

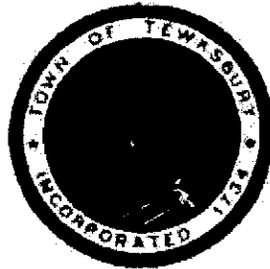
**Massachusetts Department
of Energy Resources**

**Energy Conservation
Improvement Program
Energy Audit**

The Town of Tewksbury Public Schools

**SUMMARY REPORT
Tewksbury, MA**

May 15, 2008



Prepared by



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SECTION 1: EXECUTIVE SUMMARY

American Development Institute (ADI) has been retained by the Division of Energy Resources (MA – DOER) to prepare a scoping energy audit for a number of municipal buildings and school department buildings for the Town of Tewksbury, Massachusetts.

These energy studies were commissioned in order to identify cost-effective energy conservation measures (ECMs) that would qualify for funding under the Energy Conservation Improvement Program (ECIP). The ECIP may fund a portion of this project.

Under this program, ADI has audited the Town of Tewksbury Schools, including the Tewksbury Memorial High School, the John W. Wynn Middle School, the John F. Ryan School, the Loella F. Dewing School, the Heath Brook School, the North Street School, the Louise Davy Trahan School, and the Center School. The ECMs recommended in our investigations, will, if implemented, yield annual energy savings of approximately \$139,995, or 428,118 kWh and 5,451 MMBTU. These savings represent 13.55% of the present annual energy costs of \$1,033,477 for all the buildings studied. With a total implementation cost of approximately \$617,650, the overall payback is 4.4 years. These savings include the recommended retro-commissioning at all the facilities to optimize the operational efficiency of the building systems. There may be utility incentives available from NGrid Electric Company, the electric utility company, for efficient lighting retrofits and lighting occupancy sensors, which will improve the retrofit payback to 4.0 years.

The costs, annual savings, and simple paybacks for the qualified ECMs are summarized in Table 1.1 below. To estimate cost savings, we have used each facility's blended rate for electricity and fuel. Savings calculations are estimates only, based on field observations, building plans, interviews with school employees, or assumptions based on ADI's experience on similar projects. Similarly, cost estimates were made using R.S. Means, vendor information, or ADI experience.

Acknowledgements

The cooperation and assistance of Scott Durkee of the Massachusetts DOER and John Quinn and James Sharkey of the Town of Tewksbury is greatly appreciated in making these studies possible.

Table 1.1: Summary of Energy Efficiency Measures

ECM #	ECM Description	Annual Savings			Installed Cost (\$)	Simple Payback (years)	Utility Funding (\$)	Net Cost \$	Net Payback yrs
		Electricity (kWh)	Fuel (MMBTU)	Total Savings (\$)					
	Tewksbury Memorial High School								
	Retro-commissioning		446 \$	6,356 \$	17,780 \$	2.8		17,780 \$	2.8
ECM 87	Use High-Efficiency Fluorescent Lighting	113,085		13,169 \$	102,210 \$	7.8		85,070 \$	6.5
ECM 91	Install Occupancy Sensors	4,973		579 \$	3,320 \$	5.7		1,620 \$	2.8
	John W. Wynn Middle School								
	Retro-commissioning		179 \$	3,032 \$	10,630 \$	3.5		10,630 \$	3.5
ECM 87	Use High-Efficiency Fluorescent Lighting	25,415		3,128 \$	22,620 \$	7.2		17,100 \$	5.5
ECM 91	Install Occupancy Sensors	6,728		828 \$	4,490 \$	5.4		2,190 \$	2.6
	John F. Ryan School								
	Retro-commissioning		196 \$	3,314 \$	10,600 \$	3.2		10,600 \$	3.2
ECM 87	Use High-Efficiency Fluorescent Lighting	14,918		1,772 \$	14,760 \$	8.3		11,160 \$	6.3
ECM 91	Install Occupancy Sensors	3,949		469 \$	2,930 \$	6.2		1,430 \$	3.0
	Leslie F. Dewing School								
	Retro-commissioning		235 \$	3,911 \$	7,830 \$	2.0		7,830 \$	2.0
ECM 87	Use High-Efficiency Fluorescent Lighting	80,334		10,797 \$	97,210 \$	9.0		78,190 \$	7.2
ECM 91	Install Occupancy Sensors	3,699		497 \$	3,510 \$	7.1		2,610 \$	5.3
	Heath Brook School								
	Retro-commissioning		483 \$	10,079 \$	30,230 \$	3.0		30,230 \$	3.0
ECM 97/98	Use High-Efficiency Motors/Variable Speed Drives	15,880		16,408 \$	110,000 \$	6.7		110,000 \$	6.7
ECM 102/103	Install Energy Management System	10,804		180 \$	8,000 \$	2.0		6,400 \$	1.6
	North Street School								
	Retro-commissioning		424 \$	9,234 \$	22,000 \$	2.4		22,000 \$	2.4
ECM 65	Install HVAC System Pipes		34 \$	560 \$	1,500 \$	2.7		1,500 \$	2.7
ECM 97/98A	Add VFD to Cafeteria AHU Fan		85 \$	2,242 \$	5,500 \$	2.5		4,700 \$	2.1
ECM 97/98B	Add VFD to Original Building AHU Fan		254 \$	7,145 \$	14,000 \$	2.0		12,400 \$	1.7
ECM 97/98C	Add VFD to Hot Water Distribution Pumps		424 \$	9,131 \$	14,500 \$	1.6		13,300 \$	1.5
	Leslie Davy Truham School								
	Retro-commissioning		352 \$	8,455 \$	20,000 \$	2.4		20,000 \$	2.4
ECM 65	Install Condensate Tank		34 \$	572 \$	1,500 \$	2.6		1,500 \$	2.6
ECM 97/98A	Add VFD to Cafeteria AHU Fan		70 \$	2,013 \$	5,060 \$	2.5		4,300 \$	2.1
ECM 97/98B	Add VFD to Original Building AHU Fan		211 \$	4,812 \$	9,000 \$	1.9		8,200 \$	1.7
	Custer School								
	Retro-commissioning		312 \$	6,602 \$	16,940 \$	2.6		16,940 \$	2.6
ECM 65	Install HVAC System Pipes		40 \$	662 \$	1,500 \$	2.3		1,500 \$	2.3
ECM 87	Use High-Efficiency Fluorescent Lighting	14,182		1,834 \$	10,000 \$	5.5		8,800 \$	4.8
ECM 102/103	Install Energy Management System	2,454		480 \$	50,000 \$	6.0		50,000 \$	6.0
TOTAL		428,118	5,451 \$	139,995 \$	617,560 \$	4.4	59,680 \$	557,880 \$	4.0

SECTION 2: ENERGY PROFILE

A summary of the annual energy consumption for the Town of Tewksbury buildings ADI studied is presented in Table 2.1. This table presents the total electrical and fuel energy consumption, the cost of each energy source and the total energy cost, as well as some metrics that the Town of Tewksbury can use to assess their energy consumption and procurement.

The total annual energy consumption per square foot, the Annual Energy Index (AEI), is a useful metric for determining the energy efficiency of the facility. It is affected by the annual hours of operation of the facility and the building systems, the climatic zone the facility is located, the age of the facility and equipment, etc but in general, the lower the AEI, the greater the efficiency. The cost per square foot is a measure of the relative cost to operate each building and the unit cost of the energy will allow them to compare the current energy procurement rates of all the buildings. The electric rates are a blended rate of the consumption and demand charges and will be affected by the presence of air conditioning and high electric loads.

These metrics can provide the Town of Tewksbury with very valuable information that can help them target the facilities for further investigation for energy consumption or cost reduction. As an example, all of the facilities except the High School and the Heath Brook School utilize natural gas exclusively for heating. These two schools also use natural gas and have much lower fuel costs. It may benefit the school district to investigate retrofitting their boilers with the ability to fire on both fuels to reduce heating costs. All the facilities are supplied with electricity by NGrid but have differing blended costs. This may be in part due to the demand charges but consolidation of the school district's accounts could lead to lower rates at some of the schools, especially if consolidation allows the switch the schools to a different electric rate.

Similarly, the cost per square foot and energy use per square foot can indicate where the Town of Tewksbury should concentrate their efforts for energy efficiency in addition to trying to reduce the unit cost rate of energy. As can be seen, the older facilities have higher costs and energy consumption per square foot than most of the newer facilities. This can reflect more complex HVAC systems or the age and therefore the potentially lower efficiency of the HVAC equipment but most likely is due to the affect the envelope has on the heating and cooling loads, including less efficient windows, lower insulating values, and greater amounts of infiltration. Other potential issues are over-ventilation of the facility, over-conditioning of spaces during unoccupied hours, and deterioration of heating piping insulation, leading to greater losses. These issues will be investigated and identified during the retro-commissioning process.

SECTION 3: UTILITY PURCHASING SAVINGS OPPORTUNITIES

There are a number of ways that the Town of Tewksbury can reduce their energy bills in addition to energy conservation. They are outlined below.

ENERGY PROCUREMENT

Municipalities can derive large savings by employing a number of energy procurement strategies:

1. **Electricity:** Municipalities should consider getting their electricity supply from a licensed electricity supplier.¹
 - a. **Real-time Pricing:** The savings from a variable priced offering can be great because the customer assumes the risk of price fluctuations. It is important for customers to understand the risk and potential savings of a real-time index product as compared to a fixed price contract by looking carefully at electricity usage during peak price periods and comparing those trends to the elements of the variable priced offerings. In the event that a customer's usage tends to be during off-peak periods, large savings can be derived. Suppliers should be asked if they have a real-time rate and be requested to give an estimate for what a customer would have paid in the last year using the customer's specific usage data, indicating the supplier's charge (in \$/kWh) for such a product and other charges that may apply.
2. **Aggregation:** It is recommended for municipal offices to aggregate as many electric and gas accounts as possible when going out to bid for energy procurement contracts. In some cases, municipalities have benefited even more by aggregating with other bordering municipalities.

DEMAND RESPONSE

ADI has determined that the Town of Tewksbury may be a good candidate for enrolling in the ISO New England Demand Response Program. This program pays customers for reducing their demand by at least 100 kW *when called upon*. The buildings studied may not be individually eligible but could be included in an aggregation of all the Town of Tewksbury accounts, if acceptable to the ISO New England Demand Response Program.

- There are a number of ways that customers can reduce their load when called upon: onsite generation, shifting usage to *non event periods*.
- ISO-NE usually calls upon participants depending upon the system conditions -reliability and or high prices. In 2007 there were three DR events and 10 in 2006.
- Response time depends on the program; either day ahead or within 30 minutes.
- Entities can enroll in demand response through their utility or a third party.

FORWARD CAPACITY PAYMENTS

ADI has determined that the Town of Tewksbury may be a good candidate for enrolling in the ISO New England Forward Capacity Market. This program pays customers for reducing their demand by at least 100 kW *during performance hours*

Things to consider:

- There are a number of things that customers can enroll: onsite generation, shifting usage to off peak periods.

¹ A list of licensed suppliers can be found at the Dept. of Public Utilities Commission website:
<http://db.state.ma.us/dpu/qorders/firmElectricitySuppliers.asp>

- **The measure (or project) enrolled must be metered or verified to demonstrate the customer's demand was reduced during the performance hours.**
- **Energy efficiency measures that received a rebate from the utility are NOT eligible.**
- **It is recommended for entities to enroll in FCM through their utility or a third party; this reduces the payment, but, requires less attention from facility managers.**

It is recommended for the proper representative to contact the Division of Energy Resources to learn more about opportunities for the Energy Procurement, Forward Capacity Market, and Demand Response. These programs would apply to the aggregation of all buildings in the Town of Tewksbury.