DOER report

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The Commonwealth of Massachusetts

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1998 Energy Efficiency Activities in Massachusetts

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Introduction

The Commonwealth of Massachusetts requires that the customers of electric distribution companies contribute a portion of their electricity charges to activities that reduce the consumption of electricity. Enacted as part of the Electric Industry Restructuring Act (St. 1997, c. 164, "the Act"), the policy recognizes that energy efficiency investments: lower the overall cost of electricity without reducing comfort or convenience, lower the emission of harmful air and water pollutants, create jobs, and stimulate the economy. The investments provide for the installation of high efficiency lighting, motors, air conditioners and appliances; the construction of high efficiency homes and commercial buildings; and more.

This is a summary of the Division of Energy Resources' (DOER) first annual report to the state legislature on the status of energy efficiency in the Commonwealth including funds collected, programs implemented, savings and other benefits achieved, and distribution of the funds and activities among customer classes.

1998 Highlights

- *Participants save an estimated $19 million annually in electricity costs.*
- *Over the energy efficiency measures' productive life-span, savings will grow to approximately $265 million.*
- *To achieve these savings, participating customers and ratepayers invested a total of $122 million.*
- *The cost to conserve electricity will be 60% less than the cost to buy it over the productive life of these energy efficiency measures.*
- *Average annual participant savings:*
  Low-income 13%
  All other residential 6%
  Commercial 6%
  Industrial 7%
- *Energy efficiency measures reduced emissions of harmful pollutants.*
- *Competitive retail suppliers offered bundled energy efficiency and commodity services to customers.*

Table 1: Electricity Bill Impacts for Participating Customers

Customer Class	Number of Participants	Annual Bill Reduction per Participating Customer	Reduction as a Percent o Total Average Annual Bill
Low-income	12,946	$62	13%
Residential	132,795	$42	6%
Commercial	3,241	$2,521	6%
Industrial	634	$7,173	7%

Source: DOER, E^3AS (Energy, Economic, and Environmental Analysis System) model. See Appendices C-D

1998 Program Participants Saved Money

Customers who participated in 1998's energy efficiency offerings saved a total of $19 million on their electricity bills. For the productive lifetime that the energy efficiency equipment remains in place – an average period of 10-15 years – total savings grow to approximately $265 million. These savings were in addition to those realized and mandated through electric deregulation.

Hanover Household

Ellen Robinson of Hanover participated in Eastern Edison's Residential Efficiency Services Program in 1998. The energy efficiency services provided in her home included the installation of efficient lighting, low-flow showerheads, faucet aerators, air sealing, insulation, and ventilation measures. Ms. Robinson was provided $1,206 in customer rebates, and she contributed an additional $92 for a total cost of $1,298. Annual savings from energy efficiency measures are estimated at 7,397 kWh and lifetime savings from these measures are estimated to be 157,400 kWh. These translate to $670 in annual savings and over $14,000 over the life of the measures.

Average annual savings for low-income participants was 13 %. All other residential participants saved an estimated 6%. In addition, the average commercial participant's bill dropped 6%, and the average industrial participant's bill was reduced by 7%.

Boston Department Store

Filene's Department Store located in Boston's Downtown Crossing replaced a number of old chillers in its buildings with new, high efficient chillers, and upgraded and installed additional air conditioning capacity. The total project cost was over $225,000, of which the customer received a rebate for half the cost through Boston Edison's C&I retrofit program. The energy efficiency improvements provided annual savings of 1.2 million kWh and associated savings of $110,000 per year to the department store . These savings will continue every year that the energy efficient equipment remains in place, thus providing substantial cost savings over the long-term.

Leominster Food Processor

Nasoya Foods is a manufacturer of soy milk and tofu products, with facilities located in Leominster and Ayer. When Nasoya was renovating their new facility in Ayer, Massachusetts Electric Company provided technical assistance and customer rebates for energy efficient refrigeration systems and efficient plant lighting and motor systems through their Design 2000 energy efficiency program. Nasoya was provided $227,000 in customer rebates to fund the measures that will save over 607,000 kWh in electricity per year. This amounts to an estimated $42,800 in annual savings and $642,200 over the lifetime of the installed measures.

Energy Efficiency is Cheaper Than Buying Electricity

1998 ratepayer-funded energy efficiency programs will save a projected 3.4 billion kilowatt-hours of electricity for participating customers over more than ten years. With 1998 ratepayer-funded energy efficiency expenditures totaling $99.3 million, plus $22.7 million in participant costs, this translates to an estimated average cost for conserved energy of 3.6¢/kWh – 60% less expensive than the projected average retail electricity price over the same period of 9.6¢/kWh.

Improving Air Quality in Massachusetts and the Region

1998 Ratepayer-funded energy efficiency activities reduced the amount of polluting emissions released by electricity generating units, and will continue to do so over the lifetime of the energy conservation measures installed – roughly 10-15 years. While it is difficult to attribute energy efficiency-derived emissions reductions to any specific Massachusetts generating facility, it is fair to say that overall emissions by the regional power system were reduced. Table 2 (next page) shows annual and long-term emission reductions for the three most critical pollutants — nitrogen oxides (NO_x), sulfur dioxide (SO_2), and carbon dioxide (CO_2).

The 1998 NO_x emission reductions are equivalent to the annual emissions of 25,700 passenger cars. The annual SO_2 emission reductions of 535 tons is equivalent to avoiding the burning of 22,000 tons of bituminous coal, the primary type of coal burned for electricity generation.

Table 2: Impact of 1998 Energy Efficiency Programs on Reducing Electric Power Plant Emissions

Pollutant	Environmental/Health Impact	Emission Reductions 1998 (tons)	Emission Reductions Over Lifetime (tons)
Nitrogen Oxides	Smog, acid rain, lung damage respiratory system illnesses	340	1,795
Sulfur Dioxide	Acid rain, damage to trees and lakes, lung damage, respiratory system illnesses	535	1,335
Carbon Dioxide	Climate change, abnormal weather patterns, rise in sea level, increases in temperature	220,000	1,950,000

The 220,000 tons of reduced CO_2 emissions is equivalent to 9% of the reduction that Massachusetts electric generating plants would have to make from 1990 CO_2 emissions levels in order to meet the Kyoto Protocol.

Energy efficiency programs continue to play an important role in reducing NO_X and SO_2 emissions and will do so at least until stricter emission regulations for power plants go into effect, and until new, cleaner gas-fired combined cycle generating units dominate the supply mix. Even more important is the role of energy efficiency in reducing carbon dioxide emissions. CO_2 is neither regulated nor subject to direct pollution control. Energy efficiency will continue to play a major role in helping Massachusetts and New England meet climate change and CO_2 reduction goals over the long-term.

Increasing Jobs in the Commonwealth

One of the many benefits of energy efficiency activities is that they help encourage growth in Massachusetts' energy efficiency industries. For example, DOER's economic model estimates that 1998 ratepayer-funded investments in energy efficiency will provide 815 net new jobs in Massachusetts, and $30 million in associated employment income over the next decade, most of which will develop in the near-term. These jobs will be concentrated in the areas of manufacturing (notably machinery and electrical equipment), as well as wholesale/retail trade, and business services, including design and engineering services.

In addition to creating jobs, the 1998 energy efficiency programs targeted economic development projects throughout the state, serving over 2,516 small commercial customers and saving them over 52 million kWh annually. This represents about 20% of the total 1998 energy savings.

Springfield Meat Packer

Hatfield Quality Meats, a Pennsylvania-based company, opened a new facility in Springfield to process and pack high-end pork products. In 1998, the company participated in Western Massachusetts Electric Company's economic development program, which installed efficient lighting, air compressors, air dryers and insulation, among other measures. The customer received rebates in the amount of $8,925 and is estimated to reduce its electricity bill by $12,000 annually, or $250,000 over the lifetime of the installed energy efficiency measures.

1998 Energy Efficiency Programs Were Cost-Effective

Energy efficiency programs were cost-effective according to methodologies approved by the Department of Telecommunications and Energy (DTE). By a ratio of 1.8 to 1, statewide benefits to all electric ratepayers from 1998 energy efficiency programs outweighed total program costs. These benefits include wholesale electricity costs as well as distribution and transmission costs avoided by electric distribution companies that would have otherwise been required of customers, absent the energy efficiency programs. These "system" benefits include the contributions that load management programs made to maintaining system reliability during capacity shortage or emergency situations. The load management programs were primarily Commercial and Industrial (C&I) interruptible service programs, in which large C&I customers agreed to reduce their electricity load when called upon by their distribution company during capacity shortage or emergency situations.

The cost-effectiveness ratio of these programs increases to more than 1.8 when other non-energy and environmental benefits of the programs are considered.

Other benefits include creation of employment in the state, increased economic activity stimulated by energy cost savings, increased worker productivity, property improvement for homeowners and businesses, increased electric system reliability, and improved health as a result of reduced air pollution.

In addition, energy efficiency investments save distribution companies money by reducing costs associated with late electricity bill payments, carrying costs, bad debt expenses, and termination and reconnection charges – costs that would otherwise be passed on to all customers.

Finally, benefits include resource savings to customers in the form of reduced natural gas and water bills. For example, the investment in an energy efficient clothes washer will not only reduce electricity costs to wash the clothes, but will also reduce water use and if applicable, the gas used to heat the water for washing.

Low-Income Energy Efficiency Services

Nearly 13,000 low-income customers were served with $8.3 million in energy efficiency activities during 1998. These programs resulted in estimated annual bill reductions of $62 per participating customer. Services included home energy audits, education about reducing electric bills, replacement of high energy-use refrigerators, and installation of energy conservation measures such as compact fluorescent lighting. These programs also provided wall and ceiling insulation and programmable thermostats to electric space heat customers. All measures were provided at no cost to low-income customers. As directed by the Act, the low-income programs were largely administered and delivered by the low-income Weatherization Assistance Program and fuel assistance program network in close coordination with gas utilities.

For example, in 1998, Com/Energy provided energy efficiency services to Tripp Towers in New Bedford as part of its Low-income Multi-family program. The energy efficient measures installed included super-efficient refrigerators and energy efficiency lighting retrofits resulting in estimated annual savings of 154,000 kWh, or $15,000 per year. Over time, these measures will save almost 2 million kWh and $225,000 for low-income families.

All Customer Classes Were Served Equitably

The Act directs DOER to ensure that ratepayer funding for energy efficiency is equitably allocated among customer classes. Equitable allocation was influenced by a specific requirement of the Act, which directed that low-income program funding levels be at least 20% of the amount expended for residential programs, and no less than $0.00025 per kWh (based upon total kWh sold to all customers).

The legislated amount of energy efficiency funding for low-income customers exceeded the amount collected from them. Therefore a portion of both the residential (non Low-Income) and C&I energy efficiency funds was allocated to support low-income program funding (see Table 3). After making this reallocation, the energy efficiency expenditures for the residential (non-Low/ Income) and C&I classes were equitable – in that the percent of collections was about equivalent to the percent of expenditures.

Table 3: 1998 Energy Efficiency Fund Collections and Expend

Customer Class	Collections	Expenditures
Low Income*	2.9%	8.3%
Residential (non L/I)	26.9%	24.9%
C&I	70.2%	66.8%
Total	100%	100%

*The collections from low-income customers reflects only charges fromcustom are on the discounted low-income electricity rate. Due to insufficient data, this does not reflect collections from customers who meet the 175% federal poverty guidelines but are not on the discounted low-income rate.

Programs are Balancing Short and Long Term Savings for Customers

Ratepayer-funded energy efficiency programs served two fundamental purposes in 1998: 1) they provided immediate savings for participating customers, and 2) set the foundation for future savings for all customers by transforming energy efficiency markets.

The greatest portion of 1998 energy efficiency expenditures was invested in retrofit programs. These programs encourage the replacement of outdated and inefficient electrical or mechanical equipment, such as lighting, heating and cooling systems, motors, energy management systems, and process redesign/improvement. They use rebates to persuade customers to invest in higher efficiency equipment that provide program participants immediate and long term savings.

The next largest portion of funding was spent on Lost Opportunity/New Construction programs. These programs focus on encouraging investment in higher energy efficiency at the time of a naturally-occurring market event, such as the construction of a new home or building, major expansion, renovation or remodeling, or replacement of failed equipment. Rebates are used to persuade customers to invest in the higher efficiency equipment. These programs not only provided immediate and long-term savings to program participants, but also targeted key market players (e.g., architects, designers, and builders) in order to change standard building practice and to upgrade building codes and standards, thus benefiting all customers over the long-term.

Residential Products & Services

A number of residential Product and Services programs were implemented in 1998, including the ENERGY STAR™ Appliance program. An ENERGY STAR™ appliance must be at least 11% more energy efficient than is required by Federal Appliance Standards. During 1998, the ENERGY STAR™ appliance program provided information and labels for retailers to use to identify particular models of appliances (e.g. clothes washers, dishwashers, refrigerators, and room air-conditioners) that met ENERGY STAR™ efficiency guidelines.

The balance of total 1998 expenditures was largely spent on statewide/regional Products & Services programs. These programs target non-customer actors higher up in the market chain, seeking to change the long-term production, purchasing, design, and stocking practices of manufacturers, builders, engineering, architects, and retailers. While these programs provide immediate savings to participating customers, they mainly seek to change the fundamental behavior of these market players. Such market transformations capture opportunities for more widespread and in the long-term, more cost effective energy efficiency than other types of programs. In the long run, this benefits not only program participants, but all customers.

Fitchburg Medical Center

As part of Fitchburg Gas & Electric's small commercial retrofit program, North Central Kidney Center in Fitchburg was provided with $7,755 in rebates in 1998 to install efficient lighting including T-8 lamps and electronic ballasts. The estimated annual electricity savings are 28,143 kWh, providing annual savings of nearly $2,800 to the customer. Over the lifetime of the efficient lighting installed, the projected savings are 422,145 kWh and over $40,000 in savings to the customer.

1998 Was a Transitional Year

A total of $137.5 million was collected from ratepayers during 1998, representing 3.4% of distribution companies' 1998 revenues. Total expenditures for the year amounted to $99.3 million, or about 72% of the $137.5 million collected from ratepayers. The underspending was due to: 1) the new, higher funding levels mandated by the Act, 2) the ramp-up time needed to implement new programs, and 3) the difficulties of implementing newly coordinated programs across distribution companies. Unexpended amounts (including accrued interest) were carried forward to 1999 program budgets.

Changes in the Competitive Market for Energy Efficiency Services

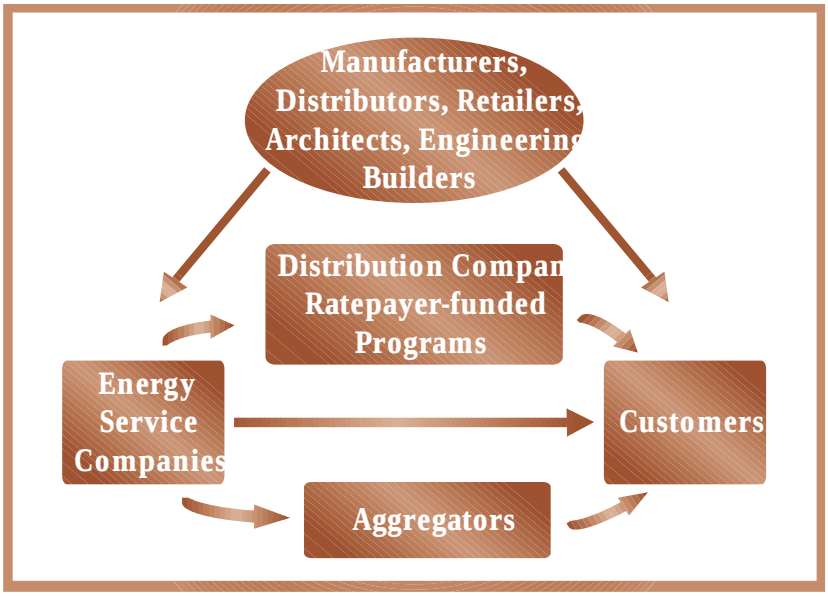
Facilitating the development of a competitive energy efficiency market that delivers services to all customers while decreasing reliance on ratepayer funding is a key objective of the Act. Up until 1998, the competitive energy efficiency market in Massachusetts involved a variety of market players, including energy service companies (ESCos) that provided energy efficiency services to customers through ratepayer-funded programs as well as financing separate from those programs. The market also included a host of manufacturers, retailers, architects, engineers and builders that supported energy efficiency activities in one form or another. Each of these market players had and continue to have a unique role in providing energy efficiency products and services to customers and eliminating barriers to consumer energy efficiency investments.

Figure 1 (below) illustrates the flow of products and services in the energy efficiency market, from upstream market actors (manufacturers, distributors, etc.) to implementors (energy service companies, aggregators and ratepayer-funded programs), and ultimately to end-use customers.

Retail Energy Service Companies Partner with Aggregators to Provide Energy Efficiency Services – Case Study

In 1998, SelectEnergy, the energy services subsidiary of Northeast Utilities, joined with National Energy Choice (NEC), a Boston-based energy aggregator, to offer municipalities a combined electricity/energy efficiency program called *MunEnergy*. This program, provided through the Massachusetts Municipal Association, packaged energy efficiency with electricity supply services. To participate in this offering, customers paid for an energy audit then implemented the audit's recommendations either directly through SelectEnergy or through vendors of their choice. Implementation may also have included participation in ratepayer-funded programs offered by the customer's distribution company. NEC also offered financing assistance for energy efficiency investments. NEC may earn its fee by sharing a percentage of the savings it obtains for customers. By the end of 1998, approximately 70 municipal customers had signed up for NEC's combined commodity and energy efficiency program.

Figure 1: The Flow of Products and Services in the Energy Efficiency M



In 1998, a new type of energy service company – competitive retail suppliers – began offering a range of energy services to customers as a bundled product with the electricity commodity. For the most part, these energy services were offered to medium and large C&I customers, and focused heavily on load management (i.e., advising customers on how to shift their energy use to periods during the day when electricity is cheaper), and power quality services. These services also included energy audits of customers' facilities with recommendations for improvements in building and process efficiency. Audited customers could then choose to participate in ratepayer-funded programs for financing assistance, or could choose to receive services directly from an ESCo vendor referred by the competitive retail supplier. These new energy service companies included Exelon Energy Services, PG&E Energy Services, and Select Energy.

A number of these competitive retail suppliers also partnered with energy aggregators to provide bundled commodity/energy efficiency services to customers. These aggregators included the Massachusetts Health & Educational Facilities Authority, the Massachusetts High Technology Council, and National Energy Choice (for the Massachusetts Municipal Association). These aggregators administered contracts (for commodity and energy efficiency services) between competitive retail suppliers and customers, and in some cases provided financing options.

At this time, it is too early to know the extent to which energy efficiency services provided by competitive retail suppliers through bundled products will eliminate barriers that large C&I customers face when investing in energy efficiency, and the degree to which ratepayer-funded programs reduce these barriers. Furthermore, other customer sectors, primarily small C&I and residential customers, received little, if any, services from competitive retail suppliers in 1998 — possibly due to the general lack of competitive commodity services offered in 1998. Therefore, it is unclear at this time whether competitive retail suppliers will ultimately offer energy efficiency services to these customer classes.

The Commonwealth of Massachusetts' Energy Efficiency Goals

OVERALL STATEWIDE ENERGY EFFICIENCY GOAL:

Protect the environment and strengthen the economy by increas the efficiency of energy use.

ENERGY EFFICIENCY OPERATIONAL GOALS:

Reduce the use of electricity cost-effectively (as defined by the DT

Ensure that energy efficiency funds are allocated to low-income customers consistent with the requirements of the Act, and allocated equitably to other customer classes.

ENERGY EFFICIENCY PROGRAMMATIC GOALS:

Reduce customer energy costs by balancing short-run and long-r savings from energy efficiency programs.

Support the development of competitive markets for energy effic products and services

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