Town of Goffstown

Energy Plan

Goffstown, New Hampshire

Prepared by the Southern New Hampshire Planning Commission

1. Introduction

1.1. Purpose

In accordance with RSA 674:2(n), the purpose of this plan is to promote energy efficiency and conservation in the Town of Goffstown with the expectation that through the implementation of the goals in this plan Goffstown can reduce operating costs and cut carbon emissions.

1.2. Energy Conservation Related to Sustainability

Energy conservation is the efficient use of energy or the reduction of energy use by implementing energy efficient practices, policies, technologies, construction, development or any other action aimed at reducing energy use.

Energy efficiency measures may:

- Reduce costs
- Reduce negative health impacts from pollutants and negative environmental impacts
- Reduce environmental pollutants
- Reduce negative environmental impacts
- Reduce carbon emissions
- Increase quality of life by reducing environmental, health and economic impacts of conventional means of energy production

1.3. Goffstown Energy Goals

The Goffstown Planning Board has developed the following goals for energy use and reduction for the town.

1. Explore the formation of an energy commission
2. Increase community awareness, advise and educate residents on reducing energy costs and consumption.
3. Explore alternative forms of energy in order to reduce fossil fuel dependence and to increase energy conservation and savings
4. Work towards reducing energy consumption in municipal buildings
5. Encourage energy conservation town-wide

1.4. Goffstown Energy Conservation Policy Resources

- **Town Board of Selectmen:** The Executive body of Goffstown charged with carrying out town policies.
- **Town Planning Board:** Develops and helps to implement the Town's Master Plan, which reflects the vision of Goffstown residents for growth, development and planning.

1.5. Current Goffstown Initiatives

- **Goffstown Energy Committee -** A voluntary committee of Goffstown residents that began in 2009. The Goffstown Energy Committee is a community organization committed to saving resources among the town's residents, businesses, and in municipal affairs, including town government and the school district by promoting energy conservation, energy efficiency and exploring other ways to reduce energy use. These goals are mostly accomplished through educational activities and programs, designed to encourage people to understand their energy needs, consumption habits and short-and long-term interests.

- **Recycling - s**ingle-stream curbside recycling program

- **NH Municipal Energy Assistance Program (NHMEAP)**, a collaborative effort involving existing New Hampshire entities, funded through the Greenhouse Gas Emissions Reductions Fund and administered by the NH Public Utilities Commission.

- **Energy Technical Assistance and Planning for New Hampshire Communities (ETAP)** is a two year program providing energy efficiency technical assistance at no charge to municipalities and counties in NH. ETAP's goal is to advance energy efficiency in all New Hampshire municipalities and provide the tools communities need to monitor energy performance. ETAP is funded by the American Recovery and Reinvestment Act (ARRA) of 2009 and administered through New Hampshire's Office of Energy and Planning.

2. State Statutes/Plans Related to Energy

State Statutes outline the purpose of land use regulations which are implemented by Planning Boards. Pertinent sections which relate to environment and energy include the following sections:

RSA 672:1

III. Proper regulations enhance the public health, safety and general welfare and encourage the appropriate and wise use of land.

III-a. Proper regulations encourage energy efficient patterns of development, the use of solar energy, including adequate access to direct sunlight for solar energy uses, and the use of other renewable forms of energy and energy conservation. Therefore, zoning ordinances should not unreasonably limit installation of solar, wind, or other renewable energy systems or the building of structures that facilitate the collection of renewable energy, except necessary to protect the public health, safety, and welfare.

RSA 674:2
The master plan may also include the following sections:

(n) an energy section, which includes an analysis of energy and fuel resources, needs, scarcities, costs, and problems affecting the municipality and a statement of policy on the conservation of energy.

RSA 38 - D Ch. 275 (effective September 27, 2009)
Enables the appointment of an energy commission by either the local legislative or the local governing body of 3 - 10 members with staggered three year terms. The purpose of an energy commission is "…for the study, planning, and utilization of energy resources for municipal buildings and built resources of such city or town", to research municipal energy use, and recommend to local boards pertaining to municipal energy plans and sustainable practices, such as energy conservation, energy efficiency, energy generation, and zoning practices.

RSA 155 - A:2(VI) permits communities to adopt stricter measures than the New Hampshire State Building Code.

RSA 72:61 - 72 permits municipalities to offer a property tax exemption on solar, wind and wood heating energy systems. These systems include solar hot water, solar photovoltaic, wind turbine or central wood heating systems (not stovetop or woodstoves).

State level energy resources, programs and funding mechanisms can be found in Appendix C. A plan for energy efficiency and compliance with state statutes relating to energy allow Goffstown to be eligible and prepared for grants and funding mechanisms which help the town to conserve energy and reduce operating costs

2.1. New Hampshire Climate Action Plan

In December 2007, Governor Lynch issued Executive Order Number 2007-3, which established a Climate Change Policy Task Force and charged the Task Force with developing a Climate Action Plan for the State of New Hampshire. The Executive Order directed the task force to submit the action plan to the Governor by September 1, 2008. Due to the extensive detail and comprehensive nature of the recommendations in the Climate Action Plan, the final Plan was released on March 25, 2009 at a Press Event with the Governor.

The New Hampshire Climate Action Plan aims at achieving the greatest feasible reductions in greenhouse gas emissions while also providing the greatest possible long-term economic benefits to the citizens of New Hampshire.

The Task Force concluded the most significant reductions in both emissions and costs will come from substantially increasing energy efficiency in all sections of the economy; continuing to increase sources of renewable energy; and designing our communities to reduce reliance on automobiles for transportation. The Climate Action Plan recommends that New Hampshire strive to achieve long-term reductions in greenhouse gas emissions of 80 percent below 1990 levels by 2050. The Climate Change Policy Task Force also recommends 67 specific actions to achieve the following goals:

- Reduce greenhouse gas emissions from buildings, electric generation, and transportation;
- Protect natural resources to maintain the amount of carbon sequestered;
- Support regional and national initiatives to reduce greenhouse gases;
- Develop an integrated education, outreach and workforce training program; and
- Adapt to existing and potential climate change impacts.

3. Existing Conditions

3.1. New Hampshire

State Energy Supply and Consumption

New Hampshire citizens, businesses, and industries spent almost $5 billion on energy in 2009[1].

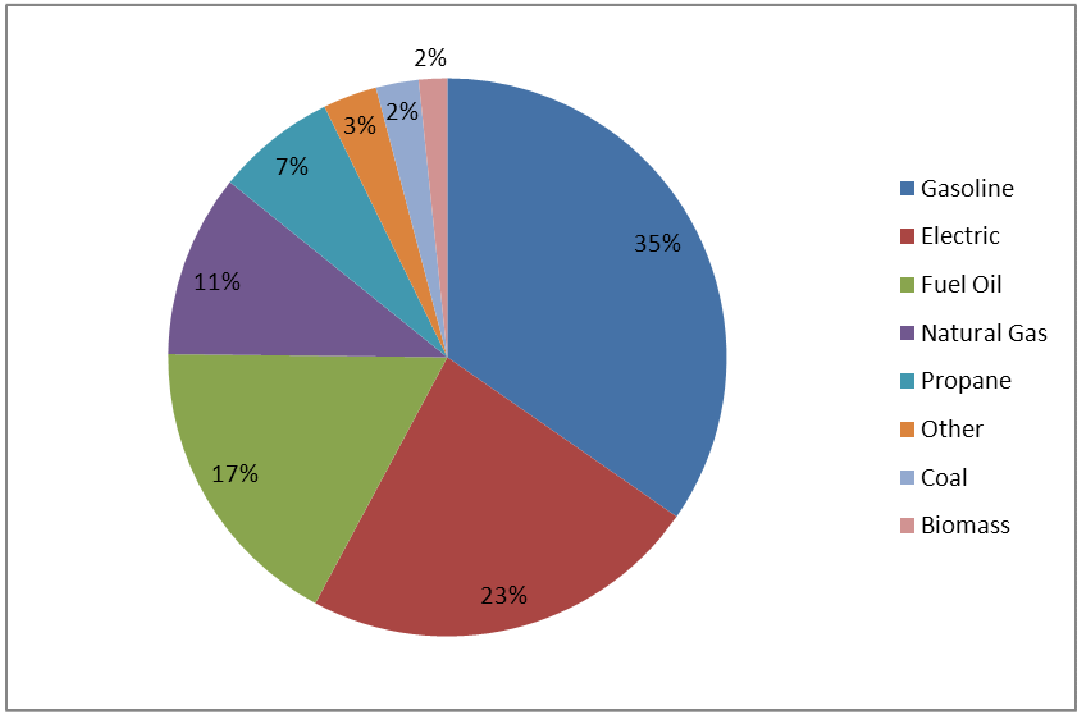


Figure 1.1

Of this money, more than two-thirds of it left the state immediately, much of it to pay for fossil fuels and nuclear fuels imported from overseas.[2] This outflow of dollars represents nearly 7 percent of New Hampshire's GDP and has been identified as a major drain on the economy. Investments in more efficient energy use could cost up to $2 billion. However, savings would offset the investments in less than 4 years. According to a 2009 study, if all state households achieved the highest level of energy efficiency, residents would save $309 million per year.[3] Commercial and industrial buildings would save $220 million per year.[4]

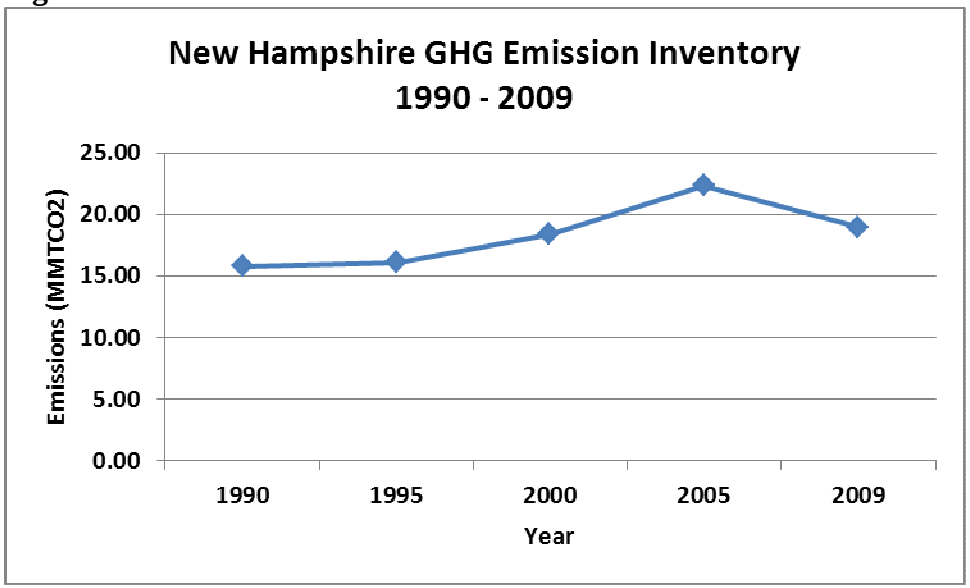
[1] Energy Information Administration, State Energy Data System 2009, "Table S1b Energy Expenditure Estimates by Source, 2009," http://www.eia.gov/emeu/states/hf.jsp?incfile=sep_sum/plain_html/sum_ex_tot.html.

[2] New Hampshire Office of Energy and Planning, "2007 New Hampshire Energy Facts," http://www.nh.gov/oep/programs/energy/nhenergyfacts/2007/introduction.htm.

[3] This represents energy savings of around 20%, as defined as cost-effective in the study *Additional Opportunities for Energy Efficiency in New Hampshire*, Final Report to the New Hampshire Public Utilities Commission, GDS Associates, Inc., 2009

[4] Independent Study of Energy Policy Issues. Vermont Energy Investment Corporation, Jeffrey Taylor and Associates, Optimal Energy Inc. June 30, 2011

Figure 1.2

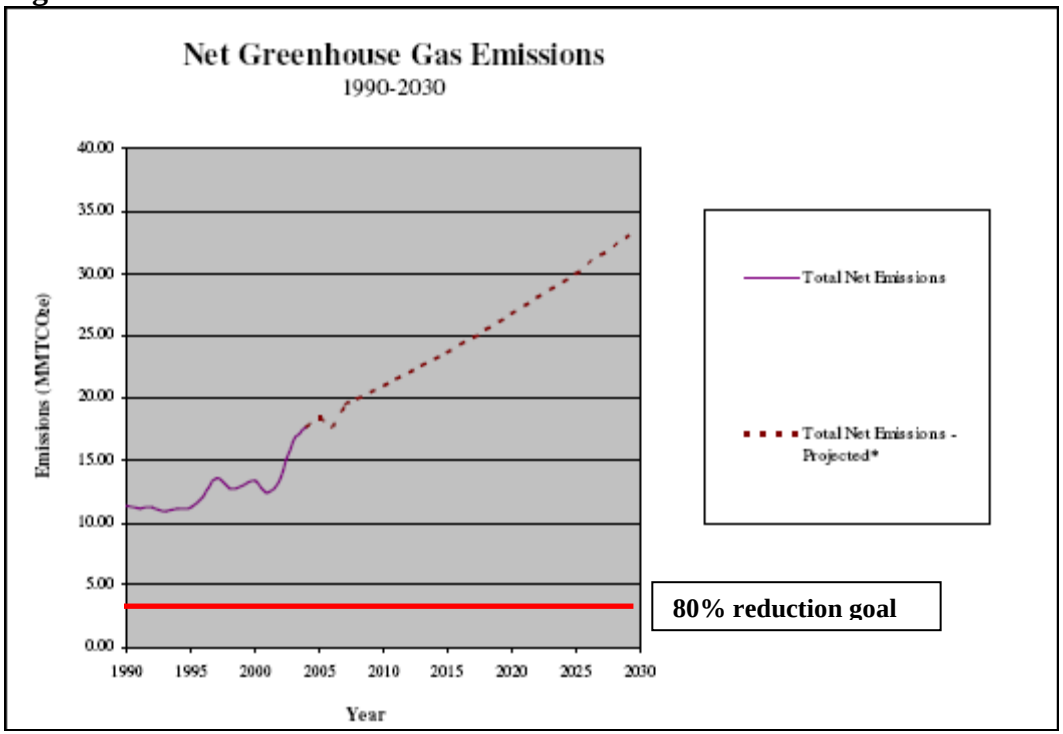


Source: NHDES, An analysis of EIA Energy Consumption Estimates By Sector for New Hampshire from 1960-2009 using EIA emission factors for all fossil fuels with NON-ENERGY emission calculations developed through the EPA's State Inventory Tool.

"In the U.S., our greenhouse gas emissions come mostly from energy use."[5] Figure 1.2 shows the net greenhouse gas emissions from 1990-2009 in New Hampshire. The New Hampshire Climate Action Plan recommends that New Hampshire strive to achieve long-term reductions in greenhouse gas emissions of 80 percent below 1990 levels by 2050. As the graph shows, emissions went up approximately 20% from 1990-2009. The New Hampshire Greenhouse Gas Emissions Reduction Fund (GHGERF) started in 2009. In the first year emissions were reduced by 4,600 metric tons from the projects that were implemented. Details on reductions made in the first year (July 2009 – June 2010) can be found in the Year 1 Evaluation published by Carbons Solutions New England, University of New Hampshire.[6]

[5] US Energy Information Administration. http://www.eia.gov/oiaf/1605/ggccebro/chapter1.html
[6] Carbon Solutions New England, University of New Hampshire. *The New Hampshire Greenhouse Gas Emissions Reduction Fund Year 1 (July 2009–June 2010) Evaluation*. 2011.

Figure 1.3*



Source: NHDES, EIA. *New Hampshire Greenhouse Gas Emissions Inventory and Projections*, 2008.
*Greenhouse gas emissions from 1990-2005 differ from Figure 1.2 as the uptake of CO2 by forests (carbon sequestration) was subtracted from emissions in Figure 1.3

Figure 1.3 shows net greenhouse gas emissions in New Hampshire from 1990-2004 (with carbon sequestration subtracted) and projections through 2030 for a "business as usual" scenario with no major changes from current trends. Projections are considered to be mid-range estimates and do not account for impact of economic recession, expansion of renewable or clean energy sources, potential shift to fuels with higher life-cycle emissions, loss of forests, or impacts of climate change on heating and cooling loads. Emissions for New Hampshire in 1990 were 14.7 million metric tons of carbon dioxide. To achieve the 80 percent reduction, levels will have to fall to 2.94 million metric tons by 2050. This shows how all municipalities in New Hampshire play an integral part in working towards energy conservation and reducing greenhouse gas emissions while New Hampshire works towards the goals in the New Hampshire Climate Action Plan.

3.2. Goffstown Energy Analysis and Savings Opportunities

New Hampshire Municipal Energy Assistance Program

In 2010, Goffstown received a Municipal Greenhouse Gas and Energy Use Baseline Report for 2009 from the NH Municipal Energy Assistance Program. For this report data was gathered on the operations of several sectors under the jurisdiction of the municipal government: the buildings, vehicle fleet, and street lights.

Figure 1.4 (graph 2b from the Report) - Site Energy Intensity and Average Site Energy Intensity for Type of Building (kBtu/sq.ft.)

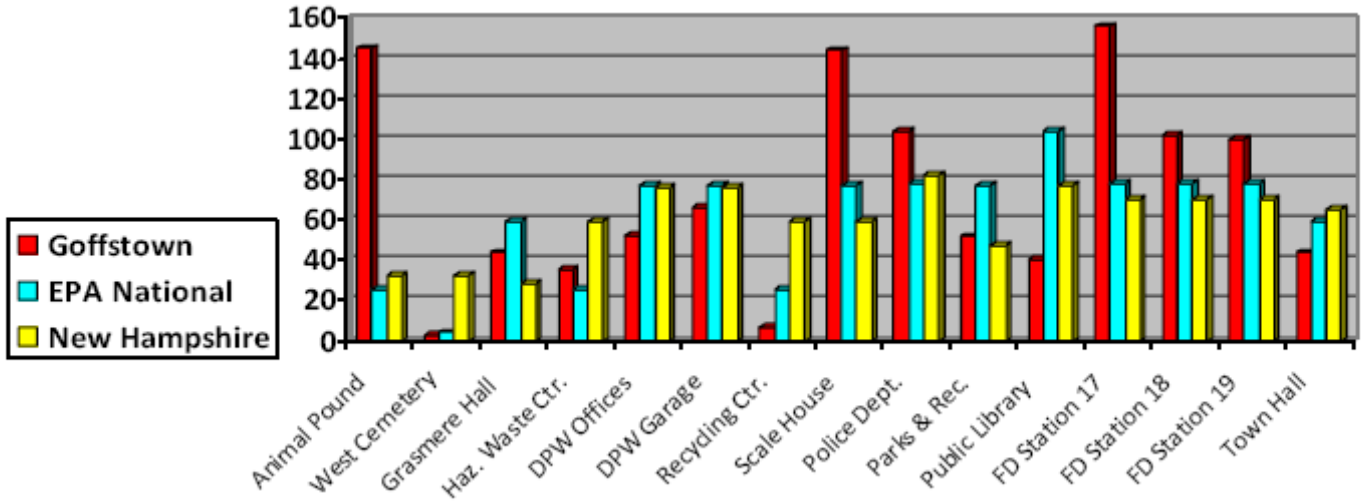


Figure 1.4 gives an idea of the municipal building site energy intensity in comparison to similar buildings in New Hampshire and Nationally. In general Goffstown's municipal building energy intensity is in line with the national and regional averages. "The fire station 17 is the most intense user of energy. While the scale house and animal pound also have very high energy intensities, their yearly energy usage totals are negligible and likely correctable with behavioral changes. All fire department stations and the police

department have slightly higher than average energy intensity levels when looked at comparatively. Review of energy usage in fire & police department buildings should be a high priority item. Furthermore, consideration of how spaces are being used within each municipal building may have a major impact on how these buildings are prioritized."[7]

In terms of energy use and cost the data gathered for the report showed that "the vehicle fleet uses 55% more energy but only creates 45% more carbon emissions than the buildings. The vehicle fleet energy costs are also 32% higher than the energy costs of the selected municipal buildings. Vehicles take up a larger percentage to the total cost and use of energy." Recommendations from the report include conducting a comprehensive vehicle fleet audit since the fleet is the largest segment of energy use in the town and targeting the Police Department and Fire Station 17 as their highest priority buildings as the Police Department is the highest total energy user and the Fire Station 17 is the most intense user of energy out of the municipal buildings of substantial size."

3.3. Goffstown Energy Inventories/Audits

Goffstown participated in the Energy Technical Assistance and Planning (ETAP) Program during 2010-2012 administered by the New Hampshire Office of Energy and Planning. The town received an initial high level energy assessment of three municipal buildings as part of this program to address the town's interests and needs with respect to energy efficiency improvements and capital upgrades. Those buildings include the Town Hall, Police Station and Fire Station. Table 1[8] shows the annual utility use and energy density of these three buildings based on data collected from 2008. The highest energy use per square foot of the municipal buildings assessed is the Fire Station, followed by the Police Station. These two buildings have the most opportunity for energy reduction and savings in town.

[7] *Municipal Greenhouse Gas and Energy Use Baseline Report for 2009*. NH Municipal Energy Assistance Program.
[8] Appendix B: Peregrine Energy Group. *Energy Efficiency Opportunities for Town Buildings Goffstown, NH*, December 16, 2010.

Table 1 – 2008 Annual Utility Use and Energy Density

Building	SF	Electricity (kWh)	Propane (Gal)	Total Annual Utility Cost	kBtu/SF[1]
Town Hall	9,500	134,000	-	$17,500	48
Fire Station No. 18[2]	5,125	50,000	4,000	$16,000	98
Police	11,318	134,000	7,000	$36,800	95

[1]Represents Btu equivalent of combined annual electricity and propane use, divided by building square footage, divided by 1,000. ENERGYSTAR reports that values can range from 30 kBtu/Sf to 340 kBtu/SF. An efficient commercial office building in the Northeast should perform at roughly 80 kBtu/SF.

[2]Utility use and cost is estimated – no data was available at the time of our visit.

The Town Hall has a number of opportunities for energy reduction and savings outlined below in Table 2. Further details on these recommendations and the others mentioned below can be found in the attached *Energy Efficiency Opportunities for Town Buildings Goffstown, NH*, December 16, 2010[9].

Table 2 – Summary of Energy Related Opportunities for the Town Hall

Description	Approximate Implementation Cost	Utility Incentive Available[1]	Other Benefits[2]	Potential Utility Savings			Annual Cost Avoidance	Simple Payback Yr
				Demand kW	Electric kWh/yr	LP Gal/yr		
Improve Door Weather Strip	$500	$0	A	-	1,000	-	$200	2 - 3
Replace Heat Pumps w/ Propane Fired AHUs	$100,000	$0	B, C	3	68,000	(2,000)	$5,800	15+
Estimated Program	***$100,500***	***$0***		***3***	***69,000***	***(2,000)***	***$6,000***	***16.8***
Notes						***Current Utility Budget:***		***$17,500***
(1) Subject to Utility Incentive Policy and Screening Analysis						***Percent Reduction:***		***34%***
(2) A - Better Comfort; B - Improved Reliability; C - Reduced Maintenance; D - Enhanced Appearance								

[9] Appendix B

Table 3 – Summary of Energy Related Opportunities for the Fire Station [10]

Description	Approximate Implementation Cost	Utility Incentive Available[1]	Other Benefits[2]	Potential Utility Savings			Annual Cost Avoidance	Simple Payback Yr
				Demand kW	Electric kWh/yr	LP Gal/yr		
Add Occupancy Sensors to Control Lights	$1,500	$0		-	2,100	-	$300	3 - 5
Update T12 and Incandscent Lights	$500	$100	B, C	< 1	600	-	$100	4 - 6
Replace Overhead Door Seals	$2,000	$0	A, B, C	1	-	100	$200	8+
Replace Exhaust Fan Dampers	$3,000	$0	B, C	-	-	200	$500	5+
Insulate HW Piping	$500	$0	A	-	-	100	$200	2 - 5
Seal Hose Tower	$5,000	$0	A	-	-	200	$500	8+
Estimated Program	***$12,500***	***$100***		***1***	***2,700***	***600***	***$1,800***	***6.9***

Notes ***Current Utility Budget:*** ***$16,000***

(1) Subject to Utility Incentive Policy and Screening Analysis ***Percent Reduction:*** ***11%***

(2) A - Better Comfort; B - Improved Reliability; C - Reduced Maintenance; D - Enhanced Appearance

Table 4 – Summary of Energy Related Opportunities for the Police Station[11]

Description	Approximate Implementation Cost	Utility Incentive Available[1]	Other Benefits[2]	Potential Utility Savings			Annual Cost Avoidance	Simple Payback Yr
				Demand kW	Electric kWh/yr	LP Gal/yr		
Replace Sallyport Direct Fired Unit Heater	$3,000	$0		-	-	100	$200	15+
Add Insulated Ceiling in Equipment Bay	$10,000	$0	A	-	-	400	$900	10+
Insulate Above Dropped Ceiling & Storage Area	$20,000	$0	A	4	6,000	700	$2,500	8+
Estimated Program	***$33,000***	***$0***		***4***	***6,000***	***1,200***	***$3,600***	***9.2***

Notes ***Current Utility Budget:*** ***$36,800***

(1) Subject to Utility Incentive Policy and Screening Analysis ***Percent Reduction:*** ***10%***

(2) A - Better Comfort; B - Improved Reliability; C - Reduced Maintenance; D - Enhanced Appearance

[10] Appendix B
[11] Appendix B

The following recommendations for projects might benefit from multiple-building contracts. Further analysis for feasibility should be conducted.

1. Building envelope - air seal and top off insulation.

Recommended for:
- Town Hall
- Fire Station
- Police Station

2. Heating system efficiency - install boiler reset controls, programmable thermostats, replace heat pumps/heater

Recommended for:
- Town Hall
- Police Station

4. Issues and Concerns

Over the past several years, municipalities have made important progress in the areas of energy efficiency and sustainability. However, as we enter the second decade of the 21st Century, there are still many challenges to overcome.

1.) **Fuel Prices:** The price of oil has increased by more than 400 percent since 1998, and in New Hampshire, the cost of home heating oil rose 30 percent between 2010 and 2011[12]
2.) **Patterns of Development:** In recent decades, development in the United States has been characterized the tendency of communities to fracture into residential and commercial zones, accessible to each other only by automobile
3.) **Public Transit:** Like many other New Hampshire towns, Goffstown lacks access to major public transit lines such as rail or bus
4.) **Funding:** Although cost-effective in the long run, many energy efficiency projects require significant up-front costs that businesses and individuals cannot afford.
5.) **Complexity, interest and education:** Many energy efficiency and sustainability programs in New Hampshire are complex and difficult for the general public to understand. For instance, one recent survey showed that more than 40 percent of NH residents had little to no idea about where to go for sustainable energy loans, rebates, or grants.[13] Also, lack of residential interest and education can present a challenge when trying to make positive changes in a community towards energy efficiency and sustainability.
6.) **Split incentives:** In the case of rented buildings, owners pay the costs of initiating energy efficiency programs, but tenants receive the savings from implementing them (or the costs from not implementing them)

[12] New Hampshire Heating Oil Dealers and Price Guide. < http://www.heatingoilnh.com/lowest-prices.htm > Retrieved 2011-10-06

[13] *Independent Study of Policy Issues*: Prepared by the Vermont Investment Corporation, June 2011. Appendix A: Page 3.

5. New Opportunities for Energy Efficiency

It is widely acknowledged that current patterns of growth, development, and consumption cannot be maintained indefinitely. As the costs of energy increase, many actors are turning to new, more creative methods of energy use. These new methods can be direct, such as implementing plans for alternative or renewable energy, or indirect, such as increasing citizen awareness about the importance of resource conservation.

5.1. Renewable Energy

Renewable energy flows involve natural phenomena such as sunlight, wind, tides, plant growth, and geothermal heat, as the International Energy Agency explains:[14]

"Renewable energy is derived from natural processes that are replenished constantly. In its various forms, it derives directly from the sun, or from heat generated deep within the earth. Included in the definition are electricity and heat generated from solar, wind, ocean, hydropower, biomass, geothermal resources, biofuels and hydrogen derived from renewable resources."

Renewable or alternative energy is an important consideration in energy planning. While energy demand cannot be eliminated completely, renewable energy can be a valuable complement to energy efficiency and conservation. The New Hampshire Office of Energy and Planning estimates that, on average, at least 85 percent of our heating energy in New Hampshire comes from imported fossil fuels. One of the best opportunities to increase the use of renewable and local energy sources is through residential renewable energy projects. These renewable energy options could also be implemented for larger uses and structures over time.

State law, RSA 72: 61-72 grants municipalities the option to exempt certain renewable energy installations from property taxation. Incentives such as this encourage people to explore different options for home heating and energy, leading to an improvement in the region's economic vitality and energy sustainability.

5.1.1. Renewable Energy Sources

Solar

New Hampshire has an average solar energy density of 4.0-4.5 kWh/m2/day[15], enough to drive significant amounts of energy on the state's rooftops and fields, as well as through larger distributed systems. Costs have indeed been steadily declining over the past few years, with installed costs for a residential-scale PV system currently averaging below $6.50/W[16]

[14] IEA Renewable Energy Working Party (2002). *Renewable Energy... into the mainstream*, p. 9.
[15] *Independent Study of Policy Issues*: Prepared by the Vermont Investment Corporation, June 2011. Section 10: Page 28
[16] See above

- **Self-Contained Solar Units** are immune to power outages and offer battery backup for cloudy days. They also are typically easier to maintain than traditionally powered units and reduce ownership costs by eliminating monthly electric bills. Self-contained solar is a good option in places where it may be difficult to run wires or that are especially remote.
- **Solar heating** harnesses the power of the sun to provide heat for hot water, space heating and swimming pools. Solar heating can be either passive, such as simply using large windows to let in more light and warmth, or active, where specially designed mechanical systems increase the heat gained from the sunlight.

Wind

Although only 0.3 percent of the state's power supply is currently provided by wind, a recent resource assessment by the National Renewable Energy Lab determined that wind could provide up to 60 percent of the state's current electricity needs.[17]

- Small wind energy systems are turbines which require 1 acre of open land and can lower electricity bills to homes and businesses by 50 to 90 percent[18]
- Smaller, single-unit wind turbines are also less likely than larger units to raise complaints over scenery issues

Hydro-electric

Currently, hydro-electric dams located in New Hampshire produce about six percent of the state's electricity needs. The Northern Pass transmission project, currently in the planning and permitting stages, is designed to deliver up to 1,200 additional megawatts of low-carbon, renewable energy to the state. As one of the most cost-effective and widely available forms of re-usable energy, hydro-electric power is expected to play a big part in NH's future sustainability goals.

LEDs

For most uses, Light Emitting Diodes typically last 20 years, compared to less than a year for incandescent bulbs. In addition to requiring less maintenance, LED bulbs provide up to a 90 percent reduction in power consumption and have a similarly wide-range of application, from commercial and home use, to street and traffic lighting.

Biomass

Unlike coal and oil, biomass has the ability to quickly replenish itself, and is thus considered a renewable energy source. In 2008, biomass represented over 6.5

[17] *Independent Study of Policy Issues*: Prepared by the Vermont Investment Corporation, June 2011. Section 10: Page 31.
[18] See above

percent of total New Hampshire electric production and just over 4 percent of residential and commercial & industrial energy consumption.[19]

- Biomass typically takes the form of unused wood chips, stumps, roots, and discarded crop matter, and thus would not negatively affect the lumber or farming industries.
- It is estimated that biomass will have a particularly large impact in rural communities with easy access to wood and crop materials. Already, more than 10 percent of rural NH residents use wood as their primary heating source.[20]
- In a recent study, the Northeast Biomass Thermal Energy Working Group developed a vision for heating the Northeast, which estimated that 19 million green tons of forest and crop biomass will be available by 2025 to fuel the region.[21]

Combined Heat and Power – (CHP), also known as cogeneration, is the concurrent production of electricity or mechanical power and useful thermal energy (heating and/or cooling) from a single source of energy. CHP is a type of distributed generation, which, unlike central station generation, is located at or near the point of consumption. Instead of purchasing electricity from a local utility and then burning fuel in a furnace or boiler to produce thermal energy, consumers use CHP to provide these energy services in one energy-efficient step. As a result, CHP improves efficiency and reduces greenhouse gas (GHG) emissions. CHP can use a variety of fuels, both fossil- and renewable-based.
[22]

Net Metering

Net metering, or net energy metering, is an electricity policy which allows utility customers to offset some or all of their energy use with self-produced renewable energy. Net metering works by utilizing a meter that is able to spin and record energy flow in both directions. The meter spins forward when a customer is drawing power from the utility grid (i.e., using more energy than they are producing) and spins backward when energy is being sent back to the grid. At the end of a given month, the customer is billed only for the net energy used.[23]

[19] *Independent Study of Policy Issues*: Prepared by the Vermont Investment Corporation, June 2011. Section 10: Page 36.
[20] *Independent Study of Policy Issues*: Prepared by the Vermont Investment Corporation, June 2011. Section 10: Page 36.
[21] *Independent Study of Policy Issues*: Prepared by the Vermont Investment Corporation, June 2011. Section 10: Page 38
[22] "Combined Heat and Power – Effective Energy Solutions for a Sustainable Future". Oak Ridge National Laboratory. 1 December 2008. Retrieved 11 April 2012.
[23] Calfinder Residential Solar Power. http://solar.calfinder.com/blog/solar-information/what-is-net-metering/

5.2. Transportation

Transportation is an activity that consumes a great deal of fossil fuel. As communities grow and physically spread out, vehicle miles traveled per household and the associated energy demand have increased to support a more auto-dependent lifestyle. Strategies for reducing vehicle miles traveled and reliance on automobiles can help to create a more energy efficient transportation network. Further, recent advances in vehicle technology have increased auto-efficiency and outreach and education to encourage alternative vehicle technology and increased efficiency can help to reduce reliance on fossil fuels.

Strategies to reduce vehicle miles traveled should include a complete streets design approach. Complete Streets are roadways designed and operated to enable safe, attractive, and comfortable access and travel for all users, including pedestrians, bicyclists, motorists and public transport users of all ages and abilities.[24]

5.3. Land Use

The way communities are designed, planned, and built may influence the amount of energy used, how energy is distributed, and the types of energy sources that will be needed in the future. Energy efficiency can be incorporated into land use planning by adopting mixed-used zoning, which would allow greater accessibility to desired services without requiring greater mobility. Other ways to promote energy efficiency and conservation in land use planning include:

- Encouraging alternative forms of transportation in the planning and design of the community.
- Encouraging energy efficient development through subdivision and site plan review regulations, zoning ordinance and building codes. Site design techniques that take advantage of sun exposure, differences in microclimate, and landscaping reduce a development's demand for fossil fuel derived energy sources and reduce overall energy consumption.[25]

Goffstown has already implemented some recognized methods for increasing energy efficiency in land use patterns:

- Goffstown Open Space Conservation Plan
- Goffstown Rail Trail
- Goffstown Village Plan
- Goffstown Main Street Program
- Route 114/114A Corridor Management Plan
- Zoning districts which allow for mixed-use

[24] Ritter, John (2007-07-29). *Complete streets' program gives more room for pedestrians, cyclists*. *USA Today*. http://www.usatoday.com/news/nation/2007-07-29-complete-streets_N.htm. Retrieved 2011-09-07.
[25] Model ordinance language can be found in *Innovative Land Use Planning Techniques*. October 2008.

5.4. Building Codes

Building codes should allow for energy efficient design and use. Programs like the U.S. Department of Energy's Building Energy Codes Program (BECP) and certifications such as Leadership in Energy & Environmental Design (LEED) offer guidelines and metrics that can be used to increase a building's energy performance and result in greater energy efficiency and ultimately cost savings.

Current building codes represent the minimum legal energy efficiency for structures. These standards focus on the building envelope and mechanical systems and disregard natural and renewable means of reducing a building's environmental impacts. By applying passive solar design in conjunction with building codes, energy utility bills can be decreased by 30 percent. Add to that "well insulated and tightly constructed building shells" and the savings can reach 75 percent.[26]

RSA 155-A: 2 VI allows municipalities to adopt more stringent building codes than the state codes. For examples of more stringent standards that a community may adopt to achieve desired energy savings please see the Innovative Land Use Planning Techniques Handbook.[27]

[26] Urban Land Institute, 2000
[27] NHDES. *Innovative Land Use Planning Techniques, A Handbook for Sustainable Development*. October 2008.

6. Recommendations and Action Plan

Promoting and incorporating energy efficient measures in town buildings and activities has many benefits to the town, including reducing operating costs and cutting carbon emissions. The following actions are recommended for Goffstown in order to work towards achieving its energy goals.

Goffstown Energy Action Plan

Goal				
	Recommendation	**Who (Leadership)**	**When (Suggested Deadline)**	**How (Resources)**
1. Explore the formation of a formal energy commission				
1a.	Discuss the role of an energy committee in Goffstown with the BOS	*BOS*	*2012*	*Local Energy Committee Volunteers*
1b.	Appoint a BOS representative to the Local Energy Committee to work with and coordinate on energy efficiency projects in Goffstown	*BOS*	*2012*	*N/A*
2. Increase community awareness, advise and educate residents on reducing energy costs and consumption				
2a.	Publicize energy savings measures the town is taking for municipal buildings and progress on reducing municipal energy and costs	*Local Energy Committee, Energy Manager*	*Ongoing*	*Energy Tracking Software: Energystar Portfolio Manager, STOCC (Clean Air Cool Planet)*
2b.	Create a page for the Energy Committee on the Town website	*Local Energy Committee, Energy Manager, IT*	*2012*	*N/A*
2c.	Publish energy efficiency tips in the local newspaper through the Local Energy Committee	*Local Energy Committee*	*Ongoing*	*N/A*

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Goal				
	Recommendation	**Who (Leadership)**	**When (Suggested Deadline)**	**How (Resources)**
2d.	Hold free events with an energy conservation focus and incorporate energy conservation measures into community events	*Local Energy Committee, Energy Manager*	*Ongoing*	*Local Energy Committee, Energy Manager, Parks and Rec, Goffstown Main Street Program*
3. Explore alternative forms of energy in order to reduce fossil fuel dependence and to increase energy conservation and savings				
3a.	Investigate alternative energy sources for municipal buildings	BOS, Energy/Facilities Manager	*2012-2015*	*See section 3.2 Goffstown Energy Analysis and Savings Opportunities, Clean Air Cool Planet, Field Guide to New Hampshire's Municipal Buildings and Energy Audit Guidelines*
3c.	Consider ways to encourage alternative transportation methods	*BOS, Planning Board, DPW, Local Energy Committee*	*2012-2015*	*National Complete Streets Coalition, Best Policy and Implementation Practices*
3d.	Encourage department heads to consider energy efficiency projects within and in coordination with other departments	BOS, Town Administrator, *Local Energy Committee*	*Ongoing*	*Municipal Energy Policies*
3e.	Consider making solar and wind renewable energy installations exempt from property taxation (per RSA 72:61-72) to encourage residents to explore different options for home heating and energy.	*Planning Board, P&Z Administrator, BOS*	*2012-2015*	*N/A*
4. Work towards reducing energy consumption in municipal buildings				
4a.	Prioritize energy efficiency recommendations	*BOS, Energy Manager, Budget Committee, CIP Committee, Local Energy Committee*	*2012-2013*	*See section 3.2. Goffstown Energy Analysis and Savings Opportunities*

Goffstown Energy Action Plan

Goal				
	Recommendation	**Who (Leadership)**	**When (Suggested Deadline)**	**How (Resources)**
4b.	Track energy use in municipal buildings and require quarterly reporting	*Energy Manager, BOS*	*Ongoing*	*Energystar Portfolio Manager, STOCC (Clean Air Cool Planet)*
4d.	Appoint a responsible party for energy management in town facilities	*BOS*	*2012*	*N/A*
4e.	Recommend energy policies for municipal buildings	*Energy Manager, Local Energy Committee*	*2012-2015*	*N/A*
4h.	Consider innovative financing techniques for energy efficiency projects in municipal buildings	*BOS, Energy Manager*	*Ongoing*	*Energy Performance Contracting, State and Utility EE Programs, Grants and low-cost loans, Appendix C*
5. Encourage energy conservation Town-wide				
5a.	Consider innovative land use planning techniques for energy efficient development	*Planning Board, P&Z Administrator*	*2012-2015*	*Innovative Land Use Planning Techniques Handbook, NHDES*
5b.	Review the existing Master Plan, Zoning Ordinances and other town policies to promote and incorporate energy efficient development	*Planning Board, BOS*	*2012-2015*	*N/A*
5c.	Encourage recycling and composting in municipal buildings and town-wide	*BOS, Town Administrator, DPW*	*Ongoing*	*N/A*

Appendices

Appendix A

Definitions

ARRA – American Reinvestment and Recovery Act

Carbon sequestration - Carbon that is removed from the atmosphere and retained in a carbon sink (such as a growing tree or in soil).[28]

Climate Change – Burning fossil fuels, increased agriculture, and deforestation all emit natural greenhouse gases and are concerning due to their contribution to increased concentrations of these greenhouse gases. Human activities also increase GHG emissions that are not naturally occurring in the atmosphere. These activities include semiconductor manufacturing, refrigerant leaks, and other industrial sources. The high level of greenhouse gases trap heat close to the surface of the earth, contributing to major shifts in the global climate.[29]

Complete Streets – Complete streets (sometimes livable streets) are roadways designed and operated to enable safe, attractive, and comfortable access and travel for all users, including pedestrians, bicyclists, motorists and public transport users of all ages and abilities.[30]

DHW – Domestic Hot Water

Energy Conservation – the efficient use of energy or the reduction of energy use by implementing energy efficient practices, policies, technologies, construction, development or any other action aimed at reducing energy use.

Energy Efficiency – Efficient energy use, sometimes simply called energy efficiency, is the goal of efforts to reduce the amount of energy required to provide products and services. For example, insulating a home allows a building to use less heating and cooling energy to achieve and maintain a comfortable temperature. Installing fluorescent lights or natural skylights reduces the amount of energy required to attain the same level of illumination compared to using traditional incandescent light bulbs. Compact fluorescent lights use two-thirds less energy and may last 6 to 10 times longer than incandescent lights. Improvements in energy efficiency are most often achieved by adopting a more efficient technology or production process.[31]

GDP – Gross Domestic Product

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[28] Energy Terms Glossary. Nebraska Energy Office. http://www.neo.ne.gov/statshtml/glossarys.htm. Retrieved 2011-11-15.
[29] US Dept. of Energy. Federal Energy Management Program
[30] Ritter, John (2007-07-29). *Complete streets' program gives more room for pedestrians, cyclists*. *USA Today*. http://www.usatoday.com/news/nation/2007-07-29-complete-streets_N.htm. Retrieved 2011-09-07.
[31] Diesendorf, Mark (2007). Greenhouse Solutions with Sustainable Energy, UNSW Press, p. 86.

Greenhouse Gas Emissions – Greenhouse gases are trace gases in the lower atmosphere that trap heat through a natural process called the "greenhouse effect." This process keeps the planet habitable. International research has linked human activities to a rapid increase in GHG concentrations in the atmosphere, contributing to major shifts in the global climate.[32]

IR – Infrared

kWh/yr – Kilowatt hours per year

Life-cycle emissions – The term 'lifecycle greenhouse gas emissions' means the aggregate quantity of greenhouse gas emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes related to the full fuel lifecycle, including all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery and use of the finished fuel to the ultimate consumer, where the mass values for all greenhouse gases are adjusted to account for their relative global warming potential.[33]

Light Emitting Diodes (LED) - A light-emitting diode (LED) is a semiconductor light source.[34] LEDs are used as indicator lamps in many devices and are increasingly used for other lighting. Introduced as a practical electronic component in 1962,[35] early LEDs emitted low-intensity red light, but modern versions are available across the visible, ultraviolet and infrared wavelengths, with very high brightness.

Point of Use DHW heaters – Point of Use Domestic Hot Water heaters. They are typically dedicated use heaters meaning the unit serves one sink / faucet or one shower, etc.

Renewable Energy – Renewable energy is derived from natural processes that are replenished constantly. In its various forms, it derives directly from the sun, or from heat generated deep within the earth. Included in the definition are electricity and heat generated from solar, wind, ocean, hydropower, biomass, geothermal resources, biofuels and hydrogen derived from renewable resources.[36]

Simple payback – Payback period in capital budgeting refers to the period of time required for the return on an investment to "repay" the sum of the original investment.

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[32] US Dept. of Energy. Federal Energy Management Program.
[33] US EPA. Clean Air Act Section 211(o)(1)
[34] "LED". The American heritage science dictionary. Houghton Mifflin Company. 2005. Via http://dictionary.reference.com/browse/led and http://www.thefreedictionary.com/LED, Retrieved 2011-11-15
[35] "Nick Holonyak, Jr. 2004 Lemelson-MIT Prize Winner". Lemenson-MIT Program. http://web.mit.edu/invent/a-winners/a-holonyak.html. Retrieved 2007-08-13.
[36] International Energy Agency

Small wind energy systems – A wind energy conversion system consisting of a wind generator, a tower, and associated control or conversion electronics, which has a rated capacity of 100 kilowatts or less and will be used primarily for onsite consumption.

Super T8 – High-performance "Super T8" lamp and ballast systems provide energy savings and longer lamp life.

Traditional Neighborhood Developments – Traditional Neighborhood Development (TND) is a compact land development pattern that includes a variety of housing types and land uses in a defined area. Public spaces, civic buildings and commercial establishments are located within walking distance of homes. Community identity, civic spaces and walkability are emphasized.[37]

Vehicle miles traveled – Vehicle Miles Traveled (VMT) is the total number of miles driven by all vehicles within a given time period and geographic area.

Village Plan Alternative – The Village Plan Alternative (VPA) is a planning tool that promotes compact development with a mix of land uses, including residential, small-scale commercial, recreation and conservation in close proximity to one another within a neighborhood. It is designed to implement the specific provisions of RSA 674:21.VI(a) to allow for the creation of new villages with mixed-used development that is scaled to the smaller populations and lower density of New Hampshire towns.[38]

Wind turbines – A wind turbine is a device that converts kinetic energy from the wind into mechanical energy.

[37]Natural Lands Trust. Conservation Tools. http://conservationtools.org/guides/show/46 Retrieved 2011-11-15

[38] NHDES. Innovative Land Use Planning Techniques Handbook. October 2008.

Appendix B

Energy Efficiency Opportunities
For
Town Buildings
Goffstown, New Hampshire

December 16, 2010

Prepared by:
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and
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Provided by:
New Hampshire's Office of Energy and Planning

Energy Technical Assistance & Planning
For New Hampshire Communities
Funded by the ARRA Energy Efficiency Conservation Block Grant

1.0 Introduction and Executive Summary

Peregrine Energy Group, Inc. ("Peregrine") and Breakaway Energy Services have prepared this Energy Opportunities Assessment and Roadmap to Energy Efficiency for the Town of Goffstown, New Hampshire. Work has been completed on behalf of the New Hampshire Office of Energy and Planning. This support is being provided through the Energy Technical Assistance & Planning for New Hampshire Communities program ("ETAP"), funded by the American Recovery and Reinvestment Act Energy Efficiency and Conservation Block Grant program of the U.S. Department of Energy.

On December 2, 2010, accompanied by Dave Roberge of Goffstown, Peregrine toured the Town Hall, Fire and Police Stations to evaluate current energy use and identify opportunities for energy cost reduction. HVAC replacement of Town Hall systems was of particular interest, as are envelope improvements at the Fire and Police stations.

Peregrine has completed this Energy Opportunity Assessment to guide the Town in developing and implementing an energy reduction strategy. This assessment includes specific recommendations and next steps to reduce energy use and increase energy efficiency. We include summary information on the building with recommendations that can provide a starting point for securing bids from installation contractors for suggested projects.

Findings and Recommendations

Peregrine's Opportunity Assessment focused on:

- Historical energy use
- Operating practices
- Lighting technology and requirements
- HVAC equipment and controls
- Building envelop materials and condition
- Future plans and requirement

We recommend an efficiency program that includes the three buildings toured and includes a number of necessary infrastruction renewal projects. The Town Hall has limited opportunity for energy cost reduction other than replacing aging heat pump systems with new propane fired units. We have also made specific recommendations to improve weatherization of the Fire and Police stations.

We estimate that identified energy reduction improvements and strategies will generate about $11,400 in utility cost savings annually, which represents roughly 16% of these facilities' combined annual utility expenditure. The recommendations will require an investment of approximately $146,000, less limited incentives from PSNH which are expected to be minimal.

This estimated budget is driven primarily by our recommendations to replace HVAC equipment at the Town Hall. The net simple payback on the program based on energy savings alone is 12.8 years, as shown in Table 1, but the benefits from the proposed program include equipment reliability improvement, reduction in current and anticipated repair expense, and increased comfort in all buildings.

Suggested Next Steps

We suggest that the town move forward aggressively with the specific projects we recommend. Within the context of the ETAP program, Peregrine can support the town at no cost with planning and executing these recommendations. All projects indentified in this report require further development to obtain firm pricing and to tighten up the saving projections.

Immediate next steps include:

- Commit to pursuing recommended projects and establish an implementation schedule.
- Develop request for proposal documents and/or contact preferred mechanical and lighting contractor(s). Unitil may require use of specific vendors for work supported by their program.
- Secure quotes for projects and select contractor(s).

Table 1 – Energy Reduction Program Potential Results

Approximate Implementation Cost	Utility Incentive Available[1]	Potential Utility Savings			Annual Cost Avoidance	Simple Payback Yr
		Demand kW	Electric kWh/yr	Gas Therms/yr		
$146,000	$100	8	77,700	(200)	$11,400	12.8

2.0 Utility Use Summary

The town buildings use electricity and propane as the primary utility supply. Electricity is supplied by Public Service of New Hampshire (PSNH) and distributed in facilities at 208 volts, three phases. Propane is delivered and storage at on-site tanks at the Fire and Police stations. Utility use data was provided for 2008 and is summarized in Table 2 below. The average cost of electricity for a more recent period, including demand, was $0.152/kWh. The average cost of propane was $2.29/gallon.

Table 2 – Annual Utility Use and Energy Density

Building	SF	Electricity (kWh)	Propane (Gal)	Total Annual Utility Cost	kBtu/SF[1]
Town Hall	9,500	134,000	-	$17,500	48
Fire Station No. 18[2]	5,125	50,000	4,000	$16,000	98
Police	11,318	134,000	7,000	$36,800	95

[1]Represents Btu equivalent of combined annual electricity and propane use, divided by building square footage, divided by 1,000. ENERGYSTAR reports that values can range from 30 kBtu/Sf to 340 kBtu/SF. An efficient commercial office building in the Northeast should perform at roughly 80 kBtu/SF.

[2]Utility use and cost is estimated – no data was available at the time of our visit.

3.0 Town Hall

The Goffstown Town Hall was built in 1930 and expanded in 1960. The building totals 9,500 square feet. The brick building is two stories with a basement level and has newer thermal pane windows. There is no insulation in the exterior walls. The attic has one layer of insulation that varies from R22 to R30. The roof is asphalt. The building houses mostly offices, but also includes a courtroom and meeting area. The building is open during normal business hours.

The Town Hall is conditioned by split heat pump air handlers (one 7.5 ton unit and three 5 ton units). These units are older, but remain in serviceable condition for now. They will likely require replacement within the next 5 years. Each unit has an electric heating coil that range in size from 11.3 to 15 kW. Electric heating is typically activated once the ambient outside temperature drops below freezing and the heat pump condenser is unable to absorb sufficient heat. Each air handler has an approximately ¾ hp fan. Controls are standard thermostats. Staff manually turn down the thermostats at night and for the weekend in the winter to conserve. There is 4.5 kW domestic hot water heater that operates on a timer to turn off at night.

Lighting at the Town Hall is T8, including some U-tube lamps.

Recommended Opportunities

This facility has unexpectedly low energy use for a poorly insulated building. The existing heat pump system is obviously working well, and we commend the town for applying good operational practices to minimize energy use.

We show two possible opportunities to make improvements in Table 3 below. Our recommendations include updating weather stripping on exterior doors and considering replacement of the heat pumps with high efficiency propane-fired split system furnaces. These recommendations are described following the table.

Table 3 – Summary of Energy-Related Opportunities for the Town Hall

Description	Approximate Implementation Cost	Utility Incentive Available[1]	Other Benefits[2]	Potential Utility Savings			Annual Cost Avoidance	Simple Payback Yr
				Demand kW	Electric kWh/yr	LP Gal/yr		
Improve Door Weather Strip	$500	$0	A	-	1,000	-	$200	2 - 3
Replace Heat Pumps w/ Propane Fired AHUs	$100,000	$0	B, C	3	68,000	(2,000)	$5,800	15+
Estimated Program	***$100,500***	***$0***		***3***	***69,000***	***(2,000)***	***$6,000***	***16.8***
Notes							***Current Utility Budget:***	***$17,500***
(1) Subject to Utility Incentive Policy and Screening Analysis							***Percent Reduction:***	***34%***
(2) A - Better Comfort; B - Improved Reliability; C - Reduced Maintenance; D - Enhanced Appearance								

3.1 Improve Door Weather Strip

The Town Hall has entrance doors at the front and back of the facility. The front door is a single door sets without vestibule and therefore any leakage around the doors equates to a significant exchange of cold air. Ideally a vestibule can be added, however this would negatively impact the appearance of the building, and we don't think this idea would be acceptable. The back door has a vestibule. We recommend replacement of door weather stripping and carefully aligning doors to

minimize air gaps. Weather stripping should be inspected and updated annually before the winter heating season.

Next Step: Consult with door specialist to select and price weather strip system. A town technician can probably install the product. Otherwise obtain pricing from a contractor.

3.2 Replace Heat Pumps with Propane-Fired Split System Air Handlers

The four split heat pump air handlers can be replaced with high efficiency propane-fired furnaces with DX cooling coils. The project requires installation of propane tanks and piping to the mechanical areas (propane supplier may furnish at no cost), installation of vent piping out of the building, removal and replacement of existing air handlers and condensing units. We recommend that the town consider this replacement in the next five years.

Replacing the heat pumps will probably be required within that time frame anyway as these existing systems continue to wear. Our recommendation for replacement will provide the town with a reliable system that operates at significantly less cost. This is because the electrical energy used for heating will be replaced by propane. Based on current utility rates, propane costs about 60% as much as electricity to provide an equivalent amount of heat.

Next Step: We recommend discussing and including this end of life equipment replacement and energy improvement project in the town's five year CIP forecast and to establish a reserve fund for replacing this equipment. In the mean time, we suggest discussing options with local heating experts or even hire an engineer to prepare specification and a detailed cost estimate for budget planning purposes. Peregrine is available to assist the town obtain technical support and/or bids to complete the work.

3.3 Additional Recommendations

Improve Building Insulation. There may be benefit to adding insulation in the attic, especially in the addition section where the existing insulation is not as thick. We believe there is no practical way to add insulation to the building's wall because the interior wall gypsum board is within ¾ inch of the exterior brick, according to Mr. Roberge.

We recommend that an air sealing expert be brought in to look at the building and assess opportunities for reducing air leakage and what, if anything would be cost effective. We also are recommending such services for the Fire and Police stations, and it will make sense to have all three buildings, including Town Hall, considered at the same time.

Add Programmable Thermostats. Staff is already setting back thermostats manually. We wonder if deeper resets could be possible if programmable thermostats are used. Programmable thermostats can be programmed to resume working toward normal setpoint well before the first person arrives to work. This permits the night temperature to be set lower since an automated increase to day

time temperatures can effectively offset deeper reductions than what would be acceptable to building occupants waiting for the temperature to recover in the morning.

4.0 Fire Station

The Goffstown main downtown Fire Station was built in 1969. This masonry block building has a main level with apparatus bay and lower basement level with living quarters. Total square footage is 5,125. The Fire Station is occupied around the clock. Windows are a mix of single and double pane glass. The roof is insulated with two inches of fiber panel. Apparatus bay doors are insulted and have weather seals, although some are damaged. There is no information or indication that exterior walls are insulated. There is an unused hose drying tower that is probably a source of substantial heat loss in the winter.

This building has hydronic baseboard heating from a 219 MBH Burnham propane-fired boiler that was installed in 2001. There are four heating zones. Two of these employ programmable thermostats. There is also a 3-ton split system that provides air conditioning to the office areas. The apparatus bay has two wall exhausters that are operated when the truck motors are on in the space. The fans have loosely fitted dampers that are supposed to close when the fans are turned off.

Lighting is mostly T8 with a few T12s. There may be a few incandescent lamps as well.

Recommended Opportunities

This facility has simple and relatively efficient systems with limited air conditioning. We suggest mostly focusing on the building envelop and weatherizing the building as best as possible. Table 4 summarizes our recommendations, which are described following the table.

Table 4 – Summary of Energy-Related Opportunities for the Fire Station

Description	Approximate Implementation Cost	Utility Incentive Available[1]	Other Benefits[2]	Potential Utility Savings			Annual Cost Avoidance	Simple Payback Yr
				Demand kW	Electric kWh/yr	LP Gal/yr		
Add Occupancy Sensors to Control Lights	$1,500	$0		-	2,100	-	$300	3 - 5
Update T12 and Incandscent Lights	$500	$100	B, C	< 1	600	-	$100	4 - 6
Replace Overhead Door Seals	$2,000	$0	A, B, C	1	-	100	$200	8+
Replace Exhaust Fan Dampers	$3,000	$0	B, C	-	-	200	$500	5+
Insulate HW Piping	$500	$0	A	-	-	100	$200	2 - 5
Seal Hose Tower	$5,000	$0	A	-	-	200	$500	8+
Estimated Program	***$12,500***	***$100***		***1***	***2,700***	***600***	***$1,800***	***6.9***

Notes ***Current Utility Budget:*** ***$16,000***

(1) Subject to Utility Incentive Policy and Screening Analysis ***Percent Reduction:*** ***11%***

(2) A - Better Comfort; B - Improved Reliability; C - Reduced Maintenance; D - Enhanced Appearance

4.1 Add Occupancy Sensor to Control Lighting

The Fire Station has mostly T8 fluorescent lighting. There are many parts of the building that are used intermittently. We recommend adding occupancy sensors to automatically turn off lights when they are not needed and turn them back on when a person enters the space. Good places for

occupancy sensors include meeting or workout rooms, offices, and even hallways. We do not recommend use of occupancy sensors in the apparatus bay as vehicles will make it difficult for sensors to detect personnel activity. Occupancy sensors are normally mounted as a replacement for wall switches. There are ceiling units available for larger or more complex areas.

Next Step: It may be possible for a town maintenance technician or electrician to install sensors. We recommend further review of the Fire Station to determine exactly which area will receive a sensor and then what sensor to install. Peregrine is available for further consultation.

4.2 Update T12 and Incandescent Lights

The Fire Station has mostly T8 fluorescent lighting. We noticed a few T12 lamps that should be replaced with T8s and electronic ballasts for optimal performance. We understand that there are at least two incandescent lamps in the Fire Station. These can be replaced with screw-in compact fluorescent lamps.

Next Step: We recommend that the town make updates themselves using maintenance funding.

4.3 Replace Overhead Door Seals

The Fire Station has three bay doors. The doors are insulated and have weather seals along the vertical track as along the top and top sills. This weather stripping is damaged in some sections leaving a gap to the weather. This is a high wear component of the doors and replacement is required periodically. Having the seals tight will improve comfort in the area and keep heating costs down.

Next Step: Consult with door specialist or supplier of original equipment to obtain pricing for replacement seals. Town maintenance staff may be able to replace the seals to save money and the complication of obtaining bids; otherwise the job should be priced by a general or door contractors.

4.4 Replace Exhaust Fan Dampers

The apparatus bay has two wall-mounted exhaust fans. These fan modules have outside air dampers that close when the fan shuts down. These exhaust fans are activated by a timer whenever trucks in the bay run their motors. The outside air dampers are not tight fitting and are a source of air leakage that is probably allowing much cold air into the bay. We recommend replacing the damper sections with gasketed dampers that have a weather tight seal.

Next Step: Consult with HVAC contractor(s) to select damper modules, develop a scope of work and obtain pricing bids. Peregrine is available to support the town by reviewing project documentation.

4.5 Insulate Hot Water Piping

Hot water piping in the boiler room is not insulated. We recommend that 1 to 1½ inch jacketed fiberglass insulation be added in the boiler room and as far into the building as can be accessed. Having uninsulated piping results in excessive thermal losses and overheating in the boiler room, where heat isn't needed.

Next Step: Consult with HVAC or insulating contractor(s) to obtain pricing. This should a simple one day (or less) task for a qualified contractor.

4.6 Seal Hose Tower

The Fire Station has a high tower that was designed to hang up hoses to dry. New hose materials used today do not require drying and the base of this section of the building has been converted to a work area. We discussed several options to seal the tower with the station staff, including replacing the overhead door accessing this area with a standard-sized weather tight one. Sealing the area off entirely is not desirable because there is a sink in the area and people occasionally work here. It was decided that the best option is to install an insulated eight foot ceiling in the tower with manway to access the upper tower space if ever required. We recommend removing the existing overhead door; otherwise the ceiling will have to much higher to make room for the door to roll up.

Next Step: Consult with general contractor to develop a task list and initial pricing. This project may need to go out to bid, if the town can't do the work themselves. Peregrine is available to review suggested scopes and help put together technical aspects of a bid document.

5.0 Police Station

The Goffstown Police Station is located across the street from the County Complex. The wood framed single story building was constructed in 1987 and there was an addition installed in 1997. The building totals 11,300 square feet and is mostly office space. There is also an equipment bay, Sallyport and prisoner retention cells. The roof has two inches of external rigid foam. Walls are insulated to R11. Windows are bullet proof single pane and probably not very thermally efficient. The building is occupied continuously.

The building has five smaller propane-fired DX rooftop units. Each has its own thermostat control. In addition, there are two propane fired unit heaters serving the equipment bay and Sallyport. The unit in the Sally port does not have electronic ignition and the pilot is believed to consume a significant amount of propane.

Lighting in the building has been updated to T8. Exit signs are LED.

Recommended Opportunities

Lighting and mechanical systems at this building are mostly as efficient as practical. We recommend replacing the Sallyport unit heater and otherwise focusing on improving building insulation. Table 5 summarizes our recommendations, which are described following the table.

Table 5 – Summary of Energy-Related Opportunities for the Police Station

Description	Approximate Implementation Cost	Utility Incentive Available[1]	Other Benefits[2]	Potential Utility Savings			Annual Cost Avoidance	Simple Payback Yr
				Demand kW	Electric kWh/yr	LP Gal/yr		
Replace Sallyport Direct Fired Unit Heater	$3,000	$0		-	-	100	$200	15+
Add Insulated Ceiling in Equipment Bay	$10,000	$0	A	-	-	400	$900	10+
Insulate Above Dropped Ceiling & Storage Area	$20,000	$0	A	4	6,000	700	$2,500	8+
Estimated Program	***$33,000***	***$0***		***4***	***6,000***	***1,200***	***$3,600***	***9.2***
Notes							***Current Utility Budget:***	***$36,800***
(1) Subject to Utility Incentive Policy and Screening Analysis							***Percent Reduction:***	***10%***
(2) A - Better Comfort; B - Improved Reliability; C - Reduced Maintenance; D - Enhanced Appearance								

5.1 Replace Sallyport Direct fired Unit Heater

The facility's Sallyport has a direct propane-fired unit heater. This unit has a pilot that is active during the heating season. We understand that the town has reviewed consumption and determined that the pilot burns up to 500 gallons of propane a year when the pilot was left on year-round. We expect use is probably less than this, but it is a significant user and cost to the town nonetheless. We recommend replacing the unit heater with a radiant unit that has electronic ignition. A radiant unit may allow the space to be maintained at a much lower temperature and activated briefly when needed to boost comfort in the area.

Next Step: Consult with an HVAC contractor to determine a suitable replacement unit and to obtain initial pricing. This project may need to go out to bid, if the town can't do the work themselves. Peregrine is available to review suggested scopes and help put together technical aspects of a bid document.

5.2 Add Insulated Ceiling in Equipment Bay

The Station's equipment bay has an open ceiling to the roof rafters. The only insulation is the two inches of rigid above the plywood roof decking. This area of the building has an ice damming issue in the corner near the unit heater. We recommend adding an insulated ceiling just below the rafters to improve building R value. This improvement should also reduce and probably eliminate the ice damming and subsequent roof damage. The space above the new ceiling should be vented to the outside to prevent mold growth in the summer.

Next Step: Consult with a general contractor to develop a scope of work and pricing to add an insulated ceiling and attic ventilation. Peregrine is available to review suggested scopes and help the town obtain bids.

5.3 Insulate Above Dropped Ceiling and Storage Area

The occupied parts of the building have suspended ceiling tiles hanging from the roof trusses. There is no insulation other than the two inches of rigid foam on the plywood roof deck. We recommend adding blown in insulation just above the suspended ceiling. This could be a somewhat complicated project as the suspended ceiling will probably have to be re-hung bit by bit to facilitate the

installation of an effective base above the suspended ceiling to hold the insulation. In the storage area, this project will result in the addition of a ceiling where there is none now.

Next Step: This project should be combined with 5.2 above. The next step is to work with a general contractor to develop a scope of work and pricing. Peregrine is available to support the town with documentation review and helping pull together technical aspects of RFP material.

Appendix C

State Level Energy Resources, Programs and Funding Mechanisms

State-Level Energy Resources

- **NH Office of Energy and Planning:** NHOEP is a cabinet-level division of the New Hampshire Executive Branch and reports directly to the Governor. It is charged with overseeing and carrying out a wide array of energy-related activities, including but not limited to the following:
  - Coordination of programs funded by the 2009 American Recovery and Reinvestment Act (ARRA), popularly known as the "Stimulus" including the Energy Technical Assistance and Planning (ETAP) Program
  - Statewide administration of the Fuel Assistance Program (see below)
  - Management of the State's "25 by '25 Program," which seeks to ensure that at least 25 percent of NH energy comes from renewable sources by 2025
  - Administration of the State's Weatherization Program (see below)

- **NH Climate Change Policy Task Force**: In December 2007, Governor Lynch issued Executive Order Number 2007-3, which established a Climate Change Policy Task Force and charged the Task Force with developing a Climate Action Plan for the State of New Hampshire. The Task Force concluded the most significant reductions in both emissions and costs will come from substantially increasing energy efficiency in all sections of the economy; continuing to increase sources of renewable energy; and designing our communities to reduce reliance on automobiles for transportation. The NH Climate Action Plan can be found at: http://des.nh.gov/organization/divisions/air/tsb/tps/climate/action_plan/nh_climate_action_plan.htm (04-16-2012)

- **NH Public Utilities Commission (PUC):** An agency affiliated with the Executive Branch, whose job is to balance the interests of regulated utilities/companies and the consumers to receive safe, adequate and reliable service at just and reasonable rates. Some of the responsibilities of the PUC include:
  - Monitoring and inspecting gas utilities for safety and proper construction
  - Acting as a mediator in disputes between customers and regulated utility companies
  - Initiating public hearings, audits of public utilities, and other forms of inquiry and investigation

- **Office of Consumer Advocate (OCA):** An independent state agency administratively attached to the PUC. However, while the PUC is charged with balancing the interests of ratepayers and utility shareholders, the role of OCA is to advocate exclusively for residential ratepayers

- **Energy Efficiency and Sustainable Energy Board (EESE):** The EESE is a relatively new board, created in 2008 to help promote and coordinate programs relating to energy efficiency, demand response, and sustainable energy in NH

- Investigates potential sources of funding for energy efficiency and sustainable energy development
- Works with local communities, non-profits, and civic engagement groups to increase statewide knowledge about energy efficiency
- Provides recommendations to the PUC about how to spend energy efficiency and renewable energy funds

State-Administered Energy Programs and Funding Mechanisms:

- **ARRA (Stimulus) Grants:** Between 2009 and 2012, stimulus grants provided $72 million towards NH energy efficiency projects.
- **State Energy Efficient Appliance Rebate Program (SEEARP):** Offers residential consumers rebates for the replacement of existing hot water heaters, boilers and furnaces to more energy efficient models
- **Enterprise Energy Fund (EEF):** A low-interest loan and grant program to help finance energy improvements in buildings owned or leased by businesses and nonprofits of all sizes
- **State Weatherization Program:** Provides insulation and heating efficiency improvements, carried out by public utility companies and NHOEP
- **RGGI:** The Regional Greenhouse Gas Initiative is a cap and trade program aimed at reducing carbon dioxide emissions across ten participating states in the northeast. It uses sales of emissions permits to fund a wide variety of state-wide energy programs.
- **Low Income Home Energy Assistance Program (LIHEAP):** Offers home-heating assistance to qualifying low-income NH residents
- **Pay For Performance Program:** Helps business owners improve energy efficiency in large commercial and industrial buildings
- **Retail Merchant's Association of NH (RMANH) Energy Program:** Offers detailed energy efficiency audits along with free energy-awareness seminars and printed materials
- **New England Carbon Challenge:** A joint initiative of the University of New Hampshire and Clean Air - Cool Planet which works to educate, inspire and support sustained reductions in residential and community energy consumption.
- **CORE EE Programs** – includes the Energy Star program and others. These programs are reviewed annually and are for energy efficiency measures/savings. They are paid for by the Systems Benefit Charge (SBC).
- **Electric Assistance Program (EAP):** Provides low-income residents with assistance on their electric bill
- **Property Assessed Clean Energy (PACE)**: Through PACE programs, residents and business owners are able to finance energy efficiency and renewable energy improvements through an additional assessment on their property tax bills or other municipal bill.