The New Hampshire Municipal Energy Assistance Program

Investment Grade Audit Report

Dorchester Town Hall
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Prepared for:

Town of Dorchester, NH

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The following report was generated as part of the NH Municipal Energy Assistance Program (MEAP). MEAP is made possible through the New Hampshire Public Utilities Commission and the Greenhouse Gas Emissions Reductions Fund. The program is a collaborative effort to carry out a sequence of greenhouse gas emissions inventories and energy audits for between 24 and 48 geographically diverse communities in New Hampshire, setting the stage for these communities to perform renovations to selected buildings that would reduce energy consumption and greenhouse gas emissions. This report has been generated as a result of the Town of Dorchester being selected to participate in this program.

To follow MEAP updates and activities please visit www.nhenergy.org.

Additionally, this report would not be possible without the assistance and input provided by municipal employees and volunteers. We are grateful for the time provided to us by the Town of Dorchester.

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Introduction:

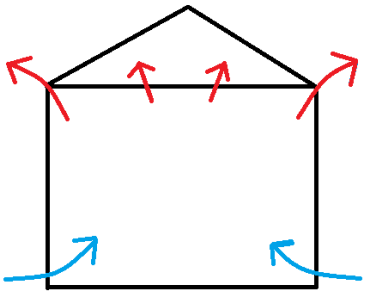
MEAP partners are pleased to provide this Investment-Grade Audit Report for the Town of Dorchester and the Town Hall building (hereinafter "the building"). This report discusses the findings and subsequent recommendations for energy efficiency and occupant health and safety improvements at the building. Included within this report are details regarding the inspection of the building, and examples that illustrate recommended building alterations and improvements that can reduce energy costs, occupancy health risks, and the building's natural resource footprint. In this report we will provide a set of options that can help achieve real energy savings and carbon dioxide reductions. These recommendations should be viewed as initial avenues to making capital investments, and participating in Federal and State level funding opportunities for municipal energy projects.

Prior to receiving an energy audit, each selected municipality must carry out the MEAP Energy Inventory process. The Energy Inventory, and subsequent energy audit, reports relied on data provided to the MEAP team by municipally appointed /authorized elected officials, employees, or community volunteers. These initial findings, along with a further review by SDES staff, helped determine the most appropriate building to provide an energy audit. The intent of the building selection process is to maximizing the potential energy savings, while at the same time catering to municipal goals and objectives. Any municipally owned building that has received any level energy audit or energy assessment prior to this program will be considered ineligible to receive a MEAP energy audit.

Basics of Heat Loss:

Though we are typically used to measuring heat in temperature, it can be measured in a variety of other units. For the purpose of measuring how much heat is produced to condition a space, and how we measure the rate at which heat leaves a structure, we measure in British Thermal Units (BTUs). One BTU is roughly the same amount of heat produced from a kitchen match. Another good reference to have is that there are about 138,500 potential BTUs in 1 gallon of heating oil. During the winter months, we cannot keep BTUs from leaving our buildings. Hot always goes to cold, or, areas of high pressure are always trying to go to areas of low pressure. What we can do is try to slow the process. We do this by using an **air barrier** and **insulation** at the building envelope to create a thermal barrier.

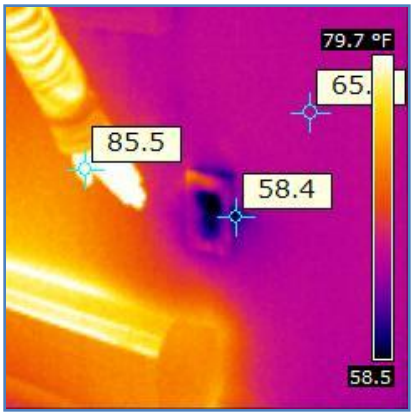
Heat moves through and leaves a building by three different means: *convection, conduction, and radiation*. One way to think of **convective** heat loss is by air movement into and out of a structure. One of the forces causing this to happen is the "stack effect".



The stack effect describes, on a macro level, the natural way in which air moves through a building. As warmed air leaves through the upper levels of a building, cold air infiltrates through the lower sections. In most cases, this pulls air from less than desirable areas of a building, such as basements, crawl spaces and mechanical rooms, which are often damp and unmaintained. These spaces can be the source of exhaust fumes from heating equipment, mold and mildew, as well as a number of other air contaminants, such as radon. Without an effective air barrier between the conditioned (heated and/or cooled) space and the attic, warm air will exit the building. For every 1 cubic foot of air that leaves a building, 1 cubic foot of air will infiltrate at a different location. Gaining control of the air movement through a building not only has a positive effect on efficiency, but also contributes to increased comfort and improved indoor air quality.

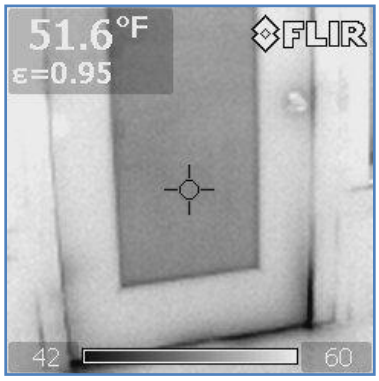
Conduction is the foremost way in which heat travels through a solid building material. R-value is one way to describe a given materials resistance to transfer heat. Materials with a high R-value, such as foams, cellulose, or fiberglass batts are used for insulation. At any location in the building envelope where there is solid building material and no insulation, "**thermal bridging**" will occur. For example, a 2x6 inch wood stud in an exterior wall has an R-value, or insulative value, of about R-7, while the 5-½ inch fiberglass insulation in the wall cavity is rated at R-19. Solid material in the exterior wall of a typical structure built with 2-inch stock, 16 inches on center (O.C.), will usually make up 20-25% of the wall surface area. This, in combination with any doors and windows, means that a significant percentage of the building envelope has an R-value of less than 10. Even a wall with a high R-value cavity insulation, such as spray foam, is subject to these weak points in the thermal boundary. Employing methods to reduce or eliminate thermal bridging in our built

environment will dramatically reduce energy costs and emissions over the long term as we move towards a new generation of energy and environmental challenges.



Radiant heat loss describes how heat waves, or infrared radiation, pass through space from one surface to another. For example, the heat from a hot copper pipe will radiate towards cooler surfaces around it, like an exterior wall. The heat can then conduct through building materials to the exterior.

With regards to the building envelope, **gaining control of convective heat loss is the main priority, and usually the easiest to address through air sealing**. After this is done, increasing insulation levels, or R-value, of the building envelope is the next step to gain better control of conductive heat loss. In many cases, a significant amount of a structure's radiant heat loss will be addressed with added insulation, either to ceilings, floors, walls, ductwork or piping. Treating the whole building as a system, and addressing all the issues of heat loss, will produce optimum savings and comfort.



<u>Basics of Moisture Control:</u>

The issue of moisture control in buildings is very complex and essential to maintaining structural durability and occupant health. The mismanagement of moisture can lead to a multitude of negative effects. Some of these include mold growth, poor indoor air quality, and the early degradation of building materials and equipment. It can also contribute to potentially serious health issues for the people who live and work in our buildings.

The two basic forms of moisture in need of managing are bulk moisture (fluid) and water vapor. Two ways to manage bulk moisture are to keep rain and ground water from entering the building and to quickly fix any water leaks from sources within the building, such as leaking pipes.

Managing relative humidity and water vapor is a challenge. At some points of the year, occupants want more humidity in the air to maintain comfort and less at other times. For example, in the winter months we want more humidity indoors because it helps occupants experience greater comfort. In many situations, we increase the relative humidity mechanically with humidifiers. When indoor air is too dry during the winter, we feel colder, develop dry skin and our upper respiratory system can become dry causing discomfort.

Conversely, in the summer we want the air to be dry. Just as hot goes to cold, wet goes to dry. We cool ourselves by perspiring. As we produce this moisture on our skin, it evaporates into the air, drawing heat away from our bodies. The temperature of a room may not be very high, but if the relative humidity is high, we will feel hot because our perspiration is evaporating at a slower

rate. Much of the comfort we achieve from using an air conditioning system (AC) is by removing the moisture from the air, allowing our skin to dry more quickly.

In the winter, there will always be some level of moisture in a heated and occupied space. We want this moisture, or water vapor, to stay within the occupied space for many reasons. Two of the most important reasons are to help occupants feel more comfortable and to keep the water vapor from causing damage within the building envelope.

Just as BTUs conduct through solid materials, water vapor diffuses through solid materials. Some materials are more resistant to vapor diffusion, such as polyethylene, and we use these to form a vapor barrier on the inside of the thermal boundary in an attempt to slow the amount of vapor diffusion. Small amounts of vapor traveling through a properly constructed building envelope will diffuse all the way to the exterior, and not cause any damage**. If a large amount of vapor is allowed to enter a wall cavity, the molecules will condense on the nearest cold surface.** When this happens, moisture can build up on the inside of the exterior wall sheathing or on other surfaces. This will cause a number of problems including long-term damage to insulation and structural components, as well as the promotion of mold growth.

It is important to identify any current moisture problems and address them appropriately. This is always done by first finding and controlling the source of the moisture. Sometimes it can be quite difficult to see moisture damage, as it may be buried inside of wall cavities. It is also important to know that by making changes to a structure and its envelope, we can change the way in which moisture can negatively affect the building.

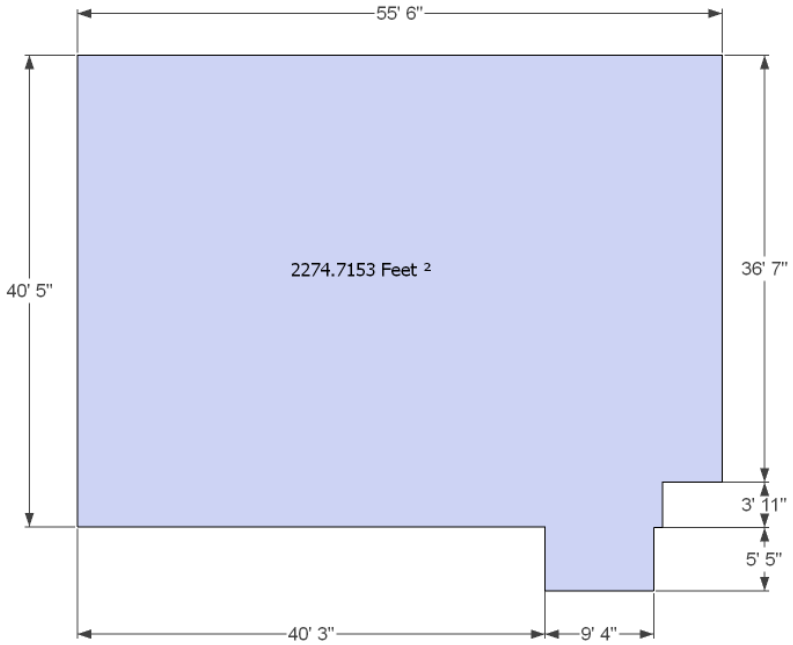
Building Description:

The Dorchester, NH Town House was constructed in 1842 and still serves as a meeting hall to this day. This is a single story wooden structure sitting on a granite foundation. The space below the main floor is an unusable dirt crawl space.
A few small additions have been added to the back side of the building over the years, which now serve as a community kitchen. In addition, this building is now serving as the community's emergency center, with a propane generator installation planned.

Front

Rear

Conditioned space, for the purpose of measuring energy usage or creating energy models of a building, should be measured from exterior points in order to include the thermal envelope.

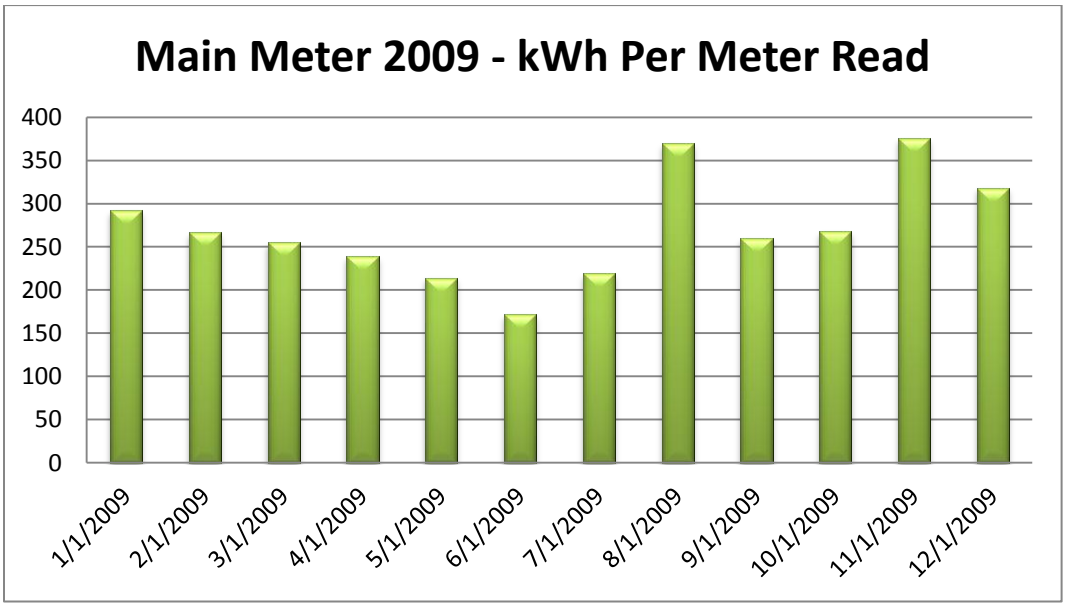


Energy Data Collection:

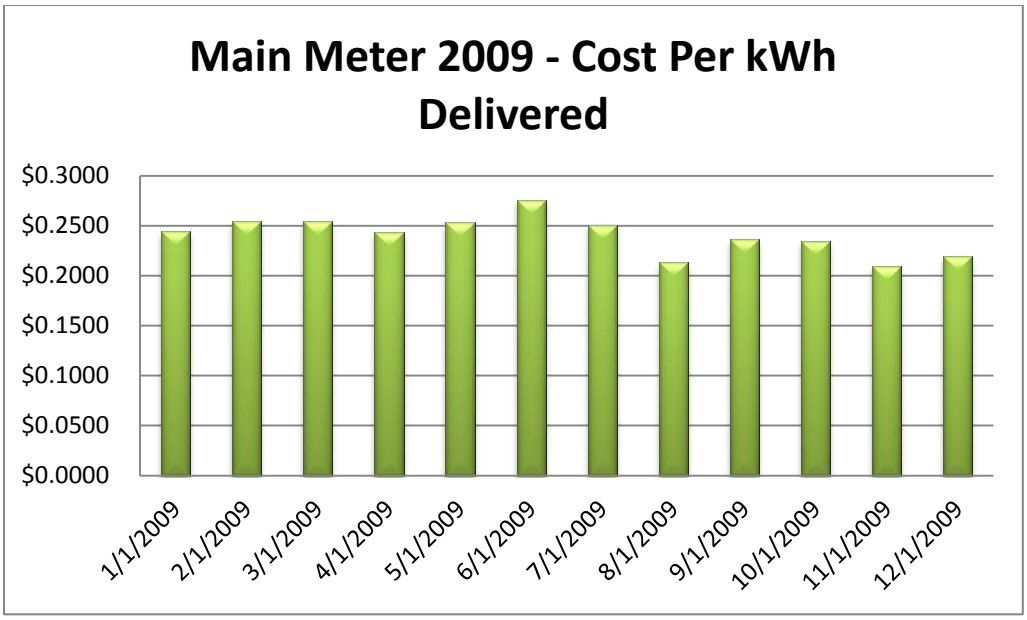
Analysis from provided utility bills for 2009 produced the following snapshot of electricity consumption. Monthly consumption is designated low to high, red being the lowest and green being the highest consumption months in the table below.

Electric -Main Meter			
NHEC			
Date	**KWH**	**Total $/mo**	**Cost Per kWh**
12/1/2009	318	$69.79	$0.2195
11/1/2009	376	$78.61	$0.2091
10/1/2009	268	$62.75	$0.2341
9/1/2009	260	$61.48	$0.2365
8/1/2009	370	$79.04	$0.2136
7/1/2009	219	$54.94	$0.2509
6/1/2009	172	$47.45	$0.2759
5/1/2009	214	$54.16	$0.2531
4/1/2009	239	$58.13	$0.2432
3/1/2009	255	$64.74	$0.2539
2/1/2009	267	$67.85	$0.2541
1/1/2009	292	$71.25	$0.2440

Average $/kWh: $0.2407
Total kWh: 3,250
Total Cost for 2009: $770.19



Annual electricity consumption for the Dorchester Town Hall



Cost of delivered electricity for the Dorchester Town Hall

Heat Source 1 - LP Boiler			
Propane			
Date	**Fuel Units**	**$**	**Cost Per Unit**
12/7/2009	288	$511.73	1.7768403
11/11/2009	302	$531.87	1.7611589
10/16/2009	251	$402.78	1.6047012
5/21/2009	175	$229.20	1.3097143
3/16/2009	572	$807.66	1.411993
2/17/2009	277	$415.73	1.5008303
1/1/2009	421	$539.98	1.2826128

Total Gallons Delivered: 2,286
Total annual payment: $3,438
Average cost per gallon: $1.50

Blower Door Test Results:

A blower door test was not performed on this building because of one or more of the following reasons.

- Hazardous building materials were found on site. SDES staff did not want to risk disturbing this material and potentially spreading it to occupied areas of the building.
- Mold was discovered in the building. SDES staff did not want to risk disturbing the mold or spreading spores to occupied areas of the building.
- Though lead paint tests were not performed, SDES felt there may be a threat of disturbing lead paint dust with the potential of spreading it to occupied areas of the building.
- Excessive amounts of bat and/or rodent droppings were discovered. SDES staff did not want to encourage the migration of hazardous gases and associated diseases to occupied areas of the building.
- The risk of spreading materials which are not considered to be hazardous such as fiberglass insulation, dust, etc., was too high. Exposure to such materials can cause respiratory, skin, eye and other irritations to individuals working in or conducting business in this building.
- For security purposes, it was logistically not possible during our building inspection to open all interior doors of the building in order to get accurate test readings.
- Business hours at this building conflicted with the scheduled SDES building inspection, rendering it not possible to keep exterior doors closed during the test.
- It was not possible to shut down heating equipment during the SDES building inspection.

Foundations, Floors, Crawl Spaces, and/or Basements:

The original building sits on large slabs of granite, which sit on smaller packed stones.
Some restorative work needs to be done to this foundation as this photo indicates

This photo helps to also show the large gaps in this foundation. These open spaces allow for ample passage of air, rendering the crawl space beneath to have "ambient conditions."

This photo shows one section of the crawls space toward the front of the building. Not only do we see and uninsulated floor but also heating and drain pipes. The height of the crawl space is about 2ft, which is enough room to make this a workable space in order to improve it.
At this time, this space is so well ventilated that little of the moisture coming from this dirt floor is making its way into the building. If part of the solution for this building is to repair/seal the foundation walls, this dirt floor will need to be covered with a moisture barrier.

The addition sits on piles of stone and is also open to ambient conditions. One challenge here is the limited amount of space to work. Although the addition has the same heat loss and moisture concerns as the main building, improving this section of the building will need to be approached differently.

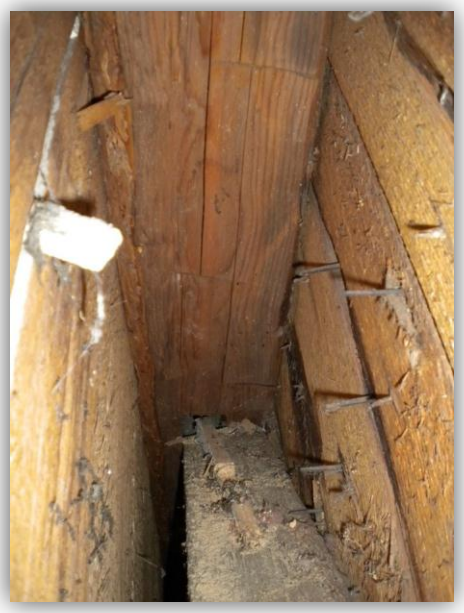
There are four objectives for this section of the building: (1) repair the foundation for structural longevity, (2) seal around the foundation to slow the stack effect and overall convective heat loss, (3) place a moisture diffusion retardant on the floor of the crawl space to try and minimize the amount of water vapor migrating into the building, and (4) slow the amount of radiant heat loss from the conditioned space above.

Exterior Walls:

Some general repairs need to be made to the siding and exterior trim. Below in the photo to the right, we see the clap boards have cracked and are pulling away from the building. From the attic space, day light is visible through these crack, which can allow for water infiltration. The photo to the left shows the bottom of the corner trim, which appears as though it has been cut and replaced with smaller sections in the past. This becomes a structural concern as the wood acts like a sponge and will transfer water to the frame behind. Before this is fixed, the source of this moisture problem needs to be addressed.

One of the first steps toward addressing this moisture problem will be to lower the ground level (grade) around this side of the building. Because stone and masonry can absorb moisture, the wood siding and frame of the building can still be faced with a moisture problem even if it is not in direct contact with soil and vegetation. Therefore, it will be important expose the granite around these higher grade sections as much as is reasonable. Bringing the depth directly next to the foundation even further than the finish grade and filling it with crushed stone will not only help drain water away from the granite but also will reduce splash-back from dripping eves. For added effect, drainage pipes could be laid down before the crush stone and run beneath the grass to drain in a discrete location.

We were able to see into the exterior wall in a few different locations and found that there is no insulation. Any empty wall cavities could be filled with cellulose insulation.



This photo was taken from the attic above the addition and shows the exterior wall of the original building. This wall is located in the hall behind the stage. Because most of this wall abuts unconditioned space, it should be thought of as an exterior wall and also insulated.

Ceilings and Attic:

Most of the ceilings have been insulated with loose-fill cellulose insulation.

As this photo indicates, there were some sections of the addition ceiling that were missed.

The photo to the right indicates how much of the ceiling may have been insulated. In many areas that we inspected, there were a few inches of cellulose on top of the finished ceiling, several inches of dead space until the attic floor boards, and then a few more inches of cellulose. This air gap between the layers of insulation is far less effective than having a single depth of insulation as convection currents can form from around the edges, and convective heat loss from cracks and gaps in the finished ceiling will inevitable be more prevalent.

The photo to the right shows electrical penetrations in the ceiling, which indicate one of the many ways for conditioned air to pass into the attic space. Other areas that will need to be sealed are as follows: the tops of the exterior and interior walls, around the chimneys, hot water pipes, and so forth.

This photo indicates the most challenging source of air passage between the conditioned space and the attic. The ceilings have been finished with wainscot boards. This is not just a challenge along the edges, but the entire field of the ceilings. What may be the least expensive way to address this would be to put a polyethylene vapor barrier against the ceiling, then fasten and finish sheetrock to the ceiling. The perimeter of the ceiling would need to be sealed, then crown molding could be installed for a decorative finish. At this point, the floor boards in the attic would be removed in order to eliminate the air space, and then blow more cellulose insulation on top.
The only other effective option would be to remove the floor boards and cellulose from the attic, spray the top side of the finished ceiling with a thin layer of closed-cell spray foam insulation, and then blow the cellulose back into the space while adding more material. The desired R-value goal for these ceilings should be R-60.

Seen in this photo is an exhaust vent that ends after entering the attic space. This, and any other exhaust, needs to be run to the exterior of the building.

Doors and Windows:

There is some restorative work that needs to be done to these windows. Part of this includes resetting panes of glass with glazing compound. This photo indicates one such window. Doing this will not only help prevent this original glass from falling out and breaking but also serves to reduce air infiltration. Replacing windows in a building usually is fairly low on a prioritized list of energy improvement recommendations, and this holds true for this building. This is because the cost of window replacement projects tend to be substantial, while the amount of energy saved is less significant. The result can be a 20 or more year return on such an investment. The historic value of the current windows may also place limits on this option. However, it is important to make sure that the current windows perform as well as possible. This means making sure that they are well-sealed when they are closed. One important measure for accomplishing this is with high efficiency storm windows. The efficiency of older storm windows is minimal when compared to modern high efficiency storm windows, which allow for minimal amount of air infiltration and can be ordered with a low-e coating to further increase efficiency by reflecting some of the radiant heat loss back into the building.

Replacing the doors of this building may also be a limited option due to historical preservation reasons. Besides, given the other conditions of the building envelope, replacing the doors would not have a large impact. The front doors of this building, seen to the right, have been replaced with custom built, solid wood doors. Though uninsulated, these doors appear to have been well-built and well-installed; however, they could be made to offer a better air seal. Some daylight was visible from the interior, and some of the weather stripping on the exterior could be made to fit tighter.

The door at the ramped entrance has been replaced with an insulated unit, and the door to the boiler room is insulated as well. Aside from these, there are only two other doors in this building, both entering the addition at the rear. Replacing these doors with insulated units will not be a priority until other building envelope issues are addressed. Even with this done, replacing them with solid wood, historic replicas would not have a substantial effect on heat loss in terms of insulative value. Instead, make sure that these doors are well-sealed when closed as reducing air infiltration will have the single largest effect.

Mechanical:

The building is heated with a Liquid Propane (LP) fired, closed combustion boiler. This model (CSC200) is rated with a combustion efficiency of 83% and can produce 167,000 BTU's per hour. This is twice the heat output that would be needed in a well-sealed and insulated structure of this size and use. Replacing this unit now, with a high efficiency modulating/condensing LP boiler could reduce LP usage by 12 to 15% and would be an investment that could pay for itself in savings within 10 years. That said, replacing this boiler is not as high a priority as making improvements to the building envelope. Instead, there are boiler controls that could be installed to make this boiler run more efficiently. The most import boiler control would be an "Outdoor Reset." An outdoor reset, or modulating aquastat, functions by monitoring the outdoor temperatures and automatically adjusts the temperature set points of a boiler. For example, on the coldest days of a NH winter, the temperature of the water sent to baseboard radiators will most often not need to be greater than 180°F. If the outdoor temperature is only 50°F, the boiler may only have to send 160°F water to the baseboard. Many types can also stage multiple boilers and help reduce short cycling. Outdoor Resets, in conjunction with an indirect hot water heater, will also reduce stand-by losses. Installing one of these units is an affordable solution and can reduce fuel usage by 10%-20% on a yearly basis.

This heating system is equipped with a bit of a rarity. Seen in the photo to the right is a small tank filled with food grade antifreeze. This system seems to create a constant pressure on the piping, when normally this is done with regular well water and a fill valve. If the water pressure drops, this diluted mixture is what is used to supplement the line fluid.

The reason this system is needed is that much of the piping runs outside the conditioned area, below the building (see page 12), and in the attic (as seen in this photo). The result of needing this system is not only the cost of more active maintenance but also a large source of heat loss and therefore heightened gas usage. With the crawl space air sealed and insulated from ambient conditions, it would be then worth rerouting the piping from the attic to the crawl space. The piping would still need to be insulated, but if the crawl space air sealing and insulation was done well, there would no longer be a threat of freezing, unless the boiler itself shut down. Whether or not this coolant system was to be left in place after moving the piping, the savings from reduced heat distribution loss would be substantial.

All of the piping within the boiler room should be insulated as well.

Any penetrations from the mechanical room need to be sealed as well—for heat loss purposes and for safety.

Though a much larger initial investment, the heat delivery system could be upgraded as well. The radiators seen in the photo to the right could be replaced with either panel radiators or with radiant tubing beneath the floor. Both of these options are ideal for heating a space with much lower temperature water.
The next option to consider would be to install an air handler and ductwork in the crawl space, which would be supplied heat via the boiler. Given the sporadic use of this building, it would also beneficial to be able to raise the temperature of the space more quickly. This could be accomplished with a forced air system. This type of system would also be a great option for incorporating a heat recovery ventilation system or HRV. More about HRV's is described later in this report.

We were unable to determine why these two thermostats were located next to each other. Regardless, replacing the current thermostats with new digital/programmable units will add greater control, reduce human error, and save money. Appropriate time and temperature settings can be discussed during the presentation of this report.

There are two sources of potable water in this building. The photo to the right shows the indirect hot water heater located in the boiler room. The other hot water heater is an electric hot water heater located in the front of the building, which is discussed in the next section of this report.
This unit should be left in place as it will add efficiency capabilities to an outdoor reset; it could, however, be wrapped in additional insulation for added performance.

Electrical:

The electric usage for 2009 is relatively low considering that this space is not used on a daily basis. However, there are still opportunities to reduce this cost.
The picture to the right shows a space beneath the building (at the front) that was dug out for space to house the well pump and an electric hot water heater that services the two lavatories at the front of the building. This hot water heater could be replaced with a high efficiency unit or, at the minimum, wrapped with insulation.

Making use of more efficient lighting options is a great way to reduce the baseline electric usage. Replacing all the incandescent bulbs with compact florescent (CFL) or LED units is a great first step towards addressing electric tied to lighting needs. Also, invest in outdoor LED options for lights that may be left on during the night year round. The more a light is used, the more important it is to use the most efficient source available.

Figure 1 shows a new addition to the building's electric load, and if it is not managed appropriately, it will substantially add to the electric bills.
Several used refrigerators and freezers were donated to the Town for the purpose of improving this building's capability to serve as the community's emergency center. Lining one wall in the kitchen addition, these units will be able to run in the case of an extended power outage. This will be possible with electricity from the new generator being installed onsite. While this is a great benefit to the security of the residents in the event of an emergency, the cost to keep these all plugged in when not needed, will be a burden.
At the time of our building inspection, we found all of these units plugged in and operating. All were found to have few contents. What is normally kept in this building should be kept in the newest refrigerator/freezer, while all other units should be unplugged and left ajar to prevent mold growth within.

Figure 1

Health, Safety and Comfort:

While preparing an insulation quote one of our contractors tested for and found lead on the backside of a paint chip. Although the test was limited in scope, the building should be assumed to contain lead paint in other areas unless otherwise proven. Information about the risks of lead paint can be found at the EPA's website: http://www.epa.gov/lead/

There were some signs of pest intrusion. Animals, such as mice and bats, can emit harmful gases from their droppings and are commonly found in a building like this. It is important to address such issues immediately should they arise. The first line of defense is always to eliminate access points into the building. Mice and bats are an important part of our ecosystem. Bats in particular are very beneficial and have been faced with many human-made challenges, and their numbers are dwindling as a result. As beneficial as they are, they do not belong in our buildings, which need to be sealed or well-screened in order to keep them out. Bat boxes on the property are a great option for keeping these important creatures on the grounds of this building.

There were no signs of major mold growth in this building. Any moisture issues that should occur need to be addressed right away, always beginning by eliminating the source of the moisture.

Any building, whether a residence or a place of business, needs to offer regular fresh air to the people living and working in these structures. The standards for how much fresh air to introduce vary depending on the use, size, and number of occupants in the structure. In some cases, this means introducing a continuous amount of air measured in cubic feet per minute (CFM). Other cases require a measured number of times per hour that the total volume of air is changed. If air-sealing and insulation work is completed on an existing building, it may leave the building providing inadequate amounts of fresh air. If an existing fresh air supply system was designed and installed well, meeting the requirements for the particular building based on square feet, use type, and number of occupants, than air-sealing projects should only serve to eliminate excessive ventilation. A blower door test would determine how tight the building is as a result of the efficiency upgrades, if there is a need for additional fresh air, and how much air to introduce.

Whether installing a fresh air supply system for the first time in a building, or wanting to make an existing system more energy efficient, the most effective way to provide fresh air in either case would be with a heat recovery ventilator (HRV) or an energy recovery ventilator (ERV). These units can be installed in a few different ways which vary where they pull stale air from, and where the fresh air is introduced to. In the case of integrating HRVs or ERVs into an existing forced-air distribution system, they will function by removing a percentage of the stale air from the return plenum, and then introducing charged, fresh air to the return plenum right before the air-handler. In the winter, warm/stale air being removed from the building will charge the incoming fresh air with a heat exchanger located inside the device. Conversely, in the summer months the exhausted cool/stale air from the interior will cool down the hot/humid air from the exterior before entering the air-handler. An ERV has a desiccant wheel as well. This allows for the transfer of moisture and recovery of some of the latent energy otherwise lost by expelling the moisture in the air. In the winter months, some of the moisture in the exhaust air will be transferred to the incoming dry air to help maintain occupancy comfort. In the summer,

dry/conditioned air from the interior will remove, at least a portion of, the moisture from the humid incoming air - see Figure 2. Typically, the benefits of an ERV are best realized in areas of high summertime humidity such as in the Southern and Southeastern regions of the US. Subsequently, HRVs are usually installed in the Northeast where humidity levels are generally lower. There are however conditions that may warrant an ERV such as in cold climates if there are few occupants (sources of humidity) in a large drafty building. The ERV may help to maintain more comfortable humidity levels.

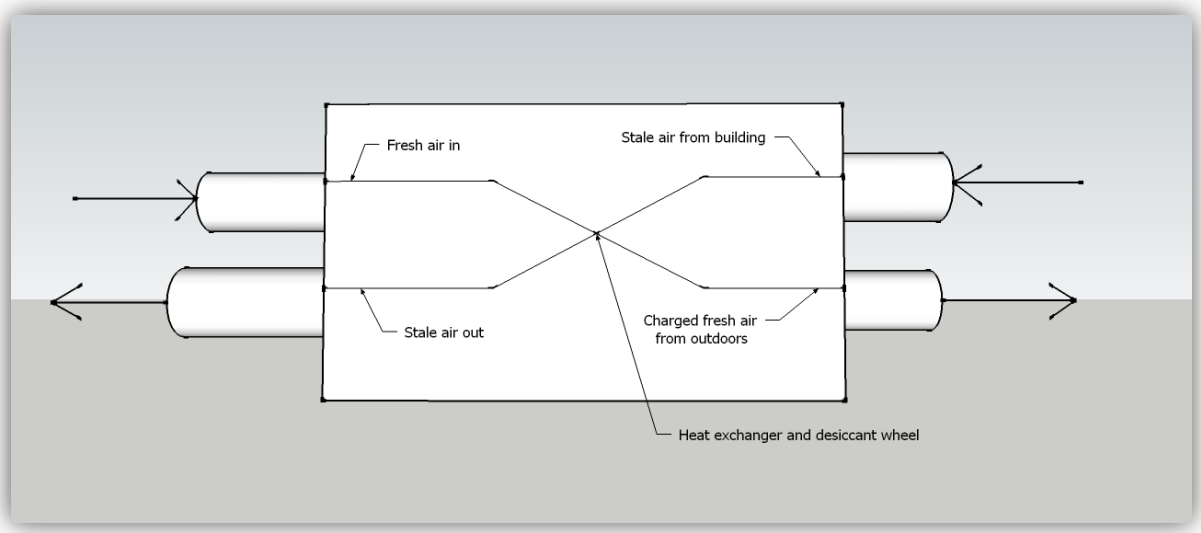


Figure 2

General Recommendations:

Foundations, Floors, Crawl Spaces:

- Make any necessary repairs to the granite foundation, including filling all gaps in preparation for further air sealing.
- Make sure that the wooden frame, siding, or trim is not in reach of soil, vegetation, or any source of moisture.
- Place a durable well-sealed vapor barrier on the dirt floor beneath the main building and the addition. A preferred material would have a reflective surface, facing up towards the underside of the building.
- Air seal and insulate the inside of the foundation, including the band joist using polyurethane spray foam.
- The space beneath the addition is shallow and difficult to access. It may be best insulated by attempting to fill this space (or at least the first 2ft along the outer perimeter) with closed-cell spray foam insulation. After the insulation cures, it should be protruding out from the edges of the building. This excess material would need to be trimmed and a durable finish (weather/pest resistant) applied to the surface that reaches 1ft below grade.

Exterior Walls:

- Make any necessary repairs to both the siding and the trim of the exterior. While making repairs to the rear gable of the main building, install an attic vent for added ventilation.
- Fill any empty wall cavities will cellulose insulation. This would include the wall that separates the original building from the addition.

Ceilings and Attic:

- See the "Priority Energy Efficiency Measures" portion of this report.

Door and Windows:

- Make any necessary repairs to the windows; then install high efficiency storm windows that have a low-e coating.
- Make sure that all of the doors provide a good air seal when closed using high quality weather stripping and door sweeps.

Mechanical:

- See the "Priority Energy Efficiency Measures" portion of this report.

Electrical:

- Replace as many lights as possible, indoors and out, with LED options, especially high use fixtures. At a minimum, replace with CFL bulbs.

- Consolidate stored food into the most energy efficient refrigerator/freezer—unplug and leave the others ajar until needed.
- Installing a photovoltaic solar system on site, either to meet the needs, or supplement the costs of electricity is always recommended. While mounting such a system on the roof of the building may not be an option, there may be an appropriate location onsite for a ground mounted system. Options for funding such a project are given in the next section of this report.

Health and Safety:

- If warranted by the results of a post insulation and air sealing blower door test, install an HRV unit ensuring an adequate number of air exchanges per hours for those working or doing business in this building.
- Address any pest or moisture issues that may arise, always by first eliminating the source or access of such unwanted problems.

Financial Considerations and Options:

A common occurrence across many communities within New Hampshire is the challenge of obtaining the necessary capital funds to carry out the recommended retrofits found within the audit. The following information is an attempt to provide some assistance with understanding some concepts and pathways to acquiring public or private funds to carry out an energy efficiency or generation project. Also, portions of the following information have been taken from the New Hampshire Handbook on Energy Efficiency and Climate Change – Volume II.

New Hampshire Energy Technical Assistance and Planning (ETAP):

ETAP is a NH specific program funded by the American Recovery and Reinvestment Act (ARRA). This federally funded program is being administered by the NH Office of Energy and Planning, and is designed specifically to aid NH municipalities as they plan for and implement measures to reduce municipal energy costs.

The highly experienced ETAP team is eager to provide this assistance to your community, but you must sign into the program before mid-2012. Your community will not be required to write a proposal, and there are not charges for these services. It is important to remember that participating in any program will require time from municipal staff. The hours needed would likely run parallel to the size and complexity of the project your community wants to endeavor.

For inquiries on how your community can receive assistance from this valuable program, you will need to contact the ETAP Technical Assistance Coordinator, Eric Halter, at 603.225.3060. You can also get started by directly contacting your Regional Planning Commission (RPC). A full list of NH RPC's is provided below.

Central New Hampshire RPC - 603.226.6020

Lakes RPC - 603.279.8171

Nashua RPC - 603.424.2240

North Country Council - 603.444.6303

Rockingham RPC - 603.778.0885

Southern New Hampshire RPC - 603.669.4664

Southwest RPC - 603.357.0557

Strafford RPC - 603.742.2523

Upper Valley Lake Sunapee RPC - 603.448.1680

NH Community Development Finance Authority (CDFA) – Municipal Energy Reduction Fund:

The NH CDFA was awarded $1.5 million through the Regional Greenhouse Gas Initiative (RGGI) to establish a revolving loan program in order to aid NH municipalities wishing to make their building stock more energy efficient. These loans are structured based on the amount of energy a given project will reduce, and terms/rates are flexible.

Municipalities can register and apply online at:
www.nhcdfa.org/web/erp/merf/merf_overview.html

For questions regarding this program, contact Cassandra Bradley at 603.717.9114 – cbradley@nhcdfa.org

NH PUC – Commercial and Industrial Renewable Energy Rebate Program:

The NH Public Utilities Commission has created a rebate program for renewable energy systems that is available to Local Governments. Participants will need to have a "Level II" audit performed, and some of the energy efficiency measures implemented prior to being eligible for receiving the final rebate. This is a great opportunity for municipalities who are interested in installing a renewable energy system to receive a similar type of aid previously only available in residential and commercial applications.
There is a maximum incentive, and funding is limited, which means that municipalities will have to carry much of the cost. Participants need to fully understand and follow the project guidelines.

For questions regarding this program contact:
Kate Epsen
NH PUC
603.271.2431
kate.epsen@puc.nh.gov

More information can be found online at:
http://www.puc.nh.gov/Sustainable%20Energy/RenewableEnergyRebates-CI.html

Utility Programs:

Dorchester is served by NH Electric Cooperative. Many utilities provide technical and financial assistance for various types of efficiency measures that can be carried out at a municipal facility. Some programs offer the opportunity for municipalities to go forward with the installation of approved measures at no up-front cost to the municipality. A town simply pays for the energy improvements with the savings from reduced energy usage until the project is paid off. Contact your utility provider to discover ways in which they can assist your municipality in reaching its energy efficiency goals.

For NH Electric Coop Customers:

- Contact Member Solutions at 1.800.698.2007
- Visit - www.nhec.com/energy_efficiency_programs.php

Additionally, a terrific resource for monitoring and understand what type of incentives are available for both energy efficiency and generation is the "Database of State Incentives for Renewables & Efficiency", or DSIRE. This site, funded by the US Department of Energy, provides a list of the potential financial incentives found within New Hampshire and the Federal Government. To see what is available within New Hampshire go to www.dsireusa.org and click on New Hampshire.

Third-Party Financing Options:

The most important part to understanding the potential in third-party is the ability to address up front capital costs and access tax benefits. Additional benefits are potential operations and maintenance savings where the implementation is owned by a third-party. In the three-party model, new businesses create an income stream and take over the insurance, performance assurance, and maintenance of the renewable energy system. New jobs and local investment follow. The business secures stable and long-term funding enabling expansion to other facilities for similar projects.

There are several benefits that appear for the municipality that is considering a third-party financing strategy.

Ability to Monetize Federal Tax Incentives. Federal tax incentives for some projects can equal 30% of the installed capital cost. Under the current law, this 30% is payable in the form of a grant from the Department of Treasury. In addition, businesses can accelerate the depreciation of the cost of some systems and installations using a five-year schedule. Together, these two incentives can have a tremendous impact on both the cost of and the financial returns on a project. Local governments, however, cannot directly benefit from these incentives. The third-party ownership model introduces a taxable entity into the structure that can benefit from the federal tax incentives, lowering the overall cost to the non-taxable entity.

*Low/No Up-front Cost*s. Even with programs to provide support to municipalities, such as rebates and grants, the need to reduce this amount, the up-front cost is significant.

Given the current economy and budget constraints, a large initial investment is difficult to achieve regardless of the return on the investment. A third-party structure places the responsibility of the increased initial cost on to the investor/developer of the project.

Predetermined Energy Pricing. In a project that involves efficiency or distributed generation, the portion of conservation or generation that is met by the project can be considered "fixed" at a particular price in the terms of the contract. This can be in the form of a fixed-priced power purchase agreement (with a predetermined escalation rate). This predictability offers stable pricing for the portion of the entity's load served by the project. In most cases, the price of electricity in power purchase agreement is usually set at or below the customer's current retail rate for the first year, and then escalates annually for term of the contract (in a solar PPA, these terms are usually 20 – 25 years). For solar projects, an annual price escalator of 3-3.5% is common.

Operations and Maintenance. Another attractive feature of the third-party ownership structure is the fact that new equipment can result in lower operation and maintenance expenses and in the case of some systems, the entire cost and responsibility can shift to the project developer.

Eventual Ownership. As a final issue, third-party structures can be pre-crafted to permit and even encourage local government buyout provisions. This allows the municipality to consider advanced purchase options if circumstances change in a way that makes this pathway more beneficial. If for instance a grant program becomes available, such funds can be used to accelerate the ownership path and provide for a more immediate "vesting" of full savings opportunities.

Otherwise, these arrangements usually provide for a number of options at the end of the term, the three likely scenarios for the host would be to: 1) extend the arrangement, 2) purchase the facility, or 3) ask that the improvements be removed.

Energy Price Stability:

The second most important concern about energy costs is the volatility. Municipalities budget on a yearly cycle and must predict energy costs over the year – sometimes over pricing the cost in the case of high lock in prices or subjecting the municipality to risk where a cost (+ some percentage) contract is used for the year. When prices go up budgets go up, when the go down, budgets tend to go down. Changes result is wide variation in predictability and thus lead to fund shortages or balances, and general frustration on all sides of the discussion.

The concept of stability in the context of energy prices is achieved through on-site distributed generation with effective predictive modeling and most importantly, efficiency. The cheapest energy available is the energy you don't need. The less you buy the less amount of appropriations are subject to the price swings.

The follow Table and three Graphs were retrieved from the U.S Energy Information Administration website, were included in the 2010 Annual Energy Outlook, and are a clear indications of the fact that energy costs will continue to rise over the long term. It is extremely difficult to predict how quickly the cost of energy will escalate as there are too many economic, political, resources, etc. variables that influence these prices. Some years energy cost may be much lower than predicted, and some years may be much higher. The one thing that appears to be certain is that the cost of energy in the decades to come will pose great financial burdens on NH municipalities and their tax payers if no steps are taken to prepare for this forecast.

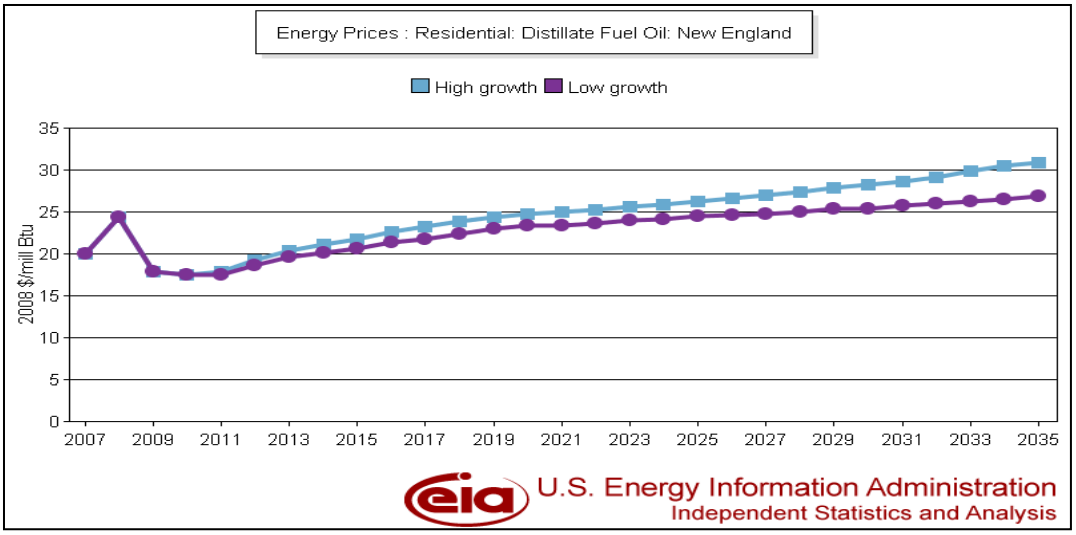
For more information on the history of energy prices and how energy cost projections are calculated, please visit: http://www.eia.doe.gov/analysis/

Price Summary

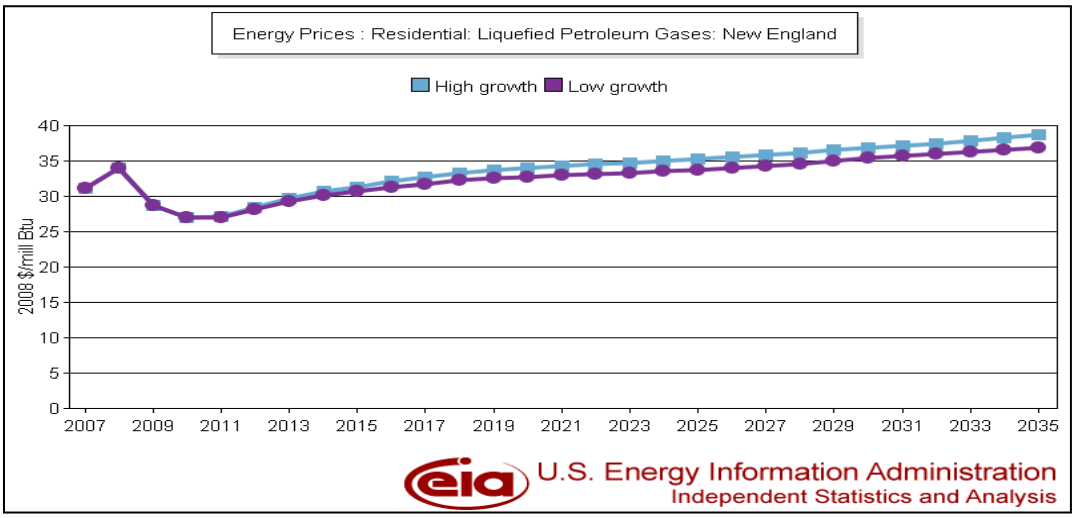
	Year				Percent Change		
	2009	2010	2011	2012	09-10	10-11	11-12
WTI Crude[a] ($/barrel)	61.65	79.40	93.26	97.50	28.8	17.5	4.5
Gasoline[b] ($/gal)	2.35	2.78	3.15	3.30	18.4	13.4	4.8
Diesel[c] ($/gal)	2.46	2.99	3.43	3.51	21.5	14.7	2.4
Heating Oil[d] ($/gal)	2.52	2.97	3.41	3.55	17.5	14.8	4.3
Natural Gas[d] ($/mcf)	12.12	11.17	11.29	12.01	-7.8	1.1	6.3
Electricity[d] (cents/kwh)	11.51	11.58	11.65	11.74	0.7	0.6	0.7

[a] West Texas Intermediate. [b] Average regular pump price.
[c] On-highway retail. [d] U.S. Residential average.

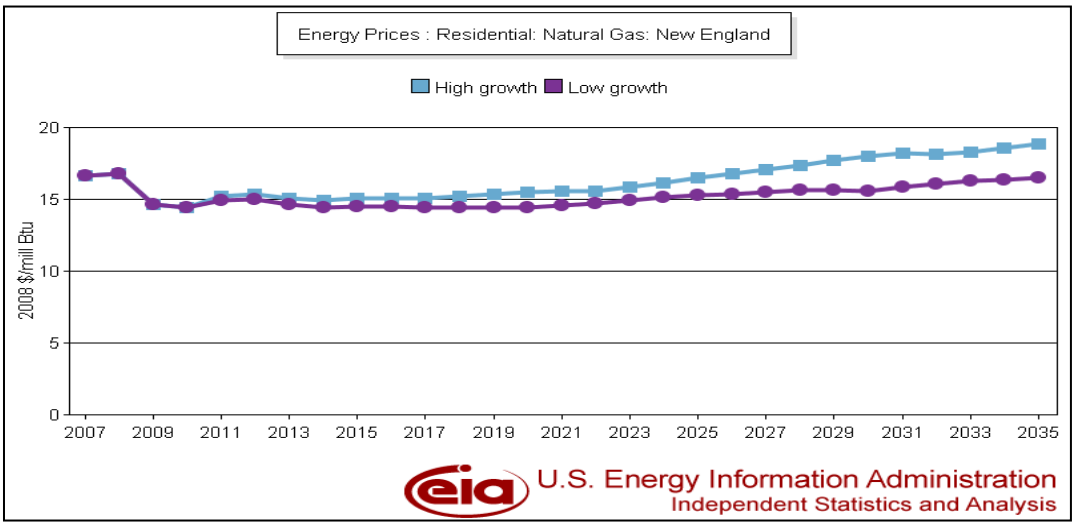
Table 1 – Retrieved from US EIA website



Graph 1 - Retrieved from US EIA website



Graph 2 - Retrieved from US EIA website



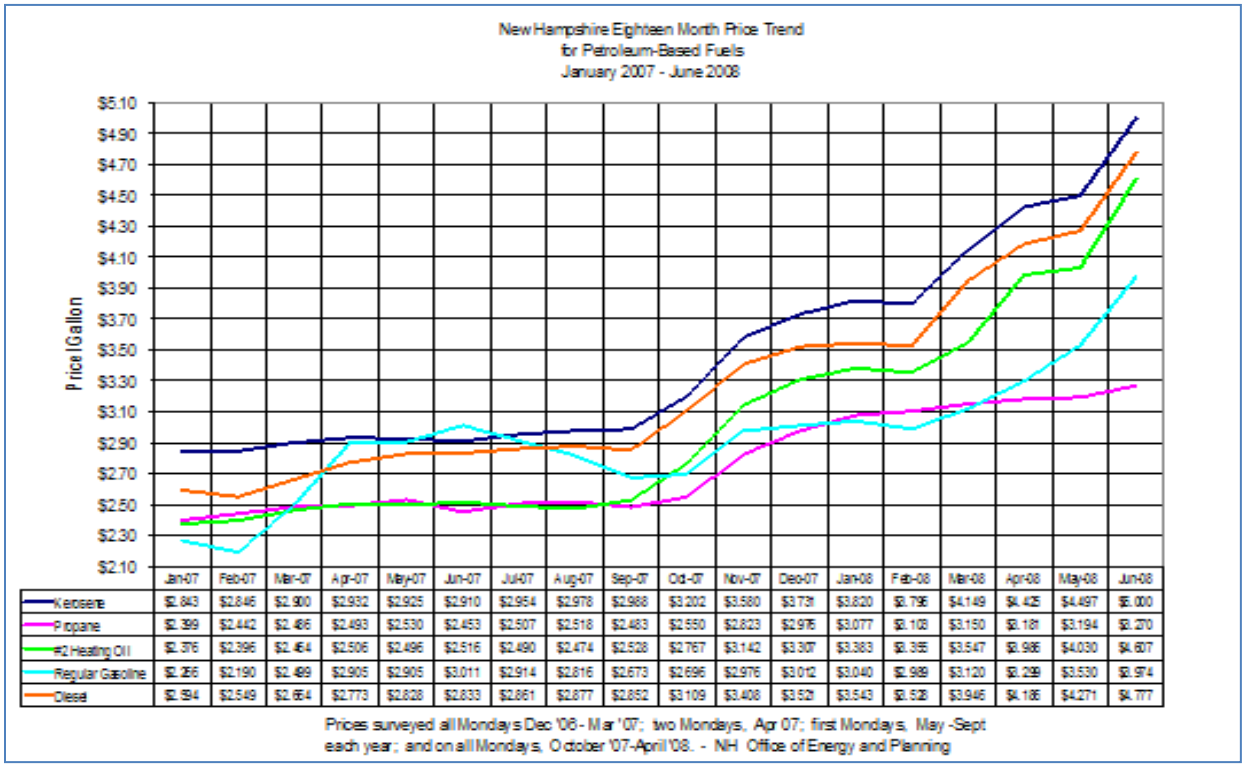
Graph 3 - Retrieved from US EIA website

The following three Graphs (retrieved from the NH OEP website) show average prices in NH for liquid fuels beginning in January of 2007 and end in December 2010. These graphs help to illustrate just how volatile the cost of energy is, and the steady rise of price regardless of occasional "spikes" or "dips" in the market. As unfortunate as the 2008 energy prices were, these types of events only serve to shorted the Return on Investment for those who implemented energy efficiency measure prior to their occurrence.

When considering the type of energy reduction project to implement, it is very important for Local Governments to look far into the future of energy costs, as municipalities will own and operate most of their building stock for as long as they may stand.

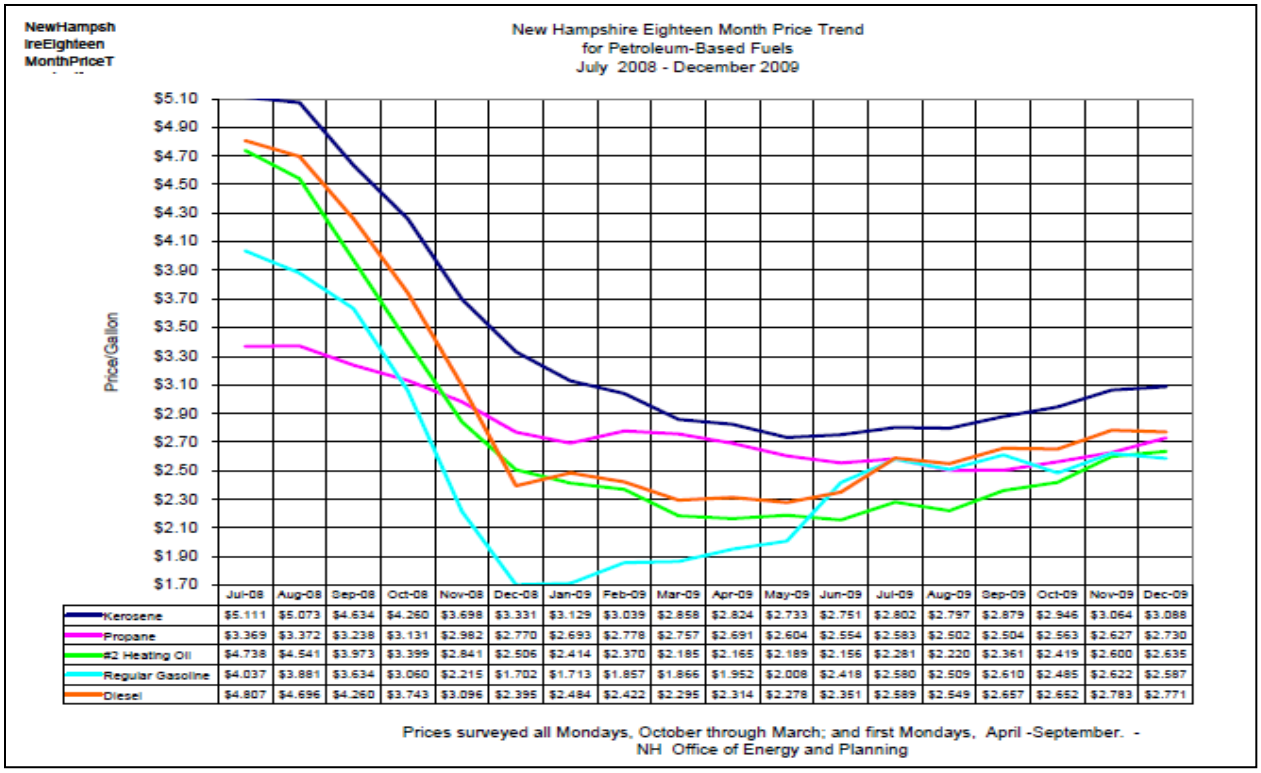
Projects such as air-sealing and insulating can be thought of as a different species of project and investment when compared to items like heat systems, appliances, and alternative energy systems. In the case of the latter, these types of energy investments have a shelf life. A boiler and a PV system may only last 30 years before it is time to replace them, even with careful maintenance and care. This is an important consideration when factoring in the true life cycle cost of the implemented solution.

Insulation and other building envelope projects are investments that are permanent, require little or no active maintenance, and will stand with the building during its lifetime. These investments secure baseline improvements that in turn provide a foundation for other investments. Lowering the amount of heat needed for a building is the best way to insure that a new and efficient heating plant is as small as it can be, providing the most savings.



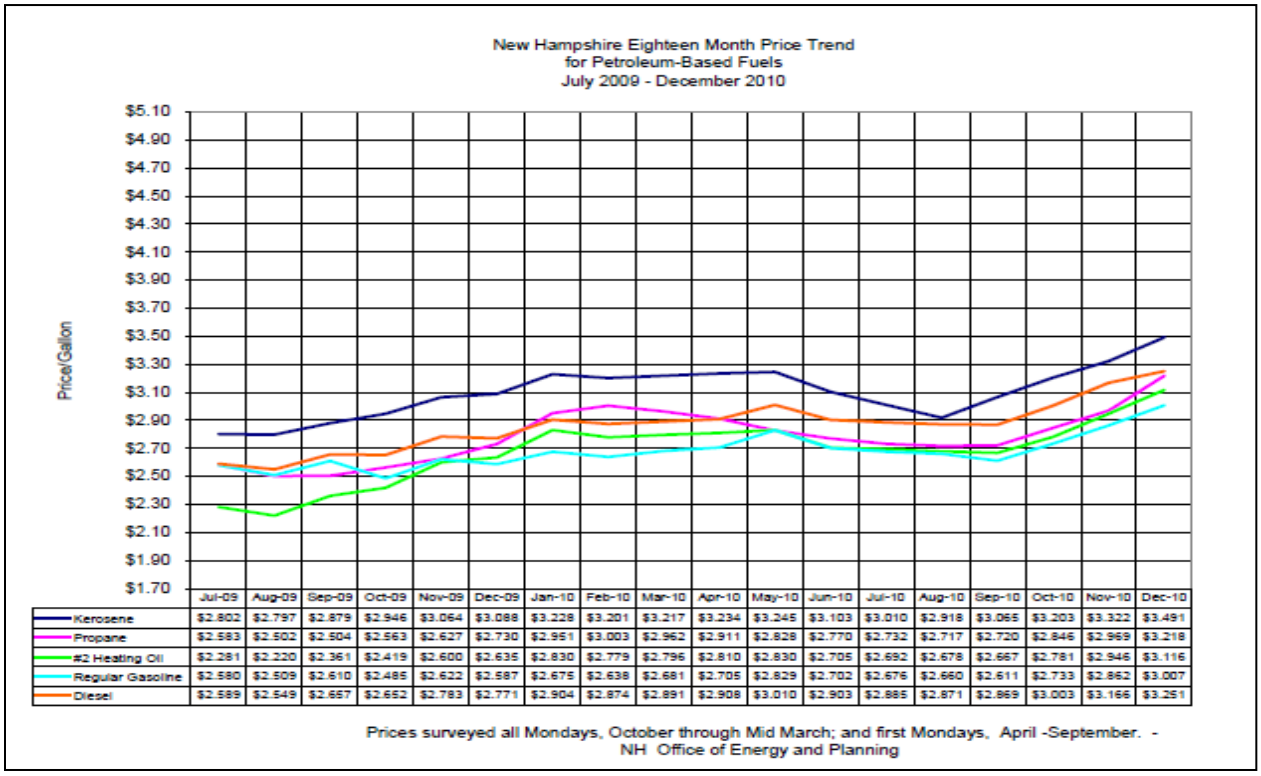
	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08
Kerosene	$2.843	$2.846	$2.900	$2.932	$2.925	$2.910	$2.954	$2.978	$2.988	$3.202	$3.580	$3.731	$3.820	$3.796	$4.149	$4.425	$4.497	$5.000
Propane	$2.399	$2.442	$2.466	$2.493	$2.530	$2.453	$2.507	$2.518	$2.483	$2.550	$2.823	$2.976	$3.077	$3.103	$3.150	$3.181	$3.194	$3.270
#2 Heating Oil	$2.376	$2.396	$2.464	$2.506	$2.496	$2.516	$2.490	$2.474	$2.528	$2.767	$3.142	$3.307	$3.383	$3.355	$3.547	$3.986	$4.030	$4.607
Regular Gasoline	$2.266	$2.190	$2.499	$2.905	$2.905	$3.011	$2.914	$2.816	$2.673	$2.696	$2.976	$3.012	$3.040	$2.989	$3.120	$3.299	$3.530	$3.974
Diesel	$2.594	$2.549	$2.664	$2.773	$2.828	$2.833	$2.861	$2.877	$2.852	$3.109	$3.408	$3.521	$3.543	$3.528	$3.946	$4.186	$4.271	$4.777

Figure 3 - Retrieved from NH OEP website



	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09
Kerosene	$5.111	$5.073	$4.634	$4.260	$3.698	$3.331	$3.129	$3.039	$2.858	$2.824	$2.733	$2.751	$2.802	$2.797	$2.879	$2.946	$3.064	$3.088
Propane	$3.369	$3.372	$3.238	$3.131	$2.982	$2.770	$2.693	$2.778	$2.757	$2.691	$2.604	$2.554	$2.583	$2.502	$2.504	$2.563	$2.627	$2.730
#2 Heating Oil	$4.738	$4.541	$3.973	$3.399	$2.841	$2.506	$2.414	$2.370	$2.185	$2.165	$2.189	$2.156	$2.281	$2.220	$2.361	$2.419	$2.600	$2.635
Regular Gasoline	$4.037	$3.881	$3.634	$3.060	$2.215	$1.702	$1.713	$1.857	$1.866	$1.952	$2.008	$2.418	$2.580	$2.509	$2.610	$2.485	$2.622	$2.587
Diesel	$4.807	$4.696	$4.260	$3.743	$3.096	$2.395	$2.484	$2.422	$2.295	$2.314	$2.278	$2.351	$2.589	$2.549	$2.657	$2.652	$2.783	$2.771

Graph 4 – Retrieved from NH OEP website



	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10
Kerosene	$2.802	$2.797	$2.879	$2.946	$3.064	$3.088	$3.228	$3.201	$3.217	$3.234	$3.245	$3.103	$3.010	$2.918	$3.065	$3.203	$3.322	$3.491
Propane	$2.583	$2.502	$2.504	$2.563	$2.627	$2.730	$2.951	$3.003	$2.962	$2.911	$2.828	$2.770	$2.732	$2.717	$2.720	$2.846	$2.969	$3.218
#2 Heating Oil	$2.281	$2.220	$2.361	$2.419	$2.600	$2.635	$2.830	$2.779	$2.796	$2.810	$2.830	$2.705	$2.692	$2.678	$2.667	$2.781	$2.946	$3.116
Regular Gasoline	$2.580	$2.509	$2.610	$2.485	$2.622	$2.587	$2.675	$2.638	$2.681	$2.705	$2.829	$2.702	$2.676	$2.660	$2.611	$2.733	$2.862	$3.007
Diesel	$2.589	$2.549	$2.657	$2.652	$2.783	$2.771	$2.904	$2.874	$2.891	$2.908	$3.010	$2.903	$2.885	$2.871	$2.869	$3.003	$3.166	$3.251

Graph 5 – Retrieved from NH OEP website

Average cost of various energy types in NH
Date - January 31st 2011

Heating Oil, credit	$3.463 per Gallon
Propane, credit	$3.549 per Gallon[1]
Kerosene, credit	$3.841 per Gallon
Electricity	$0.14260 per kilowatt-hour[2]
Natural Gas, first tier	$1.1305 per therm[3]
Natural Gas, second tier	$1.0622 per therm[4]

Figure 4 – Retrieved from NH OEP website

The table below estimates the cost of liquid fuel for this facility over a 15 year period. This is only an estimate, and is based on current yearly usage, NH price averages for January 31st 2011, with a 5% cost increase per year.

Current Fuel Usage				
Year	Energy Cost By Year	Yearly Increase	Total Accumulated Cost by Year	
		Escalation Rate	5.00%	
Year 1	$8,113.01	$405.65		$8,113
Year 2	$8,519	$425.93		$16,632
Year 3	$8,945	$447.23		$25,576
Year 4	$9,392	$469.59		$34,968
Year 5	$9,861	$493.07		$44,830
Year 6	$10,354	$517.72		$55,184
Year 7	$10,872	$543.61		$66,056
Year 8	$11,416	$570.79		$77,472
Year 9	$11,987	$599.33		$89,459
Year 10	$12,586	$629.30		$102,045
Year 11	$13,215	$660.76		$115,260
Year 12	$13,876	$693.80		$129,136
Year 13	$14,570	$728.49		$143,706
Year 14	$15,298	$764.91		$159,004
Year 15	$16,063	$803.16		**$175,067**

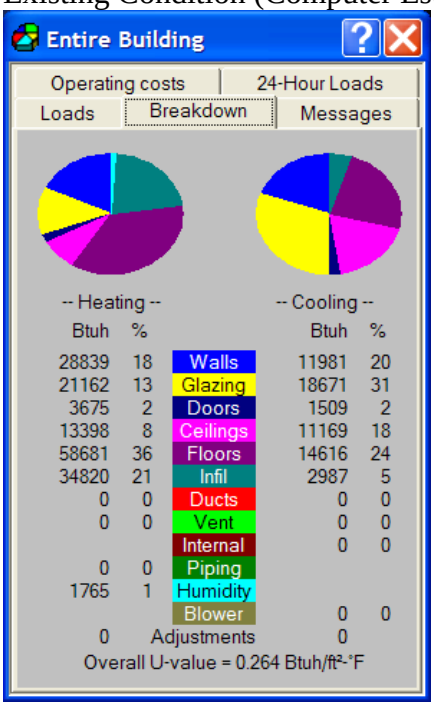
The table below estimates the cost of electricity for this facility over a 15 year period. This is only an estimate, and is based on current yearly usage, NH price averages for January 31st 2011, with a 5% cost increase per year.

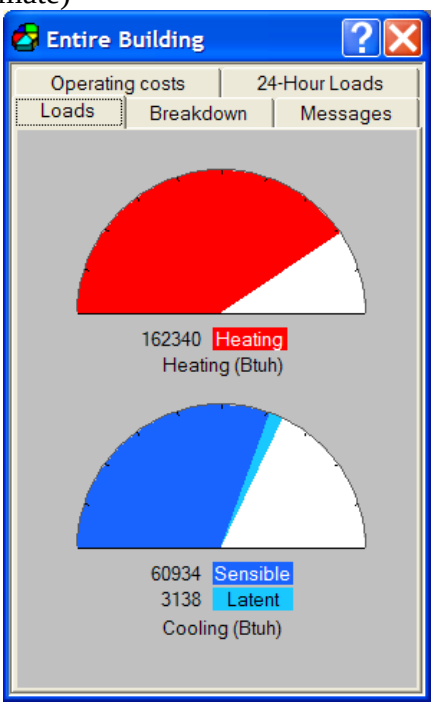
Electric Use - Current Usage				
Year	**Energy Cost By Year**	**Yearly Increase**	**Total Accumulated Cost by Year**	
		Escalation Rate	**5.00%**	
Year 1	$770.19	$38.51		$770
Year 2	$809	$40.43		$1,579
Year 3	$849	$42.46		$2,428
Year 4	$892	$44.58		$3,320
Year 5	$936	$46.81		$4,256
Year 6	$983	$49.15		$5,239
Year 7	$1,032	$51.61		$6,271
Year 8	$1,084	$54.19		$7,355
Year 9	$1,138	$56.90		$8,493
Year 10	$1,195	$59.74		$9,687
Year 11	$1,255	$62.73		$10,942
Year 12	$1,317	$65.86		$12,259
Year 13	$1,383	$69.16		$13,642
Year 14	$1,452	$72.62		$15,095
Year 15	$1,525	$76.25		**$16,620**

Modeled Energy Loads:

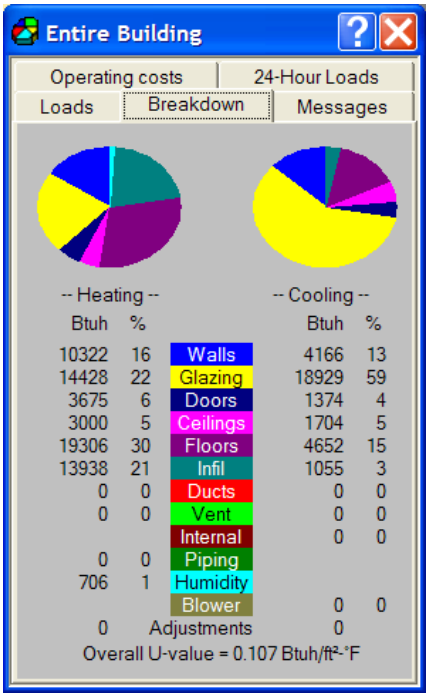
Energy loads provide the rate of heat loss (BTUs/hour) on the coldest expected day of the year. They are a useful baseline to make comparisons. Below are computer simulated heat loads for the building in the existing condition and if all of the thermally-related energy efficiency measures (EEM) where undertaken. The difference is striking.

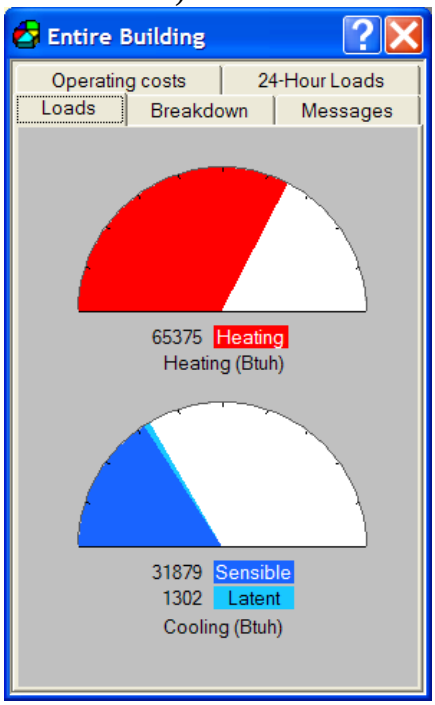
Existing Condition (Computer Estimate)





After Energy Improvements (Computer Estimate)





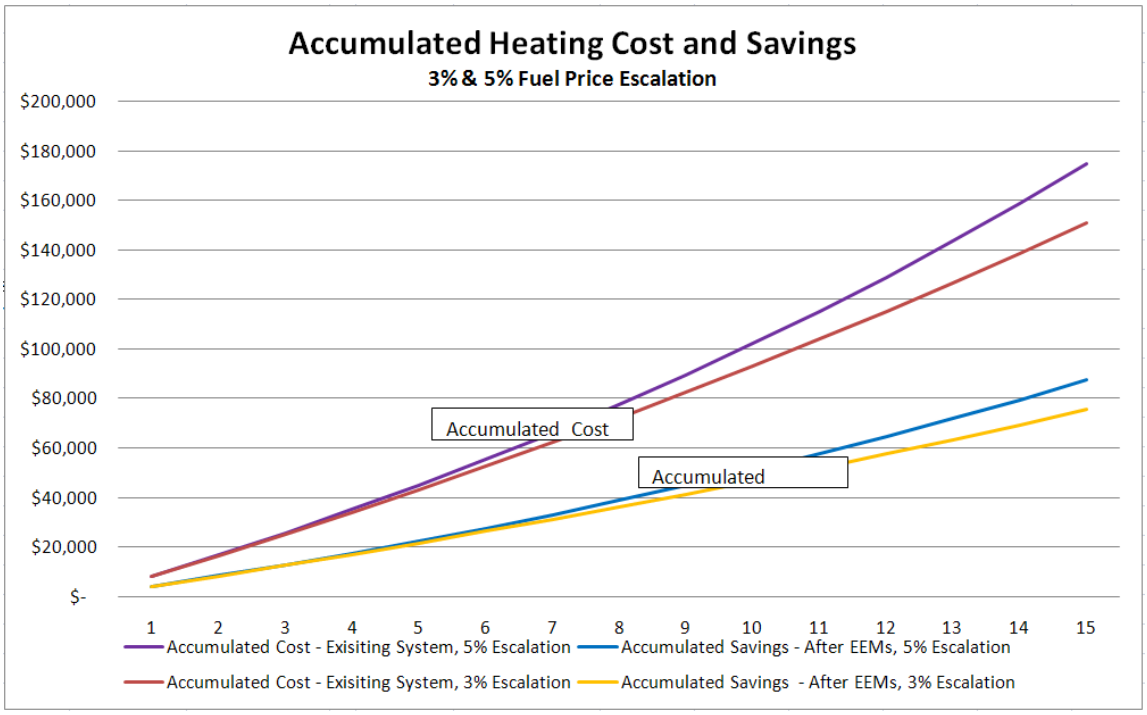
Priority Energy Efficiency Measures (EEM):

The following EEMs are listed by level of importance and cost effectiveness based upon our "what works" knowledge:

1. General Air Sealing (This includes air installing storm windows).
2. Insulate exposed pipes in boiler room.
3. Apply 1" of PU Spray Foam onto top of both ceilings (from attic).
4. Add 18" of blown-in fiberglass or cellulose (R60) to attic (old insulation removed).
5. Drill and blow-in cellulose into walls.
6. Cover dirt crawlspace beneath main room (and addition if possible) tape seams.
7. Apply 2" of PU Spray Foam on inside of foundation walls (Including foundation repairs to close gaps).
8. Install a boiler outdoor reset efficiency control to reduce boiler water temperature on milder heating days.
9. Add storm windows for convective loss reduction.
10. Install a Heat Recovery Ventilator (HRV) to provide adequate air exchanges.

Estimated Energy Savings:

Energy modeling software was used to determine the expected energy savings if the recommended building envelope improvement measures called out in this report are implemented. If they are, it estimated that the heat load will be reduced from 162,340 BTU/hr to 65,375 BTU/hr. When considering that hot water will be supplied year round this translates to an annual fuel for heating savings of approximately 50%.



Estimated Cost of EEM's:

Description	Cost	Comments
(14) Low-E Storm Windows	$4,020	Quality Insulation, Merideth, NH Quote # 606794
Insulation & Air Sealing (Walls, Crawl Space an Attics)	$ 14,040	Quality Insulation, Merideth, NH Quote # 606794
Create crawl space access	$ 500	Estimate
Foundation repair	$ 800	Estimate
Boiler Outdoor Reset Efficiency Control	$ 795	Estimate for Tekmar 260 installed.
Heat Recover Ventilator	$ 2,500	Estimate (Depending on degree of air sealing, this may or may not be required.)
Total	**$ 22,655**	

Simple Payback Period for EEM's:

If fuel prices remain constant, simple payback is estimated at $22,655 / ($3.55/gal x 2290 gal/yr x 50%) = **5.6 years**. Naturally, payback will be shorter with escalating fuel prices.

Conclusion:

As a result of this audit, the Town has a number of ways defined to increase the efficiency of the Town Hall. Not all of the energy saving recommendations for this building were included in the "Priority Energy Efficiency Measures." These smaller projects are items that can be implemented now, or chipped away at over time, and will certainly add to the long term energy savings. The priorities represent a great starting point for making the largest impact on energy savings, building durability, and occupancy health and comfort for this building.

Appendix:

1. Quality Insulation, Meredith, NH Quote # 606794

MASCO Contractor Services

Quality Insulation of Meredith
Lic #: NONE ON FILE
1 Pease Road Meredith, NH 03253-5506
Tel: (603) 279-3371, Fax: (603) 279-3321

WORK AGREEMENT

TO: CHRIC DUNDORF	**RE:** DORCHESTER TOWN HALL/INSULATION	
Address: 2 WASHINGTON STREET SUITE #206 DOVER, NH 03820	**Job Address:** 28 TOWNHOUSE ROAD, DORCHESTER, NH 03266	
Attn :	**Date:** 03/23/2011	**Expiration Date:** 06/21/2011
Tel: (603) 617-3767	**Estimator:** Delafontaine, Scott	**Quote #:**606794 **Version** 1 **Of** 1
Fax:		

Subject to the terms and conditions stated in this document, Contractor is willing to furnish to you all material and labor required for the Scope of Work described below:

Scope of Work (the "Work") to be performed:

Draft stop, fire block, fire stop (UBC 708.2.1 et seq., formerly 2516(f), or locally adopted equivalent), and fire rated caulking are not included within Contractor's Work unless specifically listed below.

CELLULOSE NOTICE. If cellulose is to be applied with a wet spray application, you must allow adequate time for it to cure and dry before installing drywall or other materials. The adequate time required varies depending upon climate, altitude and weather. Do not install vapor barriers, vapor retards, dry wall, or other interior finish until the material has dried to less than 20% moisture content. Time to cure will vary based on climate and weather. Be sure to schedule your trades accordingly.

Building codes may require a thermal barrier or ignition barrier be applied to the spray applied foam insulation. A thermal barrier or ignition barrier is not included within the scope of this agreement of work unless specifically listed below.

Plan#: ***Trade***: INSULATION

CEILING AREA FLAT	R-6.7 = 1 NOMINAL INCH CLOSED CELL FOAM R-60 STABILIZED CELLULOSE BLOW INSULATION
ATTIC WALLS	1 IN 2 LB FOIL RIGID BOARD R-13 STABILIZED CELLULOSE BLOW INSULATION
DRILL & BLOW EXTERIOR WALL	R-19 STABILIZED CELLULOSE BLOW INSULATION
BAND JOIST, BOX SILL, RIM JOIST	R-13.4 = 2 NOMINAL INCHES CLOSED CELL FOAM
BASEMENT EXTERIOR WALLS	R-13.4 = 2 NOMINAL INCHES CLOSED CELL FOAM
CRAWL SPACE CEILING	6M POLYVISQUEEN

Additional Information: PRICE INCLUDES LEAD SAFE PROCEDURES ON EXTERIOR WALLS. TESTED ON 3/22/11 AND TESTED POSOTIVE FOR LEAD PAINT.

Base Price: **$14,040.00**

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Plan#: ***Trade***: INSULATION

OPTIONS:
1. TO INSULATE HOT PIPE $4.05 PER S/F

2. INSTALL (14) HARVEY STORM TRUE CHANNEL LOW E GLASS WINDOWS WOULD COST $4020.00

Additional Information:

Base Price: