Assessment of Energy Opportunities:

Town of Bourne

Bourne, MA 02532

Sponsored by:

Date of Site Visit: May 28, 2008

Table of Contents

Introduction

On May 28, 2008, Alan Mulak, an independent consulting engineer working for Cape Light Compact and NGRID met with Paul O'Keefe and Jon Aborn, Town of Bourne Energy Committee. The reason for the meeting and subsequent walk thru energy assessment was to identify Energy Conservation Opportunities (ECOs) that exist in the facilities. The ultimate goal of this effort is to take action in an effort to become more energy efficient in a cost effective manner.

The next steps should include:

- A detailed energy evaluation of ECOs to be implemented
- Proposal(s) for work to be performed
- Implementation of approved proposal(s)

This report focuses and elaborates upon these ECOs and in each case, offers typical paybacks and returns on investments (ROIs), discusses energy efficient equipment, and suggests a course of action to accomplish the stated goals. It is an informational document created to increase management awareness of current energy practices and serve as a planning document for future action.

Note: This study has been jointly funded by Cape Light Compact, a Municipal Aggregator responsible for supplying electricity to Cape Cod and Martha's Vineyard, administering the energy efficiency funds collected from electric ratepayers and for consumer advocacy on behalf of businesses and residences and National Grid. National Grid is the fifth largest distributor of natural gas in the United States and the largest in the Northeast, operating regulated gas utilities in New York, Massachusetts, and New Hampshire that serve 2.6 million customers.

Questions regarding this study should be directed to one of the following:

John Burns
Cape Light Compact
(508) 375-6829
jburns@capelightcompact.org

Katie O'Rourke
National Grid
(781) 466-5233
kathryn.orourke@us.ngrid.com

Alan Mulak, PE
Energy Engineer and Consultant
(978) 486-4484
amulak@comcast.net

Customer and Facility Information

Customer Contact information:

Paul O'Keefe
Bourne Energy Committee
508-830-5063
pokeefe@maritime.edu

Jon Aborn
Bourne Energy Committee
508.888.0489 ext 258
jaborn@riverviewschool.org

Roger LaPort
Bourne Town Hall
24 Perry Avenue
Buzzards Bay, MA 02532
508.759.0615
rlaport@townofbourne.com

David Kingsbury
Fire Chief, Bourne Fire and Rescue Department
130 Main Street
Buzzards Bay, MA 02532

Philip Goddard
Department of Integrated Solid Waste Management
201 MacArthur Blvd
Bourne, MA 02532
508.759.0651
pgoddard@townofbourne.com

Account information:

Town Hall (24 Perry Avenue):
NSTAR: 1327 246 0018
National Grid: 54018/1531

Fire Station Headquarters (130 Main Street):
NSTAR: 1326 225 0015
National Grid: 54020/1765

Pocasset Fire Station #4 (311 Barlows Landing Road):
NSTAR: 1515 054 0019
National Grid: 54038/1909

Sagamore Fire Station #3 (51 Meeting House Lane)
NSTAR: 2748 868 0011
National Grid: 54032/1149

Department of Integrated Solid Waste Management (201 MacArthur Blvd.)
NSTAR: 1664 873 0014
1646 164 0019
1516 324 0011
1516 325 0028
1516 323 0020

The following is a prioritized list of the recommendations found in this report.

Priority #1: Recommended for immediate implementation:

ECO – 1 Employ a Town Facility Re-Commissioning Agent
ECO – 2 Send Town Facility Operators to Building Operator Certification Course
ECO – 4 Replace Obsolete Interior Fluorescent Lighting Systems
ECO – 5 Replace Incandescent Bulbs with Compact Fluorescent Lamps
ECO – 6 Install Occupancy Sensors
ECO – 7 Install LED Exit Signs
ECO – 8 Install Vending Machine Controls
ECO – 11 Install Set Back T' stats in all facilities
ECO – 16 Install VFDs on Motors

Priority #2: Recommended for implementation as soon as practical:

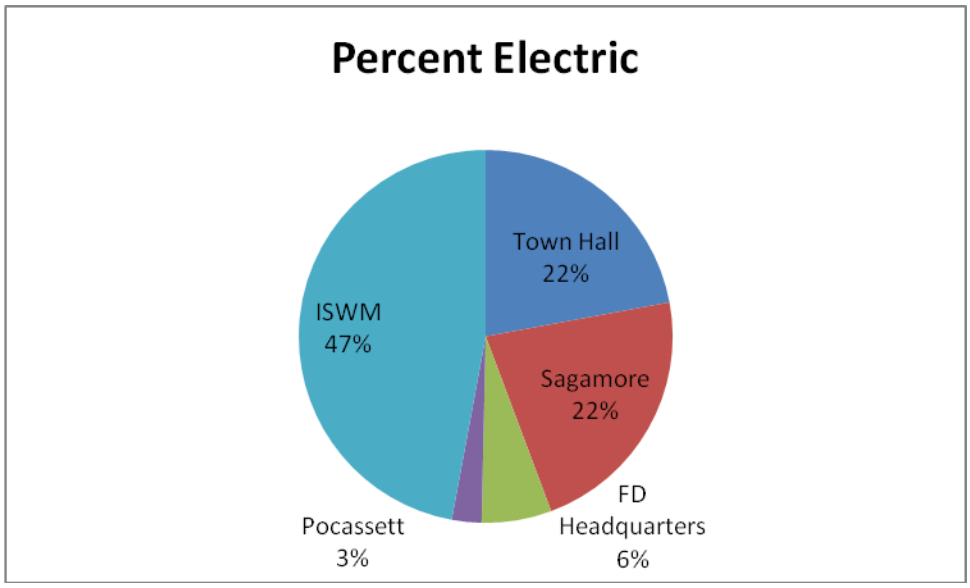
ECO – 3 Group Relamp T8 Lighting with High Performance Fluorescent Lighting
ECO – 9 Replace Hot Air Blowers with Infrared Heat
ECO – 10 Replace Hot Water Tanks with On-Demand Units
ECO – 12 Replace Electric Heat with Ductless Split System Heat Pumps
ECO – 13 Survey all Town Facilities with Infrared Camera
ECO – 14 Replace all Electric Motors with NEMA Premium Efficiency Motors
ECO – 15 Install Full Condensing Boilers.

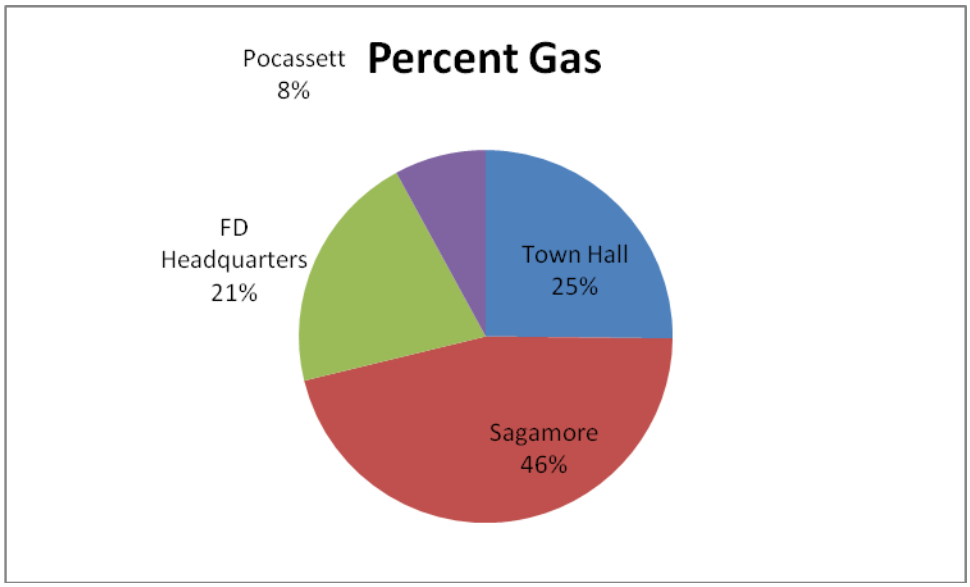
A note about Cape Light Compact Incentives:

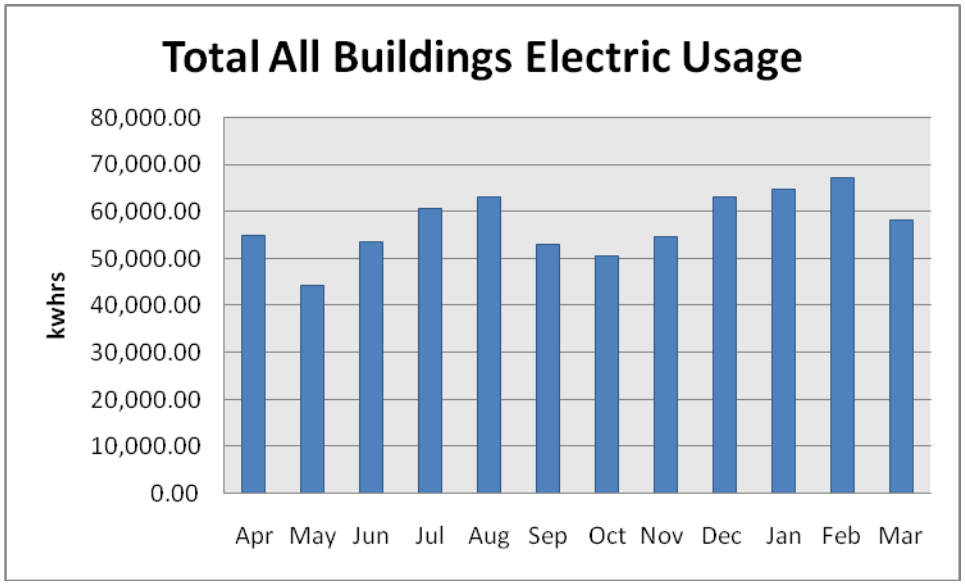
Subject to budget availability, both Cape Light Compact and NGRID offer incentives for some of the recommended Energy Conservation Opportunities. NGRID's are specified on a case by case basis within the discussion of each ECO. Incentive amounts offered by Cape Light Compact are dependent upon the classification of the customer. As the Town of Bourne Municipal Facilities are classified as Municipal Facilities, Cape Light Compact will pay 100% of pre-approved work up to $75,000.

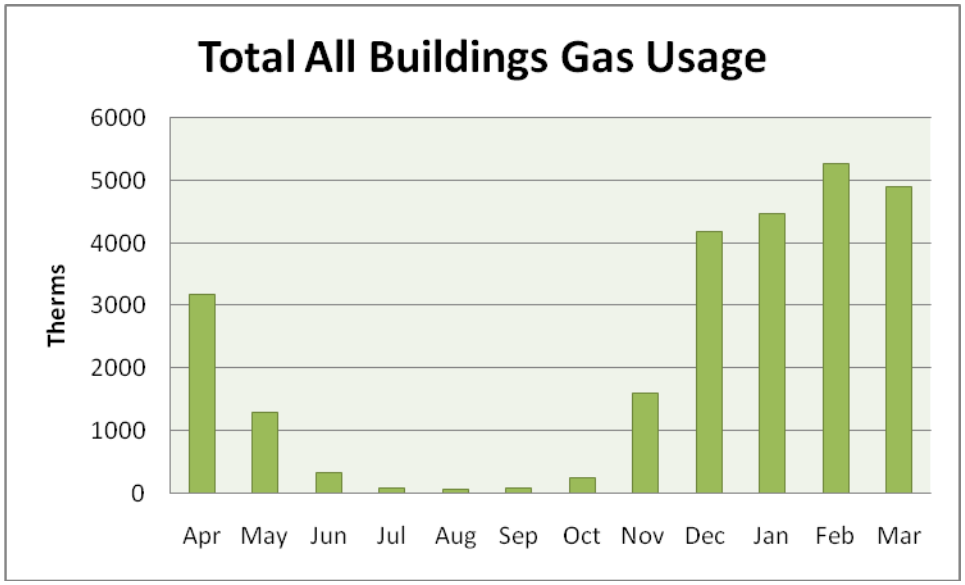
Energy Usage Graphs

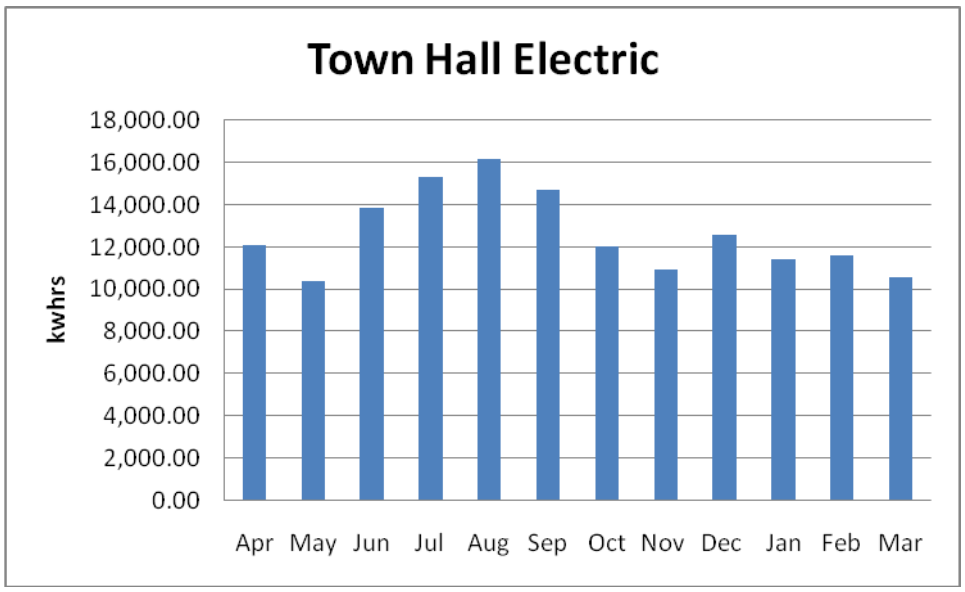
The graphs on the following pages illustrate energy usage by fuel by facility as well as in aggregate. The most alarming graphic is the percent and actual amount of gas used by the Sagamore Fire Station. As indicated by the findings within this report, the Sagamore Station is in need of controls.

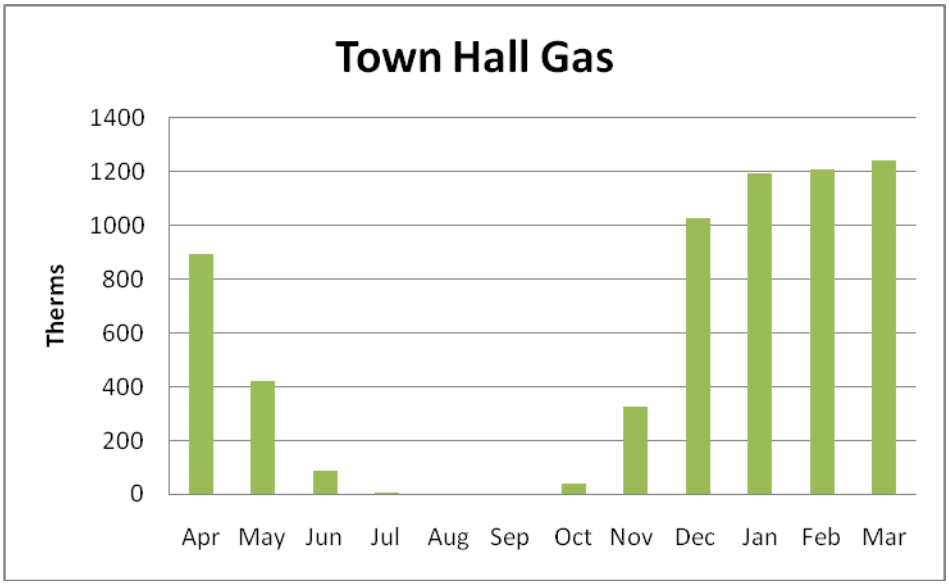


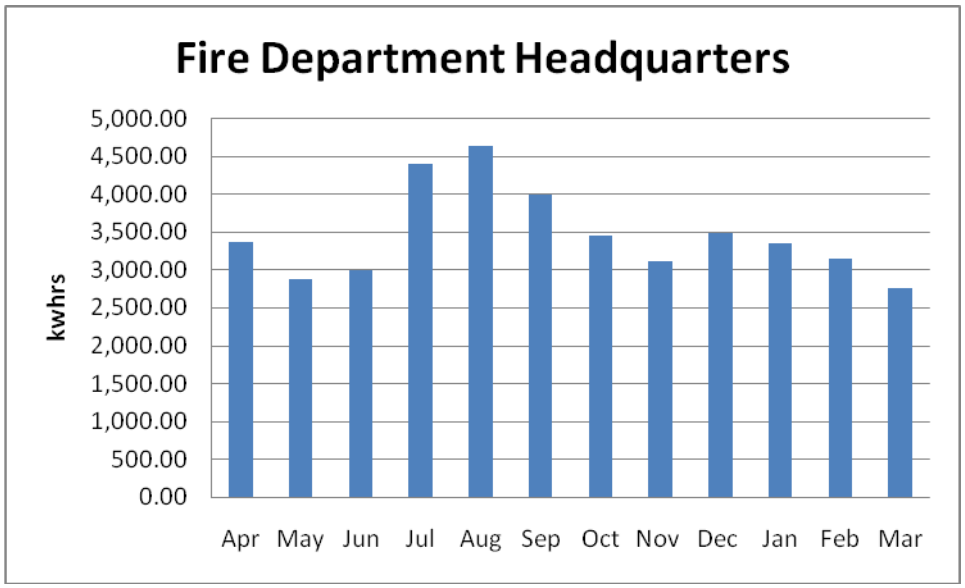


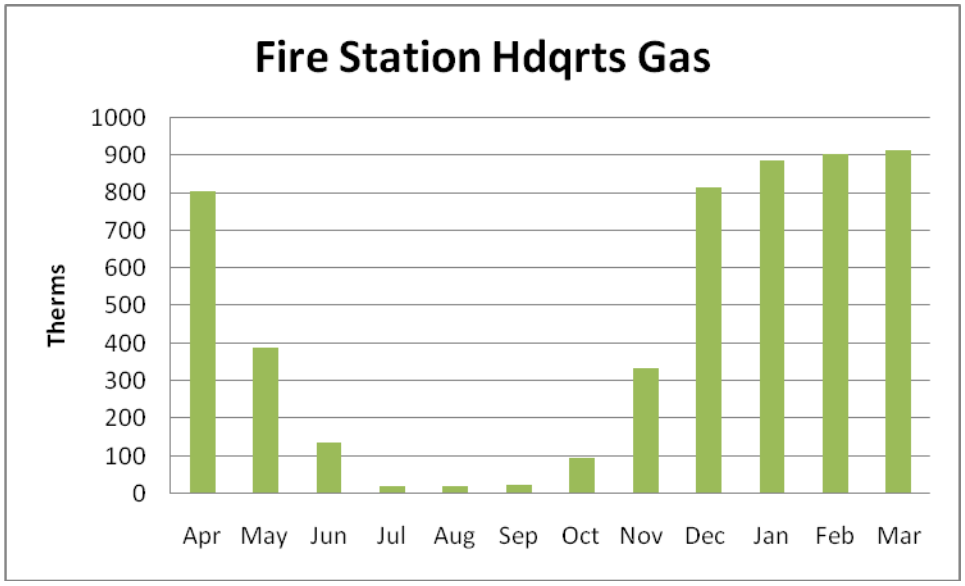

Total All Buildings Electric Usage
kwhrs
80,000.00
70,000.00
60,000.00
50,000.00
40,000.00
30,000.00
20,000.00
10,000.00
0.00
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar

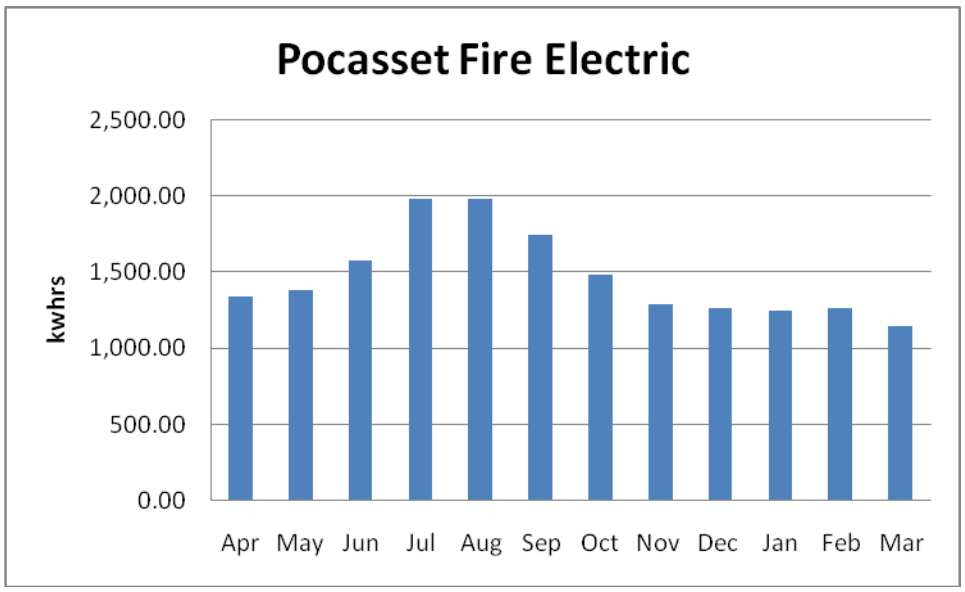

Total All Buildings Gas Usage
Therms
6000
5000
4000
3000
2000
1000
0
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar

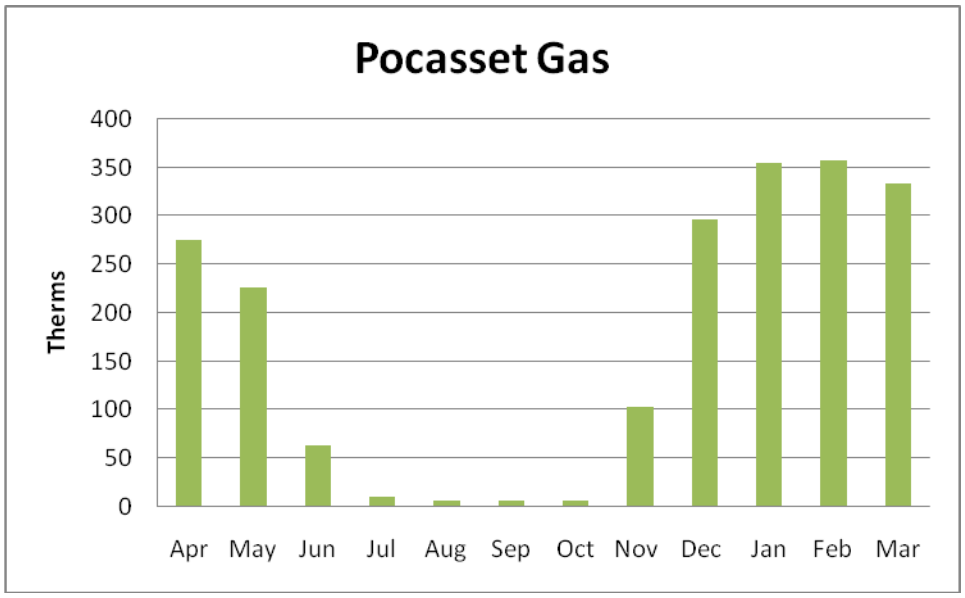

Town Hall Electric
kwhrs
18,000.00
16,000.00
14,000.00
12,000.00
10,000.00
8,000.00
6,000.00
4,000.00
2,000.00
0.00
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar

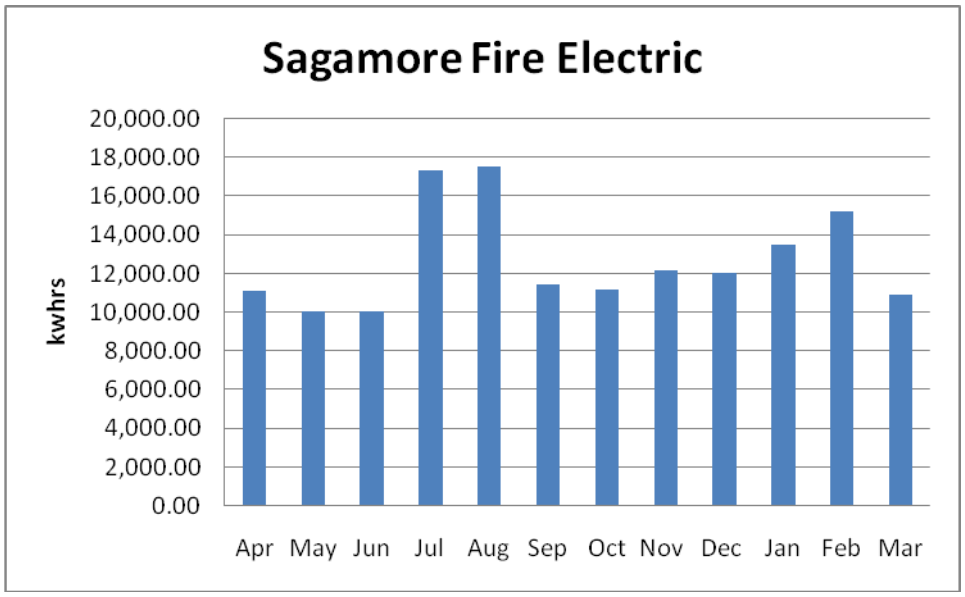

Town Hall Gas
Therms
1400
1200
1000
800
600
400
200
0
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar

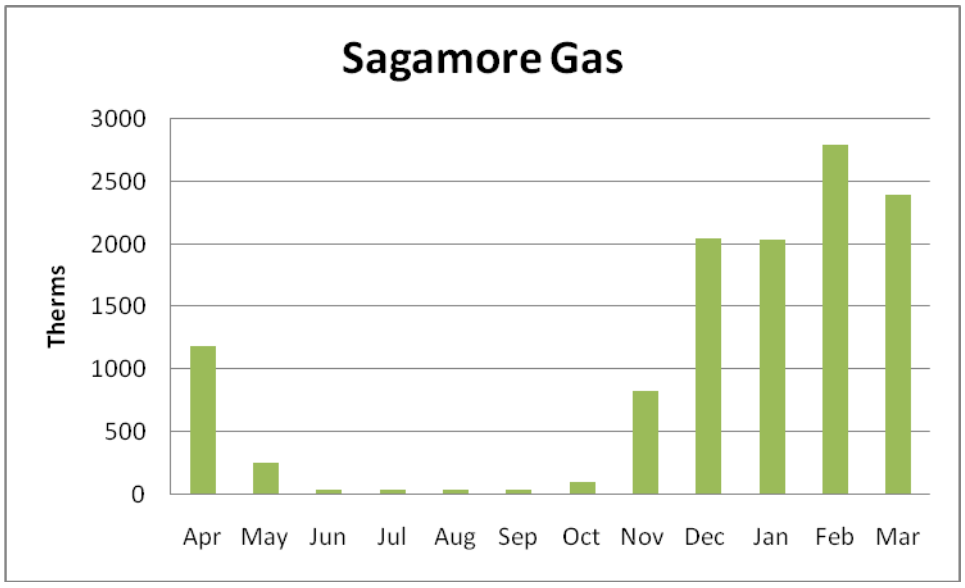

Fire Department Headquarters
kwhrs
5,000.00
4,500.00
4,000.00
3,500.00
3,000.00
2,500.00
2,000.00
1,500.00
1,000.00
500.00
0.00
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar

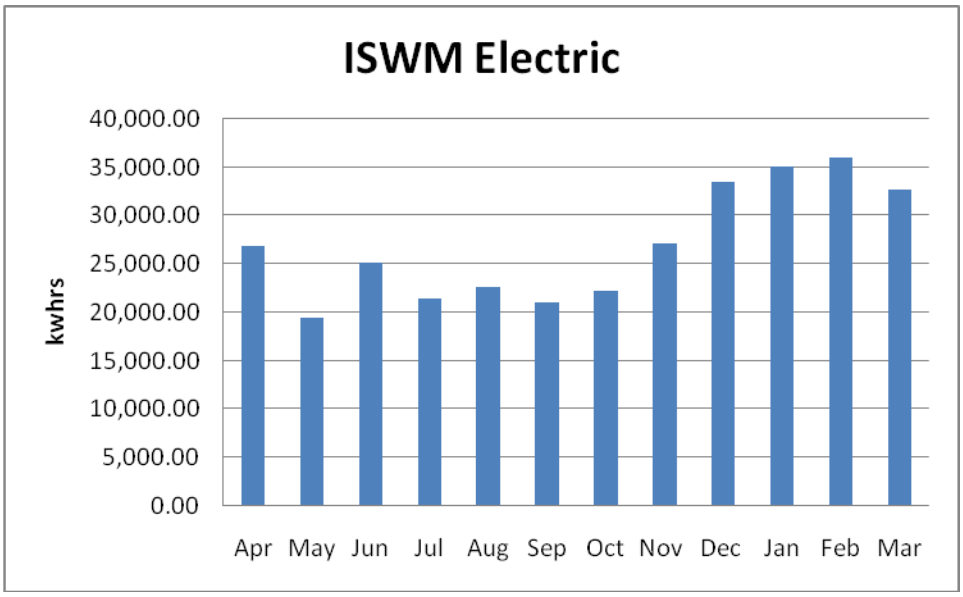

Fire Station Hdqrts Gas
Therms
1000
900
800
700
600
500
400
300
200
100
0
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar


Pocasset Fire Electric
kwhrs
2,500.00
2,000.00
1,500.00
1,000.00
500.00
0.00
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar


Pocasset Gas
Therms
400
350
300
250
200
150
100
50
0
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar


Sagamore Fire Electric
kwhrs
20,000.00
18,000.00
16,000.00
14,000.00
12,000.00
10,000.00
8,000.00
6,000.00
4,000.00
2,000.00
0.00
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar


Sagamore Gas
Therms
3000
2500
2000
1500
1000
500
0
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar


ISWM Electric
kwhrs
40,000.00
35,000.00
30,000.00
25,000.00
20,000.00
15,000.00
10,000.00
5,000.00
0.00
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar

Energy Conservation Opportunities (ECOs)

This section provides identified potential energy conservation opportunities. In this section of the report, these ECOs have been complied for all facilities. In the following section, each facility and the potential ECOs therein have been broken out separately.

In total, sixteen ECOs have been identified and noted. They are:

ECO – 1 Employ a Town Facility Re-Commissioning Agent
ECO – 2 Send Town Facility Operators to Building Operator Certification Course
ECO – 3 Group Relamp T8 Lighting with High Performance Fluorescent Lighting
ECO – 4 Replace Obsolete Interior Fluorescent Lighting Systems
ECO – 5 Replace Incandescent Bulbs with Compact Fluorescent Lamps
ECO – 6 Install Occupancy Sensors
ECO – 7 Install LED Exit Signs
ECO – 8 Install Vending Machine Controls
ECO – 9 Replace Hot Air Blowers with Infrared Heat
ECO – 10 Replace Hot Water Tanks with On-Demand Units
ECO – 11 Install Set Back T' stats in all facilities
ECO – 12 Replace Electric Heat with Ductless Split System Heat Pumps
ECO – 13 Survey all Town Facilities with Infrared Camera
ECO – 14 Replace all Electric Motors with NEMA Premium Efficiency Motors
ECO – 15 Install Full Condensing Boilers
ECO – 16 Install VFDs on Motors

In all cases, these ECOs should be reviewed to determine if they are consistent with the actual operational requirements of the facility, the desires of management, and in keeping with any future plans for renovation.

Also, stated savings and paybacks are without taking advantage of Cape Light Compact and National Grid incentives. When added into the equation, these rebates significantly reduce the payback period and thus, improve the ROI.

ECO – 1 Town Commissioning Agent

As the survey was being conducted, many examples of uncontrolled operation were viewed. Installed equipment was being operated with little or no knowledge of design intent or specifications. Training on new equipment has been limited. Personnel to focus upon efficient building operations are absent in some facilities. This method of facility energy management is not only energy wasteful but also uncomfortable for occupants.

This ECO recommends that the town hires a qualified full or part time individual (employee or contractor) to address these facility operation issues. This individual would not only commission the town facilities with the goal as underlined below in the DOE definition, but also:

1. Create (or purchase) and maintain a Town Operations and Maintenance System that would attend to all traditional O&M activities.
2. Establish a Preventative Maintenance practice wherein PMs are addressed in accordance with product specifications.
3. Standardize equipment throughout the town to reduce maintenance inventory and confusion.
4. Communicate with equipment vendors as far as learning how to operate and maintain installed equipment efficiently.
5. Act on behalf of the Town on new construction and renovation projects.
6. Establish baseline energy consumption data for all facilities and track usage going forward.
7. Establish energy goals and implementation plans to achieve these levels.
8. Work closely with Cape Light Compact and NGRID to take full advantage of energy initiatives and incentives.
9. Study emerging technologies and alternative energy ideas for potential application.
10. Stay abreast of state energy programs, LEED and Advanced Building certifications, MTC grants, and other such programs.

This individual should start ASAP.

From the DOE website on Commissioning:

Building commissioning is the process of ensuring that building systems and equipment are designed, installed, tested, and capable of being operated and maintained according to the owner's operational needs. Building commissioning is a key part of designing and building high-performance buildings because it ensures that the money spent on controls, sensors, and equipment will be paid back over time through energy-efficient building operation. The investment in commissioning an energy-efficient building is a small part of the overall project, yet the paybacks can be large.

Commissioning can certify that a new building begins at optimal productivity and improves the likelihood that the building will maintain this level of performance. Commissioning can restore an existing building to its designed productivity levels and can ensure that building renovations and equipment upgrades function as designed.

Commissioning activities start with the hiring of a commissioning authority or individual and continue from project development, after project completion, and continuously as buildings are utilized.

Benefits:	Energy savings and improved comfort of facilities.
Considerations:	Cost of employee or contractor.
Likely savings:	Difficult to quantify. Immediate?
Incentive available:	No.

ECO – 2 Building Operator Certification Training

The Building Operator Certification (BOC) is a nationally recognized training and certification program for building operators offering improved job skills and more comfortable, energy-efficient facilities. It addresses all facets of building O&M. A course is scheduled to be held at nearby Massachusetts Maritime Academy starting in September 2008.

Benefits:	Proven course. Excellent training.
Considerations:	Cost and time away from facility. Cost per student - $1,275 but $300 rebate is available from CLC and NGRID for qualifying students.
Likely savings:	As with all training, savings vary.
Rebate available:	Yes with pre-approved CLC and NGRID applications.

ECO – 3 Lighting upgrade to High Performance T8 Lamps and Matching Ballasts

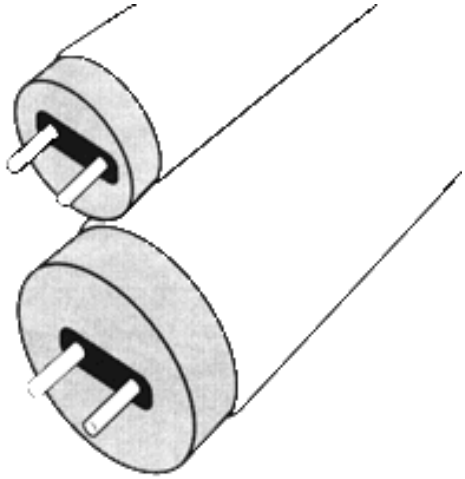
In many areas, T8 lighting is already in place but approaching the end of its useful life. Retrofit to High Performance T8s with matching electronic ballasts.

High Performance or "Super" T8s are simply more efficient that the standard T8s and provide an additional 23% energy savings. A further recommendation in this case is for "Group Relamping" which is simply changing all lamps and ballasts at one time. This will reduce the cost of labor over the life of the installed lamps.

Benefits:	Electric savings. Improved light quality.
Considerations:	Ballast change required[1].
Likely savings:	One to two year payback.
Incentive available:	Yes with pre-approved CLC application.

[1] There are some new products available that do not require a ballast change. Check with your vendor for more information and the pros and cons of this technology.

ECO – 4 Replace T12 Lighting with High Performance T8 Lamps and Matching Ballasts

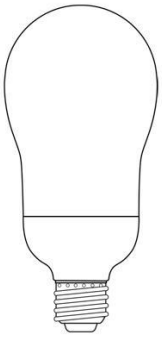


In many areas, old style T12 lighting is in place. This technology is obsolete, inefficient, and renders poor light quality. In all facilities, retrofit to High Performance T8s with matching electronic ballasts.

This technology is 33% more efficient, offers a longer life, and produces an improved light source. A further recommendation in this case is for "Group Relamping" which is simply changing all lamps and ballasts at one time. This will dramatically reduce the cost of labor over the life of the installed lamps.

Benefits:	Electric savings. Improved light quality.
Considerations:	Lamp and ballast change required.
Likely savings:	One to two year payback.
Incentive available:	Yes with pre-approved CLC application.

ECO - 5 Replace Incandescent Bulbs



Throughout the facilities, some incandescent bulbs are still in place. These range from 20 to 120 watts. All these lamps are inefficient, short-lived resulting in undue labor expenses, and generate an excessive amount of heat causing the cooling and ventilation systems to work harder than necessary. All of these problems add up and are very expensive. Compact fluorescent lamps (CFLs) have evolved to a level where they are warm in color, use about ¼ the energy, give off ¼ of the heat given off by incandescent, and last 28 times longer, greatly reducing labor and maintenance[2]. They now come in the same shape as the bulbs they are replacing (GE design shown at right), making the replacement virtually transparent to the occupant.

Benefits:	Many choices…all easy to install.
Considerations:	More expensive "first" cost.
Likely savings:	1 to 2 year payback.
Incentive available:	No. Does not qualify for rebate.

[2] Some compact fluorescent bulbs have dimming capabilities but caution must be taken when choosing these products. This technology has not yet been perfected and not all manufacturers incorporate a smooth dimming technique. Check with your supplier when making the purchase.

ECO – 6 Install Occupancy Sensors in all facilities.

Occupancy sensors turn off the lights when a room is unoccupied for more than 6 to 12 minutes. These simple, reliable devices are proven energy savers. Throughout the facility in numerous locations such as rest rooms, hallways, and private offices, wall switch and/or overhead occupancy sensors will yield a quick payback.

Note: These sensors should have two means of detection, usually Infrared and Ultrasonic. With two means of detection it is less likely for lights to go out on an occupied room.

Benefits:	Turns lights and fans off. Saves electricity.
Considerations:	Requires installation.
Likely savings:	1 to 3 year payback depending upon application.
Incentive available:	Yes with pre-approved CLC application.

ECO – 7 LED Exit Signs

Although some LED Exit signs are already installed in some facilities, there are still many old style signs in place. This technology should be installed throughout all facilities.

Exit signs are required to be illuminated 24/7. New technology has brought to the market LED lighting in exit signs. LED exits use between 1 and 3 watts each and last about 25 years. In addition to the savings in energy, the labor savings is significant.

Benefits:	Easy to install, complies with OSHA or Fire Safety Codes.
Considerations:	None.
Likely savings:	Less than a one year payback.
Incentive available:	Yes with pre-approved CLC application.

ECO – 8 Vending Machine Controls

Utilizing a custom passive infrared sensor, Vending Miser powers down a vending machine when the area surrounding it is unoccupied and automatically repowers the vending machine when the area is reoccupied. An intelligent controller uses fuzzy logic to learn from the habits of the building occupants, and modifies the time-out period accordingly. Additionally, this device monitors the ambient temperature while the vending machine is powered down. Using this information, it automatically powers up the vending machine at appropriate intervals, independent of occupancy, to ensure that the vended product stays cold.

Benefits:	Simple technology.
Considerations:	Not for ice cream or dairy products.
Likely savings:	Three to five year payback.
Incentive available:	Yes with pre-approved CLC application

ECO – 9 Gas-Fired IR Heat

In many high bay areas, hot air blowers are used for heating. These, when working, are inefficient. A gas-fired, totally enclosed, IR tube would reduce energy consumption by 50% and actually provide heat in the intended area. A typical auto maintenance garage shown at right has replaced all blowers with IR heat.

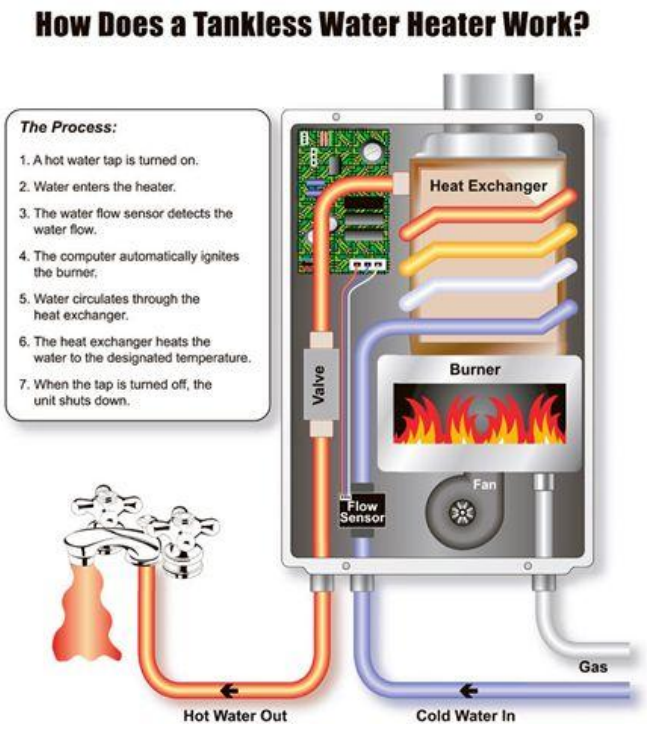
Benefits:	Effective heating.
Considerations:	Expense and availability of gas.
Likely savings:	Two to four year payback.
Rebate available:	Rebates available through National Grid's High-Efficiency Heating and Water Heating Rebate Program Schedule.

ECO – 10 Tankless Hot Water Heaters

Upon burnout, electric and gas fired hot water tanks should be replaced with gas fired tankless DHW units.

Installing a tankless water heater would eliminate the need to keep the existing electric hot water tanks "on" 24/7. These economical devices would easily handle the domestic hot water needs of all facilities. Tankless hot water heaters have no standby losses.

A typical demand water heater is up to 50 percent more energy efficient than a traditional natural gas water heater and up to 70 percent more efficient than an electric water heater.



These products utilize on-demand water heater technology which is more efficient because it only heats water when it is needed.

Benefits:	Energy savings.
Considerations:	Outside venting required
Likely savings:	Generally a 2 to 3 year payback.
Incentives available:	Possibly but further discussion required

ECO – 11 Set-back Programmable Thermostats

In most facilities, the only significant energy controls are the facility operators.

Heating, cooling, ventilation, and lighting are all operating without automatic controls. This practice becomes problematic and expensive when systems are inadvertently left "on" during "off" time periods.

Frequently in facilities without automated controls, exhaust fans, heating and cooling devices, are not controlled and run 24/7 even during periods when they could be turned off. Even a simple set back programmable thermostat will eliminate this uncontrolled practice.

Benefits:	Saves energy when space is unoccupied.
Considerations:	Requires installation (minimal).
Likely savings:	Generally a 2 to 4 year payback.
Rebate available:	Yes with pre-approved CLC application.

ECO – 12 Ductless Split System Heat Pumps

Wherever electric heat and window air condition units are being used, an efficient alternative would be to install several split system ductless heat pumps and energy recovery ventilation systems.

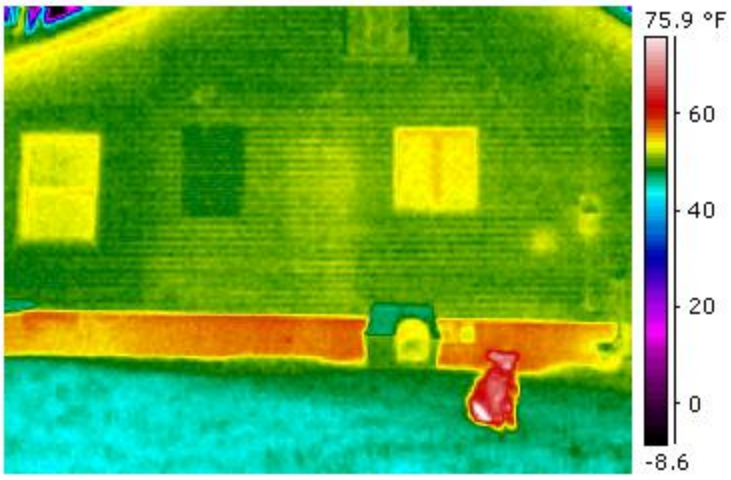
Benefits:	Independent control, energy savings, quiet operation.
Considerations:	Expense and installation required.
Likely savings:	Generally a 2 to 4 year payback.
Rebate available:	Possibly, further evaluation will be required

ECO – 13 Infrared Survey

All facilities (except Sagamore Fire Station #3) appear to be in need of shell measures such as insulation, windows, and weatherization. The first step in this process is determining where the greatest heat loss takes place. This ECO recommends an Infrared survey of all facilities using town owned IR cameras.

What will an infra red scan show?

An IR scan will point out areas of heat loss, thus indicating where insulation and air sealing are required. In the IR shot shown at right, it is easy to see the extreme heat loss taking place from the basement wall. As a result of this imagery, the facility operator can insulate the basement wall and reduce the heat loss.



Incidentally, this effort would yield best results when it is very cold outside and the heat is on inside the facility or when it is hot outside and the air conditioning is at maximum.

Benefits:	Simple, visual results. No calculations required.
Considerations:	Camera images must be interpreted by experienced operator.
Likely savings:	If insulation is installed, one year.
Incentive available:	Possibly from NGRID.

ECO – 14 NEMA Premium Efficiency Motors

As motors approach the end of their useful life and burnout, replace with NEMA premium efficiency motors.

This plan should be in place ASAP to deal with motors as they burn out as when this happens, it often needs to be addressed immediately. With a prepared plan in place, the decision is simplified.

NEMA premium efficiency motors are generally 5 to 10% more efficient which results in a significant reduction in electric expenses. Motors such as those on the circulating pumps are 80% efficient run as much as 4000 hours per year. The cost of replacement with premium efficiency motors will be realized in energy savings in roughly two years. Free software from www.motoruponline.com can be of great value in compiling a motor plan and inventory.

Note: the greatest savings from this ECO will be realized when existing motors are replaced upon burnout, not via wholesale replacement.

Note: the incentive for NEMA Premium Efficiency motors can be paid directly to the contractor.

Benefits:	Proven technology.
Considerations:	Installation required.
Likely savings:	Two to three year payback.
Incentive available:	Yes with pre-approved CLC application

ECO – 15 Full Condensing Boilers

Hot water heat in some facilities is generated by atmospheric, standard efficiency gas fired hydronic boilers. When maintenance and operation costs drive up the annual life cycle cost to the unacceptable level, this ECO (Energy Conservation Opportunity) recommends replacement with full condensing boilers.

This technology is now common and the technology has been tested and proven. In practice a conventional boiler would have an efficiency of 81% to 84% because as well as the latent heat, further flue gas heat is lost. A condensing boiler will give between 96% to 98% as all the latent heat is captured and flue losses are smaller.

Further study is required for this Energy Conservation Opportunity but conservatively, a 20% reduction in fuel consumption could be expected.

Benefits:	Efficient heating, reduced maintenance.
Considerations:	Expense and availability of gas.
Likely savings:	Three to four year payback.
Rebate available:	Rebates available through National Grid's High-Efficiency Heating and Water Heating Rebate Program Schedule.

ECO – 16 Variable Speed Drives

Install VSDs on all pumps, motors, and other non-constantly turning devices.

A Variable Speed Drive will allow the motors and pumps to run at an optimum speed based on demand. All motors and pumps that do not need to operate at 100% load, 100% of the time should be equipped with a Variable Speed Drive.

Variable Speed drives (VSDs) allow induction-motor-driven loads such as pumps and fans to operate in speed ranges as wide as 10 to 300 percent of fixed speed. (They are also called variable-frequency drives, variable-speed drives, variable-frequency inverters, or frequency converters.) By controlling motor speed so that it finely corresponds to varying load requirements, VSD installations can increase energy efficiency (in some cases energy savings can exceed 50 percent), improve power factor and process precision, and afford other performance benefits such as soft starting and over speed capability. They also can eliminate the need for expensive and energy-wasting throttling mechanisms such as control valves and outlet dampers.

Benefits:	Proven technology. Control.
Considerations:	Installation required. Cost.
Likely savings:	One year (or less) payback.
Incentive available:	Yes with pre-approved CLC application

Note: The blowers and baler motors at the Department of Integrated Solid Waste Management site should be considered for VSDs as soon as funding becomes available.

Facility Specific Energy Conservation Opportunities

This section provides identified potential Energy Conservation Opportunities (ECOs) per facility.

Facility: Bourne Town Hall

Use: Office
Occupancy: Normal Business Hours (NBH)
ECO's: 1,2,3,6,8,10,11,13,14

Additional Recommendations:

1. This facility may be a candidate for solar hot water, especially in conjunction with a tankless hot water system drawing from a solar heated storage tank.
2. Boiler interior piping should be insulated after retrocommissioning of existing HVAC system.
3. Cold spots in Selectman's office. Re-connect hot water coil in boiler room then study with IR camera.
4. This facility will be put into Energy Star Portfolio Manager.

Facility: Fire Station Headquarters

Use: Fire station plus headquarters office
Occupancy: 24/7
ECO's: 1,2,3,6,7,8,9,10,11,12,13,15

Additional Recommendations:

1. This facility may be a candidate for solar hot water, especially in conjunction with a tankless hot water system drawing from a solar heated storage tank.
2. In need of shell measures. Study with IR camera.

Facility: Pocasset Fire Station

Use: Fire station
Occupancy: 24/7
ECO's: 1,2,4,5,6,7,8,9,10,11,13,15

Additional Recommendations:

1. This facility may be a candidate for solar hot water, especially in conjunction with a tankless hot water system drawing from a solar heated storage tank.
2. In need of shell measures. Study with IR camera.

Facility: Sagamore Fire Station

Use: Fire station
Occupancy: 24/7
ECO's: 1, 2, 3,6,8,9,10,11,13, 14

Additional Recommendations:

1. This facility may be a candidate for solar hot water, especially in conjunction with a tankless hot water system drawing from a solar heated storage tank.
2. Too much hot water (2 – 100 gallon tanks for 3 occupants).
3. Ice melt system needs to be controlled.

Facility: Integrated Solid Waste Management

Use: Landfill and town waste disposal site
Occupancy: Normal Business Hours
ECO's: 1, 2,3,6,11,12, 14, 16

Additional Recommendations:

1. This facility may be a candidate for solar hot water, especially in conjunction with a tankless hot water system drawing from a solar heated storage tank.
2. Many large motors and pumps.
3. VFDs needed.

Energy Star Award Application by Facility

ESB Introduction and Summary.

As part of the U.S. EPA Energy Star program, buildings can be benchmarked and compared against buildings across the country in the same categories using the Energy Star Portfolio Manager. An office building will be compared against other office buildings, a K-12 school against other K-12 schools and so on with the data adjusted for climate differences. Buildings that achieve a score of 75% or higher can as apply for an Energy Star rating / award as well. The plaque is shown at right. These awards carry enormous PR value wherein they demonstrate superior energy performance. The award is based upon comparison of energy consumption per unit area, normalized for climate conditions. All fuel data must be considered.

Even if a building cannot achieve Energy Star award status, the benchmarking score can be a very valuable tool as it guides the facility manager in his or her effort to improve the efficiency of the building. Obviously, a low score would be an indication that there may be work to be done. A score that improves over the years would be an indication that the efficiency efforts were paying off. A building that does not qualify for an award now may qualify later after the improvements are implemented. Portfolio Manager can be found at the following site:

http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager

From the EPA website: "Buildings achieving a rating of 75 or higher and professionally verified to meet current indoor environment standards are eligible to apply for the ENERGY STAR. Display the ENERGY STAR plaque to convey superior performance to tenants, customers, and employees. Highlighting the ENERGY STAR qualified buildings in your portfolio sends a positive message to lenders, appraisers, owners, investors, and potential tenants or customers. Rate the performance of your buildings on a scale of 1-100 relative to similar buildings nationwide using EPA's national energy performance rating system. The rating system accounts for the impacts of year-to-year weather variations, as well as building size, location, and several operating characteristics. Buildings rating 75 or greater may qualify for the ENERGY STAR."

Not all building types can be benchmarked by Energy Star's Portfolio Manager but the list is continually expanding. If your building does meet the current criteria, your representative would be happy to do the initial benchmarking upon receipt of the utility bills and heating oil/propane consumption data (if applicable).

Energy Star Building Discussion

The facility entered into Portfolio Manager is the Town Hall.

The score for the Town Hall is 44[3]

This rather low score is likely due to the HVAC system. The commissioning agent may help identify some of the problem areas.

This score is arrived at by the following:

1. All facility BTUs (electric, gas, etc) are added together
2. This sum is then divided by square footage of the facility
3. This number is then regionally corrected using heating / cooling degree day data.
4. This final result is then compared to other similar buildings.
5. The resulting "Score" is simply the percentile expression of how the specific building compares to others in the study group.

I recommend running the program each month to measure the gain (or loss). Significant gains can be made by implementing the recommended energy conservation measures. Greater gains may be achieved by implementing an aggressive "turn it off / down" program.

Looking into the future, as existing equipment nears the end of its useful life, replacement with higher efficiency units as recommended in this report will result in continued improvements.

[3] The actual value for this facility is 181.3 KBTU/ SF

Next Steps

If you are interested in proceeding with any of the Energy Efficiency Opportunities suggested within this report, please contact:

John Burns
Cape Light Compact
(508) 375-6829
jburns@capelightcompact.org

Katie O'Rourke
National Grid
(781) 466-5233
kathryn.orourke@us.ngrid.com

Thank you for your interest - we look forward to serving you soon.

Assessment of Energy Opportunities:

Town of Bourne – part II

Bourne, MA 02532

Sponsored by:

Date of Site Visit: September 2, 2008

Table of Contents

Introduction

On September 2, 2008, Alan Mulak, an independent consulting engineer working for Cape Light Compact and NGRID met with Paul O'Keefe of the Town of Bourne Energy Committee for Part II of the energy assessments of town buildings. The reason for the meeting and subsequent walk thru energy assessment was to identify Energy Conservation Opportunities (ECOs) that exist in the facilities. The ultimate goal of this effort is to take action in an effort to become more energy efficient in a cost effective manner.

The next steps should include:

- A detailed energy evaluation of ECOs to be implemented
- Proposal(s) for work to be performed
- Implementation of approved proposal(s)

This report focuses and elaborates upon these ECOs and in each case, offers typical paybacks and returns on investments (ROIs), discusses energy efficient equipment, and suggests a course of action to accomplish the stated goals. It is an informational document created to increase management awareness of current energy practices and serve as a planning document for future action.

Note: This study has been jointly funded by Cape Light Compact, a Municipal Aggregator responsible for supplying electricity to Cape Cod and Martha's Vineyard, administering the energy efficiency funds collected from electric ratepayers and for consumer advocacy on behalf of businesses and residences and National Grid. National Grid is the fifth largest distributor of natural gas in the United States and the largest in the Northeast, operating regulated gas utilities in New York, Massachusetts, and New Hampshire that serve 2.6 million customers.

Questions regarding this study should be directed to one of the following:

John Burns
Cape Light Compact
(508) 375-6829
jburns@capelightcompact.org

Katie O'Rourke
National Grid
(781) 466-5233
kathryn.orourke@us.ngrid.com

Alan Mulak, PE
Energy Engineer and Consultant
(978) 486-4484
amulak@comcast.net

Customer and Facility Information

Customer Contact information:

Paul O'Keefe
Bourne Energy Committee
508 830-5063
pokeefe@maritime.edu

Jon Aborn
Bourne Energy Committee
508 888-0489 ext 258
jaborn@riverviewschool.org

Patrick Marshall, Library Director
Bourne Public Library
508 759-0644
pmarshall@bournelibrary.org

John Smith, Maintenance
Peebles Elementary School

Sam Currence, Maintenance
Bourne High School

Account information:

Bourne Public School Administration Office (36 Sandwich Road)
NSTAR: 1516-152-0018
National Grid: n/a

Peebles Elementary School (70 Trowbridge Road)
NSTAR: 1516-226-0010
National Grid: 54014/2380

Bourne High School
NSTAR: 1577-595-0026
National Grid: 54014/2374

Bourne Public Library (19 Sandwich Road)
NSTAR: 1516-128-0019
National Grid: 54014/2347

The following is a prioritized list of the recommendations found in this report.

Priority #1: Recommended for immediate implementation:

ECO – 1 Employ a Town Facility Re-Commissioning Agent
ECO – 2 Send Town Facility Operators to Building Operator Certification Course
ECO – 3 Group Relamp T8 Lighting with High Performance Fluorescent Lighting
ECO – 4 Replace Obsolete Interior Fluorescent Lighting Systems
ECO – 5 Replace Incandescent Bulbs with Compact Fluorescent Lamps
ECO – 6 Install Occupancy Sensors
ECO – 7 Install LED Exit Signs
ECO – 10 Install Demand Control Ventilation in Auditorium
ECO – 11 Install Vending Machine Controls
ECO – 13 Install Set Back T' stats in all facilities
ECO – 14 Survey all Town Facilities with Infrared Camera[1]
ECO – 21 Maintain and Repair Faulty Steam Traps
ECO – 22 Install Economizers on Walk in Coolers and Freezers
ECO – 23 Install Ultra Spray Nozzle in kitchen
ECO – 24 Control Kitchen Exhaust Hoods

Priority #2: Recommended for implementation as soon as practical:

ECO – 8 Install Daylight Harvesting System
ECO – 9 Replace Auditorium Lighting with LEDs
ECO – 12 Replace Hot Water Tanks with On-Demand Units
ECO – 15 Replace all Electric Motors with NEMA Premium Efficiency Motors
ECO – 16 Install Full Condensing Boilers
ECO – 17 Install VFDs on Motors
ECO – 18 Replace Single Pane Windows with Modern Efficient Windows
ECO – 19 Replace Leaky Exterior Doors with Efficient Insulated Doors
ECO – 20 Install Insulation where needed
ECO – 25 Replace all Pneumatic Controls with Digital Controls
ECO – 26 Replace existing Roof Top Units with modern High Efficiency Units

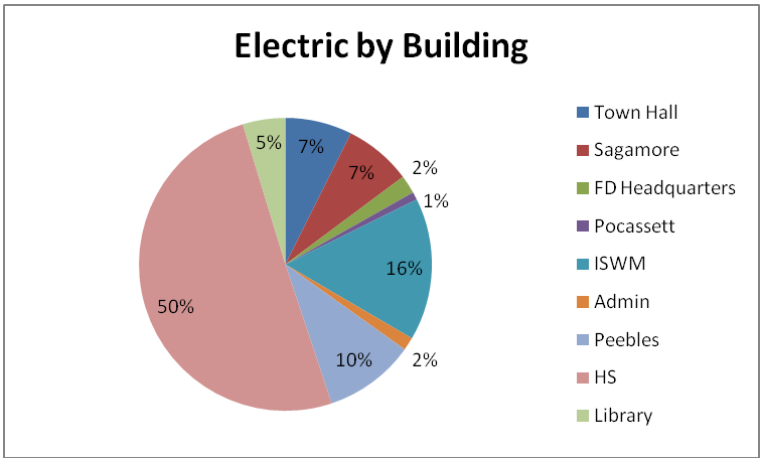
A note about Cape Light Compact Incentives:

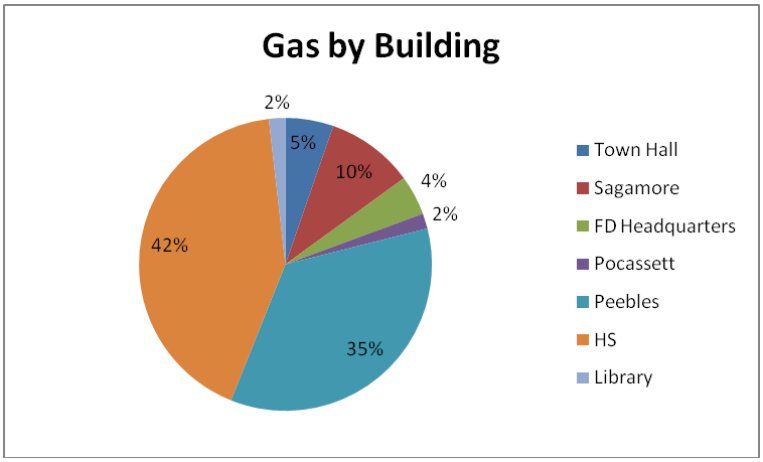
Subject to budget availability, both Cape Light Compact and NGRID offer incentives for some of the recommended Energy Conservation Opportunities. NGRID's are specified on a case by case basis within the discussion of each ECO. Incentive amounts offered by Cape Light Compact are dependent upon the classification of the customer. As the Town of Bourne Municipal Facilities are classified as Municipal Facilities, Cape Light Compact will pay 100% of pre-approved work up to $75,000.

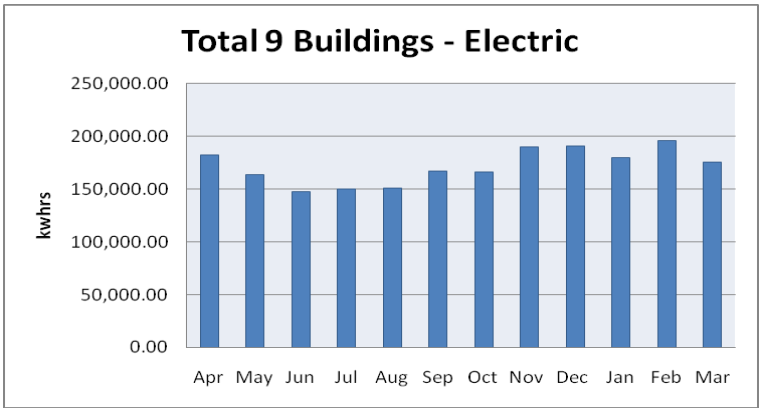
[1] This Energy Conservation Opportunity is highly recommended ASAP, thus **bolded**, as the results from this effort will show where insulation, windows, and exterior doors are needed.

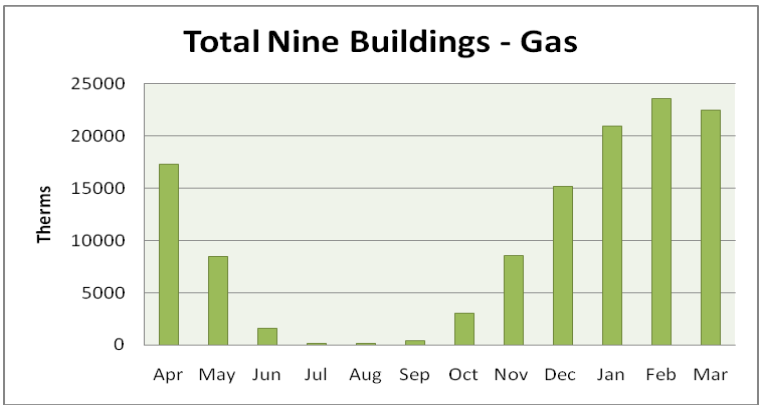
Energy Usage Graphs – All Buildings

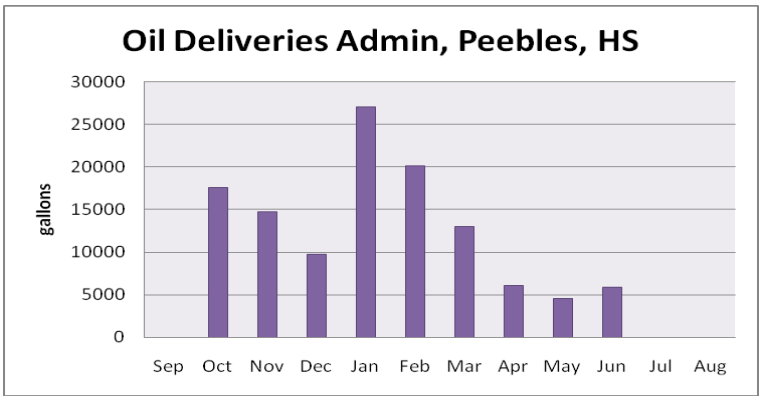
The graphs on the following pages illustrate energy usage by fuel by facility as well as in aggregate. The most alarming graphic is the percent and actual amount of gas used by the Sagamore Fire Station. This facility, far smaller than the two schools, uses a disproportionately high amount of gas. As indicated by the findings within this report, the Sagamore Station is in need of controls.

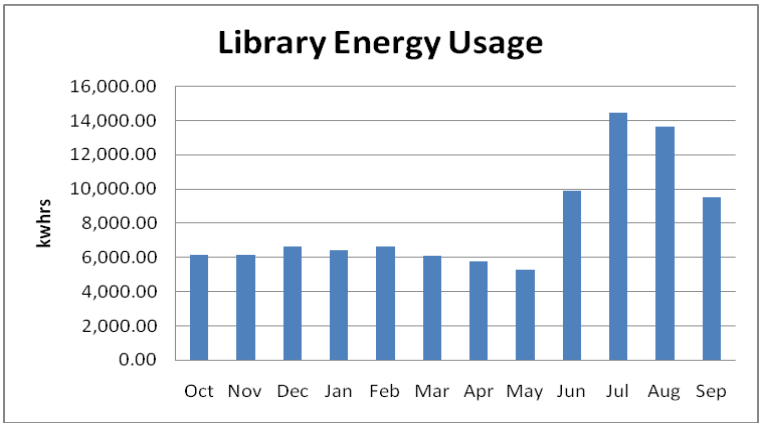


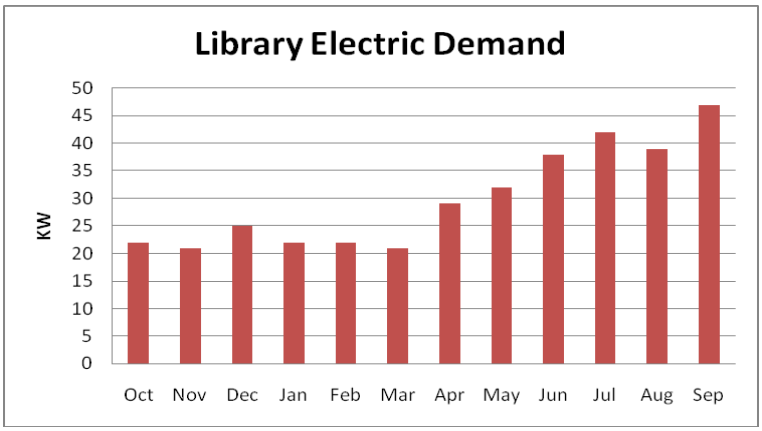


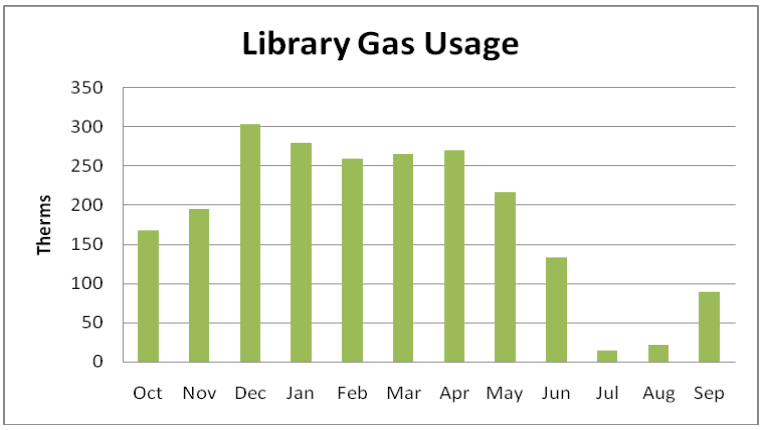

Total 9 Buildings - Electric
kwhrs
250,000.00
200,000.00
150,000.00
100,000.00
50,000.00
0.00
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar

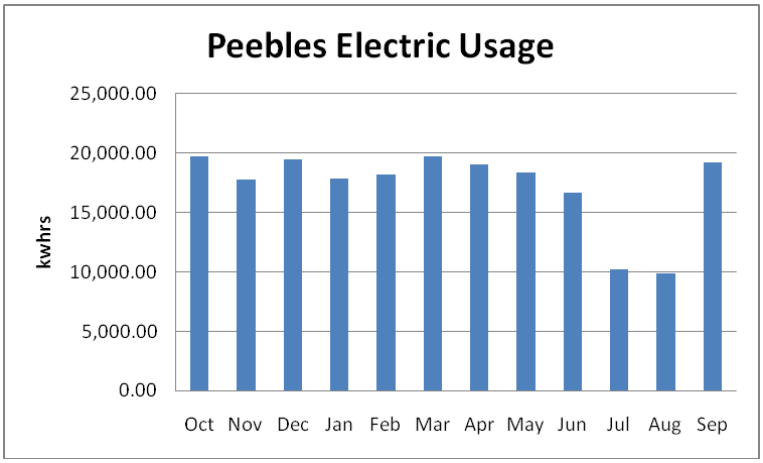

Total Nine Buildings - Gas
Therms
25000
20000
15000
10000
5000
0
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar

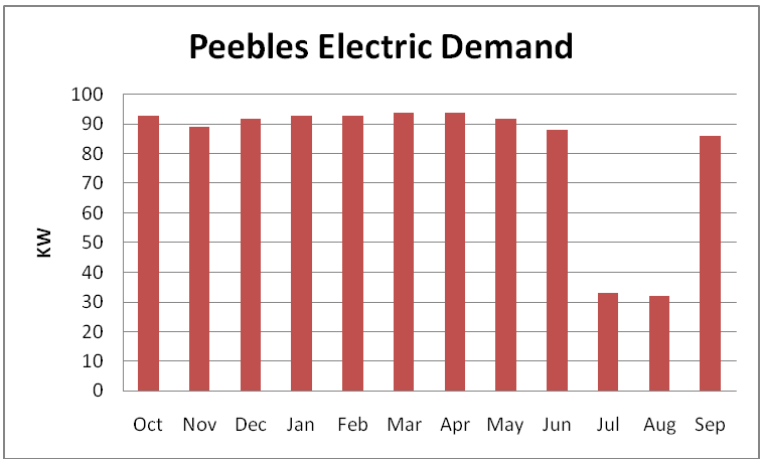

Oil Deliveries Admin, Peebles, HS
gallons
30000
25000
20000
15000
10000
5000
0
Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug

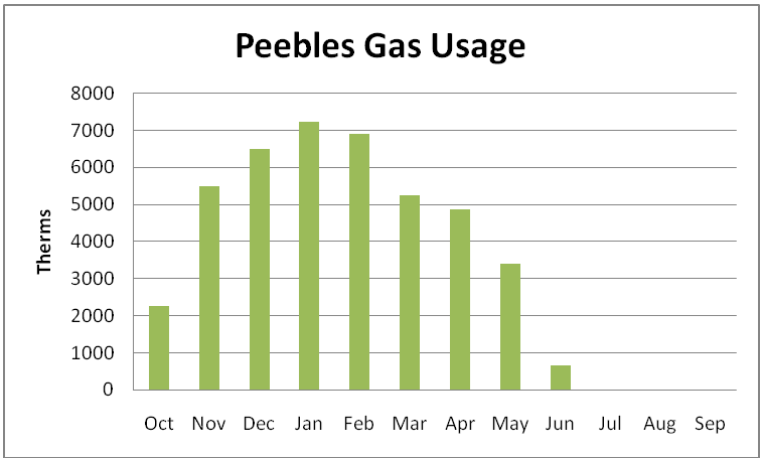

Library Energy Usage
kwhrs
16,000.00
14,000.00
12,000.00
10,000.00
8,000.00
6,000.00
4,000.00
2,000.00
0.00
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep

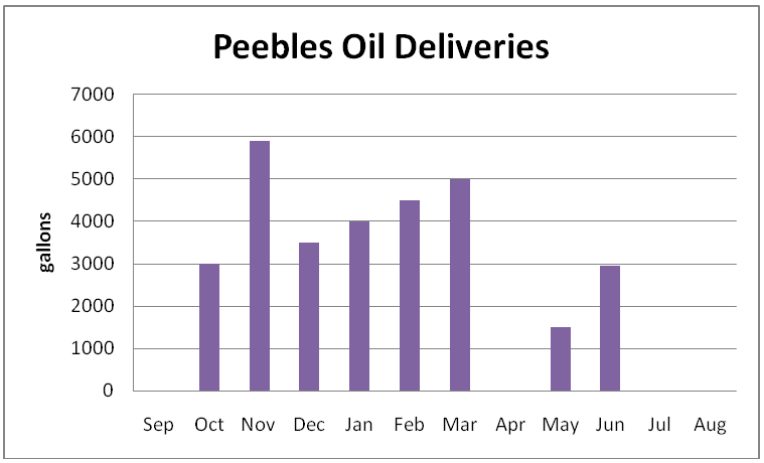

Library Electric Demand
KW
50
45
40
35
30
25
20
15
10
5
0
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep

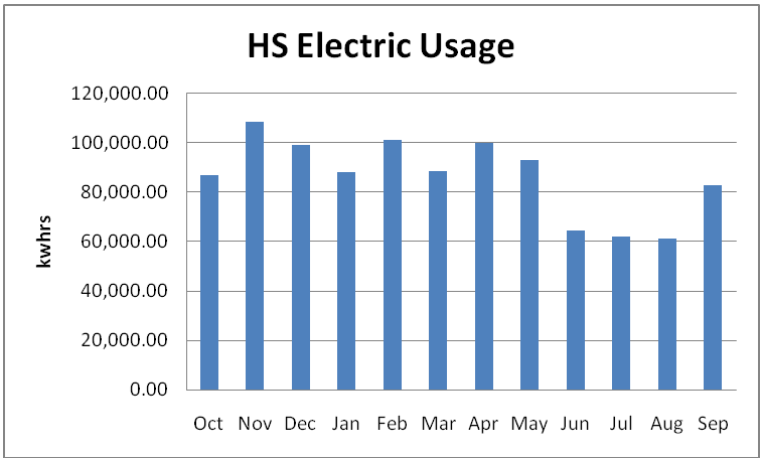

Library Gas Usage
Therms
350
300
250
200
150
100
50
0
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep

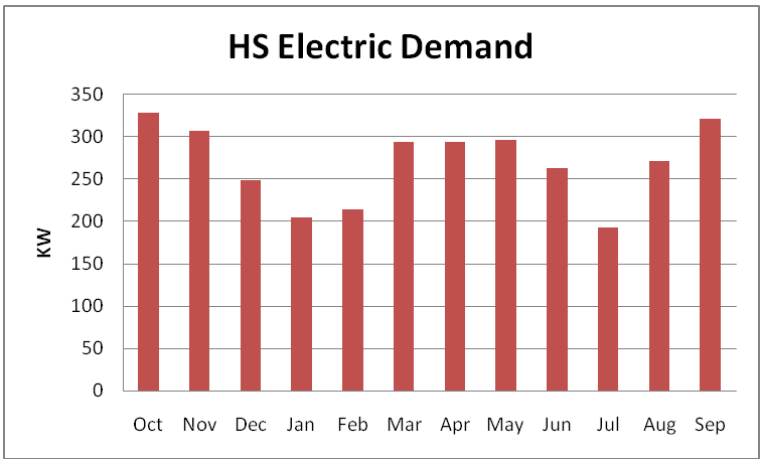

Peebles Electric Usage
kwhrs
25,000.00
20,000.00
15,000.00
10,000.00
5,000.00
0.00
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep

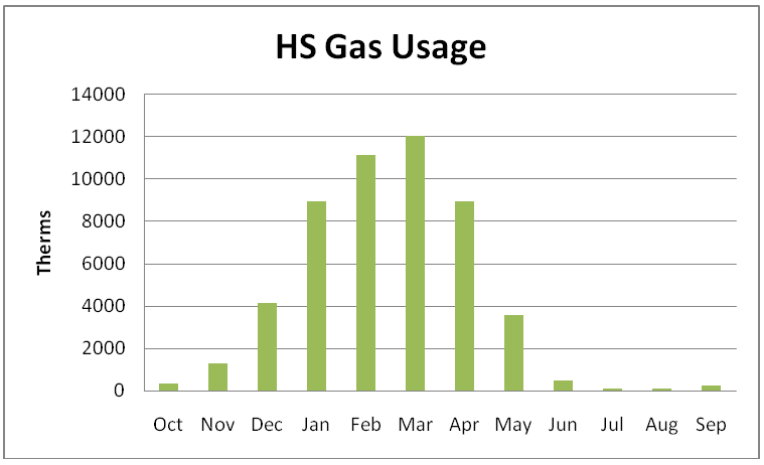

Peebles Electric Demand
KW
100
90
80
70
60
50
40
30
20
10
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep

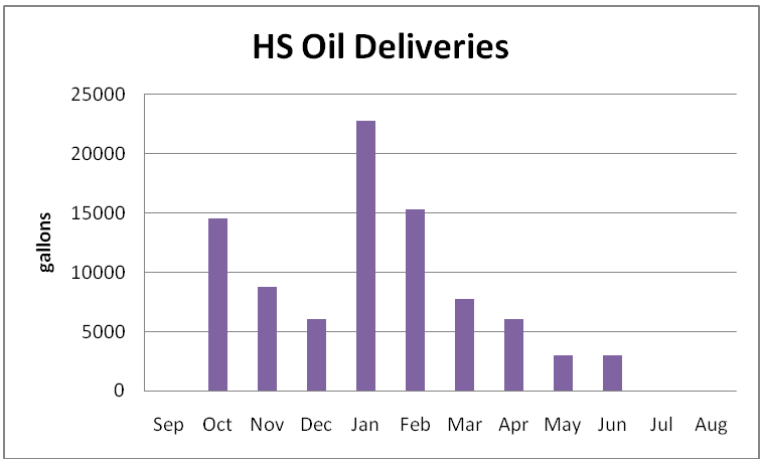

Peebles Gas Usage
Therms
8000
7000
6000
5000
4000
3000
2000
1000
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep

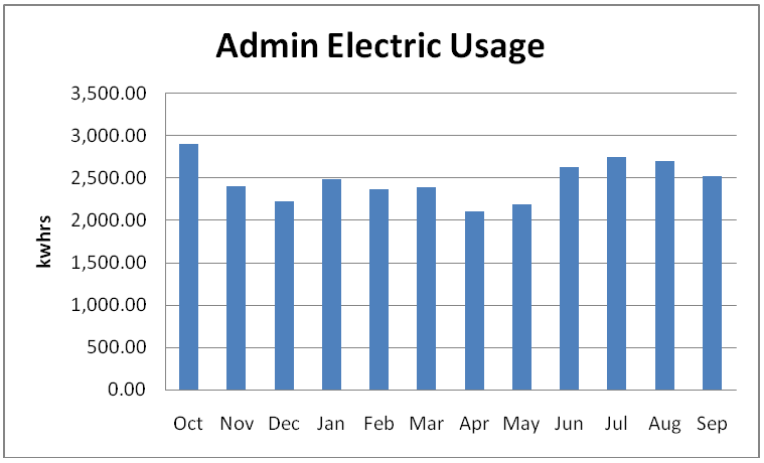

Peebles Oil Deliveries
gallons
7000
6000
5000
4000
3000
2000
1000
0
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug

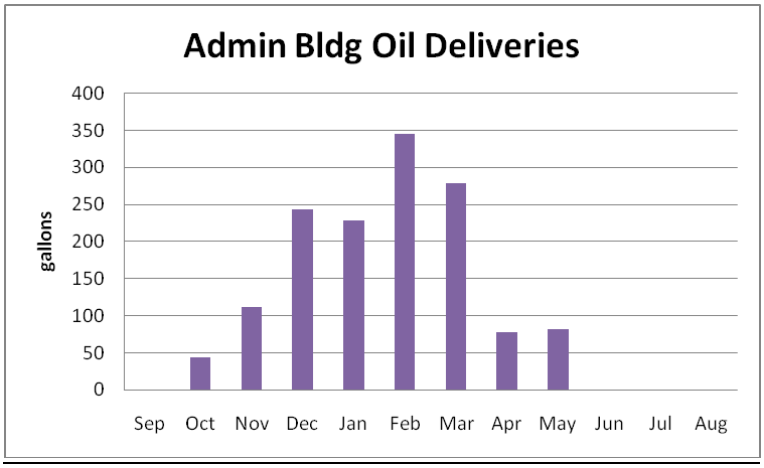

HS Electric Usage
kwhrs
120,000.00
100,000.00
80,000.00
60,000.00
40,000.00
20,000.00
0.00
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep


HS Electric Demand
KW
350
300
250
200
150
100
50
0
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep


HS Gas Usage
Therms
14000
12000
10000
8000
6000
4000
2000
0
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep


HS Oil Deliveries
gallons
25000
20000
15000
10000
5000
0
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug


Admin Electric Usage
kwhrs
3,500.00
3,000.00
2,500.00
2,000.00
1,500.00
1,000.00
500.00
0.00
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep


Admin Bldg Oil Deliveries
gallons
400
350
300
250
200
150
100
50
0
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug

Energy Conservation Opportunities (ECOs)

This section provides identified potential energy conservation opportunities. In this section of the report, these ECOs have been complied for all facilities. In the following section, each facility and the potential ECOs therein have been broken out separately.

In total, twenty six ECOs have been identified and noted. They are:

ECO – 1 Employ a Town Facility Re-Commissioning Agent
ECO – 2 Send Town Facility Operators to Building Operator Certification Course
ECO – 3 Group Relamp T8 Lighting with High Performance Fluorescent Lighting
ECO – 4 Replace Obsolete Interior Fluorescent Lighting Systems
ECO – 5 Replace Incandescent Bulbs with Compact Fluorescent Lamps
ECO – 6 Install Occupancy Sensors
ECO – 7 Install LED Exit Signs
ECO – 8 Install Daylight Harvesting System
ECO – 9 Replace Auditorium Lighting with LEDs
ECO – 10 Install Demand Control Ventilation in Auditorium
ECO – 11 Install Vending Machine Controls
ECO – 12 Replace Hot Water Tanks with On-Demand Units
ECO – 13 Install Set Back T' stats in all facilities
ECO – 14 Survey all Town Facilities with Infrared Camera
ECO – 15 Replace all Electric Motors with NEMA Premium Efficiency Motors
ECO – 16 Install Full Condensing Boilers
ECO – 17 Install VFDs on Motors
ECO – 18 Replace Single Pane Windows with Modern Efficient Windows
ECO – 19 Replace Leaky Exterior Doors with Efficient Insulated Doors
ECO – 20 Install Insulation where needed
ECO – 21 Maintain and Repair Faulty Steam Traps
ECO – 22 Install Economizers on Walk in Coolers and Freezers
ECO – 23 Install Ultra Spray Nozzle in kitchen
ECO – 24 Control Kitchen Exhaust Hoods
ECO – 25 Replace all Pneumatic Controls with Digital Controls
ECO – 26 Replace existing Roof Top Units with modern High Efficiency Units

In all cases, these ECOs should be reviewed to determine if they are consistent with the actual operational requirements of the facility, the desires of management, and in keeping with any future plans for renovation.

Also, stated savings and paybacks are without taking advantage of Cape Light Compact and National Grid incentives. When added into the equation, these rebates significantly reduce the payback period and thus, improve the ROI.

ECO – 1 Town Commissioning Agent

As the survey was being conducted, many examples of uncontrolled operation were viewed. Installed equipment was being operated with little or no knowledge of design intent or specifications. Training on new equipment has been limited. Personnel to focus upon efficient building operations are absent in some facilities. This method of facility energy management is not only energy wasteful but also uncomfortable for occupants.

This ECO recommends that the town hires a qualified full or part time individual (employee or contractor) to address these facility operation issues. This individual would not only commission the town facilities with the goal as underlined below in the DOE definition, but also:

1. Create (or purchase) and maintain a Town Operations and Maintenance System that would attend to all traditional O&M activities.
2. Establish a Preventative Maintenance practice wherein PMs are addressed in accordance with product specifications.
3. Standardize equipment throughout the town to reduce maintenance inventory and confusion.
4. Communicate with equipment vendors as far as learning how to operate and maintain installed equipment efficiently.
5. Act on behalf of the Town on new construction and renovation projects.
6. Establish baseline energy consumption data for all facilities and track usage going forward.
7. Establish energy goals and implementation plans to achieve these levels.
8. Work closely with Cape Light Compact and NGRID to take full advantage of energy initiatives and incentives.
9. Study emerging technologies and alternative energy ideas for potential application.
10. Stay abreast of state energy programs, LEED and Advanced Building certifications, MTC grants, and other such programs.

This individual should start ASAP.

From the DOE website on Commissioning:

Building commissioning is the process of ensuring that building systems and equipment are designed, installed, tested, and capable of being operated and maintained according to the owner's operational needs. Building commissioning is a key part of designing and building high-performance buildings because it ensures that the money spent on controls, sensors, and equipment will be paid back over time through energy-efficient building operation. The investment in commissioning an energy-efficient building is a small part of the overall project, yet the paybacks can be large.

Commissioning can certify that a new building begins at optimal productivity and improves the likelihood that the building will maintain this level of performance. Commissioning can restore an existing building to its designed productivity levels and can ensure that building renovations and equipment upgrades function as designed. Commissioning activities start with the hiring of a commissioning authority or individual and continue from project development, after project completion, and continuously as buildings are utilized.

Benefits:	Energy savings and improved comfort of facilities.
Considerations:	Cost of employee or contractor.
Likely savings:	Difficult to quantify. Immediate?
Incentive available:	No.

ECO – 2 Building Operator Certification Training

The Building Operator Certification (BOC) is a nationally recognized training and certification program for building operators offering improved job skills and more comfortable, energy-efficient facilities. It addresses all facets of building O&M. A course is scheduled to be held at nearby Massachusetts Maritime Academy starting in September 2008.

Benefits:	Proven course. Excellent training.
Considerations:	Cost and time away from facility. Cost per student - $1,275 but $300 rebate is available from CLC and NGRID for qualifying students.
Likely savings:	As with all training, savings vary.
Rebate available:	Yes with pre-approved CLC and NGRID applications.

ECO – 3 Lighting upgrade to High Performance T8 Lamps and Matching Ballasts

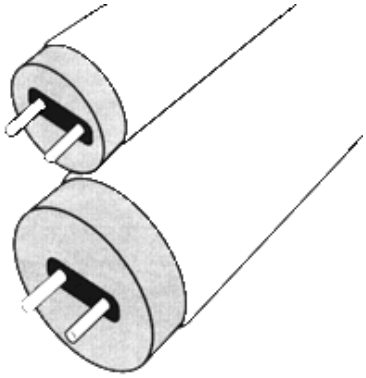
In many areas, T8 lighting is already in place but approaching the end of its useful life. Retrofit to High Performance T8s with matching electronic ballasts.

High Performance or "Super" T8s are simply more efficient that the standard T8s and provide an additional 23% energy savings. A further recommendation in this case is for "Group Relamping" which is simply changing all lamps and ballasts at one time. This will reduce the cost of labor over the life of the installed lamps.

Benefits:	Electric savings. Improved light quality.
Considerations:	Ballast change required[2].
Likely savings:	One to two year payback.
Incentive available:	Yes with pre-approved CLC application.

[2] There are some new products available that do not require a ballast change. Check with your vendor for more information and the pros and cons of this technology.

ECO – 4 Replace T12 Lighting with High Performance T8 Lamps and Matching Ballasts



In many areas, old style T12 lighting is in place. This technology is obsolete, inefficient, and renders poor light quality. In all facilities, retrofit to High Performance T8s with matching electronic ballasts.

This technology is 33% more efficient, offers a longer life, and produces an improved light source. A further recommendation in this case is for "Group Relamping" which is simply changing all lamps and ballasts at one time. This will dramatically reduce the cost of labor over the life of the installed lamps.

Benefits:	Electric savings. Improved light quality.
Considerations:	Lamp and ballast change required.
Likely savings:	One to two year payback.
Incentive available:	Yes with pre-approved CLC application.

ECO - 5 Replace Incandescent Bulbs

Throughout the facilities, some incandescent bulbs are still in place. These range from 20 to 120 watts. All these lamps are inefficient, short-lived resulting in undue labor expenses, and generate an excessive amount of heat causing the cooling and ventilation systems to work harder than necessary. All of these problems add up and are very expensive. Compact fluorescent lamps (CFLs) have evolved to a level where they are warm in color, use about ¼ the energy, give off ¼ of the heat given off by incandescent, and last 28 times longer, greatly reducing labor and maintenance[3]. They now come in the same shape as the bulbs they are replacing (GE design shown at right), making the replacement virtually transparent to the occupant.

Benefits:	Many choices…all easy to install.
Considerations:	More expensive "first" cost.
Likely savings:	1 to 2 year payback.
Incentive available:	No. Does not qualify for rebate.

[3] Some compact fluorescent bulbs have dimming capabilities but caution must be taken when choosing these products. This technology has not yet been perfected and not all manufacturers incorporate a smooth dimming technique. Check with your supplier when making the purchase.

ECO – 6 Install Occupancy Sensors in all facilities.

Occupancy sensors turn off the lights when a room is unoccupied for more than 6 to 12 minutes. These simple, reliable devices are proven energy savers. Throughout the facility in numerous locations such as rest rooms, hallways, and private offices, wall switch and/or overhead occupancy sensors will yield a quick payback.

Note: These sensors should have two means of detection, usually Infrared and Ultrasonic. With two means of detection it is less likely for lights to go out on an occupied room.

Benefits:	Turns lights and fans off. Saves electricity.
Considerations:	Requires installation.
Likely savings:	1 to 3 year payback depending upon application.
Incentive available:	Yes with pre-approved CLC application.

ECO – 7 LED Exit Signs

Although some LED Exit signs are already installed in some facilities, there are still many old style signs in place. This technology should be installed throughout all facilities.

Exit signs are required to be illuminated 24/7. New technology has brought to the market LED lighting in exit signs. LED exits use between 1 and 3 watts each and last about 25 years. In addition to the savings in energy, the labor savings is significant.

Benefits:	Easy to install, complies with OSHA or Fire Safety Codes.
Considerations:	None.
Likely savings:	Less than a one year payback.
Incentive available:	Yes with pre-approved CLC application.

ECO – 8 Daylight Dimming light controls

In many areas throughout the schools, natural lighting is available to illuminate the areas adjacent to these large windows. When this is available, light fixtures in the immediate area can be dimmed without losing any of the available light for student activities. Continuous daylight dimming controls can be used to automatically turn lights on or off, or dim them, depending on the available daylight available in the space. Daylight dimming can maintain the desired light level while providing a smooth, barely noticeable transition to or from electric lighting as daylight increases or decreases.

Benefits:	Easy to install, proven energy saving device.
Considerations:	Calibration of controls needs to be added to the annual PM schedule.
Likely savings:	Three to four year payback.
Incentive available:	Yes with pre-approved CLC application.

ECO – 9 Replace Auditorium Lighting with HID

Lighting in the auditorium is a mix of incandescent and halogen. These lamps are approaching the end of their life and need to be replaced. The picture at right shows the fixture mounted in the drop ceiling. Due to the difficult access to these fixtures (they are 20 feet about the auditorium seating), this ECO recommends replacement with LED "can" fixtures.

From the Energy Advisor Website:

LED Recessed Downlighting

Though LEDs are still not as efficient as CFLs and linear fluorescent lamps for most general indoor lighting applications, recessed downlighting is one exception. Because LEDs are directional in nature, these fixtures do not require reflectors, which reduce fixture efficiency. Also, unlike CFLs, LEDs are fully dimmable, which is often an important consideration in this application. Currently, the LED "bulbs" for recessed downlights are very expensive—as much as $100 each—but the long lifetime and energy savings mean that the best current LEDs are cost-competitive in the long-term (Table 3). But buyers should beware. As with some other LED technologies, downlighting is still an emerging niche and has been subject to overblown vendor claims in the past. Although some LEDs perform as well as CFLs, others have proven to be only about as efficient as an incandescent bulb.

Because it uses slightly less energy and lasts four times longer than a CFL, the LED downlight is becoming competitive in terms of its long-term costs despite the higher initial price. But because many recessed downlighting fixtures are tied to a dimmer, they use an incandescent light source, not a CFL. When compared to an incandescent light source, LEDs, which are fully dimmable, are substantially cheaper to operate in the long term.

Bulb	Watts	Initial cost ($)	Lifetime (hours)	Number of bulbs needed over lifetime of LED	Annual energy cost ($)	Operating expenses over lifetime of LED ($)
LED	12	85.00	32,000	1	3.50	144.00
CFL	16	5.00	8,000	4	4.40	95.00
Incandescent	75	0.50	750	42	21.90	385.00

Notes: CFL = compact fluorescent lamp;
LED = light-emitting diode.

Benefits: Long life reduces maintenance and replacement.
Considerations: Expense.
Likely savings: Eight year payback.
Incentive available: Possibly with pre-approved CLC application.

ECO – 10 Demand Control Ventilation

In areas where appropriate such as the High School auditorium, install CO2 controls for Demand Control Ventilation. This can only be employed where occupancy and ventilation are variable and the ventilation is controlled by a single source / zone control.

Occupancy fluctuations like those in auditoriums represent an opportunity for annual energy savings that can amount to as much as $1.00 per square foot (ft2). Instead of continuously ventilating the space at a constant rate designed to accommodate the maximum number of customers, building operators can implement demand-controlled ventilation (DCV) so that the amount of outside air drawn in for ventilation depends on the building's actual occupancy at any given time. This strategy results in energy savings because it reduces the amount of air that needs to be conditioned as well as the fan energy used to move that air. DCV primarily refers to when actual occupancies are approximated by measuring carbon dioxide (CO2) levels within a building with sensors.

Benefits:	Great energy savings while providing superior ventilation.
Considerations:	Calibration of controls needs to be added to the annual PM schedule.
Likely savings:	0.33 to 2 year payback depending upon application.
Incentive available:	Possibly with pre-approved CLC application

ECO – 11 Vending Machine Controls

Utilizing a custom passive infrared sensor, Vending Miser powers down a vending machine when the area surrounding it is unoccupied and automatically repowers the vending machine when the area is reoccupied. An intelligent controller uses fuzzy logic to learn from the habits of the building occupants, and modifies the time-out period accordingly. Additionally, this device monitors the ambient temperature while the vending machine is powered down. Using this information, it automatically powers up the vending machine at appropriate intervals, independent of occupancy, to ensure that the vended product stays cold.

Benefits: Simple technology.

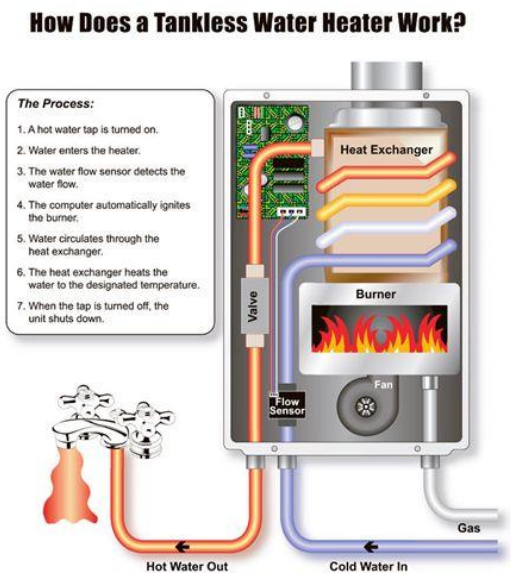
Considerations:	Not for ice cream or dairy products.
Likely savings:	Three to five year payback.
Incentive available:	Yes with pre-approved CLC application

ECO – 12 Tankless Hot Water Heaters

Upon burnout, electric, oil, and gas fired hot water tanks and pony boilers should be replaced with gas fired tankless DHW units.

Installing a tankless water heater would eliminate the need to keep the existing electric hot water tanks "on" 24/7. These economical devices would easily handle the domestic hot water needs of all facilities. Tankless hot water heaters have no standby losses.

A typical demand water heater is up to 50 percent more energy efficient than a traditional natural gas water heater and up to 70 percent more efficient than an electric water heater.



These products utilize on-demand water heater technology which is more efficient because it only heats water when it is needed.

Benefits:	Energy savings.
Considerations:	Outside venting required
Likely savings:	Generally a 2 to 3 year payback.
Incentives available:	Possibly but further discussion required

ECO – 13 Set-back Programmable Thermostats

In most facilities, the only significant energy controls are the facility operators.

Heating, cooling, ventilation, and lighting are all operating without automatic controls. This practice becomes problematic and expensive when systems are inadvertently left "on" during "off" time periods.

Frequently in facilities without automated controls, exhaust fans, heating and cooling devices, are not controlled and run 24/7 even during periods when they could be turned off. Even a simple set back programmable thermostat will eliminate this uncontrolled practice.

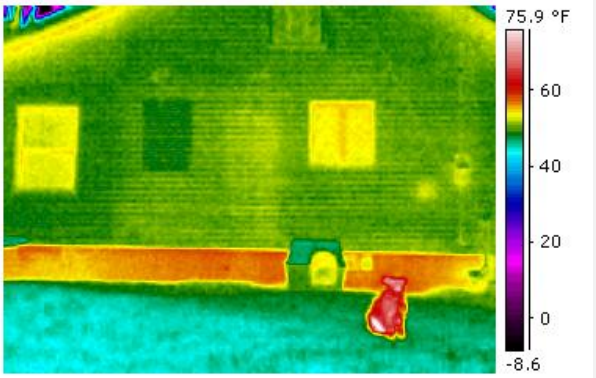
Benefits:	Saves energy when space is unoccupied.
Considerations:	Requires installation (minimal).
Likely savings:	Generally a 2 to 4 year payback.
Rebate available:	Yes with pre-approved CLC application.

ECO – 14 Infrared Survey

All facilities appear to be in need of shell measures such as insulation, windows, and weatherization. The first step in this process is determining where the greatest heat loss takes place. This ECO recommends an Infrared survey of all facilities using town owned IR cameras.

What will an infra red scan show?

An IR scan will point out areas of heat loss, thus indicating where insulation and air sealing are required. In the IR shot shown at right, it is easy to see the extreme heat loss taking place from the basement wall. As a result of this imagery, the facility operator can insulate the basement wall and reduce the heat loss.



Incidentally, this effort would yield best results when it is very cold outside and the heat is on inside the facility or when it is hot outside and the air conditioning is at maximum.

Benefits:	Simple, visual results. No calculations required.
Considerations:	Camera images must be interpreted by experienced operator.
Likely savings:	If insulation is installed, one year.
Incentive available:	Possibly from NGRID.

ECO – 15 NEMA Premium Efficiency Motors

As motors approach the end of their useful life and burnout, replace with NEMA premium efficiency motors.

This plan should be in place ASAP to deal with motors as they burn out as when this happens, it often needs to be addressed immediately. With a prepared plan in place, the decision is simplified.

NEMA premium efficiency motors are generally 5 to 10% more efficient which results in a significant reduction in electric expenses. Motors such as those on the circulating pumps are 80% efficient run as much as 4000 hours per year. The cost of replacement with premium efficiency motors will be realized in energy savings in roughly two years. Free software from www.motoruponline.com can be of great value in compiling a motor plan and inventory.

Note: the greatest savings from this ECO will be realized when existing motors are replaced upon burnout, not via wholesale replacement.

Note: the incentive for NEMA Premium Efficiency motors can be paid directly to the contractor.

Benefits:	Proven technology.
Considerations:	Installation required.
Likely savings:	Two to three year payback.
Incentive available:	Yes with pre-approved CLC application

ECO – 16 Full Condensing Boilers

Hot water heat in some facilities is generated by atmospheric, standard efficiency gas and oil fired hydronic boilers. When maintenance and operation costs drive up the annual life cycle cost to the unacceptable level, this ECO (Energy Conservation Opportunity) recommends replacement with gas fired full condensing boilers.

This technology is now common and the technology has been tested and proven. In practice a conventional boiler would have an efficiency of 81% to 84% because as well as the latent heat, further flue gas heat is lost. A condensing boiler will give between 96% to 98% efficiency as all the latent heat is captured and flue losses are smaller.

Further study is required for this Energy Conservation Opportunity but conservatively, a 20% reduction in fuel consumption could be expected.

Benefits:	Efficient heating, reduced maintenance.
Considerations:	Expense and availability of gas.
Likely savings:	Three to four year payback.
Rebate available:	Rebates available through National Grid's High-Efficiency Heating and Water Heating Rebate Program Schedule.

ECO – 17 Variable Speed Drives

Install VSDs on all pumps, motors, and other non-constantly turning devices.

A Variable Speed Drive will allow the motors and pumps to run at an optimum speed based on demand. All motors and pumps that do not need to operate at 100% load, 100% of the time should be equipped with a Variable Speed Drive.

Variable Speed drives (VSDs) allow induction-motor-driven loads such as pumps and fans to operate in speed ranges as wide as 10 to 300 percent of fixed speed. (They are also called variable-frequency drives, variable-speed drives, variable-frequency inverters, or frequency converters.) By controlling motor speed so that it finely corresponds to varying load requirements, VSD installations can increase energy efficiency (in some cases energy savings can exceed 50 percent), improve power factor and process precision, and afford other performance benefits such as soft starting and over speed capability. They also can eliminate the need for expensive and energy-wasting throttling mechanisms such as control valves and outlet dampers.

Benefits:	Proven technology. Control.
Considerations:	Installation required. Cost.
Likely savings:	One year (or less) payback.
Incentive available:	Yes with pre-approved CLC application

ECO – 18 Replace old leaky windows.

In some of the facilities, the windows are old and leaky. These windows could be replaced with Energy Star Rated commercial style windows that would address the drafty problems of those in place.

From the Energy Advisor website:

There are host of options for energy efficient windows.

Standard glazing. Standard, single-pane windows transmit about 88 percent of the solar light that strikes them and offer a resistance-to-heat R-value of less than 1. In the cooling season they are a significant source of heat gain and are also often a source of glare. In insulated buildings, they are one of the largest sources of heat loss during the heating season.

Tinted glazing. Tinted windows, also known as heat-absorbing glass, block heat transmission through bulk absorption in the glass itself. Unfortunately, this also causes the glass temperature to rise, increasing the radiation coming off the window into the conditioned space. The result is that tinting by itself yields only a modest shading coefficient—in the range of 0.5 to 0.8. The most common colors for tinted glass—bronze and gray—block light and solar near-infrared heat in roughly equal proportions. Black-tinted glass is the worst choice for cooling load reduction, because it absorbs much more visible energy than near-infrared. Green or blue-tinted glass is more selective than other colors for letting light in while keeping heat out.

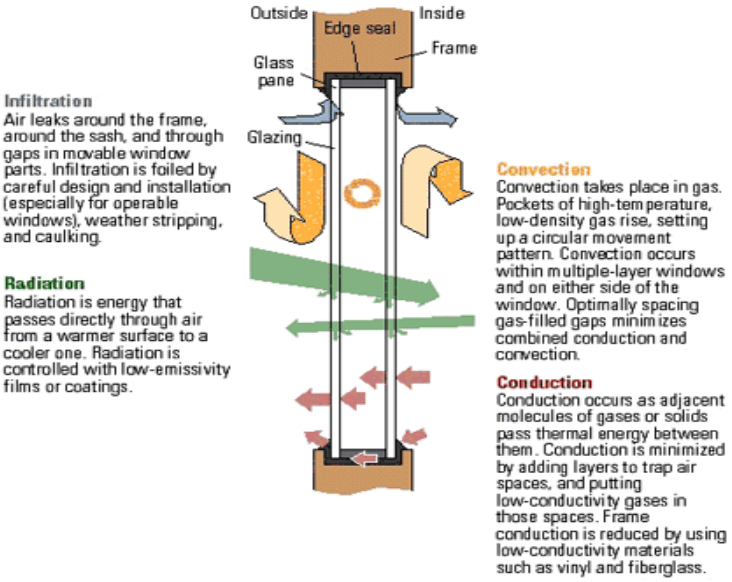
Reflective glazings. Semitransparent metallic coatings can be applied to the surfaces of clear or tinted glass. They have better shading coefficients because they reflect rather than absorb infrared energy. However, most reflective glazings block daylight more than solar heat. Reflective glass has achieved its greatest market penetration in hot-climate applications, where a high level of solar control is critical. However, reflective glass reduces cooling loads at the expense of daylight transmittance, so the reduction is offset somewhat by the heat created by the additional electric lighting required. Reflective coatings are available for single-pane applications, while some coatings must be sealed inside double-glass units.

Spectrally selective glazings. Spectrally selective glazings are a variation on earlier low-emissivity ("low-e") glazing coatings, which were designed to improve the insulation performance of windows while maximizing solar heat gain. Now the selective coatings can maximize or minimize solar gain, or achieve a balance anywhere in between. Values of Ke greater than 1.0 indicate that a glazing is spectrally selective. Typical Ke values for these "second-generation," selective low-e coatings on clear glass range from 1.1 to 1.3, with daylight transmittances as high as 65 percent. These coatings can be combined with tinted glazings, offering an extensive range of aesthetic options, all with state-of-the-art

performance in transmitting daylight while minimizing invisible solar heat gain. Advanced products for high daylight transmittance with high solar heat rejection have Ke, on clear glass, greater than 1.4 and can approach Ke values of 1.7 in conjunction with green-tinted or other specially colored glass.

Insulated glazing. Glass by itself has high heat conductivity, but by trapping air or an inert gas such as argon or krypton between layers of glass, manufacturers can produce glazing with double the ordinary resistance to heat conductance. With insulated windows, the thermal weak point becomes the edge of the unit and the window frame. To improve performance, manufacturers use thermal breaks in metal frames, increase the use of wood and clad wood sash and frames, and increase the use of frame materials with lower thermal conductivity, such as vinyl.

Source: Platts



How to proceed?

Establish which loads dominate. When cooling loads have the dominant impact on energy use, which is the case for most large commercial buildings, then the best products are those that maximize daylighting while keeping summer heat out. When heating loads dominate, then the insulating value of the window is most important.

Benefits:	Comfort and energy savings.
Considerations:	Expense and Historical Codes and requirements.
Likely savings:	Generally a 10 year payback.
Rebate available:	No. Does not qualify for rebate

ECO – 19 Replace old leaky exterior doors.

In some of the facilities, the exterior doors are old and leaky. The door shown at right is clearly very leaky. This door and others could be replaced with Energy Star Rated commercial style units that would address the drafty problems of those in place.

From the EERE Consumer Guide website:

Exterior Door Selection and Installation:

New exterior doors often fit and insulate better than older types. If you have older doors in your home, replacing them might be a good investment, resulting in lower heating and cooling costs. If you're building a new home, you should consider buying the most energy-efficient doors possible.

When selecting doors for energy efficiency, it's important to first consider their energy performance ratings in relation to your climate and home's design. This will help narrow your selection.

Types of Doors

One common type of exterior door has a steel skin with a polyurethane foam insulation core. It usually includes a magnetic strip (similar to a refrigerator door magnetic seal) as weatherstripping. If installed correctly and if the door is not bent, this type of door needs no further weatherstripping.

The R-values of most steel and fiberglass-clad entry doors range from R-5 to R-6 (not including the effects of a window.) For example: A 1-1/2 inch (3.81 cm) thick door without a window offers more than five times the insulating value of a solid wood door of the same size.

Glass or "patio" doors, especially sliding glass doors, lose heat much faster than other types of doors because glass is a very poor insulator. Most modern glass doors with metal frames have a thermal break, *which is a plastic insulator between inner and outer parts of the frame. Models with several layers of glass, low-emissivity coatings, and/or low-conductivity gases between the glass panes are a good investment, especially in extreme climates. Over the long run, the additional cost is paid back many times over in energy savings. When buying or replacing patio doors, keep in mind that swinging doors offer a much tighter seal than sliding types.*

Also, with a sliding glass door, it's impossible to stop all the air leakage around the weatherstripping and still be able to use the door. Also, after years of use, the weatherstripping wears down so air leakage increases as the door ages. If the manufacturer has made it possible to do so, you can replace worn weatherstripping on sliding glass doors.

Installation

When you buy a door, it will probably be a pre-hung frame. Pre-hung doors usually come with wood or steel frames. You will need to remove an existing door frame from the rough opening before you install a pre-hung door. The door frame must be as square as possible, so that the door seals tightly to the jamb and swings properly.
Before adding the interior trim, apply an expanding foam caulking to seal the new door frame to the rough opening and threshold. This will help prevent air from getting around the door seals and into the house. Apply carefully, especially with a wood frame, to avoid having the foam force the frame out of square.

If needed, you'll also want to add weatherstripping. Check the weatherstripping on your exterior doors annually to see if it needs replacement.

Benefits:	Comfort and energy savings.
Considerations:	Expense and Historical Codes and requirements.
Likely savings:	Generally a 10 year payback.
Rebate available:	No. Does not qualify for rebate

ECO – 20 Install Insulation as needed.

The Infared scan, ECO – 14, will determine where insulation is needed. The Elementary School (attic shown at right) will most certainly require ceiling insulation. Other town facilities will likely need insulation as well.

From the Energy Advisor website:

Building Shell: Insulation

Insulation can be one of the most important factors in achieving energy efficiency in a building. It works primarily to slow the flow of heat through a building envelope, but it also can seal the envelope, preventing outside drafts and air leakage from unconditioned spaces, thereby maintaining indoor air quality. Insulation not only saves money by reducing heating and cooling loads but also is a key factor in achieving comfortable living and working spaces.

All insulation is rated according to its resistance to heat flow, measured in units of R-value in the United States. The inverse of thermal resistance is conductance, referred to as the U-value (U = 1/R), which in the United States is measured in units of Btu/square foot-°Fahrenheit-hour.

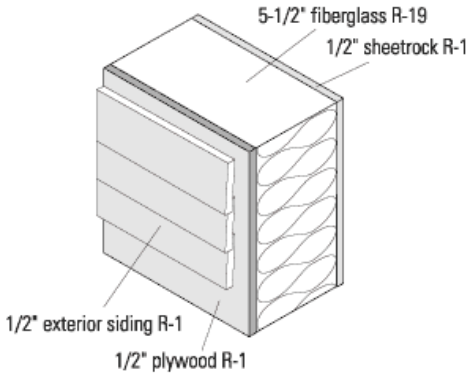
Whereas R-value is intuitively easier to understand (the higher the R-value, the better the insulating properties), U-value is more useful in calculations, because it describes the actual amount of heat that will move through the material for each degree Fahrenheit difference in temperature from one side of the material to the other. R-values of different components can be added (all the different layers of a wall, for example); U-values cannot be directly added

*(**Figure 1**).*

$$\text{Total R-value} = 1+1+19+1 = 22 \quad \frac{ft^2\text{-}°F\text{-}h}{Btu}$$

$$\text{Total U-value} = \frac{1}{1+1+19+1} = \frac{1}{22} = .045 \quad \frac{Btu}{ft^2\text{-}°F\text{-}h}$$

Source: E Source



What Are the Options?

All common insulations use air or some other gas contained within bubbles or pockets in the insulation to decrease the insulation's conductivity, because a gas conducts heat more slowly than a solid. Also, to prevent convective heat loss, which occurs from the flow of gas, the gas must be kept as still as possible. The thin fibers in fiberglass insulation, for example, create small pockets of air and thus restrict air circulation. In theory, an inch of air can achieve an insulation value of R-5.5. Realistically, however, the best air-filled insulations only achieve R-4.5 to R-4.7 per inch (meaning that two inches of insulation would give you R-9 to R-9.4), and most are rated considerably lower. To achieve higher values, hydrochlorofluorocarbons (HCFCs) are used in place of air, because they have a lower conductivity.

There are three basic types of insulation: fiber, foam, and reflective.
***Fiber insulation** is available in either loose-fill form or in batts. Loose-fill insulation consists of fiberglass, cellulose, rock wool, or some other type of fibers that are blown into wall cavities or attic joist spaces. If properly installed, loose-fill insulation can provide more complete cavity coverage than batts, because the fibers can fill around wires, piping, and other obstacles. Loose-fill is usually installed by specialized contractors, whereas batts can be installed by nearly anyone with a desire to insulate a space. R-values per inch for loose-fill insulation range from R-2.2 for fiberglass to about R-3.2 for rock wool or cellulose. Batts are available made of fiberglass, cotton, or rock wool, and all achieve an R-value of about R-3.2 per inch.*

Be aware that loose-fill insulation can settle over time. When loose-fill insulation is located in a wall, its settling creates a void above the insulation that can serve as a conduit for heat. In an attic, settling results in a nonuniform distribution of the insulation, which can reduce its effectiveness. Some types of insulation use acrylic-based or other binders to help prevent settling, though there is some question as to how well they work.

Loose-fill cellulose can be mixed with water and blown in wet, usually without any added binders. This sticky mixture molds itself into gaps and seals them to a degree, which helps to eliminate air leakage and infiltration, and has an R-value of about R-3.5 per inch. Loose-fill cellulose can also be installed dry with a blowing machine and a reduced-size application nozzle that packs the insulation tightly, creating dense-pack, or high-density cellulose. Though this method does not seal as well as wet-spray cellulose, dense-pack cellulose also reduces air infiltration. Because it is packed tightly, little settling occurs and, unlike wet-spray cellulose, it can be used on wall insulation retrofits. It too has an R-value of around R-3.5

The effectiveness of any insulation is highly dependent on its proper installation. Although the Insulation Contractors Association of America is trying to combat the problem, improperly installed insulation is still very common. Whether due to incompetence or to outright fraud by the installers, installation problems are often missed, because little inspection is done to verify workmanship at the time of installation.

Problems include installers failing to account for settling of the insulation over time, leaving gaps and otherwise improperly installing batts, or even fluffing up blown insulations to make it appear that the proper amount has been applied. The problem is compounded by the fact that insulation manufacturers' coverage charts, which dictate how much of their insulation is

needed to achieve a given R-value over an area, often stretch the material too far to achieve the claimed R- values.

Consider choosing a reputable installer who will guarantee that the installed insulation achieves the R-value promised, and have an inspection of the work done, preferably by an independent inspector, to verify the R-value after the job is complete. Also expect to pay more for a quality job. Unscrupulous contractors can charge less, because they skimp on both the materials and the time needed to do a proper job.

***Foam insulation** comes in either rigid sheets or spray. Rigid foam insulation generally has a higher R-value per inch than fiber insulation, because it uses HCFCs instead of air to create pockets or bubbles in the foam sheet, thereby achieving values from R-3.6 (expanded polystyrene) to R-7.7 (isocyanurate). Rigid foam insulation is also easy to install with nails or glue. Its cost per unit R, however, is much higher than that of fiber.*

Sprayed-in foam can be used in open or closed cavities as well as around ducts or pipes that pass through the building envelope. Low-density urethane spray foams can achieve up to R-11 per inch, though most foams are rated much lower, with values around R-4 to R-6. Like wet cellulose, spray foams are effective at sealing out drafts.

Care should be taken in selecting rigid foam insulation, as it can contribute to insect problems. Carpenter ants and termites will tunnel through polystyrene and polyisocyanurate foams to either create nesting cavities or to create a protected passage to wood inside a building. To combat this problem, one company has added a boric acid insect repellant to its foam insulation. Testing to date has shown the treatment to be fairly effective in keeping insects away.

***Reflective insulation** is different from the other kinds in that, instead of reducing conductive heat flow, it reduces radiant heat flow. It also does not use a gas to insulate. In its most basic form, it consists of a single sheet of a reflective material, which reflects heat emitted from a warm surface back to that surface. It must be positioned adjacent to an air gap to be effective, otherwise heat will simply conduct through to the next solid layer that it touches. Manufacturers' claims for the R-values of reflective insulation need to be examined closely, because the R-value can change depending on where the insulation is used. For example, in floor joist spaces above an unheated basement, convective heat losses are minimal, as the warm air will stay near the floor. As a result, radiant transfer is the primary method of heat loss, and thus a single reflective barrier can have an equivalent R-value of R-8. In a ceiling joist application, the warm air will rise away from the conditioned space, instead of into it, and so convection will be the primary method of heat loss. In this case, reflective insulation will have little effect in stopping heat loss and should not be used in place of fiber or foam insulation. A single layer of reflective insulation next to an air space in a wall can have an equivalent R-value of around R-3.*

Benefits:	Comfort and energy savings.
Considerations:	Expense and accessibility.
Likely savings:	Likely one winter.
Rebate available:	Possibly from NGRID.

ECO – 21 Repair Steam Traps in Elementary School

The steam traps in the elementary school are in various stages of disrepair and failure and need to be repaired immediately. The cost of continued operation with the existing system is extremely high and the comfort of the occupants is being compromised.

From an article by Gary W. Mohr of UE Systems, "Basically all steam traps have the same functions. They allow condensate and non-condensable gases to escape while holding steam in a device where a thermal or heat transfer process occurs. A regulator controls the input side of the process and the steam, after releasing energy to the process, condenses and reverts back to its liquid state. The purpose of the steam trap is to retain steam in the heating element and to release the non-condensable gases and condensate. The principal design consideration is to balance the condensing rate and the import rate of the control device on the input side with the exiting condensate."

"As with any mechanical device, a steam trap can malfunction." If the steam trap fails closed," the device that should be draining will flood and the heat transfer process will stop, and whatever product is being produced ... will no longer be up to the required quality standards. If the trap fails open, there will be a waste of energy, steam will not be completely consumed or condensed in the exchanger and steam will blow through."

A plume of steam escaping from the condensate receiver or from some part of the condensate return system signals such a condition. This condition exists at the High School.

Benefits:	Virtually guaranteed, **IMMEDIATE** savings.
Considerations:	Expense. Maintenance of traps needs to be added to annual PM schedule.
Likely savings:	Generally a 1 to 2 year payback.
Incentives available	Yes with pre-approved NGRID application.

ECO – 22 Walk-in Cooler and Freezer Economizers

Coolers and freezers run 24/7. Most of the time, the door is shut and the "chilled" air eventually stratifies. This results in the refrigeration system to run in an effort to mix the air. Economizers sense this layering effect, bypass the refrigeration system and simply run the fans, thus solving the problem at 1/6 the expense of running the refrigeration system.

Benefits:	Simple technology, saves energy.
Considerations	Requires installation (minimal).
Likely savings:	Three to five year payback.
Incentive available:	Yes with pre-approved CLC application.

ECO – 23 Kitchen Pre-Rinse Valve

A high velocity pre-rinse valve mounted on the flexible hose in the kitchen will save water, sewer, and hot water heating expenses. It will also save labor. These simple devices are mandatory in California where water and sewer expenses are very high.

Benefits:	Simple technology, saves energy.
Considerations	Requires installation (minimal).
Likely savings:	Three to five year payback.
Incentive available:	Rebates available through National Grid's High-Efficiency Heating and Water Heating Rebate Program Schedule

ECO – 24 Kitchen Exhaust Hood

At the High School, kitchen hood exhaust fans operate at 100%, without control, even when minimal exhausting is required. A product know as the Melink Kitchen Hood Controller could result in significant energy savings.

From their website: The Melink Intelli-Hood® Controls can be installed in any commercial kitchen including schools.

The controls are extremely simple to operate. At the beginning of each day, the chef or cook simply presses the light and fan buttons on the keypad. The hood lights turn on and the fans reach a preset minimum speed of between 10 and 50 percent. When the cooking applications are turned on, the fan speed increases based on exhaust air temperature. During actual cooking, the speed increases to 100 percent until smoke and heat are removed.

Benefits:	Energy savings potential.
Considerations:	Somewhat expensive.
Likely savings:	Paybacks generally less than five years.
Incentives available:	Possibly with pre-approved CLC application .

Comment [JB1]: Does KeySpan have a rebate for this measure??

ECO – 25 DDC Controls

The High School and Elementary School control systems are obsolete and require an expensive air compressor to operate extensively. A direct digital controlled (DDC) system will not only eliminate the need to run the air compressor but also offer a great degree of control and accuracy to the room thermostat system.

Benefits:	Energy savings potential, elimination of air compressors.
Considerations:	Complex and expensive.
Likely savings:	Paybacks generally less than five years.
Incentives available:	Yes with pre-approved CLC application.

ECO – 26 High Efficiency Roof Top Units

The existing Air Conditioning Roof Top Units (RTUs) are of standard efficiency. Upon the end of their useful life, replace with High Efficiency RTUs.

From the Energy Advisor website:

Consider high-efficiency levels recommended by CEE. *The Consortium for Energy Efficiency (CEE) offers a program known as the High-Efficiency Commercial Air Conditioning and Heat Pumps Initiative. The initiative's goal is to encourage the use of high-efficiency unitary central air-conditioning and heat pump equipment in commercial buildings (unitary equipment consists of both single-packaged units, which contain all major assemblies in one cabinet, and split systems, which have one or more of the major assemblies separate from the others). Utilities participating in the initiative use CEE's high-efficiency equipment specifications in their education and rebate programs. As of May 2007, CEE suggests three tiers of efficiency levels for commercial equipment. Efficiency levels in Tier 1 are approximately 22 percent greater than those in the current federal standard and closely match the levels specified in the new federal standard that takes effect in 2010. Efficiency levels in Tiers 2 and 3 are even higher. All three tiers will be revised before the new federal standard takes effect. The CEE has also produced a table showing the availability of models that meet each tier.*

Energy Star is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy (DOE) that establishes an efficiency specification above the federal standards. Equipment that meets these specifications is awarded the Energy Star label, which helps consumers and others readily identify high-efficiency products. The current efficiency level for Energy Star was set in 2002 and is not scheduled to be revised in the immediate future.

Benefits:	Proven technology, saves energy.
Considerations	Initial cost higher than standard efficiency.
Likely savings:	Four to five year payback.
Incentive available:	Yes with pre-approved Cool Choice Program application.

Facility Specific Energy Conservation Opportunities

This section provides identified potential Energy Conservation Opportunities (ECOs) per facility.

Facility: Bourne School Administration Building

Use: Office
Occupancy: Normal Business Hours (NBH)
ECO's: 1,3,5,6,7,12, 13, 14, 16, 18, 19, 20

Additional Recommendations:

1. The doors and windows in this facility were particularly leaky.
2. If eligible, this facility will be put into Energy Star Portfolio Manager.

Facility: Bourne High School

Use: School
Occupancy: Normal School year
ECO's: All except ECO 18 (windows).

Additional Recommendations:

1. Every aspect of this facility needs controls.
2. Domestic hot water is via boilers. On demand systems needed.
3. In need of shell measures. Study with IR camera.

Facility: Peebles Elementary School

Use: School
Occupancy: Normal school hours
ECO's: All except 9 and 10

Additional Recommendations:

1. This facility needs attic insulation and windows. Study with IR camera. High Priority.

Facility: Bourne Public Library

Use: Library
Occupancy: Normal Business Hours
ECO's: 1, 3, 6, 7, 8, 12, 13, 14, 16, 18, 20, 26

Additional Recommendations:

1. This facility needs re-commissioning of the HVAC system. High Priority.

Energy Star Award Application by Facility

ESB Introduction and Summary.

As part of the U.S. EPA Energy Star program, buildings can be benchmarked and compared against buildings across the country in the same categories using the Energy Star Portfolio Manager. An office building will be compared against other office buildings, a K-12 school against other K-12 schools and so on with the data adjusted for climate differences. Buildings that achieve a score of 75% or higher can as apply for an Energy Star rating / award as well. The plaque is shown at right. These awards carry enormous PR value wherein they demonstrate superior energy performance. The award is based upon comparison of energy consumption per unit area, normalized for climate conditions. All fuel data must be considered.

Even if a building cannot achieve Energy Star award status, the benchmarking score can be a very valuable tool as it guides the facility manager in his or her effort to improve the efficiency of the building. Obviously, a low score would be an indication that there may be work to be done. A score that improves over the years would be an indication that the efficiency efforts were paying off. A building that does not qualify for an award now may qualify later after the improvements are implemented. Portfolio Manager can be found at the following site:

http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager

From the EPA website: "Buildings achieving a rating of 75 or higher and professionally verified to meet current indoor environment standards are eligible to apply for the ENERGY STAR. Display the ENERGY STAR plaque to convey superior performance to tenants, customers, and employees. Highlighting the ENERGY STAR qualified buildings in your portfolio sends a positive message to lenders, appraisers, owners, investors, and potential tenants or customers. Rate the performance of your buildings on a scale of 1-100 relative to similar buildings nationwide using EPA's national energy performance rating system. The rating system accounts for the impacts of year-to-year weather variations, as well as building size, location, and several operating characteristics. Buildings rating 75 or greater may qualify for the ENERGY STAR."

Not all building types can be benchmarked by Energy Star's Portfolio Manager but the list is continually expanding. If your building does meet the current criteria, your representative would be happy to do the initial benchmarking upon receipt of the utility bills and heating oil/propane consumption data (if applicable).

Energy Star Building Discussion

The two facilities entered into Portfolio Manager are the High School and Peebles Elementary School.

The score for the High School is 17.
The score for Peebles Elementary School is 26.

The scores are very low due to a variety of issues. Not the least of which is the lack of insulation and poor windows. The HVAC system also appears to be running out of control. The commissioning agent may help identify some of the problem areas.

This score is arrived at by the following:

1. All facility BTUs (electric, gas, oil, etc) are added together
2. This sum is then divided by square footage of the facility
3. This number is then regionally corrected using heating / cooling degree day data.
4. This final result is then compared to other similar buildings.
5. The resulting "Score" is simply the percentile expression of how the specific building compares to others in the study group.

I recommend running the program each month to measure the gain (or loss). Significant gains can be made by implementing the recommended energy conservation measures. Greater gains may be achieved by implementing an aggressive "turn it off / down" program.

Looking into the future, as existing equipment nears the end of its useful life, replacement with higher efficiency units as recommended in this report will result in continued improvements.

Next Steps

If you are interested in proceeding with any of the Energy Efficiency Opportunities suggested within this report, please contact:

John Burns
Cape Light Compact
(508) 375-6829
jburns@capelightcompact.org

Katie O'Rourke
National Grid
(781) 466-5233
kathryn.orourke@us.ngrid.com

Thank you for your interest - we look forward to serving you soon.