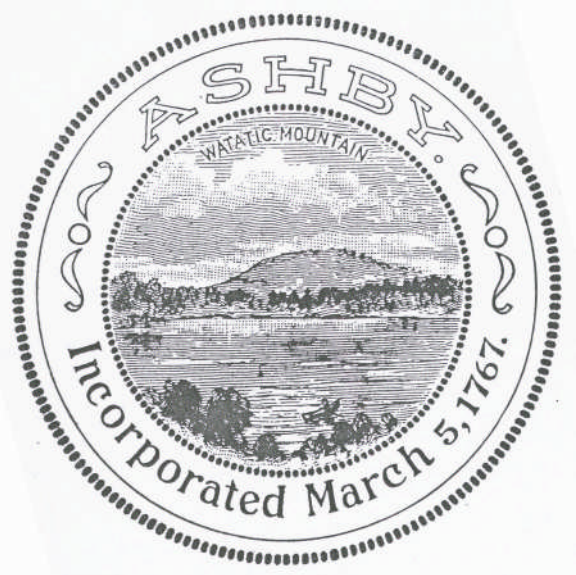


Town of Ashby

Energy Baseline

&

Energy Reduction Plan

October 29, 2013

Revised 11/24/2013

I. PURPOSE AND ACKNOWLEDGEMENTS

The Town of Ashby has established an Energy Reduction Plan. Ashby's planned goal is to reduce energy use for municipal buildings, streetlights and vehicles by 20 percent over the next 5 years. The action items in the plan would allow Ashby to reduce energy consumption, decrease carbon emissions and save tax money. Ashby will use educational programs, rebates, incentives, grant programs and other funding sources, including the DOER Green Communities Grant Program to implement the action items. Our plan will also affect the energy efficiency of all privately owned new buildings and all remodeled existing buildings.

A. Letters of Adoption

The letter from the Board of Selectmen verifying that the general government has approved this Energy Reduction Plan is in the file Ashby-CR3-ERP-approval-selectmen.pdf submitted with this plan.

B. Contributors

The following individuals contributed to the development of the energy use baseline and the energy reduction plan:

- Kelley Brown, Regional Coordinator, Green Communities Division, Central Region
- Jim Barry, Regional Coordinator, Green Communities Division, Western Region
- Bart Bales, PE MSME; Bales Energy Associates; Greenfield, MA
- Board of Selectmen: Janet Flinkstrom, Steve Ingerson, Michael McCallum,
- Energy Efficiency Committee Members: Jim Hubert, Bill Stanwood, Bob Higgins-Steele, John Mickola, Alan Pease
- All of the town department personnel that provided vital information for the plan

II. EXECUTIVE SUMMARY

A. Context

Ashby is located in north central Massachusetts on Route 119 and Route 31. It has an area of 24.2 square miles and a population 3,074. The land is hilly and there are no rivers in the community. Unitil supplies electricity to the entire Town and natural gas to a portion of it. The Town is primarily residential with commercial and industrial use located on the state highways.

Ashby is part of the North Middlesex Regional School system along with Townsend and Pepperell. The regional school is not part of this plan and is not included in the baseline inventory.

B. Summary Municipal Energy Uses

Table 1 is a summary of the type of fuels used in buildings operated by the Town.

Table 1: Municipal Energy Uses

Buildings	**Heat Fuel**	
Fire	oil	
Highway Main Building	oil	
Highway Shed	oil	
Library	oil	to gas in FY14
Police	oil	
Town Hall	gas	
Cemetery	none	
RCTS	none	
Allen Field	none	
Town Common	n/a	
Land Fill operations	n/a	
Vehicles	**Number**	
Non-Exempt	1	
Exempt	27	
Street Lights	3	Utility owned

C. Summary of Energy Use Baseline and Plans for Reductions

Table 2: Summary of Municipal Energy Use Baseline

BASELINE YEAR FY13	**MMBtu Used in Baseline Year**	**% of Total MMBtu Baseline Energy Consumption**	**Projected Planned MMBtu Savings**	**Savings as % of Total MMBtu Baseline Energy Consumption**
Buildings	**2711**	**57.1%**	**758.6**	**16%**
Vehicles	**2026**	**42.7%**	**231.9**	**5%**
Street/Traffic Lights	**2**	**0.0%**		
Open Space	**10**	**0.2%**		
Total	**4749**	**100%**	**990.5**	**21%**

III. Energy Use Baseline Inventory

A. Inventory Tool Used

DOER's web-based tool, MassEnergyInsight (MEI), was used to compile the energy baseline inventory.

B. Baseline Year

Fiscal Year 2013 was selected as the baseline year.

C. Municipal Energy Consumption for Baseline Year

Total energy consumption for Ashby's municipal buildings and streetlights in FY2013 was 4749 Million British Thermal Units (MMBTUs). This total combines electricity oil and gas used to light and operate buildings and street lights as well as the fuel to operate exempt and non-exempt vehicles. The following two tables provide a breakdown of energy use.

Table 3A. Municipal Energy Consumption for FY2013 in Units

Facility	Facility Category	building_id	Fuel (units)	FY of Usage End Date	Use (Native Units)
Town Office	Building	6723	Gas (therms)	2013	10052
Town Office	Building	6723	Electric (kWh)	2013	41254
Highway	Building	6724	Oil (gallons)	2013	3963
Highway	Building	6724	Electric (kWh)	2013	3368
RCTS-General	Building	6726	Electric (kWh)	2013	18
Cemetery	Building	6727	Electric (kWh)	2013	236
Landfill Operations	Building	6728	Electric (kWh)	2013	388
Library	Building	6729	Oil (gallons)	2013	3148
Library	Building	6729	Electric (kWh)	2013	30986
Fire Dept	Building	17793	Oil (gallons)	2013	1342
Fire Dept	Building	17793	Electric (kWh)	2013	12780
Police Dept	Building	17794	Oil (gallons)	2013	565
Police Dept	Building	17794	Electric (kWh)	2013	43640
Allen Field	Open Space	6730	Electric (kWh)	2013	2302
Town Common	Open Space	6731	Electric (kWh)	2013	497
Street Lights	Street/Traffic Lights	6725	Electric (kWh)	2013	676
Highway Fuel	Vehicle	44073	Diesel (gallons)	2013	5153
Highway Fuel	Vehicle	44073	Gasoline (gallons)	2013	2476
Fire Dept Fuel	Vehicle	44074	Diesel (gallons)	2013	1416
Fire Dept Fuel	Vehicle	44074	Gasoline (gallons)	2013	699
Parks Fuel	Vehicle	44075	Gasoline (gallons)	2013	153
Police Fuel	Vehicle	44076	Gasoline (gallons)	2013	5273
Cemetery Fuel	Vehicle	44077	Diesel (gallons)	2013	27
Cemetery Fuel	Vehicle	44077	Gasoline (gallons)	2013	342

	2013 Electric (kWh)	2013 Gas (therms)	2013 Oil (gallons)	2013 Gasoline (gallons)	2013 Diesel (gallons)
Grand Total	136,145	10,052	9,018	8,943	6,596

Table 3B. Municipal Energy Consumption for FY2013 in MMBTU

Fuel	Facility	Facility Category	building_id	FY of Usage End Date	Use (MMBTU)	Percent of Total
Gas	Town Office	Building	6723	2013	1005	
Electric	Town Office	Building	6723	2013	141	
Oil	Highway	Building	6724	2013	551	
Electric	Highway	Building	6724	2013	11	
Electric	RCTS-General	Building	6726	2013	0	
Electric	Cemetery	Building	6727	2013	1	
Electric	Landfill Operations	Building	6728	2013	1	
Oil	Library	Building	6729	2013	438	
Electric	Library	Building	6729	2013	106	
Oil	Fire Dept	Building	17793	2013	187	
Electric	Fire Dept	Building	17793	2013	44	
Oil	Police Dept	Building	17794	2013	79	
Electric	Police Dept	Building	17794	2013	149	
	subtotal Building				**2711**	**57.1%**
Electric	Allen Field	Open Space	6730	2013	8	
Electric	Town Common	Open Space	6731	2013	2	
	subtotal Open Space				**10**	**0.2%**
Electric	Street Lights	Street/Traffic Lights	6725	2013	2	
	subtotal Street Lights				**2**	**0.0%**
Gasoline	Highway Fuel	Vehicle	44073	2013	307	
Diesel	Highway Fuel	Vehicle	44073	2013	716	
Gasoline	Fire Dept Fuel	Vehicle	44074	2013	87	
Diesel	Fire Dept Fuel	Vehicle	44074	2013	197	
Gasoline	Parks Fuel	Vehicle	44075	2013	19	
Gasoline	Police Fuel	Vehicle	44076	2013	654	
Gasoline	Cemetery Fuel	Vehicle	44077	2013	42	
Diesel	Cemetery Fuel	Vehicle	44077	2013	4	
	subtotal Vehicle				**2026**	**42.7%**
	Total				**4749**	

IV. ENERGY REDUCTION PLAN

A. Narrative Summary

1. Goals Years 1-3

The initial goals will be to target the least energy efficient buildings, Police Station, Town Hall and the Highway Buildings. The measures to be undertaken are weather sealing and boiler and furnace upgrade and improved heating and ventilation controls. An idling policy has been adopted by the Selectmen and will be implemented during year 1. An energy saving awareness program will be initiated alongside the physical improvements.

As a first step in finalizing and prioritizing projects, Ashby's energy consultant, Bales Energy Associates will complete ASHRAE Level 2 Audits of the facilities targeted in the energy plan. These audits shall be funded using part of the initial Green Communities grant. (Bales Energy Associates is a pre-approved consultant under the MA Division of Capital Asset Management's Facility & Energy Advisor Program.) Based on the results of this audit, Ashby will review the prioritization of which projects to implement first.

2. Goals Years 4-5

The goals in the last 2 years will be to target the more energy efficient buildings, Library and Fire Station and lighting improvements. These two buildings would see improvements in heating and ventilation controls. Lighting improvements would be targeted at parking/security flood lights, street lights and interior lighting that has not yet been upgraded to more efficient fixtures.

3. Inefficiency

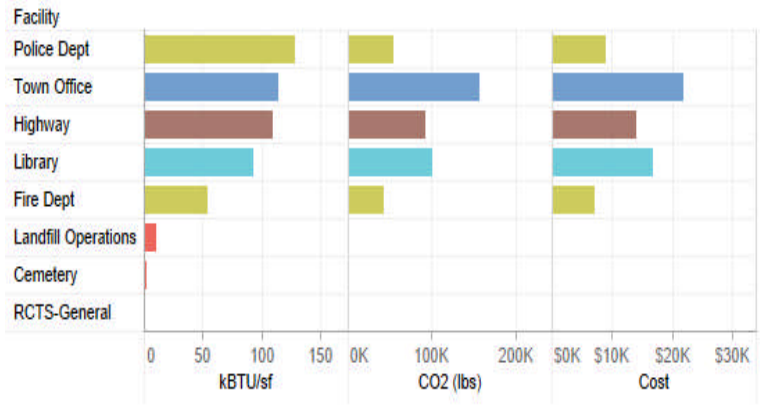
Based on energy use per square foot the Police Station is the least efficient building closely followed the Town Office and Highway buildings. Total energy use is highest for the Town Offices being more than double that of the Highway buildings. Approximately 65% of the Police Station energy use is for electricity to run computers, servers, monitors and radios as well as lighting for both police and 911 Dispatch. The remaining 35% is for heat. This limits the scale of improvement that may be made to energy consumption at this location. The Town Offices appear to have the most potential for improvement. The following table from MassEnergyInsight graphical shows the buildings and their efficiency.

Buildings to Target

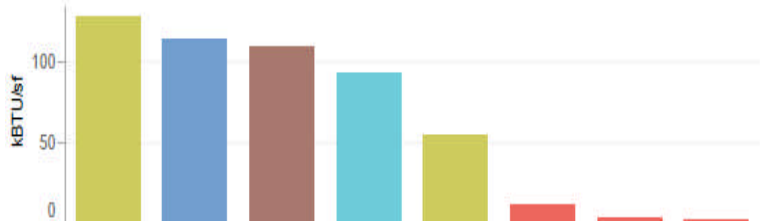
This dashboard compares buildings to one other on an energy use per area metric, measured as kBTU/square foot. In the quadrant chart on the right, buildings with the highest enegy use and worst efficiency (as compared to other buildings in your portfolio) are in the upper right hand quadrant. Facilities of the types Open Space, Water/Sewer, Street/Traffic Lights, and Vehicles are not displayed.

Building Efficiency, Emissions and Cost

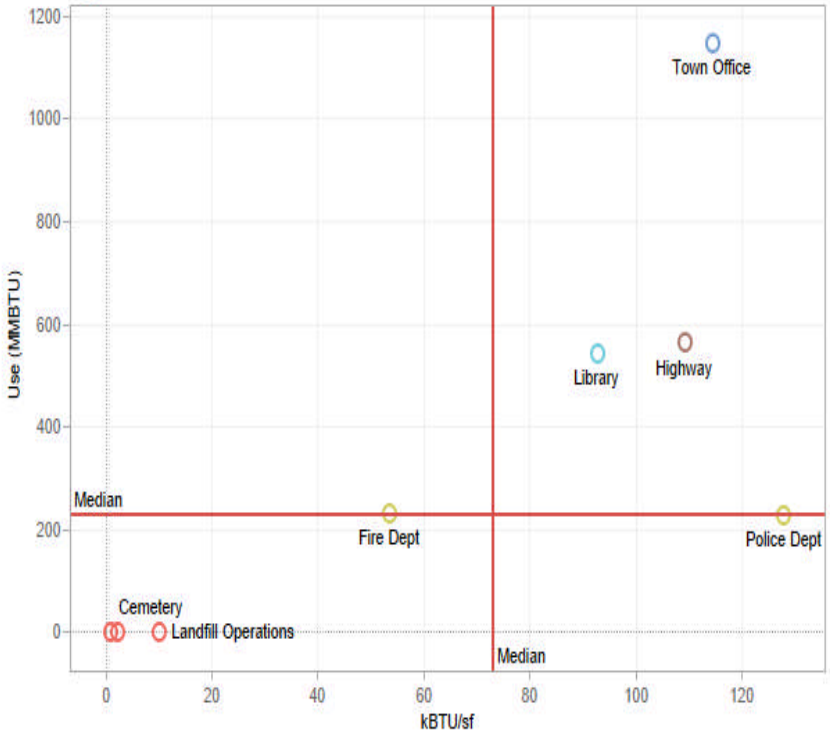
Emissions factors updated 1/4/2012 using Massachusetts-specific greenhouse gas emssions factors.



Select a building name above to see how efficient it is compared to your other buildings. Lower numbers indicate greater efficiency.



Efficiency and Use



B. 20% Energy Reduction in 5 Years

1. Program Management Plan for Implementation, Monitoring and Oversight

Overall management will be the responsibility of the Town Administrator under the general direction of the Board of Selectmen (BoS). Implementation of physical improvements will fall to Town Administrator. He will also implement town wide energy policies. The department head or board overseeing each building and/or vehicles will be responsible for approving physical upgrades and implementing town energy policy within their department. Annual reporting requirements will be divided between Town Hall administrative personnel and the Energy Efficiency Committee.

Data from MassEnergyInsight identified the Police Station, Town Hall and Highway Department buildings as the least efficient on the basis of btu use per square foot. Of the three, the Town Hall is by far the largest user of energy, using twice the energy of the Highway Department buildings and 4 times that of the Police Station.

Motor vehicles account for 42% of the Town's energy use. All but one of the Town's 28 motor vehicles is exempt from meeting Green Communities mileage standards. Reduction in the fleet energy use can be obtained through an idling policy aimed at reducing engine operation while a vehicle is not in use.

Table 4 ASHBY ENERGY REDUCTION PLAN

Table 4
Energy Conservation Measures Data

Measure		Status	Energy Data						Financial Data						Reference Data	
Category/Building	Energy Conservation Measure	Status (Completed with month/year or planned Qtr/year)	Projected Annual Electricity Savings (kWh)	Projected Annual Natural Gas Savings (therms)	Projected Annual 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 ($)	Utility Incentives ($)	Other Grants ($)	Net Town Cost ($)	Funding Source(s) for Other Grants and Net Town Costs	Source for Projected Savings
1. Town Hall																
	a. Building envelope & air sealing improvements			1,990					$2,786	$24,206						*Preliminary estimates*
	b. Storm windows for upper floors			114					$160	$1,596						*by energy consultant*
	c. Boiler upgrade &			3,100					$4,340	$67,000						
	Improve boiler control strategies, possible boiler room piping changes															
	Enhanced Temperature controls & monitoring;															
	Domestic hot water improvements															
2. Police Station	c. Building envelope & air sealing improvements- crawl space				85				$372	$6,086						*Preliminary estimates*
																by energy consultant
3. Fire Station																*Preliminary estimates*
	c. Temperature controls improvements				40											*by energy consultant*
																Level II audits planned
4. Ashby Library																
	a. Lighting controls improvements		1,009													*Preliminary estimates*
	b. Heating system & ventilation improvements				693											*by energy consultant*
	Temperature controls improvements															*Level II audits planned*
5. Highway DPW Bldg 1																
	a. Heating system & temperature controls improvements &				539											*Preliminary estimates*
	Building envelope & air sealing improvements															*by energy consultant*
																Level II audits planned
6. Highway DPW Bldg 2																*Preliminary estimates*
	a. Heating system & temperature controls improvements &				333											*by energy consultant*
	Building envelope & air sealing improvements															*Level II audits planned*
		Projected MMBtu savings														
	BUILDINGS SUBTOTAL		**1,009**	**5,204**	**1,689**	**0**	**0**	**0**	**$7,658**	**$98,888**	**$0**	**$0**	**$0**	**$0**		
	Buildings MMBtu SAVINGS	**758.6746722**	**3.4439022**	**520.4**	**234.83077**	**0**	**0**	**0**								
	STREET AND TRAFFIC LIGHTS SUBTOTAL		**0**	**0**	**0**	**0**	**0**	**0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		
	WATER/SEWER/PUMPING SUBTOTAL		**0**	**0**	**0**	**0**	**0**	**0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		
Vehicles																Percent of use redutcion projected
Highway Gasoline	Idling & use policies						214		$750							10%
Highway Diesel	Idling & use policies							703	$2,986							15%
Fire Dept Gasoline	Idling & use policies						10		$36							2%
Fire Dept Diesel	Idling & use policies							20	$83							2%
Parks Gasoline	Idling & use policies						2		$8							2%
Police Gasoline	Idling & use policies - reduce /eliminate excess night idling						829		$2,902							20%
Cemetery Gasoline	Idling & use policies						4		$13							2%
Cemetery Diesel	Idling & use policies							0.4	$2							2%
General	Replacement of old vehicle with more fuel efficient model - TBD															
	Future vehicle enhancements															
	VEHICLES SUBTOTAL						**1,060**	**723**	**$6,781**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	
	Vehicles MMBtu SAVINGS	**231.87028**	**0**	**0**	**0**	**0**	**131.44**	**100.43028**								
	TOTAL		**1,009**	**5,204**	**1,689**		**1,060**	**723**	**$14,438**	**$98,888**	**$0**	**$0**	**$0**	**$0**		
	TOTAL MMBtu SAVINGS	**990.5449522**	**3.4439022**	**520.4**	**234.83077**	**0**	**131.44**	**100.43028**								

Note: Building space heating and enclosure savings estimates are based upon reasonable percentage use reductions for billed fuel and electricity use at each facility for the type of measure under consideration. Savings assumptions differ based upon the particular conditions observed during the site visits and are consistent with . realistic savings levels obtained in similar building retrofits analyzed by the consultant over many years of energy consulting on similar buildings.

assumes	
Gasoline ($/gal	3.5
Diesel ($/gal)	4.25

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

Long term the Town will need to provide for maintenance to its older buildings. This involves maintaining heating and ventilation systems and the weather sealing around doors windows and other penetrations through the building envelope. The Town would commit 25% of the dollar value of energy saved through the Green Communities program to such maintenance. Any money not required for maintenance would go to improving the efficiency of the energy infrastructure.

An ongoing program to encourage departments to consider fuel consumption when purchasing vehicles would be established. This could include requiring purchasing authorities to consider operating cost as well as purchase price when making vehicle purchases.

V. Onsite Renewable energy Projects Renewable Energy

The Town of Ashby plans to convert as much of its energy generation to solar power as is feasible. The town recently passed the Green Community Solar By-Law allowing As of-right siting of large scale ground-mounted solar installations. The town owns several parcels of land that would be suitable for large-scale ground mounted solar photovoltaic units. Feasibility studies will be needed to proceed with this goal. Ideally, the renewable energy would cover the energy consumption of the town and produce more energy that would be sold back to the grid.

VI. LIST OF RESOURCES

Web Sites

Executive Office of Energy and Environmental Affairs, Green Communities
http://www.mass.gov/eea/energy-utilities-clean-tech/green-communities/

State Personnel

Kelley Brown, Regional Coordinator, Green Communities Division, Central Region, kelly.brown@state.ma.us

Jim Barry, Regional Coordinator, Green Communities Division, Western Region, jim.barry@state.ma.us

Professionals

Bart Bales, PE MSME; Bales Energy Associates; Greenfield, MA, bart.bales@balesenergy.com.
http://www.balesenergy.com/

Local Personnel

Board of Selectmen: Janet Flinkstrom, Steve Ingerson, Michael McCallum,

Town Administrator: Bob Hanson, tadministrator@ashbyma.gov

Assistant to the Board of Selectmen: Jennifer Collins, tabos@ashbyma.gov

Town Accountant: Terry Walsh, account@ashbyma.gov

Assessor's Clerk: Lois Raymond, assess@ci.ashby.ma.us

Highway Superintendent: William Davis

Library Trustees chairman: John Mickola

Police Lieutenant: Fred Alden

Fire Chief: William Seymour

Full Time Firefighter/EMT: Wanda Goodwin

Energy Efficiency Committee Members: Jim Hubert, Bill Stanwood, Bob Higgins-Steele, John Mickola, Alan Pease

All of the town department personnel that provided vital information for the plan.

Appendix

Energy Conservation Calculations & Assumptions

Town Hall:

Existing Enclosure:

Savings were applied as fraction of billed fuel use.

Third floor occupied space & attic massive air and thermal bypasses connecting conditioned and unconditioned spaces. Un-insulated walls and stairwells.

~20% reduction in overall energy use estimated after enclosure improvements: ~20% * 10000 therms =1990 therms

Second and third floor without storm windows, existing windows badly deteriotated: ~1% load reduction estimated = 114 therms

Existing heating and controls system: Two oversized boilers serving separate zones with no ability to share load and poor temperature and boiler controls

To be evaluated: Conversion to condensing boilers with good timeclock setback, outdoor temperature reset and optimal start controls:

31% x 10,000 therms = 3100 therms saved

Savings percentage applied to actual use: **31%**

Breakdown:

Seasonal efficiency comparison: ~ 75% to 92% = 17%/92% = 18.5%

(Combustion efficiency comparison: ~ 80% to 92% = 12%/80% = 15% improvement)

Savings due to combining boiler functions: 2.5%

Temperature scheduling in building is manual and not reliably setback: 10%

Police Station

Police Station is located in former modular classroom building installed on pilings with thin-walled plywood makeshift sidewalls to reduce air and(rodent movement) to the untempered space beneath.

Loss to floor represents a large percentage of total heat losses.

The measure considered for this building is insulate beneath the Police Station and airseal the building in general. Estimated savings of 15% of total usage. 15% x 565 = 85 gallons.

Fire Station

The Fire Station has modern high-performance heating system. Enhanced scheduling thermostat to be evaluated. Projected savings of 3% of use. 3% x 1342 = 40 gallons

Library

Standard efficiency boiler at library, uneven temperature delivery, potential for improved control

To be evaluated: Conversion to condensing boilers with good time clock setback, outdoor temperature reset and optimal start controls:

22% x 3148 gallons = 693 gallons saved

Savings percentage applied to actual use: 22**%**

Breakdown:

Seasonal efficiency comparison: ~ 75% to 92% = 17%/92% = 18.5%

(Combustion efficiency comparison: ~ 80% to 92% = 12%/80% = 15% improvement)

Temperature scheduling in building and improved setback: 3.5%

Lighting

Potential for daylighting sensors, plus occupancy sensors for certain areas.

15% x 6729 = 1009 KWH

Highway DPW Bldg 1

Standard efficiency heating system, potential for improved control

To be evaluated: Conversion to condensing boilers with good time clock setback, and improved controls:

22% x 2449 gallons = 539 gallons saved

Savings percentage applied to actual use: 22**%**

Breakdown:

Seasonal efficiency comparison: ~ 75% to 92% = 17%/92% = 18.5%

(Combustion efficiency comparison: ~ 80% to 92% = 12%/80% = 15% improvement)

Temperature scheduling in building and improved setback: 3.5%

In addition, envelope improvements likely, not yet evaluated

Highway DPW Bldg 2

Standard efficiency heating system, potential for improved control

To be evaluated: Conversion to condensing technology with good time clock setback and improved controls:

22% x 1514 gallons = 333 gallons saved

Savings percentage applied to actual use: 22**%**

Breakdown:

Seasonal efficiency comparison: ~ 75% to 92% = 17%/92% = 18.5%

(Combustion efficiency comparison: ~ 80% to 92% = 12%/80% = 15% improvement)

Temperature scheduling in building and improved setback: 3.5%

In addition, envelope improvements likely, not yet evaluated