Massachusetts Department
of Energy Resources

Energy Conservation
Improvement Program
Energy Audit

The Town of Tewksbury

SUMMARY REPORT
Tewksbury, MA

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Prepared by

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SECTION 1: EXECUTIVE SUMMARY

American Development Institute (ADI) has been retained by the Department 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.

This energy study for the Town of Tewksbury was 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.

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Under this program, ADI has audited the Tewksbury Town Hall, the Town Hall Annex, the Department of Public Works, the North and Central Fire Stations, the Police Department, the Library, the 70s Parks and Recreation building, the 1960s Parks and Recreation building, the South Fire Station, the Food Pantry, and the 2000 Parks and Recreation building.

The ECMs recommended in our investigations, will, if implemented, yield annual energy savings of approximately $40,358, or 140,433 kWh and 2,393 MMBTU. These savings represent 12.32% of the present annual energy costs of $369,577 for all the buildings studied with the exception of the 2000 Parks and Recreation Building. This building's utility information was incomplete so the savings and total energy usage shown do not include this building. With a total implementation cost of approximately $68,560, the overall payback is 1.7 years. These savings include the retro-commissioning at the recommended 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, which will improve the retrofit payback to 1.7 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 Ralph Knight of the Town of Tewksbury is greatly appreciated in making this study possible.

Table 1.1: Summary of Energy Efficiency Measures

ECM #	ECM Description	Annual Savings				Simple Payback (years)	Utility Funding ($)	Net Cost $	Net Payback yrs
		Electricity (kWh)	Fuel (MMBTU)	Total Savings ($)	Installed Cost ($)				
Tewksbury Town Hall									
RCX	Retro-commissioning		71	$ 1,115	$ 2,160	1.9		$ 2,160	1.9
ECM 87	Use High-Efficiency Fluorescent Lighting	4,572		$ 632	$ 4,330	6.9	$ 570	$ 3,760	6.0
Town Hall Annex									
RCX	Retro-commissioning	7,093	32	$ 1,525	$ 3,000	2.0		$ 3,000	2.0
Department of Public Works									
RCX	Retro-commissioning	4,730	193	$ 4,099	$ 11,300	2.8		$ 11,300	2.8
North Fire Station									
RCX	Retro-commissioning		31	$ 268	$ 570	2.1		$ 570	2.1
ECM 87	Use High-Efficiency Fluorescent Lighting	7,666		$ 1,074	$ 2,990	2.8	$ 440	$ 2,550	2.4
Center Station									
RCX	Retro-commissioning		73	$ 613	$ 1,720	2.8		$ 1,720	2.8
Police Department									
RCX	Retro-commissioning	98,329	1,108	$ 20,391	$ 25,000	1.2		$ 25,000	1.2
ECM 28	Reduce Ventilation Rates Without Affecting Indoor Air Quality	9,688	698	$ 6,963	$ 5,000	0.7		$ 5,000	0.7
Library									
RCX	Retro-commissioning	4,266	32	$ 1,177	$ 1,800	1.5		$ 1,800	1.5
70's Parks & Recreation									
ECM 102	Install Setback Thermostat	1,577	23	$ 447	$ 3,000	6.7		$ 3,000	6.7
1960 Parks & Recreation									
ECM 87	Use High-Efficiency Fluorescent Lighting	295		$ 66	$ 1,290	19.4	$ 160	$ 1,130	17.0
ECM 102	Install Setback Thermostat		9	$ 356	$ 1,200	3.4		$ 1,200	3.4
South Fire Station									
RCX	Retro-commissioning	883	96	$ 979	$ 3,000	3.1		$ 3,000	3.1
Food Pantry									
RCX	Retro-commissioning	1,345	27	$ 654	$ 2,200	3.4		$ 2,200	3.4
2000 Parks & Recreation									
ECM 102	Install Setback Thermostat	0	0	$ -	$ -	0.0		$ -	0.0
TOTAL		**140,433**	**2,393**	**$ 40,358**	**$ 68,560**	**1.7**	**$ 1,170**	**$ 67,390**	**1.7**

Introduction

Through the Energy Audit Program (EAP) offered by the Commonwealth of Massachusetts, Department of Energy Resources (DOER), technical assistance is provided for all buildings owned and operated by cities, towns, regional school districts and wastewater districts to identify capital improvements to reduce energy costs. The technical assistance provided by DOER includes an initial benchmarking of buildings and structures included in the application. Based on the results of the benchmarking, a detailed energy audit may be performed as well as a variety of feasibility studies to evaluate the potential to incorporate renewable energy sources. This comprehensive assistance provides communities with the knowledge needed to reduce energy consumption and associated financial resources.

The purpose of this audit report is to provide the program participant with a list of energy conservation projects, their costs and estimated energy savings. This information may be used to support a future application to DOER's Energy Conservation Improvement Program (ECIP), support performance contracting or justify a municipal bond funded improvement program. ECIP is a state funded grant program that provides funds for energy conserving capital improvements.

The approach taken in this audit included a thorough walk-through of the building(s) and associated systems and equipment, including both process systems and building systems. The major areas covered in the audit included the building envelope, process systems, electrical systems, HVAC systems, lighting systems and operational and maintenance procedures. A major element of the audit also included an initial interview and ongoing consultation with operational and maintenance personnel, as well as building occupants. This approach is critical to the quality of the audit process, since the input of building personnel is invaluable to the effort to obtain accurate information required for the audit.

The recommendations within this report are based on one year of submitted usage data, a site review and preliminary evaluation. The energy savings and energy production figures are projected estimates based on conceptual project upgrades, information gathered at the site, and from the historical utility information provided. The actual savings may vary from these estimates due to a variety of factors. The figures used for the cost of recommended upgrades are 'opinions of probable cost' and are intended to be used for feasibility purposes only. The recommended measures should proceed to detailed design and further re-evaluation followed by competitive bidding per the Massachusetts Procurement Guidelines. The resulting responses to the bid should be used for budget approval purposes. For more information see:

Office of the Inspector General, Municipal, County, District, and Local Authority Procurement of Supplies, Services, and Real Property, Publication No. CR-1520-170-200-09/06-IGO.

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. Note that the utility information for the 2000 Parks and Recreation building was incomplete and is not included in the totals.

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 utilize natural for heating but the cost per MMBTU per building varies greatly. It may be to their advantage to aggregate their accounts to possibly get a better rate from their supplier. Similar advantages may be availably by aggregating the electrical accounts, including the possibility of a rate change. The 1960s Parks and Recreation building has a particularly high electrical utility cost, indicating that the usage is low enough to allow the customer service charges to have an effect on the rate. The AEI and cost per square foot of the Town Hall Annex and the Police Department are much higher than the rest of the facilities, due in part to their higher energy usage. These facilities may have higher equipment loads, such as computers and other office equipment, than the other facilities. This, coupled with the 24 hour operation of the Police Department, tends to lead to higher energy consumption. Another factor for the Annex, as well as the Library, is the high energy cost for these facilities. As can be seen, the Annex's cost per MMBTU is more than twice that of other facilities. This is due to the higher cost for fuel at these facilities; aggregation of accounts will mitigate this issue but not eliminate the higher energy usage for the Annex. It is possible, due to its age, that this facility has a less efficient envelope, with less efficient insulation and windows, greater amounts of infiltration than newer facilities, and even over-ventilation compared to newer standards. It is also possible that the spaces are being over-conditioned during unoccupied hours. These issues will be investigated during the retro-commissioning at each facility.

Table 2.1: Profile of Annual Energy Use

Building	Year Built	Area	Electricity			Fuel			Total					
			kWh	$	$/kWh	MMBTU	$	$/MMBTU	MMBTU	$	MMBTU/sf	$/MMBTU	$/sf
Tewksbury Town Hall	1919	12,400	48,400	$ 6,686	$0.1381	951	$ 14,868	$ 15.64	1,116	$ 21,554	0.090	$ 19.31	$1.74
Town Hall Annex	1966	9,000	141,868	$ 17,373	$0.1225	425	$ 8,745	$ 20.57	909	$ 26,118	0.101	$ 28.72	$2.90
Department of Public Works	1975	32,000	116,240	$ 17,442	$0.1475	2,571	$ 45,349	$ 17.64	2,975	$ 62,791	0.093	$ 21.11	$1.96
North Fire Station	1975	3,736	23,351	$ 3,270	$0.1400	626	$ 5,359	$ 8.56	706	$ 8,630	0.189	$ 12.22	$2.31
Center Station	1965	8,600	63,782	$ 8,777	$0.1376	1,454	$ 12,259	$ 8.43	1,672	$ 21,036	0.194	$ 12.58	$2.45
Police Department	1995	26,000	491,646	$ 55,372	$0.1126	4,656	$ 39,144	$ 8.41	6,334	$ 94,516	0.244	$ 14.92	$3.64
Library	1998	36,000	438,640	$ 52,806	$0.1204	2,230	$ 40,167	$ 18.01	3,727	$ 92,973	0.104	$ 24.94	$2.58
70's Parks & Recreation	1970	4,180	31,532	$ 4,396	$0.1394	453	$ 4,550	$ 10.04	561	$ 8,946	0.134	$ 15.96	$2.14
1960 Parks & Recreation	1960	4,000	1,719	$ 388	$0.2256	94	$ 3,664	$ 38.88	100	$ 4,052	0.025	$ 40.47	$1.01
South Fire Station	2001	7,480	88,290	$ 12,122	$0.1373	959	$ 8,577	$ 8.94	1,261	$ 20,699	0.169	$ 16.42	$2.77
Food Pantry	1999	5,350	26,896	$ 3,452	$0.1284	271	$ 4,810	$ 17.74	363	$ 8,262	0.068	$ 22.77	$1.54
2000 Parks & Recreation	2000	2,400	0	$ -	$ -	0	$ -	$ -	0	$ -	0.000	$ -	$ -
TOTAL		**151,146**	**1,474,364**	**$ 182,086**	**$0.1235**	**14,691**	**$ 187,492**	**$ 12.76**	**19,723**	**$ 369,577**	**0.130**	**$ 18.74**	**$2.45**

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 p*eriods.
- 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/frmElectricitySuppliers.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 Department 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.

SECTION 4: CLEAN ENERGY OPPORTUNITIES

The Commonwealth of Massachusetts is dedicated to promoting clean energy as an alternative to traditional sources of energy. As such, the DOER and other agencies have developed a number of programs to promote the use of clean energy sources by potentially providing technical assistance and/or financial incentives based on project feasibility. A brief discussion of the various programs is provided below, along with specific projects that may be appropriate for the respective technologies.

SOLAR ENERGY

Through the Commonwealth Solar Program[2], rebates are offered to encourage the installation of solar photovoltaic (PV) power by homeowners, businesses and municipalities. The rebate program is designed to help defray the costs that are associated with the installation of eligible systems from 20% - 60%. Rebate applications have been available since January 23, 2008. Incentives are greater for projects on public buildings and those that incorporate products manufactured in Massachusetts. The rebates are available for systems that will be directly owned by the applicant, as well as those financed through a third-party ownership model that takes advantage of federal and state tax credits. A total of $68 million is available over the next four years. The following table provides the initial rebate levels:

Non-Residential Rebates for Incremental Capacity ($/Watt)				
Incremental Capacity	First: 1 to 25 kW	Next: > 25 to 100 kW	Next: > 100 kW to 200 kW	Next: > 200 kW to 500 kW
Base Incentive	$3.25	$2.50	$2.00	$1.50
PLUS: Additions to Base Incentives				
Massachusetts Manufactured System	$0.25	$0.25	$0.25	$0.25
Public Building	$0.50	$0.50	$0.25	$0.25

WIND AND HYDROELECTRIC

The Massachusetts Technology Collaborative[3] (MTC) is a quasi-public agency and is the state's development agency for renewable energy. MTC offers a number of programs, including those that provide funding for wind and hydroelectric projects. The two primary programs are the Small Renewables Initiative (SRI) and the Large Onsite Renewables Initiative (LORI). The SRI provides rebates for the installation of wind and small hydroelectric projects that are up to 10 kW. Annual funding is approximately $3.6 million and is provided on a "first come – first served" basis.

The LORI awards grants for feasibility studies and design and construction projects for projects that are greater than 10 kW. Feasibility grants are capped at $40,000 with an applicant cost share of 15%. Design grants are capped at the lesser of $125,000 or 75% of actual cost and construction grants are capped at the lesser of $275,000 or 75% of actual costs.

[2] Web site: www.commonwealthsolar.org
[3] Web site: www.masstech.org

WOOD PELLET FUELED HEATING

On a periodic basis, the DOER accepts grant applications for wood pellet fueled heating systems[4], which burn pellets made from renewable sources of energy such as compacted sawdust, wood chips, bark and agricultural crop waste. Funding is available to cities, towns, regional school districts, as well as water and wastewater districts. A maximum of $50,000 per project is available for installation; however, applicants may propose greater grant requests, which will be considered based on the merits of the project and available funding. A total of $525,000 is available for this program. The grantee is responsible for repaying 30% of the funds granted within one year of the completed installation.

CLEAN ENERGY PROJECTS FOR THE TOWN OF TEWKSBURY

Based on the walkthrough that was performed as part of this audit, the Town of Tewksbury does not have *Clean Energy* opportunities at their school facilities that could be pursued further. If a decision is made in the future to move forward on any *Clean Energy* opportunities, then the granting authority should be contacted for the respective program, as previously described. The typical process requires the submittal of an initial application. Once a preliminary approval is obtained, a more detailed technical assessment is performed to determine the specific costs and potential payback of the project. Often times, the granting authority will provide some level of funding to support this phase of the project. If there are any questions or further guidance required, please contact Scott Durkee at DOER, phone number (617) 727-4732 ext. 40156.

[4] http://www.mass.gov/Eoca/docs/doer/pub_info/doer_pellet_guidebook.pdf