment

There are many well-documented market barriers, market failures, and other factors explaining why consumers consistently fail to adopt cost-saving efficiency measures that are in their own economic best interest and thus need the support of comprehensive efficiency programs. A list of the common market barriers is detailed in the table below.

Common Market Barriers Inhibiting Adoption of Cost-Effective Efficiency	
Split Incentives	Building owners often do not pay energy bills so are less likely to invest in EE as it benefits the renter.
Lack of individual cost information	Energy bills are generally a single figure and do not contain info on how much energy an individual appliance or building feature (e.g., windows) contributes to bill. Weatherization measures save on both heating and cooling, exacerbating this.
Uncertainty of savings	A residential consumer will not know with certainty future energy prices or the exact energy savings of an upgrade, making it difficult to compare costs and benefits.

Inadequate info about Efficient Options	Consumers often do not know which product or service choices are the more efficient ones.
Bounded Rationality / Complexity	The complexity of many decisions on weatherization projects are beyond the ability of a residential consumer to make an economically optimal choice.
Elevated Discount Rates	There is significant research that indicates that consumers have inconsistent and often very high internal discount rates when making economic decisions. This can lead to decisions not to implement weatherization projects that are cost effective.
Liquidity Constraints	Consumers often have inadequate (or inconvenient) access to capital to pay the up-front costs of weatherization projects.
Transaction Costs	Like high discount rates, many consumers have high internal values on their time. The time and effort required to research an efficient upgrade, fill out a loan application, find a contractor and get quotes, or have workers in their home can outweigh the expected value of returns in energy savings.

To overcome most of these impediments and create functioning markets, comprehensive energy efficiency programs deploy three primary tools:

- **Technical assistance and information**: Guidance from energy efficiency professionals can make energy efficiency improvements more understandable, accessible, and easily implemented by both homeowners and business people. Experts help consumers work through the available information about upfront costs, how to choose a contractor, quotes and pricing, available incentives, and resulting energy cost savings.
- **Financial incentives and rebates:** Incentives help by reducing the risk (or perceived risk) of not recouping an energy efficiency investment and by guiding customers to the best options. Energy efficiency incentives reduce the length of the payback period and make the project feasible, even for business customers that must conform to strict payback periods.
- **Efficiency financing:** Access to capital is a barrier to implementing efficiency for some customers, and various forms of financing have been used to cost-effectively address this in many markets. Loans can help homeowners or business owners with efficiency upgrades when access to capital is a problem.

With this toolbox of strategies, comprehensive efficiency programs are able to correct the market failures that currently inhibit widespread adoption of efficiency. A flourishing market is created for efficiency goods and services, and over time many markets are transformed to the point that program support is no longer needed.

Align Utility Incentives

Key reforms that align utilities with Efficiency Procurement and focus on economic resource acquisition include:

- **Utility's financial incentives are aligned with consumer interests**: Utility revenue reform, or "decoupling," breaks the link between the utility's profits and sales volume, removing the

disincentive for the utility to be a full partner in energy efficiency. Performance-based incentives that reward the utility for achieving energy savings goals drive excellent program delivery.

- **Defined cost-benefit framework for investing in all cost-effective efficiency**: To ensure that the benefits of energy efficiency programs are greater than the costs, each state has established a cost-benefit test to measure cost-effectiveness. Rhode Island and Massachusetts' regulators have adopted the Total Resource Cost (TRC) test to facilitate investments in energy efficiency based on economics. By comparing the net present value of a stream of benefits over the net present value of a corresponding stream of costs, the TRC test indicates that an efficiency measure or program is cost-effective if the benefits outweigh the costs for consumers.
- **Developing a stable, long-term funding source**: Once the utility, stakeholders, and regulators have determined the annual level of cost-effective energy efficiency to be procured, there are several funding sources used to make that investment. The first source is a ratepayer surcharge that is applied to all electric and natural gas customers. Every customer contributes toward the needed amount of funding and in return the energy efficiency programs, energy audits, technical assistance, rebates, and incentives are offered to every customer. Additional funding sources include: 1) revenue from bidding the capacity value of the states' energy efficiency programs into the ISO-New England Forward Capacity Market; and, 2) re-investing revenue from states' Regional Greenhouse Gas Initiative (RGGI) auctions in energy efficiency.

Involve Stakeholders through Structured Participation

Consumers are the focus of Efficiency Procurement, so improving the consumer voice in Efficiency Procurement decisions is critically important. A consumer stakeholder advisory council can provide meaningful input into utilities' Efficiency Procurement plans and add significant stability to investment decisions. Structured stakeholder participation can benefit Efficiency Procurement efforts in several ways:

- **Address the imbalance in resources and information** that can lead to utilities' disproportionate ability to influence regulatory decisions and result in the public perception of unfairness.
- **Greater buy-in by all affected parties**, which can reduce the total time of making and implementing decisions. This reduces the regulatory burden and the potential for litigation or appeals of regulatory decisions.
- **Bringing together diverse interests** to identify, discuss, and address complex issues and provide recommendations. This helps overcome information gaps and assist regulators' evaluation of plans and policies.
- **Building a foundation of common knowledge** will lead to greater public acceptance. Actively engaging consumer, business, and environmental interests will ensure more balanced and stable outcomes.

Rather than expend effort on contentious litigated proceedings between utilities, interveners, and public agencies, a coordinated process can bring all stakeholders into the discussion before policies and plan details progress to the point where there is little flexibility to address concerns and instead seek solutions that better satisfy multiple objectives.

Stakeholder Participation: A Case Study

A comparison of recent experiences in New York and Massachusetts highlights the value of stakeholder participation.

New York

- In 2008, the NY Public Service Commission issued an order establishing an Energy Efficiency Portfolio Standard, directing all utilities to file proposals for efficiency programs to meet certain savings targets.
- The volume of filings was divided into two groups for filing on different schedules.
- Most utilities filed multiple programs in each round.
- The Commission had to review over 200 filings in total, requiring 16 full-time Commission employees.

Massachusetts

- The Energy Efficiency Advisory Council (EEAC) has a long history of collaboration on efficiency programs.
- Shortly after its creation, the EEAC developed aggressive three-year targets for energy efficiency savings over the course of several meetings and discussions in 2009.
- The process bypassed back-and-forth filings, interrogatories, and re-submissions before the Department of Public Utilities.
- Participants in the negotiations were primary utility staff and EEAC stakeholders, representing a wide range of interests, as opposed to attorneys and expert witnesses.

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Appendix: Efficiency Procurement Benefits in Top States

Massachusetts

- Since implementation of the first three-year plan in 2010, Massachusetts' program administrators have invested $2.1 billion in the energy efficiency programs, delivering over **$11 billion in economic benefits**
- The state's energy efficiency investments have created over **83,000 job-years of employment** economy-wide and added **$12.6 billion** to the Gross State Product
- Annual GHG reductions from these efficiency savings total **2.57 million metric tons** of CO2, the equivalent of removing nearly 540,000 cars from the road every year.

Rhode Island

- Since 2008, Rhode Island has invested $558 million in energy efficiency and consumers have realized **$1.99 billion in economic benefits**.
- Rhode Island currently meets 12% of its electric needs through low cost efficiency and is on track **to meet 17% of its electricity consumption through efficiency by 2017.**
- The state's energy efficiency investments will create over **25,000 job-years of employment** economy-wide and **add $2.34 billion to Gross State Product**.

Connecticut

- Connecticut's electric efficiency investments since 2000 have **saved over 650 MW in peak demand** and reduced overall consumption by 13%.
- Nearly **eliminating future growth in electricity demand** over the next ten years and also significantly slowing the forecasted rate of increase in electric peak demand to only 0.05% per year.
- Energy efficiency investments in 2015 alone are projected to **reduce average customer bills by $300 million** over the next 20 years.
- Electric efficiency investments made to date are "building" the equivalent of **a 165 MW power plant every three years**.
- Economic analysis shows that Connecticut's electric efficiency investments from 2009 to 2013 **grew its economy by $3.4 billion**.

Appendix: Efficiency Impact in Winter Peak Study

System Optimization in Markets: Excerpt from Winter Peak Study: Comparisons of actual electric demand, wholesale prices, and costs to estimates without efficiency show the significant value that regional consumers accrued from efficiency savings during the winter of 2014 alone. Without savings from electric efficiency programs, region-wide demand would have been 13.7% higher, wholesale electricity prices would have been 24% higher, and electricity costs would have been $1.46 billion higher. 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.

Table 1: Monthly Total Demand and Average Real Time and Fay 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 1:Daily Electricity Demand With and Without Efficiency

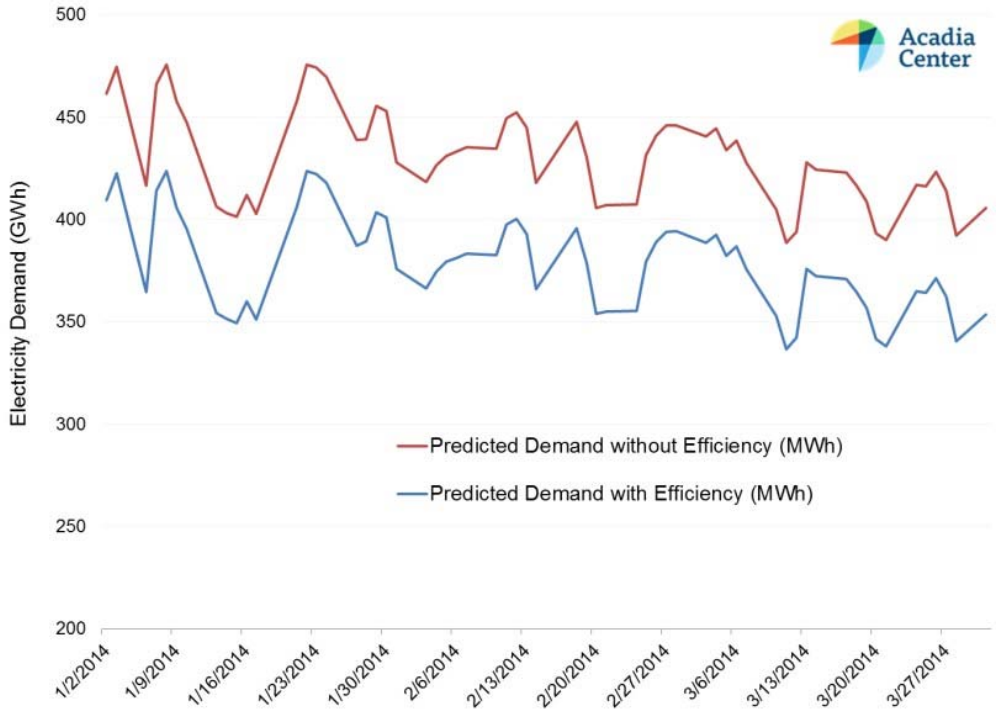

Figure 2: Daily Day Ahead Locational Marginal Prices With and Without Efficiency

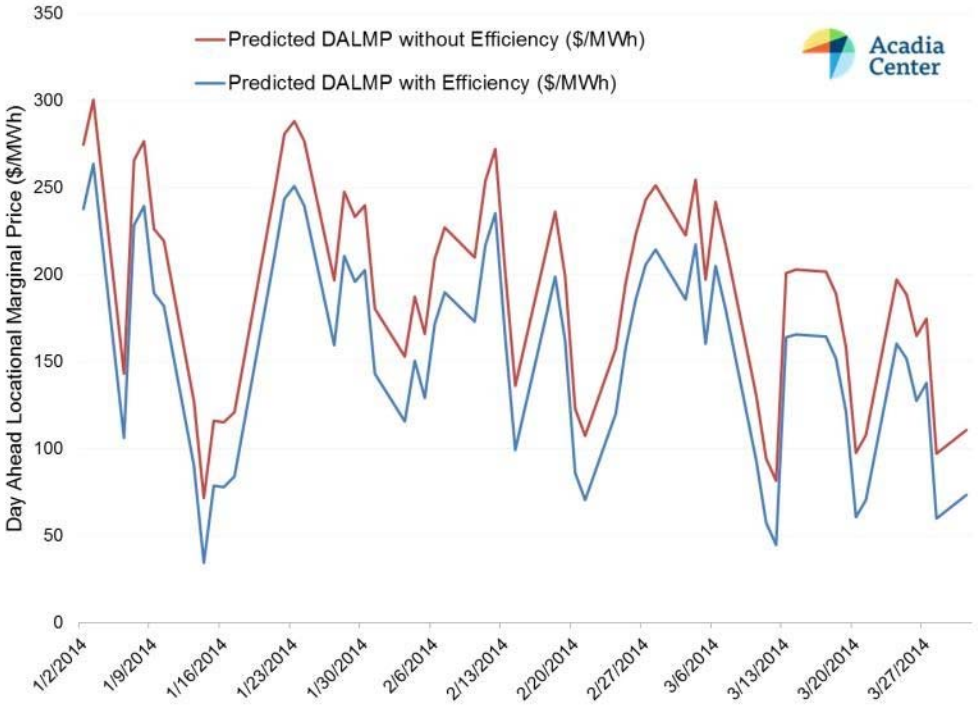

Figure 3: Daily Real Time Locational Marginal Prices With and Without Efficiency