The New Hampshire Municipal Energy Assistance Program

Decision Grade Audit Report

New Castle Town Hall
49 Main Street New Castle, NH 03854

Prepared for:

Town of New Castle, NH

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Clean Air – Cool Planet

Sustainable Energy Resource Group

Vital Communities

Carbon Solutions New England

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The following report was generated as part of the 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 New Castle 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 New Castle.

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Introduction:

MEAP partners are pleased to provide this Decision-Grade Audit Report for the Town of New Castle and the Town Hall (hereinafter "the building"). This report discusses the findings and subsequent recommendations for energy efficiency improvements at the building. Included within this report are details regarding the walk-through and exploration conducted in the facility and examples that illustrate recommended building alterations and improvements that can reduce energy costs 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 participating in several State level funding opportunities for municipal energy projects. These funds distributed under the aegis of the ARRA (American Recovery and Reinvestment Act) are targeted specifically to towns and cities.

Prior to the audit process beginning, each selected municipality must carry out the MEAP energy inventory process. The inventory process is required in order to receive an energy audit. This report relied on those initial findings to help determine the most appropriate building to conduct an energy audit for, with the intent of maximizing the potential energy savings.

The Audit

The first stage of any audit process is understanding the nature of the system and the objectives of the audit. The use of the building and the Town's goals and objectives are the foundation of a solid audit. In most cases, these objectives combine environmental and economic goals. In the case of public buildings and facilities, comfort and safety are also primary concerns that help guide our analysis and recommendations.

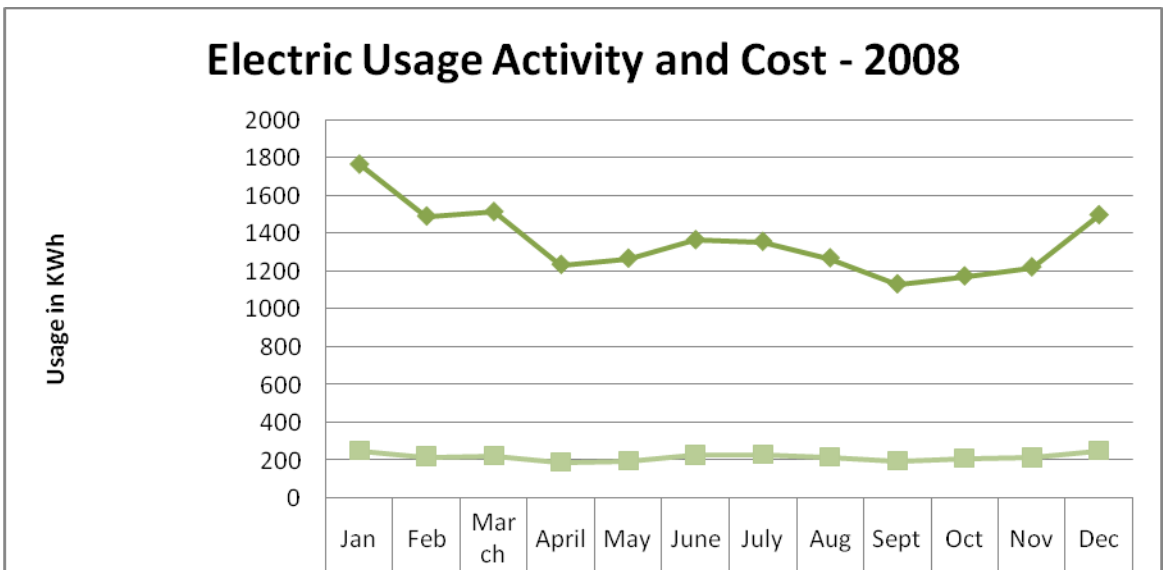
A decision grade audit involves an inventory of heating systems, quantification of energy usage (electrical and heating fuel), and the process of coordinating this information with the goals and objectives of the Town into a decision tool. Under MEAP we look to provide recommendations that will, if carried out, help the Town achieve at least a 30% reduction in energy consumption. The level of detail provided herein is meant to create the basis upon which investment grade audits and decisions can be made. The decision grade audit is meant to filter options and expectations so that the Town can understand the fundamental building system, how changes to the system can result in economic and environmental benefits and how those changes can interact with other policy and philosophical objectives.

The following information will describe the characteristics witnessed during the site visit and those areas of the building complex where improvements may be made. The objective of these recommendations is to create a series of options the Town can further explore.

<u>Energy Data Collection</u>:

The graph in Figure 1 shows usage trends and monthly energy costs for 2008. We see elevated usage during the summer months, likely due to the usage of air conditioning (AC) and a spike in usage during the winter months. The elevated usage during the winter months is likely occurring for a few reasons:

- During the winter months, lights are usually in operation for longer periods because of fewer hours of daylight.
- Usually occupants use more hot water in the winter months, and the domestic hot water (DHW) source is an electric water heater. Also, the water heater is outside the thermal boundary and none of the pipes are insulated; therefore, it likely takes more electricity to keep the tank warm during the winter, even if usage is down.
- The heating system draws electricity for pumps, fans, ignition, etc.
- Sometimes small electric space heaters are used to supplement heat where there is a lack of comfort due to envelope inefficiencies and zoning issues.
- There is an electric element heating a concrete fire proof room attached to the first floor. Precisely how much electricity is being drawn from this device is not known. Better insulating this room, however, and possibly heating with a different source, would certainly cut down on the winter electric bills.



	Jan	Feb	Mar ch	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Usage in KWh	1768	1493	1517	1237	1270	1368	1359	1272	1134	1176	1224	1500
Delivered Cost in $	252	221	224	192	196	229	230	218	198	210	216	251

Figure 1

*The data from Figure 1 was collected from the same data used to create the 2008 Municipal Energy Use Baseline Report and Action Plan. All data for July was missing, and only September kilowatt hours were available. SDES used averages to fill in the blanks.

Total cost for electricity in 2008: $2,637.00

The cost of electricity, as with all energy sources, is only predicted to rise over time. Though prices of electricity are affected by peak demand rates, Figure 2 does show a steady increase in the overall electricity rate (includes all rates) over the course of 2008.

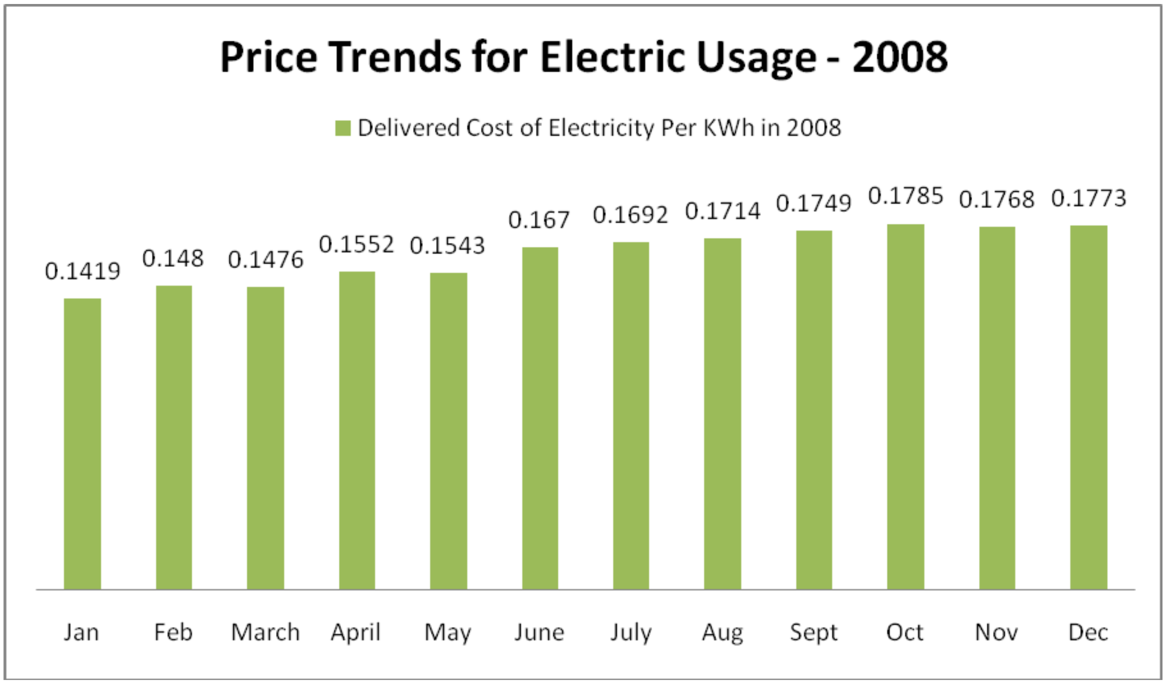
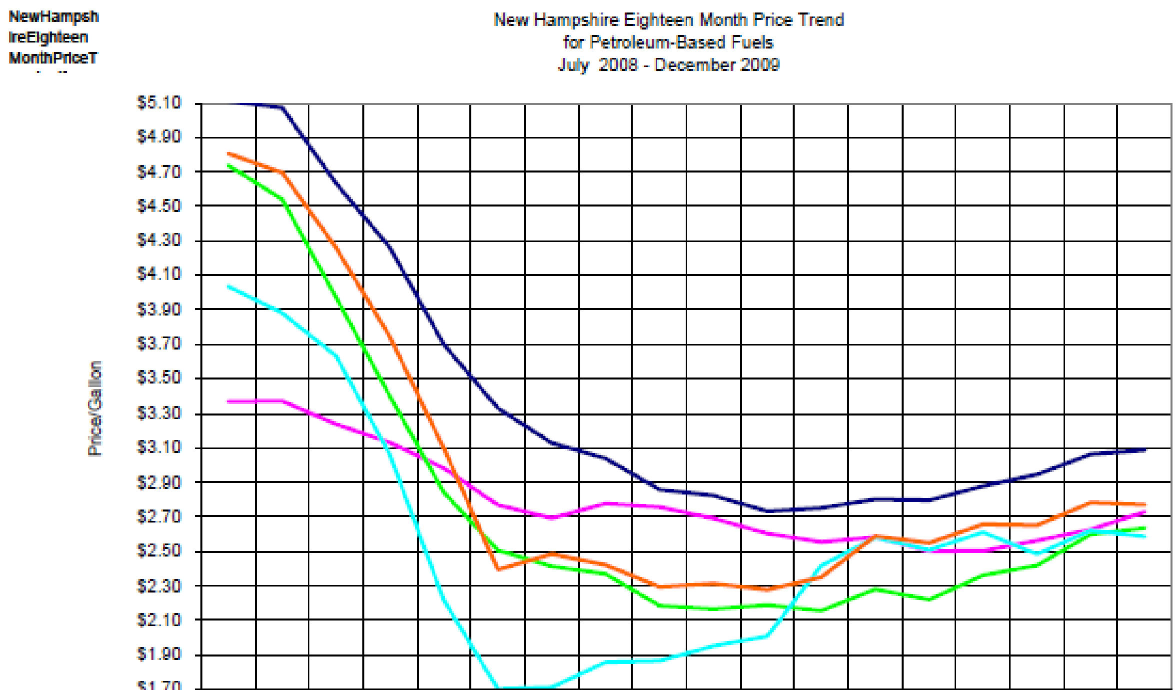


Figure 2

*The data from Figure 2 was collected from the same data used to create the 2008 Municipal Energy Use Baseline Report and Action Plan. All data for July was missing, and only September kilowatt hours were available. SDES used averages to fill in the blanks.

2009 Fuel Usage:

We were unable to obtain heating oil usage and costs from 2008; therefore, 2009 data has been examined. What is seen is a relatively large amount of oil used to heat the conditioned areas of this building. Figure 3 shows average NH fuel costs for the previous eighteen months including all 2009 averages. Figure 4 shows the amount and cost of oil delivered to the building. When comparing the two, clearly the cost per gallon delivered to the building was substantially higher than the state average for most of the 2009 deliveries.



	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09
Kerosene	$5.111	$5.073	$4.634	$4.260	$3.698	$3.331	$3.129	$3.039	$2.858
Propane	$3.369	$3.372	$3.238	$3.131	$2.982	$2.770	$2.693	$2.778	$2.757
#2 Heating Oil	$4.738	$4.541	$3.973	$3.399	$2.841	$2.506	$2.414	$2.370	$2.185
Regular Gasoline	$4.037	$3.881	$3.634	$3.060	$2.215	$1.702	$1.713	$1.857	$1.866
Diesel	$4.807	$4.696	$4.260	$3.743	$3.096	$2.395	$2.484	$2.422	$2.295

	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09
Kerosene	$2.824	$2.733	$2.751	$2.802	$2.797	$2.879	$2.946	$3.064	$3.088
Propane	$2.691	$2.604	$2.554	$2.583	$2.502	$2.504	$2.563	$2.627	$2.730
#2 Heating Oil	$2.165	$2.189	$2.156	$2.281	$2.220	$2.361	$2.419	$2.600	$2.635
Regular Gasoline	$1.952	$2.008	$2.418	$2.580	$2.509	$2.610	$2.485	$2.622	$2.587
Diesel	$2.314	$2.278	$2.351	$2.589	$2.549	$2.657	$2.652	$2.783	$2.771

Prices surveyed all Mondays, October through March; and first Mondays, April -September. - NH Office of Energy and Planning

Figure 3

*Figure 3 retrieved from the NH Office of Energy and planning website.

Date Delivered	Gallons Delivered	Cost	Price Per Gallon
12.31.08	124.5	$430.65	$3.46
1.20.09	205.4	$710.40	$3.46
2.5.09	139.3	$501.34	$3.60
2.18.09	97.7	$337.94	$3.46
3.20.09	202	$727.00	$3.60
4.23.09	162	$584.48	$3.60
9.23.09	34.7	$124.89	$3.60
11.19.09	159.5	$346.12	$2.17
12.26.09	271.1	$588.29	$2.17
Total	**1397**	**$4,351.11**	

Figure 4

*The data in Figure 4 was provided to SDES directly from a Town volunteer who acquired it from the heating oil provider for the building.

Building Description:

The Town Hall was constructed in 1900, and was later renovated in 1980. This is a two story wood structure. Only the first floor is occupied space, with no heating elements in the second floor.
The square footage of the first floor is about 2299ft², plus a 12ft x 8ft concrete fire proof storage room, not seen in Figure 6.

Under current design conditions, 2299ft² should be considered the total amount of conditioned space.

Figure 5

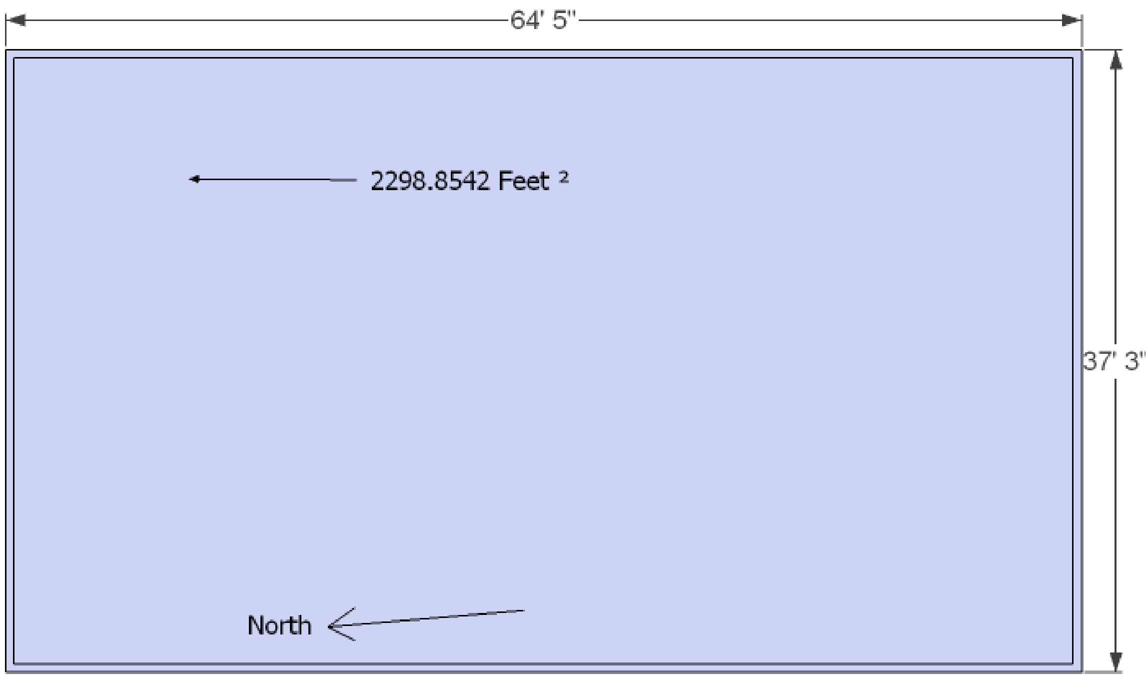


Figure 6

Crawl Space:

The building sits over a crawl space that ranges in height from about three feet to five feet. One corner of the building sits almost entirely on ledge. The foundation wall is a mix of brick and granite, and as seen in Figure 7, there is a great deal of heat-loss from this wall. There is a poly moisture barrier on the dirt floor of the crawl space. Fiberglass batt insulation is found between the floor joists ranging in thickness from 3.5 inches to 5.5 inches with areas of no insulation. As seen in Figure 7, there is a poly barrier against this that is poorly sealed and falling down in many areas. Though this is certainly better than no insulation at all, it is still minimally effective because of the amount of air able to rise from the crawl space to the first floor. Furthermore, there are several duct grills in the floor which also allow for air passage between the two spaces. This duct work from a previous heating system has ducts running to the unoccupied second floor, allowing for cold air to capture heat and rise through the system creating a series of small chimneys pulling heat towards the mostly uninsulated second floor.

Figure 7

Recommendations:

- Insulate the foundation walls. This should be done with closed-cell spray foam applied at a thickness of 2 inches to the entire perimeter of the foundation. The fiberglass insulation and poly barrier should be pulled away from underneath the floor around the edges of the floor so that the foam can be sprayed up past the band joist, slightly over lapping the floor boards. The fiberglass and poly barrier can then be put back in place. Depending on local codes, it may be necessary to spray an ignition barrier over the foam.
- There is a small access door to the crawl space seen in Figure 8. We recommend fastening this door in place and spraying it with foam. The access to the crawl space


Figure 8

from the mechanical room should suffice.
- Remove any duct work leading to the first and second floor, and seal the openings with foam board making sure to seal around the edges of the board with spray foam.
- Seal any other major penetrations between the crawl space and the first floor. This may require temporarily removing the poly barrier, sealing the penetrations with foam, or other products as necessary, and then replacing the fiberglass and poly barrier.
- Repair the poly barrier underneath the first floor, making sure that it is properly stapled to the bottom of the floor joists, and all seams are taped.

Exterior Walls:

The exterior walls are constructed with 2x4 wood framing, and are for the most part insulated with R-11 fiberglass batts. The vertical dark lines in Figure 9 are wall studs. They appear to be cold because of their low R-value. This means that heat is conducting through them faster than the insulation leaving them to serve as a thermal bridge from the interior to the exterior. Only the first floor walls have any insulation, except where it continues up the exterior walls of the stair well.

Some of the exteriors walls still have the original chair rail with wainscoting below. It appears as though when the building was renovated in 1980, there was an attempt to drop rock wool down into the wall cavities behind the trim and wainscot. During our site visits, we were able to find empty wall cavities, and cavities that were not adequately filled. Warm spots show up as yellow areas in Figure 10 revealing these weak points in the building envelope. Above the wainscot is where the fiberglass insulation begins.

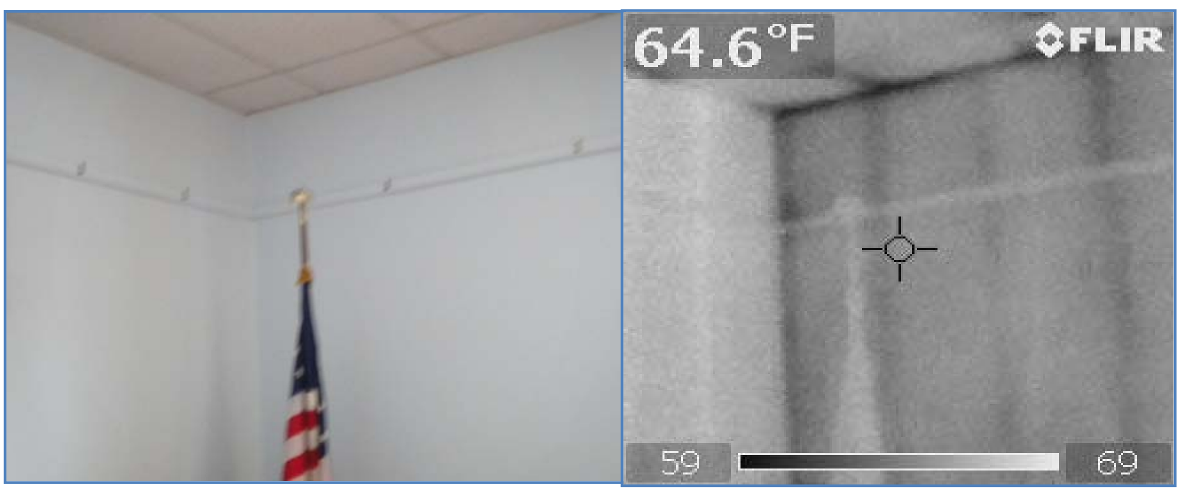


Figure 9

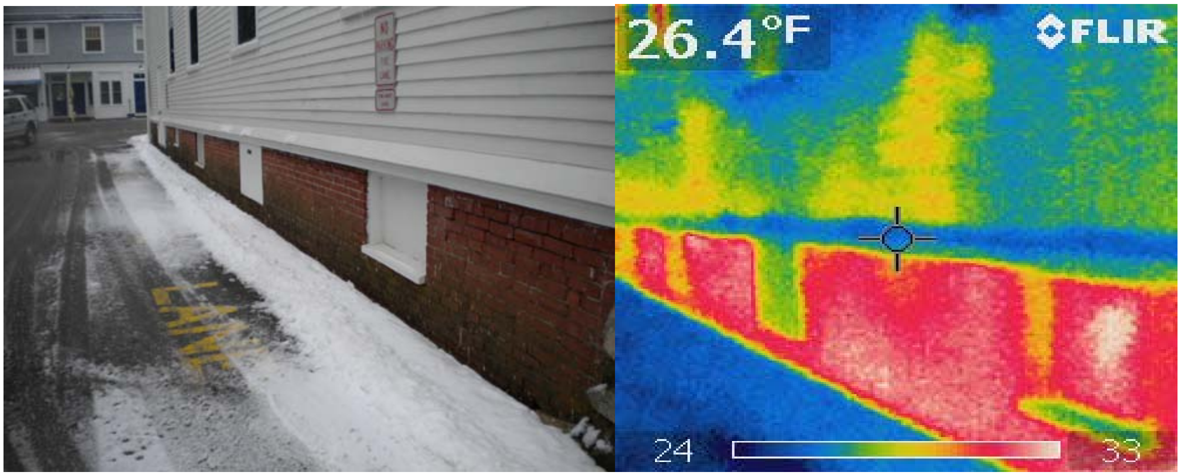


Figure 10

It could be possible to blow cellulose in the lower portion of this wall to deal with the weak spots; however, this may be more effort than it's worth. Our recommendation is to focus air-seal and insulation efforts on the ceiling and crawl space at this time. Figure 11 shows an example of a double stud wall. In this case, it would take a major renovation to accomplish this. It would require removing all of the exterior wall finish, building a second exterior wall against the first, then re-insulating the wall. It would also require moving electric boxes, radiators, and fabricating jamb extensions for the window trim. Because energy prices are still relatively low, this type of project would require consideration towards the long term use and environmental impacts of operating this building.

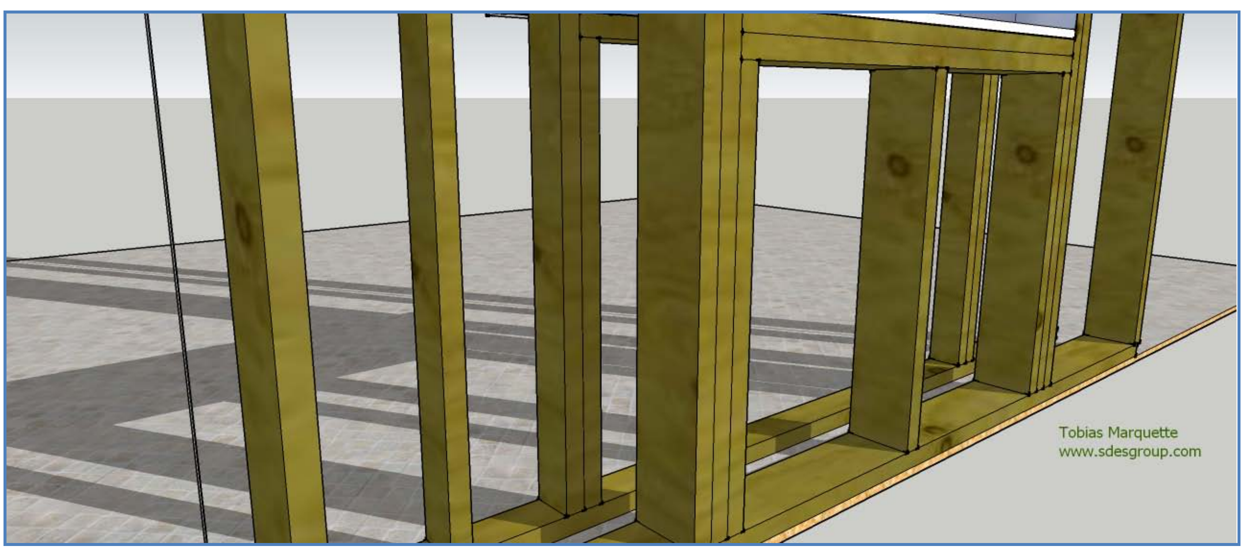


Figure 11

Ceilings:

There are suspended ceilings above the offices and Selectmen's room and sheetrock above the hall with fiberglass batts sitting on top of both areas, seen in Figure 12. Though this serves to contain some of the heat from the first floor, it is a poor example of a thermal barrier as air can move relatively freely from the first floor space to the space above. Once on the other side of the insulation, there is very little keeping the heat from exiting the building.

Figure 12

The sheetrock against the exterior walls only continues a few inches above the suspended ceiling. Above this are exposed floor joists, decking boards, and the finished floor of the second story. Figure 13 shows exposed studs with fiberglass insulation stuffed between. Even though the fiberglass batts are foil faced, this is an ineffective vapor barrier.

Figure 13

Figures 14, 15 and 16 display some of the ways in which heat moves through the second floor ceiling after it has made it past the first floor. About half of the second floor ceiling is insulated with 8 to 10 inches of vermiculite insulation which only has an R-value of about 2 per inch. This R-20 at best is only 1/3 of what is required by today's building codes. In order to improve this area of the ceiling, we would recommend having the vermiculite removed by a certified company, ceiling any penetrations to the space below, and re-insulating the ceiling with cellulose insulation.

Also visible in Figure 14 is a large amount of heat coming from the wall cavities of the partition wall. What is likely occurring here is the following:

Because of the framing technique used at the time this building was constructed, there may not be a bottom plate underneath the studs. This means that heat lost through the first floor ceiling is rising up and being pulled into this wall like the flue of a chimney and then deposited in the attic space.

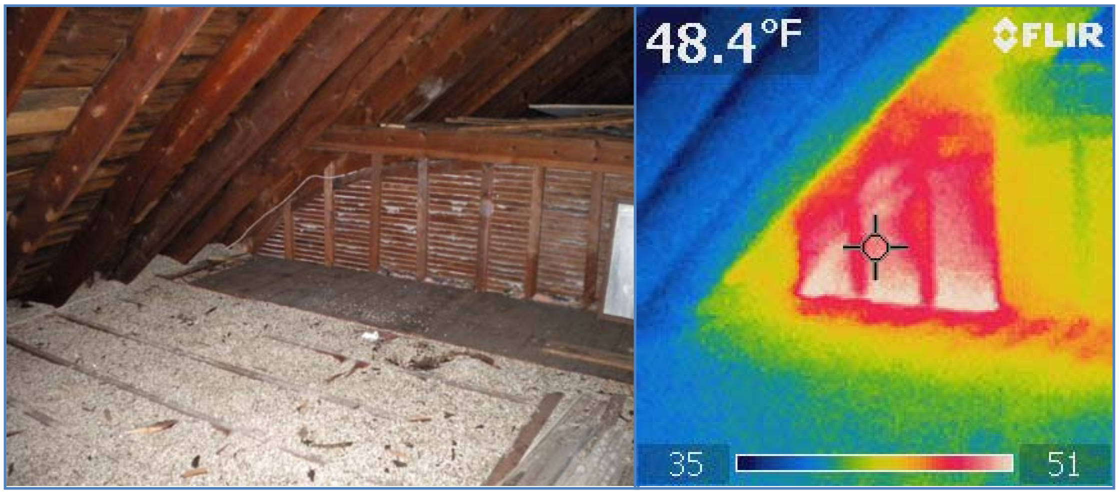


Figure 14

Figure 15 shows the sloped ceilings above the main room of the second floor. As we can see, there is no insulation at all and a large amount of heat is radiating from this surface.

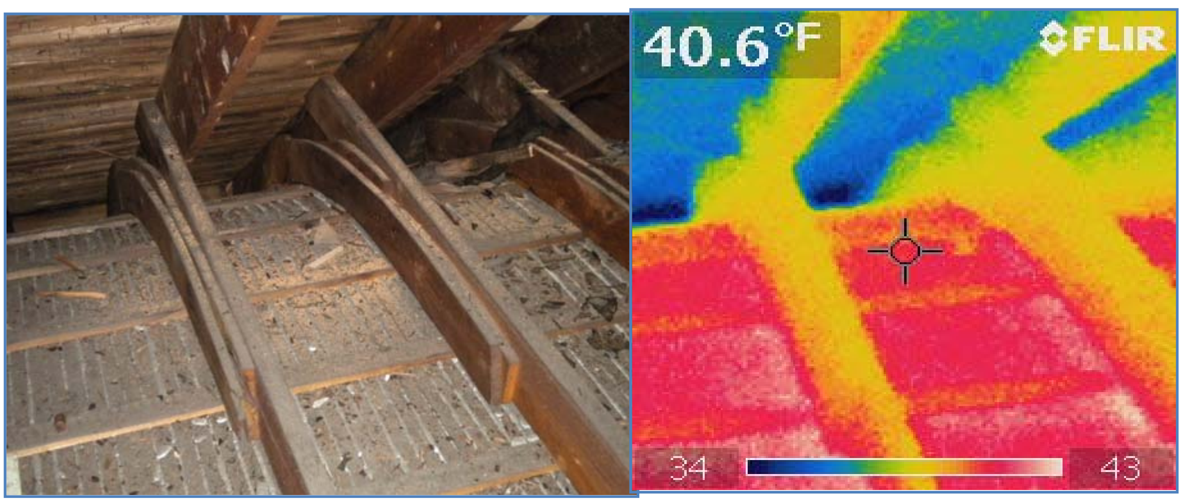


Figure 15

Figure 16 shows a beautifully crafted metal ventilation grill above the main room of the second floor. Its original purpose was likely to help vent heat from the space during functions taking place in the warmer months. Unfortunately, it is drawing heat from the building years round.

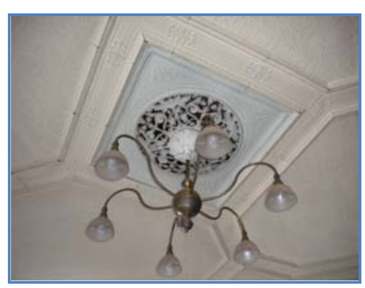


Figure 16

The issue of where and how to better insulate the ceilings is complex. The second floor of this building is not in use, and it is unknown how long, if at all, it will be until the space is renovated for use. Even then, there is also the question of what it would be used for and how many hours a week the space would have to be conditioned. Insulating above the second floor ceiling now would certainly have its benefits. For it to have substantial, positive effects, it would have to include the insulation of all the exterior second floor walls, and would have to include the cost of removing the vermiculite. The following recommendations reflect these facts, and are also based on certain conclusions reached through various discussions with the community.

<u>Recommendations:</u>

- Insulate the ceilings above the first floor. This should be done with closed-cell spray foam applied at a thickness minimum of 4 inches.
- Remove the fiberglass batt insulation from the exterior walls of the first floor above the suspended ceiling and continue the closed-cell spray foam down the exterior wall applied at a thickness of 3 inches, overlapping the face of all wooden structures stopping at the top of the sheetrock.
- Insulate the two interior walls at the top of the stair well. This should be done with dense pack cellulose insulation.
- Apply weather stripping to the jambs of the two doors at the top landing of the stairs. Foam board insulation could also be temporarily fastened to these doors for added R-value.

<u>Doors and Windows:</u>

Figure 17

There are three exterior doors, 2 wood and 1 metal foam core. Steps should be taken to ensure that these doors have a good seal. Most of the windows on the first floor have been replaced with double pane replacement windows. While there are more effieint windows on the market today, we do not recommend replacing the existing windows at this time. This would only be done in conjunction with a major renovation of the first story walls. There are many cracks and gaps where the replacement windows meet the original trim. See Figure 17. These should be filled with caulking to reduce air infiltration from around these units. There are a few original windows still in place; one towards the rear of the building by the back door, one in the stair well, and one located at the top of the stair well. All have storm windows. We would not recommend replacing these windows at this time.

If the recommended air-seal and insulation work is completed, it may be necessary to provide fresh air to the building. A blower door test would determine how tight the building is as a result of the efficiency upgrades, if there is a need for fresh air, and how much air to introduce per hour.

If the recommendations for air-sealing and insulating are carried out, it will likely then be necessary to install some sort of mechanical ventilation. The most efficient way to provide fresh air in this case would be with an energy recovery ventilator (ERV). An ERV functions 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 ERV. 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. In the winter months, 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 18. One of these units could be installed above the suspended ceiling of the first floor and would likely cost about $2000.00.

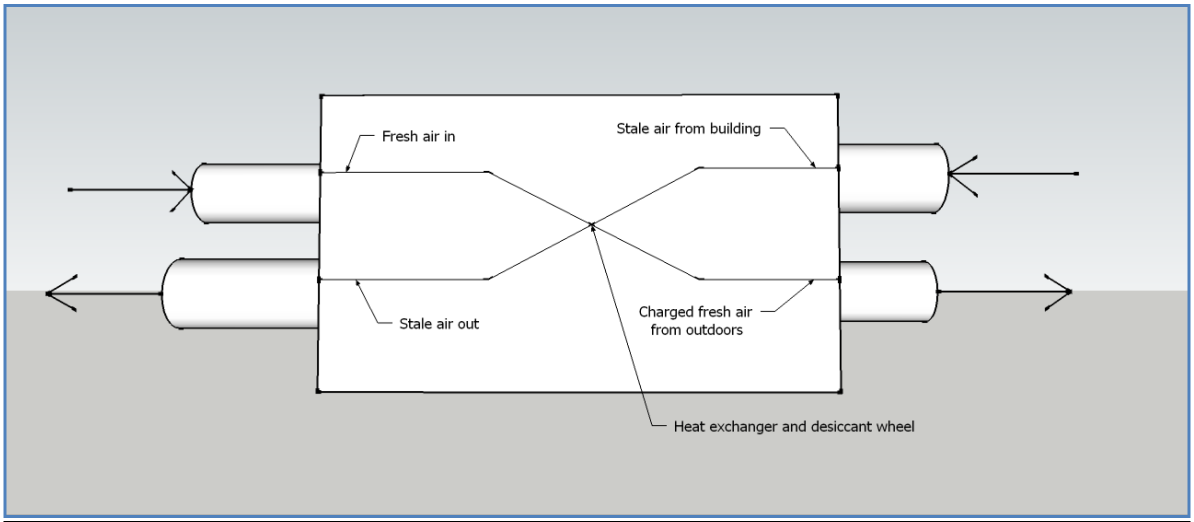


Figure 18

Envelope Efficiency:

The single largest area for improvement in building efficiency involves the building envelope. The best ways to increase an envelope's performance is to complete air-sealing and insulation work. Although it would be a major undertaking to air-seal and insulate the building, the resulting benefit would be equally significant.

From a building efficiency standpoint, 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 may only last 20 years, or 40 years before possibly needing to replace a PV array, but building envelope efficiency have a lasting positive impact long after equipment must to be replaced. 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 provides the most savings.

Mechanical:


Figure 19

The building is heated with one oil fired boiler with a rated BTU input of 160,000 and a rated BTU output of 130,000. This boiler's combustion efficiency is about 82%. There are three zones tied to this system, each providing heat to three sections of the first floor. The distribution pipes are located in the crawl space, and none are insulated. There are three thermostats, one located in each zone. One of the thermostats is digital/ programmable and seems to be functioning properly. The other two do not appear to be functioning properly. They are misinterpreting the temperatures in the room, and are unable to control the functions of the boiler. For example; the thermostat in the Selectmen meeting room may be set to 62°F. The temperature in the room is actually 72°F and the radiators are being supplied heat. Replacing these old thermostats should be the first step to determining appropriate functioning of the zone. If this is done and there still seems to be comfort issues and inefficient distribution of heat, a further examination into the piping schematics and pumps will be necessary. Though there are more efficient boilers available, we do not recommend replacing this unit at this time. The efficiency gain would not be substantial enough to produce a wise financial investment. When the boiler is in need of replacement, install the most efficient system available. Switching to a propane fired modulating/condensing boiler would certainly be the most efficient way to produce heat in this location, but may not be the least expensive at today's current prices for propane. The decision to do this now would have to be out of concern for reducing building operation emissions. Other generation alternatives should also be considered at that time.

Visible in Figure 20, several of the copper distribution pipes in the basement have pulled away from where they were fastened to the bottom of the floor joists leaving them hanging down far below their original placement. Because of this, there is a serious risk of them bursting. This should be addressed immediately. Also visible here, and in Figures 21 and 22, is that none of the pipes are insulated. This should also be corrected immediately and is a low cost item.

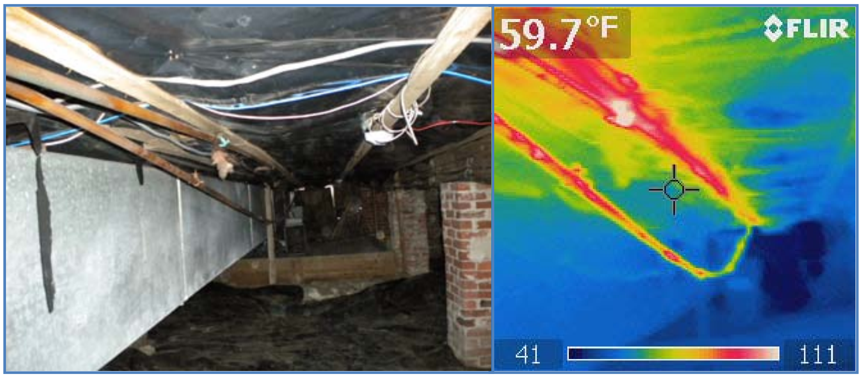


Figure 20

Figure 21

There is an electric hot water heater in the mechanical room. None of the pipes associated with this unit are insulated either.

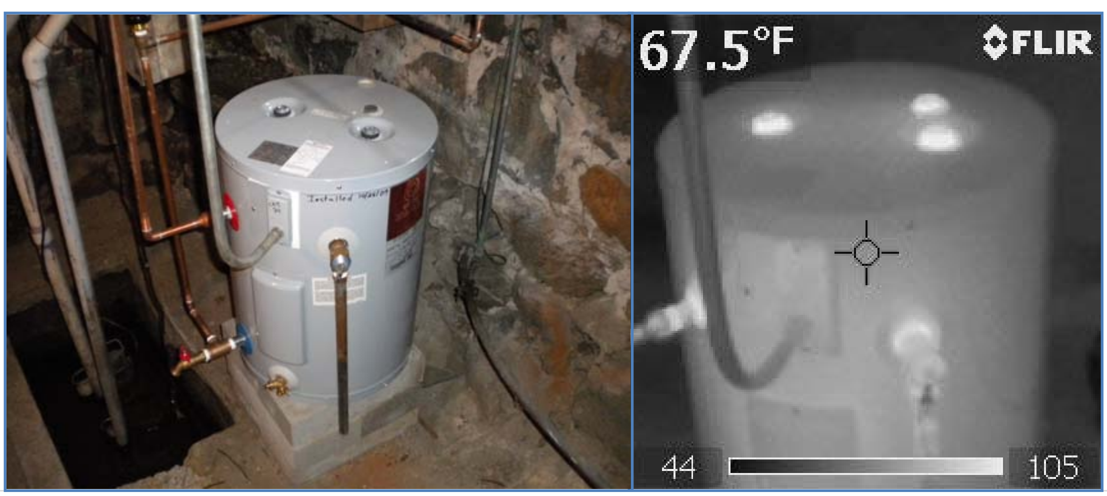


Figure 22

Recommendation:

- Arrange for an HVAC technician to come as soon as possible to affix the fallen pipes back into their original position.
- Insulate all of the copper piping in the crawl space and mechanical room, both for the heating system and the DHW system. Make sure this is done with special attention to detail, using a high R-value pipe insulation.
- Replace the two older thermostats with digital/programmable units. Determine a good schedule for temperature in the different zones and program set back temperatures appropriately. The schedule may vary between zones depending on the amounts of use.
- Install an outdoor reset to the boiler. These units are most effective when the boiler is connected to an indirect hot water heater, but even under the scenario, this unit should reduce consumption by about 5% to 7%.

Electrical:

There are some lights which could be replaced. The lights in the main hall were replaced with T8 florescent tubes, but the lights in the offices and meeting room could be replaced with more efficient units.

Figure 23

In the fire proof file room, there is an electrical heating element on the ceiling. See Figure 23. Though the thermostat for this unit is set to a low temperature, it still draws a fair amount of electricity. The question was raised of how important it is to keep this small room to temperature. The outcome of the discussion was that it may be a good idea to try shutting the unit down, and monitor the conditions of the room. If it is found that the cold temperature has no negative effect on the files, and the relative humidity remains at acceptable levels, than use of the unit may not be necessary.

There is a typical amount of office equipment associated with the operations of the building. Though there may be computers which need to remain on at all times for remote access, it is a good idea to plug all other equipment into smart strips and cut power to the devices when they are not in use. Just because a piece of equipment is turned off does not mean that it has stopped drawing electricity. Also, insulating all of the DHW pipes will help further reduce electrical demands.

Recommendations:

- Finish upgrading the lighting to more efficient units.
- Discontinue the use of the electric space heater in the file room and monitor the conditions to ensure proper climate needed to store documents.
- Try to plug as much equipment as possible into smart strips, and turn off the strips at night and on weekends.

- Insulate all the DHW pipes in the mechanical room. Wrapping the heater with more insulation would be easy and likely produce more savings.
- Consider installing a photovoltaic system on site. After reducing electrical needs through equipment upgrades and behavioral changes, local generation of electricity is always a great option.

Summary of Recommendations:

- Insulate the foundation walls. This should be done with closed-cell spray foam applied at a thickness of 2 inches to the entire perimeter of the foundation. The fiberglass insulation and poly barrier should be pulled away from underneath the floor around the edges so that the foam can be sprayed up past the band joist, slightly over lapping the floor boards. The fiberglass and poly barrier can then be put back in place. Depending on local codes, it may be necessary to spray an ignition barrier over the foam.
- There is a small access door to the crawl space seen in Figure 8. We recommend fastening this door in place and spraying it with foam. The access to the crawl space from the mechanical room should suffice.
- Remove any duct work leading to the first and second floor, and seal the openings with foam board making sure to seal around the edges of the board with spray foam.
- Seal any other major penetrations between the crawl space and the first floor. This may require temporarily removing the poly barrier, sealing the penetrations with foam, or other products as necessary, and then replacing the fiberglass and poly barrier.
- Repair the poly barrier underneath the first floor, making sure that it is properly stapled to the bottom of the floor joists, and all seams are taped.
- Insulate the ceilings above the first floor. This should be done with closed-cell spray foam applied at a minimum thickness of 4 inches.
- Remove the fiberglass batt insulation from the exterior walls of the first floor above the suspended ceiling and continue the closed-cell spray foam down the exterior wall applied at a thickness of 3 inches, overlapping the face of all wooden structures, stopping at the top of the sheetrock.
- Insulate the two interior walls at the top of the stair well. This should be done with dense pack cellulose insulation.
- Apply weather stripping to the jambs of the two doors at the top landing of the stairs. Foam board insulation could also be temporarily fastened to these doors for added R-value.
- Install an energy recovery ventilation system to ensure proper ventilation levels (if needed).
- Arrange for an HVAC technician to come as soon as possible to affix the fallen pipes back into their original position.
- Insulate all of the copper piping in the crawl space and mechanical room, both for the heating system and the DHW system. Make sure this is done with special attention to detail, using a high R-value pipe insulation.
- Replace the two older thermostats with digital/programmable units. Determine a good schedule for temperature in the different zones and appropriately program set back temperatures. The schedule may vary between zones depending on the amounts of use.

- Install an outdoor reset to the boiler. These units are most effective when the boiler is connected to an indirect hot water heater, but even with, this unit should reduce consumption by about 5% to 7%.
- Finish upgrading the lighting to more efficient units.
- Discontinue the use of the electric space heater in the file room and monitor the conditions to ensure proper climate needed to store documents.
- Try to plug as much equipment as possible into smart strips, and turn off the strips at night and on weekends.
- Insulate all the DHW pipes in the mechanical room. Wrapping the heater with more insulation would be easy and likely produce more savings.
- Consider installing a photovoltaic system on site. After reducing electrical needs through equipment upgrades and behavioral changes, local generation of electricity is always a great option.

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.

Life Cycle Costing –

The National Institute of Standards and Technology (NIST) Handbook 135, 1995 edition, defines Life Cycle Cost as "the total discounted dollar cost of owning, operating, maintaining, and disposing of a building or a building system" over a period of time. Life Cycle Cost Analysis is an economic evaluation technique that determines the total cost of owning and operating a facility over period of time.

Since municipal buildings are funded in their initial year through bonds and/or capital outlays, they generally fall victim to an inordinate focus on the bottom line cost of construction instead of the lifetime cost to operate the building. This is a critical misstep in particular with energy concerns for municipal buildings because they are placed in service for a significant period and are subject to extended energy pricing. A more efficient building could save the costs of initial investments several times over during its lifespan.

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.

"Green" Building Cost Myths –

A perception that all energy-efficient construction costs more than conventional construction persists. We have been unable to find valid research that supports this conclusion - especially where choices made about efficiency are evaluated in a realistic context considering the life cycle cost to operate the facility. To the contrary, we have found several sources, from government facility agencies, that show not only that in most cases costs are in fact lower but that any increased cost is almost immediately realized through lower operating expenses.

State Grant Program Under American Recovery and Reinvestment Act (ARRA)

A significant opportunity that the town should consider looking into that is coming up very shortly is opportunities to acquire funding through the New Hampshire Office of Energy and Planning (OEP) The following information can be found on the OEP's website at the following link - http://www.nh.gov/oep/recovery/news/122309.htm#sa1. The site discusses the announcement of available funding to municipalities under the Energy Efficiency and Conservation Block Grant program.

> The New Hampshire Office of Energy and Planning (OEP) announces the availability of $6.6 million through the Energy Efficiency and Conservation Block Grant (EECBG) program. This grant program will fund projects that reduce energy use and fossil fuel emissions, and improve energy efficiency. OEP is currently targeting the following timetable:
>
> - **Grant Application Released: January 8, 2010**
> - **Intent to Bid Letter Due: January 15, 2010**
> - **Applications Due: February 15, 2010**
> - **Grants Awarded: March 10, 2010**
>
> In conjunction with the January 8, 2010 release of the EECBG Subgrant Application, OEP will also release a program guidance document and guidelines for the format of the "Intent to Bid" submission. EECBG will entail a competitive application process and funds will be awarded based on the value of the project and the benefit to the public. Selection criteria include, but are not limited to, projected energy savings, greenhouse gas emission reductions, and the ability to implement projects expeditiously. Eligible applicants are local governments and local government partnerships.

Eligible uses of this funding include projects such as: energy efficiency retrofits; energy audits; transportation efficiency measures; solid waste/wastewater treatment; energy distribution technologies; financial incentive programs; and renewable energy technologies for local government buildings. Each community will be eligible to receive funding up to 100% of the project cost with a limit of $400,000 per applicant.

For more information please contact Dari Sassan, (603) 271-1765, or visit the EECBG Web site.

Additionally, a terrific resource to 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.

Utility Programs:

Many utilities provide rebates for various types of efficiency measures that can be carried out at a municipal facility. PSNH offers the Municipal Smart Start Program. This program offers 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.

For more information please contact Kathleen Lewis, (603) 436-7708 ext. 5628, or visit http://www.psnh.com/Business/Efficiency/Paysave.asp

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.

Conclusion:

As a result of this audit, the Town has several options available to increase the efficiency of the Town Hall. We highly encourage the that the Town pursue these recommendations described in this report and to utilize the further assistance provided under this program to help develop plans for implementation – including possible identification of contractors who will provide the services needed to carry out the recommendations. SDES Group will provide the Town with additional hours of Community Energy Advocate services to assist with further efforts under the MEAP program in an effort to bring the recommendations outlined in the report to fruition. A further explanation of these additional services will be provided during the audit presentation.