

Vermont Superintendents Association School Energy Management Program

Bob Mason, Chief Operating Officer
Chittenden South SU
5420 Shelburne Road Suite 300
Shelburne, Vermont 05482

Subject: Energy Assessment

Dear Bob:

Enclosed you will find the write-up of my visit to your school.

Key recommendations and opportunities for savings include:

- Lighting retrofit to change exit lights to LEDs and gym lights to T-5 fluorescents.
- Additional use of occupancy sensors to control lighting.
- Use of variable speed drives for motors.
- Upgrade to digital controls.
- Envelope assessment.
- Better management of plug loads.

Because of the major renovations under consideration, a comprehensive energy analysis of the building is recommended to form the basis for good decision making on energy related items.

Please contact me to discuss the report or for any follow-up that is necessary.

Thank you.



Norm Etkind
Program Director

Cc: Richard Donnelly, Efficiency Vermont
Bob Donnis, EVT
Dave LeBlanc, Facility Manager
Elaine Pinckney, Superintendent

Vermont Superintendents Association School Energy Management Program

Site Assessment Report

School: Charlotte Central School

Date of Site Visit: July 21, 2009

Present at Site Visit: Bob Mason, Chief Operating Officer
Dave Le Blanc, Facility Manager
Norm Etkind, SEMP

Purpose of Visit: Walk-thru Energy Assessment

Report Format - - this report begins with a brief description of the building, its energy use, and site visit observations. Next, there are recommendations for changes in the way the building is operated and finally a description of more costly measures that will save energy and may be cost-effective. The report concludes with a listing of other resources and potential funding sources.

1) **Basic Building Description** - - this is a two-story building built originally in 1939 with additions in 1949, 1969, 1989 and 1996. Building size is estimated at 93,000 square feet. The building serves 460 grade K-8 students.

2) **Building Energy Use** -

- a) Fuel Oil - -
 - i) The school uses #2 oil as its main fuel. Oil usage is estimated at 25,000 gallons annually which is very low for this size building.
- b) Electricity
 - i) The school used 518,880 kWh of electricity for the last twelve months which is about average for this size school.
 - ii) Power factor varied from 91-95%. Penalty cutoff is at 95% for GMP.
 - iii) A printout was distributed that showed electrical energy use and demand for the last several years.
 - iv) Maximum demand for the past twelve months was 159 kW. Demand is about 1.7 kW per thousand square feet.
- c) Domestic hot water is produced by a mixture of propane and electric hot water heaters.
- d) Kitchen appliances use propane.

3) **Site Visit Observations**

- a) HVAC Systems -
 - i) Heat -
 - (1) The building is heated with two HB Smith oil fired boilers 1.9 MMBtu and 1.3 MMBtu.
 - (2) There is a new outside temperature reset control.

- (3) Heat distribution is via forced hot water.
- ii) Ventilation system
 - (1) The gym and cafeteria have dedicated ventilation systems.
 - (2) Classrooms use unit ventilators that take outside air directly into the unit.
- iii) Controls
 - (1) There is a DDC control system for about 10% of the building's HVAC functions.
 - (2) There are VFDs (variable frequency drives) on the gym ventilation motors. Its exact mode of operation was not known.
 - (3) Occupied cycle is from 7 AM to 5 PM.
- b) Electrical –
 - i) Lighting –
 - (1) The gyms use metal halide fixtures.
 - (2) General lighting is a mix of T-12s and T-8s.
 - (3) Some miscellaneous lighting is incandescent.
 - (4) Exit lights are a mix of fluorescent and LEDs.
 - (5) There are no occupancy sensors to control lighting.
 - (6) Outside lighting - - there are outside utility provided lighting.
 - ii) Plug loads
 - (1) There are vending machines that dispense non-perishable items.
 - (2) There are some small refrigerators in classrooms.
 - (3) Microwaves and coffeemakers are in several rooms.
 - (4) There is a kiln that draws 11 kW.
 - (5) There is a electric dishwasher booster that draws 12.9 kW.
- c) Building Envelope - some windows have been replaced, others are in poor condition. EIFS insulation is failing.

4) **Planned Renovations** – there are extensive renovations in the planning stages for this building. Some of these changes are energy related although many are designed to correct deficiencies and maintenance problems. When planning for substantial building upgrades, it makes sense to understand the costs and savings from the energy-related retrofits to allow for good decision making. If the schedule allows, the energy analysis delineated below would make sense to perform.

5) **Complete Energy Analysis** - - The Charlotte Central School has seen many upgrades, additions, renovations, and changes in use over the years. At this point, it makes sense to re-engineer the building from an energy perspective. It is important to have accurate information on the costs and savings of the various measures so a good decision making process can take place. The detailed analysis includes the following:

- a) Gather all relevant information on building energy and water use.
- b) Understand the building's historic energy use and build a model of how the facility uses energy. This process includes all systems: envelope, motors, lighting, heat, ventilation, water use, plug loads, etc.
- c) Test the model against actual bills to make sure the model is accurate.
- d) Consider improvements to operations - - modify the model accordingly.
- e) Next consider the more costly potential improvements on a stand alone basis. Items in the consideration include; cost of the measure, maintenance savings (or increase), energy savings, and any other related costs or savings. The result is a delineation of the cost effectiveness of the various measures.
- f) Decide on a likely order of implementation and interact the measures to see what the net savings would

- be. The implementation of one measure may impact on the cost effectiveness of another.
- g) Provide recommendations on how to proceed with the energy retrofit.

6) **Suggested Changes to Operations and Maintenance** – These items are important because many small changes in the way the building is managed can add up to big energy savings. Schools tend to have good operational savings because they are only active for a portion of the day, week and year. A good operating strategy takes advantage of this fact to turn off energy using devices when the building is not occupied. In order to realize the benefits of proper energy management, all parties need to be on board with the program. This starts with administration from principals to teachers to students to staff. While all parties can help, someone has to have the key responsibility for this function and the time to perform it.

a) Information –

- i) It is important for the building manager to understand the building's energy use. The manager should get copies of all electrical and fuel bills and track them. Fuel tanks should be checked at the beginning and end of each heating season to determine usage. Spreadsheets on electrical use should be kept updated to determine trends in usage and analyze anomalies. Contact should be made to the appropriate representative of the electrical utility to get information on the time of day that the school reaches its peak demand and to make sure that the school is on the correct rate structure based on its usage.
- ii) DDC systems often have trending log capabilities where the performance of the system over time can be tracked. It is important to review the logs to see that the systems are performing as designed. When planning your new systems, data logging capability should be included.
- iii) Documents that are critical to long-term facility management can get misplaced, damaged, or lost. Scanning them into computers or taking digital pictures of important plans can help prevent the loss of this valuable information. For new architecture and engineering work, you should get copies of the digital files along with the ability to use them in the future for your purposes.

b) HVAC Systems –

i) Heat –

- (1) Circulators should shut down automatically based on outside temperature, if there is no automated system in place, they should be shut off manually when heat is not needed.
- (2) Boilers should be serviced and tuned at least once a year to ensure efficient performance and reliability.
- (3) Operating fluid in hot water boilers should be tested annually to ensure that anti-freeze levels are adequate and that rust inhibitors and pH levels are where they should be.
- (4) Heat coils in unit ventilators and baseboard radiation should be thoroughly cleaned at least once a year to allow for good heat transfer.
- (5) Unit ventilators and baseboard radiation need good air flow to operate efficiently. Obstructions should be removed.
- (6) The boilers are equipped with an outside temperature reset. It is a good idea to post a chart in the boiler room that shows what the boiler temperature should be at different outside air temperatures. This helps to ensure that this system is working correctly.
- (7) Some pipe insulation is missing or damaged and should be installed or repaired on all exposed hot water or heating pipes.
- (8) To help resolve complaints about heating temperatures, it is helpful to use a temperature chart recorder. This gives a visual printout of temperatures in the space over a twenty four hour period. One type can be found at <http://www.omega.com/ppt/pptsc.asp?ref=CT88&Nav=tems07>

(This is not an endorsement of this particular product or vender.)

ii) Ventilation system

- (1) Most schools change the air filters on a quarterly basis. Some filters that are in heavy use areas or where the intake can be fouled by outside contaminants may need more frequent changes. Manufacturer's recommendations should be followed for these changes.
- (2) Outside air dampers should be checked at least annually for proper operation.
- (3) Putting streamers on the supply air registers is recommended as a way to easily determine that the ventilation is operating when it should. Without these, it can be hard to tell if the system is on and shuts down correctly during the un-occupied cycle. This is also a good way to convince occupants that fresh air is being supplied and windows do not need to be opened.

iii) Controls

- (1) There was some question about proper operational sequencing for certain controls. People charged with operation of the building's heating, ventilating and air conditioning (HVAC) systems had some questions about the way the systems are set up. I suggest having the controls contractor in to explain the workings of all the systems and how to adjust them to the building operator and having this presentation recorded on DVD for future reference and to be incorporated into a Facility Operating Plan.
- (2) Tweaking of controls for optimum performance of the heating and ventilation systems is an important conservation strategy. The goal is to provide all the heat and ventilation necessary but no more than that. It is best to make incremental adjustments to make sure no problems are created. Lowering the setback temperatures for nights and weekends and reducing the on-time for ventilation to match occupied times will reduce energy use. Systems should also be set to go to unoccupied schedule for weekends, vacation periods, snow days etc.. Most schools have the ventilation come on when children arrive and shut off when they leave, generally from about 7 AM to 3 PM. Heating systems usually set back around 3 PM and come on around 6 AM. Some schools may need a longer pre-heat period, especially after a week-end or vacation period. Most schools set back temperatures ten degrees for the unoccupied cycle during the winter and further during the shoulder seasons. The best facility managers have learned how far they can set back temperatures based on the time of year and the weather and are constantly adjusting their temperature setpoints and hours of operation accordingly to maximize the energy savings. This assumes that the building operator has sufficient time available to properly manage the building's systems. This is not always the case.
- (3) It should be noted that some systems have the capability of bringing the building back up to temperature in the morning independently of turning the ventilation on. This allows significantly reduced energy use during the warm-up period.
- (4) If possible, consolidate after-hours use of the facility so only certain wings of the building will need to be kept in the occupied cycle during the evening hours.

c) Building envelope

- i) Weatherstripping should be maintained to ensure good air sealing of the spaces.
- ii) Leaks in the roofing and other areas of the building envelope should be fixed to maintain the integrity of the insulation.

d) Electrical –

i) Lighting –

- (1) While its easy to say that lights should be turned off when not in use, it is harder to get people to do it. Some schools have appointed students to be lighting monitors for extra credit. They tour the school to make sure unused lights are turned off.

- (2) Timers that are used to control outside lights need adjustment seasonally or after power outages. There have been studies that show reduced vandalism when lights are shut off at night. A copy of the study can be emailed to you upon request.
 - (3) Teachers should be instructed in the proper use of the existing switches and about proper lighting levels. It is helpful to have a simple light meter that can be used to determine that proper light levels are achieved.
 - (4) Night janitors should shut lights off in areas they are not currently working in to reduce energy use.
 - (5) When repainting hallways, use of lighter colors will allow for reduced need for light from fixtures.
 - (6) I have attached an Excel spreadsheet that shows your electrical energy use. Use the tab at the bottom to access the graph. It is a good idea to keep this spreadsheet updated with new bills to keep track of electrical use trends and to determine if there are unusual events that may need attention.
- ii) Plug loads
- (1) Small refrigerators in classrooms – schools have used a variety of strategies to address the issue of refrigerators in classrooms. These small units can use as much electricity as a full sized efficient unit. Sometimes they are necessary for student health reasons. However, very often, non-refrigerated options exist (such as packaged juices that don't require refrigeration). This can be a sensitive subject with teachers so discretion as to whether it is worth addressing is an important issue. Here is a range of strategies that other schools have used:
 - (a) Simply ban the use of them and provide a central energy efficient refrigerator that teachers can use. This may be a good strategy if people aren't already used to having "their own" unit. Some schools that have instituted this ban have not reported negative consequences.
 - (b) Allow teachers to have them but charge them a monthly fee to cover the electrical cost (some schools charge anywhere from \$6 - \$20 per month for this).
 - (c) Require teachers to take them home for the summer and long breaks. This avoids usage during those months and prevents the school from having to clean them out. Also, they don't always come back.
 - (d) Require that the small refrigerators be Energy Star rated (this ensures that they are energy efficient).
 - (e) Require written permission from the principal after demonstrating the need for the unit. The unit itself must also be approved by maintenance after checking its condition.
 - (2) Microwave ovens are not substantial energy users. Some facility managers require that they inspect and approve any that are brought into the school because of safety issues.
 - (3) Coffee Makers - - there are several different kinds. Some retain the coffee in insulated carafes and don't use a lot of energy. Some use considerable energy all the time because they have heating elements that are always on. Policy makers can require the low energy use ones for people that want to have them. Timers can be placed on the coffee makers that maintain heat constantly to shut them off after use and at night.
 - (4) Other miscellaneous loads - - such items as lava lamps, chargers for cell phones and other equipment all use power. Some schools require permission from administration when any outside energy using items are to be added to the classrooms or other areas. All of these devices should be put on power strips and shut off for unoccupied periods.
 - (5) Kilns - - these units overall do not use that much electricity because they aren't used that frequently. However, they can have a very costly impact on demand charges. Most schools are

billed separately for their maximum electrical demand (this is the highest 15 minute use during the whole month). This is a hefty charge and can have year round impacts. Extra demand charges from just one kiln can cost as much as an extra \$1000 a year. There is no impact on demand if the kiln is used outside of when the school would otherwise reach their peak usage. Information specific to the school can usually be obtained from your utility. If it is possible to use the kiln only outside those hours, you won't have to pay this charge.

(6) Computers and copiers - -

- (a) Computers should have their software activated to allow them to enter their "sleep" modes when not used for a short period of time. Most computers have this software as part of their basic systems. If they do not, free software can be downloaded from the Energy Star website http://www.energystar.gov/index.cfm?c=power_mgt.pr_pm_wizard.
- (b) The switch on the computer monitors allow for the monitor itself to be turned off when it will not be used for a period of time. A monitor in sleep mode can still draw power.
- (c) Computers and their related equipment should be shut down at night and if not used for extended periods of time (an exception may be a server that may be needed in off hours). A power strip that shuts down the computer and all related equipment makes sense. This saves energy and also helps to protect the equipment from power spikes and lightning.
- (d) There are several different types of surge protectors or power strips that shut off power automatically when either there is no occupancy or when the computer goes to sleep mode. Some are called "Smart Strips" and another type is by "WattStopper." We don't endorse a particular brand but you may want to check into these options. There is still a considerable draw from peripherals and/or computers when they go to sleep mode.
- (e) Copiers and peripheral equipment should also be shut down at night.
- (f) Some schools have attached rain gutters to the back of the desks used for computers. They then lay the wiring and power strips where they are easily accessible and off the floor to allow for easier cleaning.

e) Kitchen

- i) All refrigeration condenser coils should be cleaned periodically.
- f) It is a good idea for the building manager to visit the building after midnight to see what building systems are still operating. Almost all systems should be shut off at this time of night (the exceptions are exit lights, certain computer servers and heat on night setback).
- g) Summer shut down – when the school or large areas of it will not be used for an extended period many systems can be turned off. Think of it this way; if the entire building were shut down, what would need to be turned back on during this period? Everything else should be left off. Items to consider (some are covered elsewhere as well).
 - i) Computers and peripheral equipment- - if it is okay with the technical people, teachers should unplug the computers and peripherals on the last day of school. This shuts them all down, saves energy, and helps prevent losses due to lightning or power surges.
 - ii) Walk-in coolers, refrigerators and similar equipment – these should be cleaned out and turned off for the summer.
 - iii) Television/VCRs - - unplug them. When just turned off these units still use power. Over the summer they use about 23 kWh (at least the one I recently tested did). Plus you reduce the chance of lightning or other damage. Same holds true for LCD projectors and Smart Boards.
 - iv) Ventilation systems - - these can usually be left off except as needed to help with drying after cleaning carpets etc. Care needs to be taken to help control mold and prevent bringing in moist humid air. Some schools use dehumidifiers and fans to dry their cleaning areas and leave their

central ventilation system off. There are times when the outside air is so humid that it will not help dry areas appreciably and may increase problems with humidity in the school.

- v) Kitchen equipment - - the gas line should be shut down for the summer unless needed. Pilot lights typically use about a third of the energy use of gas-fired kitchen equipment.
- vi) Heating equipment - - boilers should be shut down for the summer. It is recommended that they be fired up once a month to drive off any moisture in the system. Circulators should also be shut off.

7) Potential Energy Conservation Measures

a) HVAC Systems –

i) Heating –

(1) Variable frequency drives for circulators and ventilation fans allow for energy savings by reducing motor speeds. They can be controlled automatically for maximum effect. A fan or circulator motor going at half speed uses one eighth the amount of power. Efficiency Vermont will provide significant incentives for this measure. This measure needs careful consideration by an expert to ensure that savings are achieved and the systems will function correctly with the VFDs and should be considered as part of the renovation package.

ii) Domestic Hot Water (DHW)- -

(1) While main boilers are operating, hot water should come from these units because it is less expensive than electric hot water. After the main boilers are turned off for the season, it makes sense to use the electric units to provide hot water rather than incur the standby losses of the main boiler. In areas where there is little usage or a great distance from the boiler room and electric hot water heaters are used, an additional insulated jacket can be installed to reduce standby losses.

(2) The domestic hot water systems are typically oversized for the amount of use in a typical school. If the systems or their components are in need of replacement, an assessment of the best way to provide the DHW is in order. An option is to provide a dedicated hot water heater for the kitchen (which you already have) and have small on demand water heaters at lavatories. This reduces the heat losses from the DHW system and the need for having a circulator run.

(3) The Vermont Department of Health recommends that DHW tanks maintain a temperature of 140 degrees to help prevent contamination by Legionella bacteria. Circulation pumps can be put on timers to shut them down at night when the building is unoccupied.

iii) Ventilation system

(1) Gym and cafeteria ventilation is designed for maximum occupancy but is rarely needed at this level. Demand controls based on CO2 levels and/or occupancy can automatically close outside air dampers when CO2 is satisfied. Some systems can also be coupled with a variable speed fan drive to save considerable energy and reduce noise levels. Also, controls can allow for free night cooling during summer months to reduce overheating, known as an economizer cycle (described below). The building has CO2 controls on the gym ventilation system. It's mode of operation should be verified and may need to be adjusted as part of the renovations.

(2) Economizer cycle (or night purge) - A typical scenario for schools during hot days in May, June, August and September would be that the ventilation system is shut off at the end of the day when the building goes into the unoccupied cycle. Temperature at that point is likely to be very warm. When the building begins its occupied cycle in the morning some fresh air will be brought in by the ventilation system and begin cooling the space. However, the ventilation air heats up quickly with outside temperature (and is sometimes brought in off the hot roof). This will continue throughout the day and warm the space making it uncomfortable.

Instead, with proper controls the system can work like this; for a period during the night, sensors will monitor indoor and outdoor temperature. The system will bring in cooler night air (as long as it is available) until a certain setpoint, say 65 degrees is reached. The ventilation system at night will only operate to maintain this indoor temperature. Some care needs to be exercised or more sophisticated controls put in place to prevent night air from being introduced into the building when outside humidity levels are very high.

iv) Controls

- (1) Pneumatic control systems are becoming obsolete. While they can still function well when properly maintained, a digital control system has many more opportunities for closer control of the systems. Conversion of the remaining pneumatic system components to DDC at the time of renovation is recommended and is currently being planned for most sections of the building.
- (2) Once controls are upgraded, I recommend having the controls contractor review all the controls and their proper settings, functioning, and methods of adjustment with building staff. It is advisable to record this review on DVD for future reference and staff.

b) Electrical –

i) Lighting -

- (1) All older fixtures that use T-12 fluorescent tubes should be converted to high performance T-8 ballasts and lamps (with the exception of those fixtures with minimal on times). This provides for improved lighting quality and energy savings.
- (2) When changing T-8 ballasts, high performance ones should be used. Efficiency Vermont has rebate forms to help pay for this upgrade.
- (3) The gym and library use metal halide lights which require a relatively long warm up period. They are therefore left on all day. Many schools are now replacing these fixtures with more efficient T-5 high-bay fluorescent ones that improve lighting quality and can be switched on and off as needed. They can also be coupled with occupancy sensors that will automatically energize them when people are present. Lighting retrofits such as replacing metal halides in gyms with T5s can have simple paybacks including the Efficiency Vermont incentive on the order of 2-3 years.
- (4) Areas that receive intermittent use such as teacher prep areas and bathrooms can benefit by the use of occupancy sensors to control the lighting. Some schools also use occupancy sensors to control hallway and classroom lighting with good results. Efficiency Vermont offers \$35 per wall-mounted occupancy sensor (for small, enclosed rooms) and \$75 per remote-mounted occupancy sensor (for open areas such as the gym).
- (5) Utility provided lights are generally more expensive than if the school installed their own building mounted lights and controlled them correctly. Outside lights should be controlled by photocells or both photocells and timers if they are to be shut off later during the night. Alternatively they can operate based on motion sensors. A strategy used by some schools is to have the outside lighting enabled by the timer but they come on with the photocell. They are shut off by the timer, usually around 10 or 11 PM depending on the use of the building. Using the timer in conjunction with the photocells prevents the lights from coming on if the photocell fails and allows for the later shut off.
- (6) Some miscellaneous lighting using incandescent bulbs should be replaced with compact fluorescents (CFL). Use only brand name CFLs to ensure savings and longevity. Many schools use CFLs in their range hoods and walk-in coolers as well.
- (7) Exit lights should all be converted to LEDs to save on energy costs.

- c) Kitchen
 - i) Consider changing any remaining electric heating equipment to gas appliances when replacing equipment to reduce demand charges.
 - ii) Consider the potential of using a gas booster for the dishwasher at time of replacement. This can have a significant impact on electrical demand charges. Dishwasher boosters almost always contribute to the facilities' peak demand. As such, they can add \$1,000 or more in demand charges (depending on the size of the booster and your electric rates). A propane booster eliminates this charge.
- d) Plug Loads
 - i) School bus block heaters, if put on timers, only need to operate for about an hour before the buses are started up. Many schools now do this and do not report any problems.
 - ii) Vending Machines – “vending misers” act as occupancy sensors for vending machines that put them in a sleep mode when the area is not occupied. They typically save about half the energy that the machine uses and has a little more than a year payback. They can only be used on machines that dispense non-perishable items like water, soda, etc. Incentives are available from Efficiency Vermont for this device and some vendors will provide them at no charge if requested.
 - iii) Refrigerators – some older refrigerators use twice the energy of newer, efficient ones. Efficiency Vermont offers a \$25 rebate for ENERGY STAR-qualified units and a \$40 rebate for ENERGY STAR units that also meet the CEE Tier 2 standard.
- e) Building Envelope
 - i) A complete evaluation of the building envelope should be undertaken. This will involve a thermal scan of the building and sometimes blower door test to see where the building is leaking heat.
 - ii) The older windows in poor condition are in need of replacement. New energy efficient windows will save the equivalent of about a gallon of oil a square foot a year over the existing ones. There will also be maintenance cost savings and improvement in occupant comfort. However, window replacement can be quite costly. The energy savings alone may not cover the cost of the new windows due to the high replacement cost. However, replacement as part of a renovation or long-term capital plan is necessary due to maintenance costs, comfort, aesthetic issues and building obsolescence.
- f) Power factor - - this is a measure of how efficiently the building electrical systems utilize power. In inductive loads like motors and transformers the voltage leads the current. This can result in inefficient use of the electrical distribution system both within the facility and for the power company. Due to this dynamic, power companies penalize building owners if the power factor is outside a certain range. There are several ways to do power factor correction ranging from automated devices to simple capacitors. Power factor correction will have a quick payback depending on how it is done. Charlotte Central School is close to the line for the penalty. The situation should be monitored and action taken if necessary.

8) **Efficiency Vermont (EVT)**

- a) Efficiency Vermont can provide incentives for the electrical measures discussed above. If you want to proceed with some of these measures please contact me and I will help get an EVT project manager assigned. They can do an analysis that will provide annual savings estimates and simple payback calculations. This data is typically needed to generate momentum to get money allocated in the budget.
- b) If you are proceeding piecemeal with some measurers, EVT has prescriptive forms on their website (<http://www.encyvermont.com/pages/Business/RebateCenter/>) that cover lighting, occupancy sensors, vending misers, efficient three phase motors, VFDs, HVAC equipment, and refrigeration equipment. You can use these forms to get rebates on projects you are executing yourself. Please insert

VSA-SEMP in the lower right hand corner of the last page where it asks for “tracking number”.

- 9) **Facility Operating Plan** – a written plan that lays out the key modes of building operation would be helpful for administrators and staff. This plan should include maintenance schedules for key building systems, operating schedules for ventilation and setback temperatures and other important information about the building’s systems. SEMP has created a template that schools can use for this purpose. The template will be emailed along with this report.
- 10) **Facility Operator Training** - - it is important that the person responsible for maintaining a facility keep up with the many requirements of their job. There is an eight-day Building Operator Course II being organized for the fall (completion of this course, held over a period of several months, provides a certification for participants). The course begins on September 22 and will be held in Berlin, Vermont. Also, facility managers meet periodically to get updated on best practices. If interested in either of these, please let me know and I will see that you get on the mailing list for information.
- 11) **Capital Plan** - - for proper building maintenance, schools should have both a short term and a long term capital plan. At some point, upgrades will be needed to keep the building safe, comfortable and efficient. Items that affect energy use, such as windows, roofing, boilers etc. should be included in this long term capital plan.
- 12) **Energy Saving Program** - A school-wide program to improve energy efficiency and conservation can be both educational and pay significant monetary dividends. An incentive (maybe a school party with a band or other such inducement) based on achieving a percentage reduction in energy use can be an effective inducement to participate in this kind of program. Annual energy cost savings of 10% are achievable with a concerted effort. With students engaged, they will help evaluate potential energy saving measures and help ensure lights are turned of when not needed etc. Some schools have also given a financial incentive to staff if energy savings goals are achieved.
- 13) **Energy Policy** – some school boards have adopted an energy policy to help guide school personnel. This is a useful document to help support energy efficiency efforts. A model policy can be found on the School Board Association website: <http://www.vtvsba.org/policy/e10.pdf>
- 14) **Energy Star** - Appliances are rated by the Energy Star system to ensure that they are energy efficient. It is helpful to adopt a policy to acquire only Energy Star rated equipment. For more information, visit the Energy Star website at www.energystar.gov .
- 15) **Energy Manager**– someone at the school should be designated as “Energy Manager”. It would be this person’s responsibility to continually tweak the building’s systems to achieve maximum efficiency. Building staff very often already have too full a plate to pay attention to the detail of maximizing the efficiency of the buildings. Some one can be hired and trained to fulfill this role or this scope could be added (along with hours) to a part time position. The savings would more than pay for the cost of this person’s time.
- 16) **Other Resources**
 - a) An excellent manual entitled “School Operations and Maintenance: Best Practices for Controlling Energy Costs - - A Guidebook for K-12 School System Business Officers and Facilities Managers” can be obtained as a free download at http://www.ase.org/uploaded_files/greenschools/School%20Energy%20Guidebook_9-04.pdf
 - b) Vermont School Board Insurance Trust (VSBIT) - Tim Pedrotty will visit schools and advise them on a whole range of facility management issues including cleaning programs, indoor air quality, playground safety, work order systems, managing contractors, grounds maintenance etc. Contact VSBIT at 223-

- 5040 and/or check out their website at www.vsbitt.org where they have many resources for schools.
- c) The Vermont Energy Education Program (VEEP) offers a variety of hands-on/minds-on learning experiences about energy and our environment for Vermont teachers and their students in grades 3 - 12. For an overview of VEEP's programs and mini grants for teachers, visit www.veep.org. For further information contact Fran Barhydt, VEEP Director of Curriculum and Development at franbarhydt@hughes.net or 748-8917.
 - d) The Association of VT Recyclers (AVR) works with school custodial staff to evaluate and assess cleaning products/practices regarding environmental health and indoor air quality. The resulting report is reviewed with custodial staff and administration. Technical and policy recommendations are made to improve indoor air quality. AVR works with the Vermont Department of Health's voluntary ENVISION Healthy Schools Program. AVR can be reached at 802-224-1000. www.vtrecyclers.org
 - e) The "Kill a Watt" device is a great educational tool that gives readings on kWh, volts, amps etc. for plug loads. It can be obtained from many sources found on the internet and elsewhere for around \$25. You plug it into an outlet and then plug items into it to get the readings.
 - f) The CHPS Best Practices Manual for Operations and Maintenance of schools can be found along with a good many other publications of interest to schools at this address - - <http://www.chps.net/manual/index.htm#BPM> .

17) **Funding Sources** - - below is a summary of funding sources to help pay for energy retrofit programs:

Qualified School Construction Bonds – were authorized in the tax section of ARRA. They will offer good opportunities for districts to finance capital projects and land acquisition at **zero interest**. Vermont's allocation is \$24 million. More information can be found here:

http://education.vermont.gov/new/pdfdoc/pgm_construction/arra_qualified_construction_bonds_app.pdf

Envision Grants - - This is a small grant program to help schools improve indoor air quality. Help with planning for retrofit of ventilation systems, installation of environmentally friendly materials etc. are eligible. A new grant round will be announced shortly (as of this writing 12/24/08). Contact Amanda LaScala at 800-439-8550 or alascal@vdh.state.vt.us .

Community Facilities Grants - - Schools are eligible for funding under this USDA Rural Development Program. General information can be obtained at: <http://www.rurdev.usda.gov/VT/vtnhcf.htm> . A listing of town eligibility can be found at:

<http://www.rurdev.usda.gov/VT/VT%20Census%20List%20for%20Web.pdf> . I suggest first checking for eligibility so you don't waste your time if your community will not be able to get support. Maximum percentage grant is 75% (but few towns are eligible for this high percentage). Contact the state reps shown on the website for more information. The particulars of this program can be different from the general info on the website and higher grant amounts are possible sometimes.

Bonding and Municipal Leasing - - School districts can obtain project funds either by bonding or by obtaining a municipal lease. They both carry somewhat similar (low, tax exempt) interest rates (although you should always be clear on the total interest, fees, and terms). Current rates for a ten year term are about 3.5% and 4.5% for a twenty year term.

The source for school districts to obtain bond funding is primarily the Vermont Municipal Bond Bank www.vtbondagency.org . Most school business managers are familiar with the bonding mechanism. The bond bank also has a program to assist school districts looking to go to bid to obtain a municipal lease for their project.

For energy projects, you can enter into a municipal lease that generally has you pay an annual amount for the use of the equipment and obtain ownership of the equipment at the end of the lease period. A “non-appropriations clause” is included in the agreement that gives the leasing company the right to remove the collateralized equipment in the event of non-payment of the lease. If certain criteria are met, the school district does not need to include the lease amount as “debt” and will not need a vote of the electorate to enter into this agreement. Check with your counsel to clarify exactly how the law applies and what these criteria are for your project.

For smaller projects and for smaller school districts that don't generally have a CPA performed audit, leasing may be a better option. For more information about these options, I suggest you contact Bob Giroux at the bond bank – 223-2717.

Solar Hot Water, Wind and Electricity - - there is an incentive program for the installation of solar domestic hot water systems, wind systems and photovoltaics for schools. This program is administered by the Renewable Energy Resource Center at Vermont Energy Investment Corporation (<http://www.nerc-vt.org/index.htm>) . Schools are eligible for incentives of up to \$8,750 for solar systems and \$20,000 for wind systems. Many requirements apply.

Department of Education Program - the “Solar in Schools Initiative” will be started up shortly and will help fund 5 KW photovoltaic systems for schools. Information can be found here: http://education.vermont.gov/new/pdfdoc/pgm_construction/solar_schools_initiative.pdf

QZAB Program - - Qualified Zone Academy Bond - - this program provides tax credits to the issuer of the bond for the school district. The net result is that the school can get an interest free loan for their project. There are income based eligibility criteria and many hoops to go through. For general information go to www.qzab.org . For specific information contact Cathy Hilgendorf, Construction Aid Coordinator for the Vermont Department of Education 828-5402.

Qualified Energy Conservation Bonds can be used for capital expenditures that reduce energy consumption in public buildings by 20 percent and for implementing “Green Community Programs.” These bonds are available for schools and other entities. The ARRA provides \$3.2 billion in bond authority for the program, which will be allocated to states by population. We should know more about this soon too.

Clean Energy Fund - - This is a Vermont fund that was established initially with funds from Vermont Yankee. Recent legislation has stimulus package money from the State Energy Program and perhaps the Community Energy Block Grant program also running through this fund. Again, the details of how all this will play out for school efficiency projects is uncertain. Alternative energy projects that generate electricity like photovoltaics, wind, and combined heat and power have been and would continue to be eligible. This program also provides planning money. More information here: http://publicservice.vermont.gov/energy/ee_cleanenergyfund.html

Vermont Community Climate Change Grant Program - The Vermont Community Climate Change Grant Program has been established by the Department of Environmental Conservation to enable Vermont

communities to implement measures that will improve energy efficiency. Grants of up to \$12,000 were available to Vermont schools for projects that will be implemented within twelve months of the grant award. They had their last funding round recently. It is uncertain as of this writing whether they will continue the program. It makes sense to check in with them if you are contemplating a fundable project.

<http://www.anr.state.vt.us/air/Planning/htm/ClimateChangeApp.htm>

20) Other

Disclaimer - - Recommendations for improvements are made based upon experience with other similar schools and general engineering practices. Before implementing significant changes to your building(s), a more in-depth analysis by competent professionals may be needed to help ensure that the changes will not result in any problems for the school or its occupants.

Final Note - - I see a large quantity of schools. At times I may make a mistake in describing an element of your building or neglect to include an important feature. I apologize in advance in case this may have occurred with your facility. Please let me know if this happened so I can correct my report accordingly.