

Townsend Energy Reduction Plan

May 29, 2012

1. PURPOSE AND ACKNOWLEDGEMENTS

The purpose of the Town of Townsend's Energy Reduction Plan is to reduce the Town's energy consumption by 20% between Fiscal Years (FY) 2011 and 2015, and thereby comply with the third criteria required for designation as a *Green Community* by the Massachusetts Department of Energy Resources (DOER).

For many years, Townsend has consciously reduced its consumption of energy, investing in energy-efficient heating, cooling, and hot water systems, insulation, and lighting in many of its facilities. This document details efforts which have been completed since the beginning of FY2011 (July 1, 2010), currently underway, and currently planned. Additional projects are identified as *in the works* that may result in significant energy cost savings for Townsend.

With this completed application, Townsend requests approval by the Mass DOER of its Energy Reduction Plan and approval of our Green Communities application.

A) On Thursday May 24th the Select Board of the Town of Townsend voted to support this Energy Reduction Plan. Please see [Attachment A](#) (end of document) for a letter verifying adoption of the Townsend Energy Reduction Plan by the Board of Selectmen.

B) List of contributors that participated in baseline and Energy Reduction Plan development

Christopher Campion, Ph.D.	Townsend Energy Committee, Chairman
Sue Dejnia	Townsend Energy Committee, Vice Chairman
Sandra Brown	Townsend Energy Committee, Secretary
Andrew Sheehan	Townsend Town Administrator, Energy Committee Liaison
Karen Chapman	Townsend Land Use Coordinator
Mark Mercurio	Townsend Facilities Manager
Ed Kukkula	Townsend Highway Superintendent
Paul Rafuse	Townsend Water Department Superintendent
John Barrett	Townsend Cemetery and Parks Commissioners
Marianne Graham	ICF International, Project Coordinator, for MA DOER

2. EXECUTIVE SUMMARY

A) Narrative Summary of the Town

The Town of Townsend was first settled in 1676 and incorporated in 1732. According to the 2010 Federal census Townsend is the most statistically "average" town located in Middlesex County, Massachusetts, United States, with a population of 8,926. The town has a total area of 33.1 square miles (85.8 km²), of which 32.9 square miles (85.1 km²) is land and 0.2 square mile (0.6 km²) (0.72%) is water. Townsend has the largest land area of any town in Middlesex County which is largely wooded.

Townsend is home to many businesses, single, and multi-family residents, as well as farms and Pearl Brook State Park. Situated at the junction of Routes 119 and 13, with rural New Hampshire bordering us to the North, Lunenburg and Fitchburg to the South, Ashby on the West side, and Groton and Pepperell to the East. This location uniquely places Townsend between the rural and the suburban, and has characteristics of both.

A self-sufficient character summarizes many of our citizens, and the town is eager to achieve *Green Community* designation. Collectively our town favors a pragmatic approach to achieve energy savings and cost reduction. The municipality of Townsend has 16 buildings, 84 vehicles, 6 water pump houses, and a single open space comprising the town common and gazebo. Table 1 summarizes municipal energy users.

Table 1: Summary of Municipal Energy Users

Energy Consumer	Number	Ownership
Buildings		
Gas (<i>therms</i>)	8	Town of Townsend
Oil (<i>gallons</i>)	4	Town of Townsend
Propane (<i>gallons</i>)	1	Town of Townsend
Open Space		
Electric (<i>kWh</i>)	1	Town of Townsend
Street & Traffic Lights		
Electric (<i>kWh</i>)	88 Street Lights	Unitil
LED Electric	2 Traffic Lights	Town of Townsend
Vehicles ²		
Non-exempt	7	Town of Townsend
Exempt	77	Town of Townsend
Water Department		
Electric (<i>kWh</i>)	7	Town of Townsend
Gas (<i>therms</i>)	4	Town of Townsend

Of the 84 vehicles, there are 8 types and in total only 7 are qualified as non-exempt based on vehicle weight per the *Green Community* Criteria 4 guidance. Currently, non-exempt vehicles account for more than 85% of fuel use. In the aim of obtaining *Green Community* status Townsend has instituted a policy requiring the purchase of fuel-efficient vehicles to replace non-exempt vehicles (see Criterion 4). Additionally, Townsend will replace currently exempt vehicles with fuel-efficient vehicles as suitable substitutes become available in the market place.

Table 2: Summary of Municipal Energy Use Baseline

	MMBTU Used in Baseline Year (2010)	% of Total MMBTU Baseline Energy Consumption	Projected Planned MMBTU Savings	Savings as % of Total MMBTU Baseline Energy Consumption
Buildings	4,190	40.1%	843	8.1%
Open Space	4	0.04%	0	0%
Traffic Lights	16	0.2%	0	0%
Vehicles	4,464	42.7%	791	7.6%
Water Department	1,787	17.1%	0	0%
Total	10,461		1607	15.7%

At this time, street lights located in Townsend are not municipally owned and thus are not included as an energy user, two traffic lights in Townsend are included, and have already been replaced with LED fixtures to reduce energy costs.

3. ENERGY USE BASELINE INVENTORY

A) Identification of Inventory Tool Used

The Townsend Energy Committee used the MassEnergyInsight tracking tool to create the baseline inventory of municipal energy use in FY 2010. Karen Chapman, Townsend's Land Use Coordinator, led the effort to compile all of Townsend's energy data and associated invoices— including electrical and natural gas service provided by Unitil, #2 Distillate Fuel Oil, Propane, Gasoline, and Diesel Oil. Paul Rafuse, the Townsend Water Department Superintendent, also provided details on renewable energy generation which came from Townsends 40 kW Solar Array, located at the Harbor Trace Pumping Station. Marianne Graham, of ICF International, provided additional assistance and guidance through a Mass. DOER Green Communities Planning Grant. The Energy Committee expresses its gratitude.

B) Identification of the Baseline Year

The Energy Committee selected Fiscal Year 2010 as the base line, as it provided a more accurate estimation of Townsend's energy consumption and facility use going forward.

C) Municipal Energy Consumption for the Baseline Year

Table 3 details Townsend's energy consumption during FY2010.

Townsend's energy reduction goal of 20% is based off the Table 3 total of 10,632 MMBtus, which includes exempt vehicles..

Prior to the baseline year, energy-efficient projects were undertaken in many town facilities including:

- Library and Senior Center: Energy-efficient lighting, occupancy sensors
- Police Station: Energy-efficient lighting and occupancy sensors
- Cemetery Department: Energy-efficient lighting
- West Townsend Reading Room: Energy-efficient lighting
- Water Department Headquarters: Energy-efficient lighting and occupancy sensors
- Witches' Brook Pumping Station: Installation of Variable Frequency Drive (VFD)

Table 3: Municipal Energy Use Baseline

	Electricity		Natural Gas		#2 Distillate Fuel Oil		Propane		Gasoline		Diesel		Renewable Energy - Electric		Total MMBtu
	kWh	MMBtu	Therms	MMBtu	Gallons	MMBtu	Gallons	MMBtu	Gallons	MMBtu	Gallons	MMBtu	kWh	MMBtu	
West Townsend Reading Room	1,783	6		0	730	101	105	10							117
Office Building	13,037	44	1,697	170											214
Garage/Barn	156	1	240	24											25
Office Building	4,943	17	570	57											74
Station/Communications	95,639	326	3,485	349											675
Repeater/Generator Site	847	3		0											3
Fire Department Office/Garage	37,816	129		0	406	56									185
West Townsend Fire Station	4,978	17		0	836	116									133
Harbor Fire Station	9,132	31	1,902	190											221
Center Fire Station	5,661	19		0	1,477	205									224
Highway Garage	33,379	114	3,475	348											462
Memorial Hall	87,920	300	5,747	575											875
Old Hart Library	3,250	11		0											11
Garage/Recycling Center	14,971	51		0											51
Library and Senior Center	90,800	310	6,087	609											919
Town Hall Annex (Bank)	329	1		0											1
Subtotal for Buildings	404,641	1,381	23,203	2,320	3,449	479	105	10	0	0	0	0	0	0	4,190
Main Street Pumping Station	98,400	336	1,215	122											458
Cross St. Pumping Station	68,359	233													233
Harbor Trace Pumping Station	78,671	268	613	61									50,237	171	500
Witch's Brook Pumping Station Well #1	61,325	209	884	88											297
90 W. Meadow Rd. Pump House	29,225	100													100
Witch's Brook Pumping Station Well #2	82,500	281	834	83											364
Highland Water Tank	1,154	4													4
Subtotal for Water Department	419,634	1,431	3,546	354	0	0	0	0	0	0	0	0	50,237	171	1956
Vehicles in Aggregate									22937	2844	11655	1620			4464
Traffic Lights	4,616	16													16
Open Space	1,154	4													4
Total Energy Use	830,045	2,832	26,749	2,675	3,449	479	105	10	22937	2844	11655	1620	50,237	171	10,630

4. ENERGY REDUCTION PLAN

A) Narrative Summary

Our greatest opportunities to reduce energy consumption reside in the reduction of electricity demanded by the Library and Senior Center, Memorial Hall, Fire Stations and Police Station as well as the reduction of vehicle fuel consumption. We intend to accomplish this through conservation measures, controls and retro-commissioning; energy-efficient variable speed drive water pump replacements; energy efficient lighting upgrades; insulation; energy efficient vehicle purchases and awareness and outreach programs.

i. Overview of Goals for Year 1

As we approach the final quarter of FY2012, Townsend has completed Energy Conservation Measures at the **West Townsend Reading** and **West Townsend Fire Department** building with funding obtained via Energy Efficiency Conservation Block Grants from MassDOER. The projects, completed in September, 2011, are estimated to result in the equivalent reduction of 1,022 gallons of #2 distillate fuel oil (or 142 MMBtus) annually. The Energy Conservation Measures installed were as follows:

West Townsend Reading Room

- Wall Cavity Insulation
- Furnace Replacement and Natural Gas Conversion
- Domestic Hot Water Tank replacement and Natural Gas Conversion

West Townsend Fire Station

- Meeting Room Wall Insulation
- Boiler Replacement and Natural Gas Conversion
- Domestic Hot Water Tank replacement and Natural Gas Conversion

Fire Headquarters and Medic Quarters – 13 Elm Street

Upgrades occurred at the Fire Headquarters and Medic Quarters, located at 13 Elm Street in 2011. An inefficient oil fired furnace and air conditioning system for one third of the facility was replaced with an energy efficient Trane X13 Heat Pump, which provides both heating and cooling to the facility. The installation of the energy-efficient heat pump will result in an equivalent reduction of 1,912 kWh and 47 gallons of heating fuel.

Library and Senior Center

In March, 2012 the new Library and Senior Center will undergo HVAC upgrades including installation of an energy recovery wheel and remote Energy Management System controls for lighting and HVAC systems. Additionally, the facility will undergo retro-commissioning to establish more-energy efficient set-points and tables for the facility. Current engineering estimates indicate a 25-30% reduction in overall energy use at the facility; the Energy Committee has selected to estimate a 25% reduction in Table 4, below.

Steps to Achieve Additional 5% to complete 20% reduction

The EC has identified several measures, beginning in year one which are designed to bring the additional 5% MMBTU savings resulting in the 20% goal over the next five years. These measures include:

- Working with the departments utilizing the most fuel consumption via vehicle pathways; the EC will help identify technology (such as Havis' IdleRight 2 a \$150 device intended to reduce fuel consumption and engine wear of vehicles which idle for long periods of time) and behaviors to realize energy savings.

- Investigating modernization of elevator technology. Currently we are using WYE Delta starters which are significantly more energy intensive than modern solid state starters. Reducing the electricity draw at the start-up will realize further savings by potentially changing the rate at which we are charged for electricity.
- In several of the town's buildings, older refrigerators could be replaced with modern energy equivalent models.
- Replacement Windows and Doors: Several buildings in the Town of Townsend are still in possession of their original windows and doors and would realize energy savings through a replacement pathway. Energy savings in these buildings would not significantly contribute to the overall savings as these facilities are neither large in size nor large in energy consumption. The buildings include: West Townsend Reading Room, Kimble House Cemetery Building, Ambulance Garage and the West Station.

ii. Overview of Goals for Years 2-3

Upon receiving Green Community status, the Energy Committee will seek additional funds for the following projects identified in the Town's 2009 Energy Audits completed by Bowman Engineering, Inc. The identified energy conservation measures will allow Townsend to *hit the ground running* and realize a quick turnaround on our energy savings goals.

ECM 1: HVAC Retro-commissioning and Demand Control Ventilation at municipal buildings

Memorial Hall

Municipal staff in Memorial Hall often cite inefficient cooling and heating as a major cause of discomfort and expense for Townsend. The Energy Committee would like to pursue Bowman Engineering's recommendation of retro-commissioning the building, which was renovated in 1999, and installing demand control ventilation. Townsend's Facilities Manager Mark Mercurio has also identified specific air handlers which could be replaced with VFD.

Five staged Slant/Fin Galaxy gas-fired boilers provide hot water to twelve heating coils in air handling units (AHU) mostly mounted above the suspended ceilings around the building. There are three cabinet heaters in the main entrance, two unit heaters in the boiler room and above the stage, and radiant baseboard heaters in the auditorium. Thirteen outdoor condensing units provide chilled fluid to the AHU cooling coils. This essentially creates twelve independent heating and thirteen cooling zones within Memorial Hall. Even with this level of zone control, occupants report high dissatisfaction with comfort levels in both the heating and cooling seasons.

This ECM recommends an engineering analysis to determine system modifications required to improve occupant thermal comfort, verification of component operations, and implementing recommended changes. This ECM also recommends installing demand control ventilation (DCV) to more closely match outside air supply with indoor air quality requirements. This ECM requires thermostat programming and EMS monitoring to ensure correct system operation.

Fire Stations

Further upgrades with energy-efficient equipment are planned at 13 Elm Street as current equipment reaches the end of its useful life. Items which will require replacement include 2 remaining oil fired furnaces (84,000 BTU/HR Capacity), two air conditioning units, and three electric resistance water heaters. Goals include bringing natural gas service to the facility, which requires a 200' length of piping to be brought in from Rt. 13. The effort would increase the options and associated efficiencies of available HVAC elements Townsend can choose to install.

Police Headquarters

Current upgrades planned are in progress to install new, energy-efficient air handlers and required duct connections. The system complies with ASHRAE right-sizing guidelines.

ECM 2: Upgrades of Vehicles with Energy Efficient Alternatives

- Non-Exempt vehicles such as Ford F150, Explorer XLT and Taurus currently owned by the town would be replaced by GMC Sierra and Ford Fusion Hybrids
- Exempt vehicles such as Ford Expedition, F250 and F350 currently owned by the town would be replaced with Ford Escape and GMC Sierra Hybrids.

ECM 3: Upgrades to Main Street Pumping Station – Water Department

- The two electric motors, including one 50-hp TEFC, 1800 RPM motor and one 60-hp motor, will be replaced with new energy-efficient motors.
- Replace incandescent lighting with energy efficient fluorescent or compact fluorescent lighting, and install occupancy sensors to control lighting.

ECM 4: Upgrades to Cross Street Pumping Station – Water Department

- Install an energy-efficient 30-hp 1800 RPM motor.
- Adjust cooling system set point temperatures to be higher in the summer (from 76 to 85° F). Revise heating system set point temperatures and monitor indoor temperatures in the vicinity of the potassium hydroxide tanks and handling equipment to ensure bottom thresholds for temperature are not exceeded.
- Install ceiling mounted occupancy sensors.

ECM 5: Harbor Trace Station – Water Department

- Adjust cooling system set point temperatures to be higher in the summer (from 76 to 85° F). Revise heating system set point temperatures and monitor indoor temperatures in the vicinity of the potassium hydroxide tanks and handling equipment to ensure bottom thresholds for temperature are not exceeded.

ECM 6: Administrative Building – Water Department

- Replace existing 5-ton air conditioning unit with an energy-efficient, ENERGY STAR certified air conditioning unit.

iii. Overview of Goals for Years 4-5

ECM 7: Wall Insulation at 274 Main Street (Town Hall Annex)

The building walls are insulated with a brick exterior, wood frame, and plaster and lathe interior finish. Most of the wall area does not have adequate space between the interior plaster and exterior brick to hold adequate insulation. This ECM analyzes installing no-load-bearing 2x4 stud walls against the interior plaster walls and filling the spaces between the studs with blown cellulose insulation and finishing with gypsum wallboard. Alternative methods could include filling wall cavities with spray foam, as was completed in the West Townsend Fire Station, or installing rigid foam board.

ECM 8: Attic/ Crawlspace Insulation at 274 Main Street (Bank Annex)

The existing or amount of attic insulation in the building could not be accurately determined due to limited access to the sections of the attic. One section of the attic accessed by a set of stairs houses a storage area with wooden cabinets. Installing a door or other means to isolate this unconditioned space from the rest of the building should be included as part of the ECM.

ECM 9: Supplemental Glazing at 274 Main Street (Bank Annex)

The building windows appear to be original, and are mostly double hung wood frame units with single pane divided light glazing. Sashes are loose, leaky, and the wood is deteriorating.

ECM 10: Lighting Retrofit at 274 Main Street (Bank Annex)

The building currently has linear fluorescent fixtures with T12 lamps and some accent lighting fixtures with incandescent lamps.

EMC 11: Lighting Retrofit at Hart Library

Library lighting has not been upgraded to energy efficient lamps. The upper level main reading room has four chandeliers, each with twelve incandescent lamps. Elsewhere there are five fixtures, each with two T12 lamps, and five individual incandescent lamp fixtures in hallways and restrooms. This ECM recommends replacing these with CFLs and T8 linear fluorescent lamps and compatible electronic ballasts.

EMC 12: Supplemental Glazing at Hart Library

Building windows are original with single pane divided lites, partially operable, and in poor condition. Many sashes are loose fitting. Most windows have been fitted with interior storm windows constructed of plastic sheet and aluminum frames attached to the walls with screws. These storm windows do not provide an adequate air seal and staff report significant drafts.

EMC 13: Boiler Replacement at Hart Library

A Smith 20 mills steam boiler heats the library. This boiler was originally coal-fired and was converted to oil-fired at some point in the past. This particular model was discontinued in the mid 1980s. Precise operating parameters are uncertain due to conversion from coal to oil. This ECM recommends converting the facility to natural gas service and replacing the current oil-fired boiler with a gas-fired appliance.

ECM 14: LED Exit Signs at Hart Library

The building currently has three exit signs with incandescent lamps. Since these signs are active full time replacing them with LED models will reduce energy consumption.

iv. Identify Areas of Least Efficiency/Greatest Waste

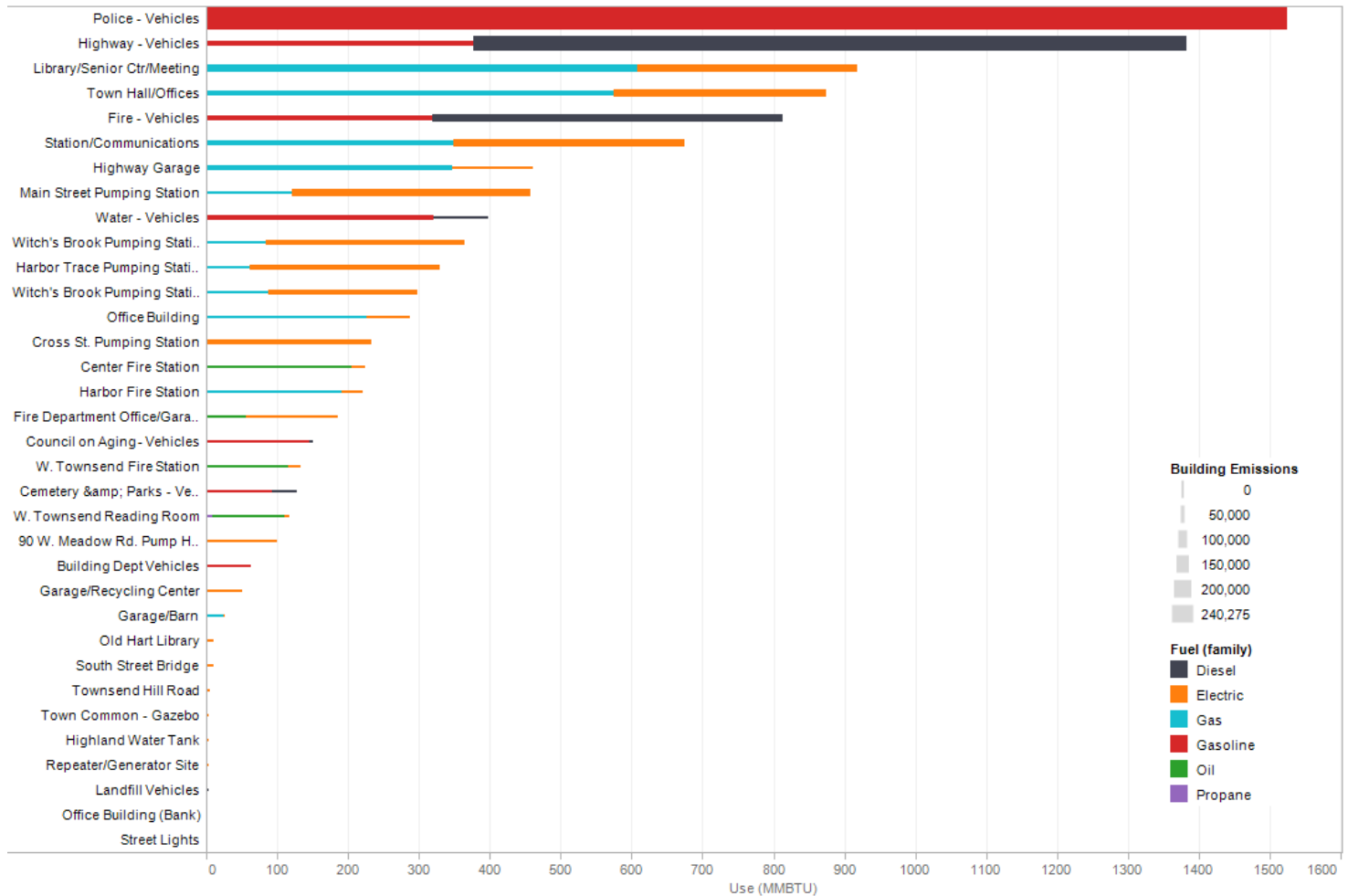


Figure 1: Townsend Energy Consumption by Category: The greatest consumers of energy in the Town of Townsend when evaluated using MassEnergyInsight's "Buildings to Target" visualization.

Figure 1 illustrates that vehicles are the primary consumer of energy in Townsend. The majority of vehicles (77 or of 84) is exempt from the vehicle policy. However, reducing energy costs associated with exempt vehicles is central to the Green Communities Goals to reduce energy costs for the Town of Townsend. We plan to replace additional, exempt vehicles including Ford Expedition, Taurus, and Five Hundred SE AWD models with fuel-efficient equivalents (Ford Fusion and Escape Hybrids) as their use and purpose allows.

B) Program Management Plan for Implementation, Monitoring and Oversight

The Townsend Energy Committee would provide oversight for the implementation of the Energy Reduction Plan through regular meetings and communication with the Town Administrator, committees and department heads. The Town Administrator and Energy Committee liaison, Andy Sheehan, Land Use Coordinator Karen Chapman, and Facilities Manager Mark Mercurio will provide support to the Energy Committee in this capacity.

Most of our energy conservation measures are already in proposal form or at the planning stage. The Energy Committee will work with the department heads (listed at the front of this document) responsible for executing respective ECMs to ensure:

- 1) Energy-efficient equipment in compliance with ENERGY STAR, ASHRAE or another established standard is specified at the onset of a project, including drafted requests for proposals.
- 2) Support and verify implementation of ECM measures, and provide reporting to funding sources and grant programs as necessary on behalf of the department heads
- 3) Summarize the accomplishments of all ECMs via reports to DOER and The Selectmen through the Town Administrator.

C) Summary of Energy Audit(s) or Other Sources for Projected Energy Savings

In 2009, Bowman Engineering, Inc. completed an audit of Town Facilities including Memorial Hall, Hart Public Library, West Townsend Reading Room, Bank Annex (274 Main Street) and West Townsend Fire Station, identifying numerous Energy Conservation Measures.

Additional audits are planned to evaluate energy savings opportunities at the Fire Station located at 8 Elm Street. The Town's original Fire Station is an iconic building to most town residences, and has not been renovated in many (many) years. The facility is still used to house trucks and ambulances, and has a large meeting hall and associated facilities in the second floor which could be put to better use.

D) Energy Conservation Measures

Please refer to Table 4 for a summary of ECM proposed and planned to achieve 15.4% concrete reduction in energy consumption over the next five years should we be accepted into the Green Communities group.

Table 4: Energy Conservation Measures Data

Measure		Status	Energy Data						Financial Data					Reference Data	
Category/ Building	Energy Conservation Measure	Status (Completed month/year or planned Qtr/year)	Projected Annual Electricity Savings (kWh)	Projected Annual Natural Gas Savings (therms)	Projected Annual Heating Oil Savings (gallons)	Projected Annual Propane Savings (gallons)	Projected Annual Gasoline Savings (gallons)	Projected Annual Diesel Savings (gallons)	Projected Annual Cost Savings (\$)	Total Installed Cost (\$)	Green Community Grant (\$)	Utility Incentives (\$)	Net Cost (\$)	Funding Source(s) for Net Costs	Source for Projected Savings
Memorial Hall	Upgrade Variable Frequency Drives (VFD) for Boilers														
	HVAC Retro-Commissioning and Demand Control Ventilation		19,757	1,215					\$5,344	\$45,344					Bowman 2009
Townsend Police Station	Replace split system cooling equipment									\$62,400					Metrowest Mechanical
Fire Headquarters and Medic Quarters 13 Elm Street	Replace 1/3 HVAC Oil & AC system with Air Source Heat Pump	2011	2,037											\$2,500	Energy Star Calculator
	Replace 2/3 HVAC Oil & AC System with Air Source Heat Pump	2015	4,074											\$5,000	Energy Star Calculator
Fire Station (West Townsend) 460 Main Street	3" Wall Cavity Insulation	9/2011			345				\$749	\$3,450				EECBG Grant	Bowman 2009
	Boiler Replacement and Natural Gas Conversion	9/2011			86				\$511	\$7,064				EECBG Grant	Bowman 2009
	Hot Water Storage Tank	9/2011		-62										EECBG Grant	Engineering Estimate
Library and Senior Center	HVAC Upgrades and Recommissioning	5/2012	22,700	1,522											
Hart Library	Lighting Retrofits		4,898						\$882	\$609					Bowman 2009
	Supplemental Glazing				813				\$1,798	\$6,559					Bowman 2009
	Boiler Replacement			-5,000	4,338				\$3,307	\$25,477					Bowman 2009
	LED Exit Signs		578						\$102	\$219					Bowman 2009
Annex (274 Main Street)	Wall Insulation								\$551	\$3,757					Bowman 2009
	Attic/ Crawlspace Insulation								\$545	\$4,734					Bowman 2009
	Supplemental Glazing								\$428	\$5,020					Bowman 2009
	Lighting Retrofit								\$237	\$1,267					Bowman 2009
West Townsend Reading Room	3" Wall Cavity Insulation	9/2011			432				\$937	\$9,178				EECBG Grant	Bowman 2009
	Furnace Replacement and Natural Gas Conversion	9/2011			37				\$202	\$2,002				EECBG Grant	Bowman 2009
	Hot Water Storage Tank	9/2011	255											EECBG Grant	Engineering Estimate
BUILDINGS SUBTOTAL			54,229	-2,325	6,051	0	0	0	\$15,593	\$177,080	\$0	\$0	\$0		

Measure		Status	Energy Data						Financial Data					Reference Data	
Category/ Building	Energy Conservation Measure	Status (Completed month/year or planned Qtr/year)	Projected Annual Electricity Savings (kWh)	Projected Annual Natural Gas Savings (therms)	Projected Annual Heating Oil Savings (gallons)	Projected Annual Propane Savings (gallons)	Projected Annual Gasoline Savings (gallons)	Projected Annual Diesel Savings (gallons)	Projected Annual Cost Savings (\$)	Total Installed Cost (\$)	Green Community Grant (\$)	Utility Incentives (\$)	Net Cost (\$)	Funding Source(s) for Net Costs	Source for Projected Savings
No projects identified at the time of this report.															
STREET AND TRAFFIC LIGHTS SUBTOTAL			0	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0		
No projects identified at the time of this report.															
WATER/SEWER/PUMPING SUBTOTAL			0	0	0	0	0	0	\$0	\$0	\$0	\$0	\$0		
Non-exempt Vehicle Replacement	2 Ford F150 (1984 and 2007) with GMC Sierra Hybrids						643		\$2,571	\$85,680					www.fueleconomy.gov
	3 Explorer XLT (2000, 2000, 2006) with Ford Fusion Hybrids						1,846		\$7,385	\$91,710					www.fueleconomy.gov
	2 Ford Taurus' (2008, 2011) with Ford Fusion Hybrids						627		\$2,507	\$57,550					www.fueleconomy.gov
Exempt Vehicle Replacement	1 Expedition XLT (2003) with Ford Escape Hybrid						603		\$2,411	\$30,570					www.fueleconomy.gov
	2 Ford F250 (1994, 1999) with GMC Sierra Hybrid						714		\$2,857	\$85,680					www.fueleconomy.gov
	3 Ford F350 (1996, 1997, 1997) with GMC Sierra Hybrid						1,948		\$7,792	\$128,520					www.fueleconomy.gov
VEHICLES SUBTOTAL			0	0	0	0	6,275	0	\$25,524	\$479,710	\$0	\$0	\$0		
TOTAL Projected Savings			54,299	-2,325	6,051	0	6,275	0	\$41,117	\$656,790	\$0	\$0	\$0		
TOTAL MMBtu SAVINGS		1,572	185	-233	841	0	778	0							

5. Summary of Long-Term Energy Reduction Goals – Reaching Beyond 5 years

a. Municipal Buildings

We intend to work with our public library and town offices to adopt a power down policy for computers when not in use, examination of our lighting contracts and assets while considering eliminating extraneous lights on our Highway Department building. The Energy Committee has discussed our role in the education of both our municipal employees and citizens in energy conservation behaviors. We propose to do this by working with departments (such as the library) to bring guest speakers who can deliver educational programs informing participants on how their behaviors can result in energy savings both at work and at home.

b. Vehicles

In accord with the above mentioned ECM2 and following the guidelines within the *Policy for Purchasing Fuel Efficient Vehicles* we will purchase only fuel-efficient vehicles for all non-exempt applications. When exempt vehicles are due for replacement, we endeavor to seek out the most-energy efficient model that complies with the critical qualities of the vehicle. In order to find further energy savings amongst our exempt vehicles, the energy committee will work with the appropriate departments to generate an Energy Savings Plan which may include, but is not limited to a policy on idling. Anti-idling policies have been adopted by other Green Communities; we are confident that we can work together to create a plan which reduces fuel usage while maintaining utmost safety and security for our town employees and the citizens they serve.

c. Street and Traffic Lighting

Currently, the Town of Townsend does not own our streetlights and with only two traffic lights, there are limited opportunities to save energy at this front. The feasibility of acquiring our streetlights and maintaining them directly will be investigated. Should the municipality gain control of the streetlight asset, we would want to investigate the energy savings which could be realized by transition to LED or a similar energy-frugal technology.

d. Perpetuating Energy Efficiency

At this time, the Town of Townsend does not have an energy conservation savings reinvestment plan. Such a plan is not outside the scope of the Energy Committee to investigate in the near future. Pending the outcome of such discussions further steps would be to include a presentation to the Selectmen or solicitation for cooperation with various department heads or committees.

As the community of Townsend begins to embrace Green Community status the Energy Committee will take a role in seeking energy savings from less-obvious sources. An example would be for us to approach the Open Spaces department and work together on a plan to reduce the need for watering our green spaces with potable water, as is the current method. Xeriscaping and other water saving techniques could be coupled with sustainable/energy-efficient watering methods to generate an energy reduction plan that reduces the energy used to maintain our green spaces.

6. ONSITE RENEWABLE ENERGY PROJECTS & RENEWABLE ENERGY

Memorial Hall

The sloped south facing rooftop on the building, above the newly constructed Selectmen's Chambers is a good candidate for the installation of a PV or Solar Thermal array, and we plan to obtain a formal estimate and site feasibility.

Hart Public Library

The building could participate in a district heating system (biomass or natural gas) with other nearby municipal buildings – including Memorial Hall, the Bank Annex, and a number of fire stations.

Highway Department

Bask Power, LLC completed a preliminary site feasibility for the new garage, indicating the roof would support 20 kW that would meet 90% of the onsite demand for electricity.

Police Department

In the Townsend Police Department Capital Plan, they identify the opportunity for a 65.5 kW solar PV array located at their headquarters. Additionally, they are pursuing the possibility of installing a Solar PV Array mounted on a carport, which would meet multiple needs at the facility.

7. List of Resources

- <http://www.mass.gov/eea/energy-utilities-clean-tech/green-communities/>
- <http://www.MassEnergyInsight.gov>
- <http://www.EnergyStar.gov>
- <http://www.fueleconomy.gov>
- <http://www.havis.com/idleright.htm>
- Police Department Capital Plan, *Town of Townsend internal document*
- 2009 Bowman Engineering Audit of the Town of Townsend

Appendix A:

Example calculation detail for each energy saving measure citing: 1) The Energy Star calculator and 2. Fuel Economy US Government site.

A.1 Example Calculation for determining energy savings using **Energy Star Calculator**

Annual and Life Cycle Costs and Savings for 1 Air Source Heat Pump(s)			
	1 ENERGY STAR Qualified Units	1 Conventional Units	Savings with ENERGY STAR
Annual Operating Costs*			
Energy cost	\$797	\$1,019	\$222
Energy consumption (kWh)	7,321	9,358	2,037
Maintenance cost	\$0	\$0	\$0
Total	\$797	\$1,019	\$222
Life Cycle Costs*			
Operating costs (energy and maintenance)	\$7,483	\$9,564	\$2,081
Energy costs	\$7,483	\$9,564	\$2,081
Energy consumption (kWh)	87,855	112,294	24,439
Maintenance costs	\$0	\$0	\$0
Purchase price for 1 unit(s)	\$6,700	\$5,700	-\$1,000
Total	\$14,183	\$15,264	\$1,081
Simple payback of initial additional cost (years) [†]			4.5

* Annual costs exclude the initial purchase price. All costs, except initial cost, are discounted over the products' lifetime using a real discount rate of 4%. See "Assumptions" to change factors including the discount rate.

† A simple payback period of zero years means that the payback is immediate.

A.2 Example Calculation for determining energy savings using <http://fuelconomy.gov>

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy

Office of Transportation
& Air Quality

U.S. ENVIRONMENTAL
PROTECTION AGENCY

www.fueleconomy.gov
the official U.S. government source for fuel economy information


Find a CarSave Money & FuelBenefitsYour MPGAdvanced Vehicles & FuelsAbout EPA RatingsMore...

You are here: [Find a Car Home](#) > [Side-by-Side Select](#) > Compare Side-by-Side | [Share](#)

Fuel Economy | Energy and Environment | Safety | Specs


Personalize

2012 GMC Sierra 15
Hybrid 2WD
Hybrid Vehicle



6.0 L, 8 cyl, Automatic (variable
gear ratios)
MSRP: \$40,010 - \$46,790

2007 Ford F150 Pickup
4WD



4.6 L, 8 cyl, Automatic 4-spd

1984 Ford F150 Pickup
4WD



Photo Not Available
4.9 L, 6 cyl, Automatic 3-spd

Add a Vehicle

REGULAR GASOLINE

21

Combined

20

City

23

Highway

Miles per Gallon

MPG estimates for 2007 and
older vehicles have been revised

[View Original EPA MPG](#)

REGULAR GASOLINE

15

Combined

13

City

17

Highway

REGULAR GASOLINE

13

Combined

12

City

13

Highway

[View Original EPA MPG](#)

MPG Estimates from Drivers Like You

[Learn more about "Your MPG"](#)

User MPG estimates are not yet
available for this vehicle

Average based on 1 vehicle

14.0

[View Individual Estimates](#)

User MPG estimates are not yet
available for this vehicle

Fuel Economics ⓘ

Cost to Drive 25 Miles

\$4.46

\$6.25

\$7.21

Fuel to Drive 25 Miles

1.19 gallons

1.67 gallons

1.92 gallons

Cost to Fill the Tank

\$88

\$88-\$101

-

Miles on a Tank

491 miles

351-405 miles

-

Tank Size

26.0 gallons

26.0-30.0 gallons

-

Annual Fuel Cost*

\$2,700

\$3,750

\$4,350




*Based on 45% highway, 55% city driving, 15,000 annual miles and current fuel prices. [Personalize](#).

MSRP and tank size data provided by Edmunds.com, Inc.

www.fueleconomy.gov

the official U.S. government source for fuel economy information

[Find a Car](#) [Save Money & Fuel](#) [Benefits](#) [Your MPG](#) [Advanced Vehicles & Fuels](#) [About EPA Ratings](#) [More...](#)You are here: [Find a Car Home](#) > Compare Side-by-Side| [Share](#)**Compare Side-by-Side**

Fuel Economy	Energy and Environment	Safety	Specs																																												
<div>Personalize</div>	<div>2006 Ford Explorer 4WD</div> <div></div> <div>4.6 L, 8 cyl, Automatic 6-spd</div>	<div>2012 Ford Escape Hybrid FWD</div> <div>Hybrid Vehicle</div> <div></div> <div>2.5 L, 4 cyl, Automatic (variable gear ratios) MSRP: \$30,570 - \$33,080</div>	<div>2000 Ford Explorer 4WD</div> <div></div> <div>5.0 L, 8 cyl, Automatic 4-spd</div>	<div>Add a Vehicle</div>																																											
	<div>EPA Fuel Economy</div> <table><tr><td rowspan="3">Miles per Gallon</td><td><div>REGULAR GASOLINE</div><div>15</div><div>Combined</div><div>13 City 18 Highway</div></td><td><div>REGULAR GASOLINE</div><div>32</div><div>Combined</div><div>34 City 31 Highway</div></td><td><div>REGULAR GASOLINE</div><div>15</div><div>Combined</div><div>13 City 18 Highway</div></td></tr><tr><td colspan="3">MPG estimates for 2007 and older vehicles have been revised</td></tr><tr><td>View Original EPA MPG</td><td></td><td>View Original EPA MPG</td></tr></table> <div>MPG Estimates from Drivers Like You</div> <table><tr><td rowspan="3">Learn more about "Your MPG"</td><td>Average based on 5 vehicles</td><td>Average based on 2 vehicles</td><td>Average based on 5 vehicles</td></tr><tr><td><div>15.2</div><div>13 Lo 18 Hi</div></td><td><div>37.2</div><div>35 Lo 40 Hi</div></td><td><div>14.6</div><div>9 Lo 18 Hi</div></td></tr><tr><td>View Individual Estimates</td><td>View Individual Estimates</td><td>View Individual Estimates</td></tr></table> <div>Fuel Economics ⓘ</div> <table><tr><td>Cost to Drive 25 Miles</td><td>\$6.25</td><td>\$2.93</td><td>\$6.25</td></tr><tr><td>Fuel to Drive 25 Miles</td><td>1.67 gallons</td><td>0.78 gallons</td><td>1.67 gallons</td></tr><tr><td>Cost to Fill the Tank</td><td>\$76</td><td>\$51</td><td>-</td></tr><tr><td>Miles on a Tank</td><td>304 miles</td><td>435 miles</td><td>-</td></tr><tr><td>Tank Size</td><td>22.5 gallons</td><td>15.1 gallons</td><td>-</td></tr><tr><td>Annual Fuel Cost*</td><td>\$3,750</td><td>\$1,750</td><td>\$3,750</td></tr></table> <div>*Based on 45% highway, 55% city driving, 15,000 annual miles and current fuel prices. Personalize. MSRP and tank size data provided by Edmunds.com, Inc.</div>				Miles per Gallon	<div>REGULAR GASOLINE</div> <div>15</div> <div>Combined</div> <div>13 City 18 Highway</div>	<div>REGULAR GASOLINE</div> <div>32</div> <div>Combined</div> <div>34 City 31 Highway</div>	<div>REGULAR GASOLINE</div> <div>15</div> <div>Combined</div> <div>13 City 18 Highway</div>	MPG estimates for 2007 and older vehicles have been revised			View Original EPA MPG		View Original EPA MPG	Learn more about "Your MPG"	Average based on 5 vehicles	Average based on 2 vehicles	Average based on 5 vehicles	<div>15.2</div> <div>13 Lo 18 Hi</div>	<div>37.2</div> <div>35 Lo 40 Hi</div>	<div>14.6</div> <div>9 Lo 18 Hi</div>	View Individual Estimates	View Individual Estimates	View Individual Estimates	Cost to Drive 25 Miles	\$6.25	\$2.93	\$6.25	Fuel to Drive 25 Miles	1.67 gallons	0.78 gallons	1.67 gallons	Cost to Fill the Tank	\$76	\$51	-	Miles on a Tank	304 miles	435 miles	-	Tank Size	22.5 gallons	15.1 gallons	-	Annual Fuel Cost*	\$3,750	\$1,750
Miles per Gallon	<div>REGULAR GASOLINE</div> <div>15</div> <div>Combined</div> <div>13 City 18 Highway</div>	<div>REGULAR GASOLINE</div> <div>32</div> <div>Combined</div> <div>34 City 31 Highway</div>	<div>REGULAR GASOLINE</div> <div>15</div> <div>Combined</div> <div>13 City 18 Highway</div>																																												
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Appendix B: Excerpts from the 2009 Bowman Engineering Audit specifically pertaining to EECBG projects described in Table

Town of Townsend

Page 22 of 31

Municipal Summary

West Townsend Fire Station ECM 2 – Boiler Replacement/Natural Gas Conversion

Description

The current Peerless oil-fired boiler has substantially more than twice the capacity than the maximum estimated hourly heat load. This degree of oversizing results in frequent on and off cycles and reduced seasonal efficiency. This ECM recommends replacing the boiler with one more appropriately sized to anticipated building heating loads.

In addition, maintenance staff reports that natural gas is available at this location. Based on historical trends and current oil and natural gas prices, switching to natural gas can reduce fuel costs by nearly 20%. This ECM recommends replacing the current oil-fired boiler with a gas-fired appliance and connecting the building to the gas main.

Operation

There are no operational changes associated with this ECM.

Initial Cost Estimate

This ECM requires replacing the existing boiler with a new gas appliance and connecting the building to the gas main. The estimated cost for this ECM is \$7,064.

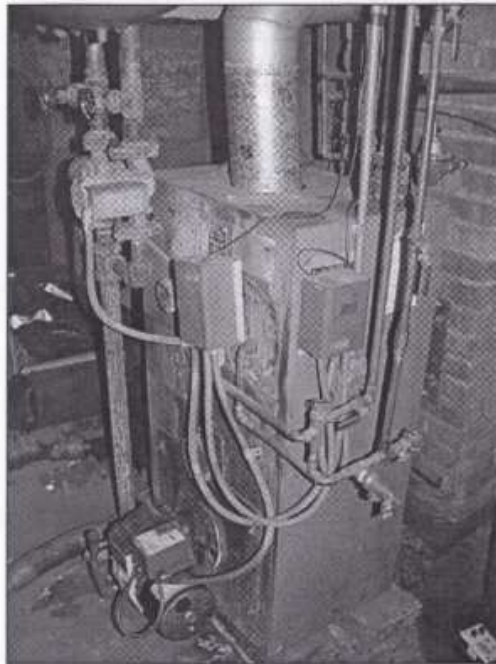
Annual Savings Estimate and Payback

This ECM assumes that ECM 1 has been implemented and uses the resulting estimated reduced heat load.

The following table summarizes the estimated annual energy savings, cost savings, and simple payback for this ECM:

Annual Gross Energy Savings (MMBtu)	Annual Cost Savings	Simple Payback (Years)
12	\$511	13.8

If building usage patterns change, particularly if temperature setpoints increase, then savings will increase and the payback period will be reduced.



BOWMAN
ENGINEERING, INC.™

West Townsend Fire Station ECM 1 – Meeting Room Wall Insulation

Description

The West Townsend Fire Station is normally unoccupied. The building thermostats are set to 55°F during the heating season to prevent equipment freezing. Soundings and a probe of the wall of the upper level meeting room indicate that this level lacks insulation and that there is approximately a 3" deep space between studs that can be filled with insulation. This ECM recommends verifying the lack of insulation and the capacity to hold insulation, then installing insulation.

Operation

There are no operational changes associated with this ECM.

Initial Cost Estimate

This ECM is estimated to cost \$3,450 using spray foam.

Annual Savings Estimate and Payback

The following table summarizes the estimated annual energy savings, cost savings, and simple payback for this ECM:

	Energy Savings (MMBtu)	Cost Savings	Simple Payback (Years)
Spray Foam	48	\$749	4.6

If building usage patterns change, particularly if temperature setpoints increase, then savings will increase and the payback period will shorten.

West Townsend Reading Room ECM 2 – Furnace Replacement/Natural Gas Conversion

Description

The current oil-fired hot air furnace has substantially more capacity than the maximum estimated hourly heat load. This degree of oversizing results in frequent on and off cycles and reduced seasonal efficiency. This ECM recommends rightsizing the furnace to better meet anticipated loads.

In addition, maintenance staff reports that natural gas is available at this location. Based on historical trends and current oil and natural gas prices switching to natural gas can reduce fuel costs by nearly 20%. This ECM recommends replacing the current oil-fired furnace with a gas-fired appliance and connecting the house to the gas main.

Operation

There are no operational changes associated with this ECM.

Initial Cost Estimate

This ECM requires replacing the existing furnace with a new gas appliance and connecting the house to the gas main. The estimated cost for this ECM is \$2,002.

Annual Savings Estimate and Payback

This ECM assumes that ECM 1 has been implemented and estimates that right-sizing the furnace and converting to natural gas will reduce annual energy consumption by 5.2 MMBtu and annual costs by \$202.

Simple Payback is $\$2,002/\$202 = 9.9$ years

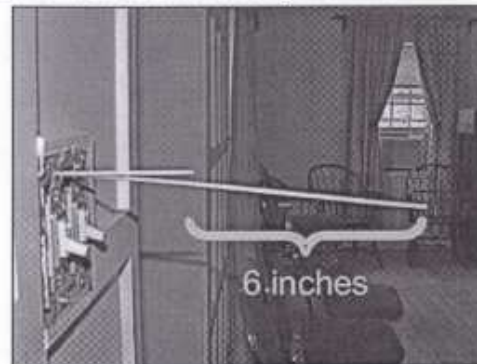
If occupancy rates increase then savings will increase and payback will improve.

West Townsend Reading Room ECM 1 – Wall Cavity Insulation

Description

The exterior walls of the West Townsend Reading Room building are frame construction. The interior finished walls are plaster and lathe. Probes inserted into the walls did not indicate any insulation.

Soundings and probes through wall penetrations indicate that at least 6 inch deep cavities exist between the finished walls and the exterior finishes in the meeting room and 3 inch cavities exist in the remainder of the building. This ECM recommends confirming the wall cavity capacity and if confirmed filling the spaces with blown cellulose or sprayed foam insulation providing additional thermal resistance between R23 and R43 in the meeting room and R17 and R23 in the rest of the building depending upon the chosen insulating material.



Operation

There are no operational changes associated with this ECM.

Initial Cost Estimate

It is estimated that this ECM will cost \$9,178 using blown cellulose.

Annual Savings Estimate and Payback

The following table summarizes estimated ECM energy and cost savings:

	Energy Savings (MMBtu)	Cost Savings	Cost	Simple Payback (Years)
Cellulose	60	\$937	\$9,178	9.8

Higher occupancy rates will increase savings and shorten the payback.

Appendix C: Example calculation from the *Engineering Estimate* related to upgraded domestic hot water savings realized through the EECBG projects described in Table 4.

West Townsend Reading Room

Conversion of a 20+ year electric resistance tank to a new standard efficiency electric unit with and Therm-X-Trol expansion tank. At this time we are unable to estimate energy savings resulting from the installation of the expansion tank. Additional energy savings will be estimated through billing analysis.

Water Heater Load

$$\begin{aligned}
 &= \Delta \text{Temp } 77^{\circ}\text{F} \times 365 \text{ days} \times \frac{5 \text{ Persons}}{\text{Day}} \times 15 \frac{\text{Gallons}}{\text{Person/Day}} \times 8.33 \frac{\text{lbs}}{\text{Gallon}} \\
 &= 17,558,598.75
 \end{aligned}$$

$$\text{Baseline Energy Use} = 5,866 \text{ kWh} = \frac{17,558,599 \text{ (load)}}{.8772 \text{ Ef}/3,412 \text{ BTU/kWh}}$$

$$\text{Revised Energy Use} = 5,611 \text{ kWh} = \frac{17,558,599 \text{ (load)}}{.917 \text{ Ef}/3,412 \text{ BTU/kWh}}$$

Total energy savings equals 255 kWh per year.

West Townsend Fire Station

Conversion of a 20+ year electric resistance tank to an energy efficient natural gas unit with and Therm-X-Trol expansion tank. At this time we are unable to estimate energy savings resulting from the installation of the expansion tank. Additional energy savings will be estimated through billing analysis.

Water Heater Load

$$\begin{aligned}
 &= \Delta \text{Temp } 77^{\circ}\text{F} \times 365 \text{ days} \times \frac{5 \text{ Persons}}{\text{Day}} \times 15 \frac{\text{Gallons}}{\text{Person/Day}} \times 8.33 \frac{\text{lbs}}{\text{Gallon}} \\
 &= 17,558,598.75
 \end{aligned}$$

$$\text{Baseline Energy Use} = 5,866 \text{ kWh} = \frac{17,558,599 \text{ (load)}}{.8772/3,412 \text{ BTU/kWh}}$$

$$\text{Revised Energy Use} = 262 \text{ therms} = \frac{17,558,599 \text{ (load)}}{.67/100,000 \text{ BTU/Therm}}$$

Total energy savings equals (6.19) MMBTU, or (61.9) Therms.

Appendix D: Vehicle Fuel Savings Example Calculations

Non-Exempt Vehicles Identified for Replacement:

- 1984 Ford F150 with GMC Sierra Hybrid

$$\frac{15,000 \text{ Miles Per Year}}{21 \text{ MPG}} - \frac{15,000 \text{ Miles Per Year}}{13 \text{ MPG}} = 357.14 \text{ Gallon Projected Reduction}$$

- 2007 Ford F150 with GMC Sierra Hybrid

$$\frac{15,000 \text{ Miles Per Year}}{21 \text{ MPG}} - \frac{15,000 \text{ Miles Per Year}}{15 \text{ MPG}} = 285.71 \text{ Gallon Projected Reduction}$$

- 2 - 2000 Explorer XLT with Ford Escape Hybrids

$$2 \times \frac{15,000 \text{ Miles Per Year}}{23 \text{ MPG}} - \frac{15,000 \text{ Miles Per Year}}{16 \text{ MPG}} = 1,062.50 \text{ Gallon Projected Reduction}$$

- 2006 Explorer XLT with Ford Escape Hybrid

$$\frac{15,000 \text{ Miles Per Year}}{32 \text{ MPG}} - \frac{15,000 \text{ Miles Per Year}}{15 \text{ MPG}} = 531.25 \text{ Gallon Projected Reduction}$$

- 2008 and 2011 Ford Taurus with Ford Fusion Hybrid

$$2 \times \frac{15,000 \text{ Miles Per Year}}{39 \text{ MPG}} - \frac{15,000 \text{ Miles Per Year}}{22 \text{ MPG}} = 594.41 \text{ Gallon Projected Reduction}$$

Exempt Vehicles Identified for Replacement:

- 2003 Expedition XLT with Ford Escape Hybrid

$$\frac{15,000 \text{ Miles Per Year}}{32 \text{ MPG}} - \frac{15,000 \text{ Miles Per Year}}{14 \text{ MPG}} = 602.68 \text{ Gallon Projected Reduction}$$

- 1994 Ford F250 with GMC Sierra Hybrid

$$\frac{15,000 \text{ Miles Per Year}}{21 \text{ MPG}} - \frac{15,000 \text{ Miles Per Year}}{14 \text{ MPG}} = 357.14 \text{ Gallon Projected Reduction}$$

- 1999 Ford F250 Super Duty with GMC Sierra Hybrid

$$\frac{15,000 \text{ Miles Per Year}}{21 \text{ MPG}} - \frac{15,000 \text{ Miles Per Year}}{12 \text{ MPG}} = 535.71 \text{ Gallon Projected Reduction}$$

- 1996 Ford F350 with GMC Sierra Hybrid

$$\frac{15,000 \text{ Miles Per Year}}{21 \text{ MPG}} - \frac{15,000 \text{ Miles Per Year}}{11 \text{ MPG}} = 649.35 \text{ Gallon Projected Reduction}$$

- 2 - 1997 Ford F350 with GMC Sierra Hybrid

$$2 \times \frac{15,000 \text{ Miles Per Year}}{21 \text{ MPG}} - \frac{15,000 \text{ Miles Per Year}}{11 \text{ MPG}} = 1,298.7 \text{ Gallon Projected Reduction}$$

** 12 MPG Rating is based on reported at Fuely.com for gasoline vehicles. Estimated MPG not calculated for these heavy duty vehicles.



Office of the
BOARD OF SELECTMEN
272 Main Street
Townsend, Massachusetts 01469

Nicholas Thalheimer, *Chairman*

Sue Lisio, *Vice-Chairman*

Robert Plamondon, *Clerk*

Andrew J. Sheehan,
Town Administrator

Office (978) 597-1701
Fax (978) 597-1719

May 22, 2012

Massachusetts Department of Energy Resources
Green Communities Division
100 Cambridge Street, Suite 1040
Boston, MA 02114

At a public meeting held on May 22, 2012, the Townsend Board of Selectmen voted unanimously to accept the attached Green Communities Energy Reduction Plan for the Town of Townsend, dated May 2012.

Please contact Andrew J. Sheehan, Town Administrator, if you require further information in this regard.

Very truly yours,

TOWNSEND BOARD OF SELECTMEN

Nicholas Thalheimer, Chairman

Sue Lisio, Vice Chairman

Robert Plamondon, Clerk

Attachment A: Approval and support of the Townsend Board of Selectmen