2008 MUNICIPAL ENERGY USE BASELINE REPORT AND ENERGY ACTION PLAN

Prepared for the

New Castle Energy Committee and the
Town of New Castle, New Hampshire

by the
Rockingham Planning Commission

June 2009

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2008 MUNICIPAL ENERGY USE BASELINE REPORT AND ENERGY ACTION PLAN
TOWN OF NEW CASTLE, NEW HAMPSHIRE
JUNE 2009

1.0 INTRODUCTION

This report is a summary of energy use, energy costs and greenhouse gas emissions for all municipal buildings and facilities of the Town of New Castle, New Hampshire for the year 2008. The focus of this report is the municipal operations of the town, with special emphasis on town-owned buildings. This report does not include information about residential, commercial, or industrial energy use (i.e. Wentworth Hotel, UNH, US Coast Guard, and other non-municipal uses).

This report was prepared by the Rockingham Planning Commission in partnership with and funded by a grant from Clean Air-Cool Planet. Energy data was gathered through the volunteer efforts of the New Castle Energy Committee and staff of the Rockingham Planning Commission, using the Small Town Carbon Calculator (STOCC) program developed by Clean Air Cool Planet.

2.0 TOWN OF NEW CASTLE PROFILE

Town Population:	1,026 (US Census Bureau, 2007)
Area of Municipality (land):	512 acres (0.8 square miles)
Population Density (0.8 square miles of land):	1,277.5 persons per square mile
Number of municipal buildings for this report:	5
Total area of municipal building space:	52,252 square feet
Number of street lights:	Approximately 50
Number of vehicles in municipal fleet:	8 (4 fire, 2 police, 2 DPW)

Total municipal energy costs in 2008	**$71,614**
Total energy costs for municipal buildings	$37,630
Total energy costs for municipal facilities	$9,418
Total cost for vehicles (gasoline)	$14,760
Total cost for streetlights (electric)	$9,806

2008 Average energy intensity of municipal buildings	*0.78 kBtu/square feet*
Town Hall	36.65 kBtu/sq ft
Maude H. Trefethen Elementary School	43.77 kBtu/ sq ft
House on the Common	13.32 kBtu/ sq ft
Recreation Building/Library	9.28 kBtu/ sq ft
Fire Station	24.90 kBtu/ sq ft

Energy Costs by Type

Total electricity costs for buildings and facilities	$22,695
Total No. 2 heating oil costs for buildings and facilities	$16,926
Total propane costs for buildings and facilities	$7,427

2008 Energy Use and Emissions

Total municipal energy use	2,321 MMBtu
Total municipal CO_2 emissions	445,451 lbs

3.0 NEW CASTLE ENERGY COMMITTEE

In 2007, New Castle was one of 165 municipalities - of the 183 municipalities in the state - that passed the New Hampshire Climate Change Resolution that calls on the federal government to prioritize climate change policy and enables the formation of a local energy committee for the town of New Castle to address energy efficiency and conservation, emission reductions, and other energy related issues in the community. The generation and use of energy and emissions from energy use - whether for our homes, businesses, transportation or recreation - has a very significant impact on our environment, and the health and welfare of the community. In support of energy conservation, NH State law encourages energy efficient patterns of development through zoning that does not unreasonably limit development of alternative and renewable sources of energy.

Role of the NCEC

The role of the New Castle Energy Committee is to:

- Coordinate energy conservation activities among municipal officials, town departments, zoning and planning boards, town committees, the elementary school, businesses, residents, and other community groups or activities;
- Work with town officials to develop a capital improvement plan that includes energy efficiency and conservation strategies;
- Develop a comprehensive energy plan or strategies for the town;
- Identify sources of funding including regional, state and federal grants, and organize fundraising activities;
- Recommend revisions and/or the development of regulatory and planning documents; and
- Coordinate energy related outreach and awareness activities in the community.

Members of the New Castle Energy Committee include:

Sandra Bisset (Chair), Jim Rini, Ansel Braseth, David McArdle, David Borden, Nancy Borden, Wally Mallett, Teddy Golter, Brad Greeley, Jim Cerny, Jerry Gulley, Jim Zuckerman, Susan Oliver Whitney, Gordon Hand, Rebecca Reilly, Mike Geanoulis , Skip Homicz, Peter Rice, Sam Page, Leonard Seagren, and other members not noted here.

Board of Selectmen - Lorn Buxton, Gene Doherty replaced by Patti Cohen, Peter Gamester

Other Municipal Supporters of the NCEC:

Department of Public Works - Brad Meade

Municipal Staff - Pam Cullen, Lynn Seward

Conservation Commission - Beth Hume

The New Castle Energy Committee (NCEC) was formally established in July 2008. The NCEC has worked diligently to identify the town's energy uses and potential cost savings. The NCEC formed into sub-task teams and one of these, the building weatherization team, identified potential energy improvements for several municipal buildings. In addition, NCEC obtained a grant from the Rockingham Planning Commission and Clean Air-Cool Planet to facilitate its energy planning.

The first task for the NCEC was to develop a Building Weatherization Team for which David McArdle volunteered as the team lead. He and his team developed for all of the municipal buildings an energy assessment (excluding the school) with a pay back schedule for various improvement items. A Fact Sheet on the Weatherization program, as well as the recommendations from this program, were delivered to the Town Selectmen on September 15, 2008. After this presentation we evaluated the Maude Trefethen Elementary School and had an energy audit conducted by Paul Button of Energy Audit Unlimited. The recommendations from the energy audit were submitted to the SAU50; the SAU50 is in the process of implementing the recommendations (i.e. install programmable thermostats throughout school and schedule a contractor to isolate warm air and improve the insulation in attic).

To date, NCEC tasks have included development of an energy inventory for municipal buildings and a draft Energy Chapter for the Town Master Plan. The draft Energy Chapter to the New Castle Town Master Plan was submitted to the Board of Selectmen and the Planning Board for review on May 30, 2009. The Planning Board endorsed the draft Energy Chapter and intends to continue its review of the document in preparation for conducting a public hearing in the fall of 2009, to proceed with possible adoption of the Energy Chapter to the Town Master Plan.

4.0 NEW CASTLE ENERGY INVENTORY

A municipal energy inventory involves the collection of data on the energy usage and energy costs for all buildings, facilities, street and other lighting, and vehicle fleet owned and operated by the municipality. Energy usage data includes the units of energy for all forms of energy used to power electric fixtures, heating and cooling systems, equipment, and facilities operation. Energy cost data includes the per unit charge for all forms of energy consumed as well as any service, transmission and other fees charged by the provider.

Data Collection and Inventory Methods

Data collection for this inventory involved collaborative efforts between the New Castle Energy Committee, town staff, and staff of the Rockingham Planning Commission (RPC). New Castle Energy Committee, with assistance from the RPC staff, were able to determine where to identify sources and locations of energy data to complete the energy inventory. The Committee used 2008 as a baseline year to collect municipal fuel and energy consumption information. Data was gathered for all sectors of energy usage under the jurisdiction of the municipal town: buildings including the Maude Trefethen Elementary School, facilities and infrastructure, vehicle fleet, and street lights. The different types of energy use were collected for each sector including electricity, heating oil, propane, and gasoline. Energy usage associated with town staff travel, school buses, water, and waste were not included in this analysis.

Staff from the Rockingham Planning Commission coordinated with and met the NCEC on a regular basis to make sure that the inventory progressed, the data collection process was effective, and the data needed was accurately collected.

Data Processing and Analysis

To process the data collected, Excel spreadsheets and the Small Town Carbon Calculator (STOCC) program, an energy assessment software program developed by Clean Air Cool Planet, were used. The STOCC program was used to quantify and estimate the amount of energy used and the greenhouse gases (GHG) generated from municipal energy consumption.

Energy and Utility Providers for New Castle

Electricity: Public Service of New Hampshire (PSNH)
Fuel Oil: Lamprey Brothers and Atlantic Fuel
Propane: Downeast Energy, Energy USA

Table 1. Summary of municipal buildings and infrastructure included in the energy inventory.

Municipal Buildings	**Year Built**	**Size (sq ft)**	**Energy/Fuel Types**
Town Hall	1900/1980	10,033	Electric, No. 2 heating oil, propane
Maude H. Trefethen Elem. School	1950/1985/1995)	16,575	Electric, No. 2 heating oil
House on the Common	1935	2,123	Electric, No. 2 heating oil
Recreation Building/Library	1989	20,488	Electric, propane
DPW	1965	1,170	Electric, propane
Fire Station (old)	1974/75	3,033	Electric/propane
DPW Facilities	**Year Installed**	**Capacity**	**Energy/Fuel Types**
Sewer Pump at Quarterdeck Lane	1976	7 horsepower	Electric
Sewer Pump at River Road	1976	10 horsepower	Electric
Sewer Pump at Steamboat Lane	1976	4 horsepower	Electric
Boat Storage Area	--	--	Electric

5.0 2008 MUNICIPAL ENERGY INVENTORY RESULTS

The New Castle municipal energy inventory statistical results are summarized in Table 1 below. Table 1 and the three graphs below illustrate the fact that municipal buildings are the most significant sector in New Castle in terms of overall energy use and energy cost, and especially in terms of carbon dioxide emissions.

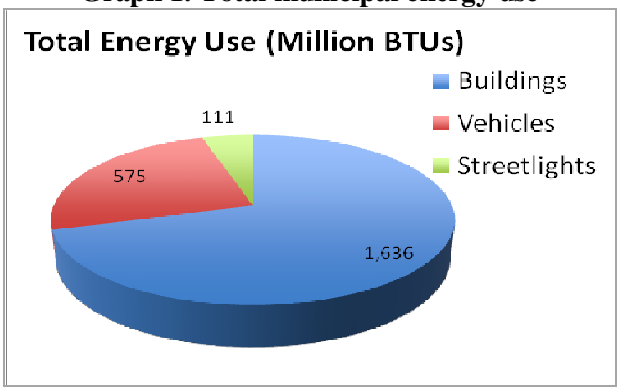
Table 2. Energy use, equivalent carbon emissions, and costs, by municipal sector.

Municipal Sector	Energy Use (MMBtu)*	Energy Use (%)	CO_2 (lbs)	CO_2 (%)	Energy Cost (US$)	Energy Cost %
Buildings/Facilities	1,636	70%	323,553	73%	$47,048	66%
Vehicle Fleet	575	25%	89,710	20%	$14,760	21%
Street Lights	111	5%	32,288	7%	$9,806	13%
Total	***2,322***	**--**	***445,551***	**--**	***$71,614***	**--**

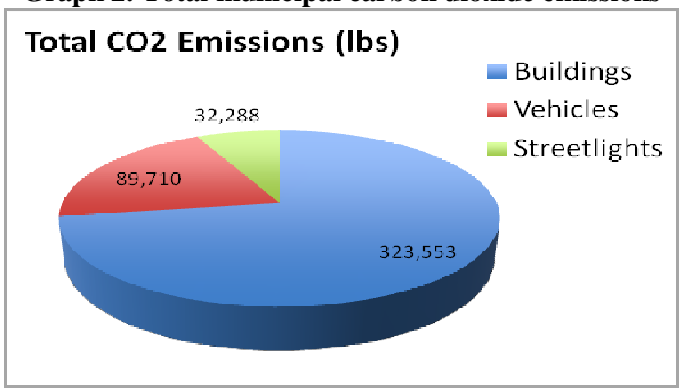
* MMBtu = one million British Thermal Units

Note energy statistics for each building and facility are presented in the following section.

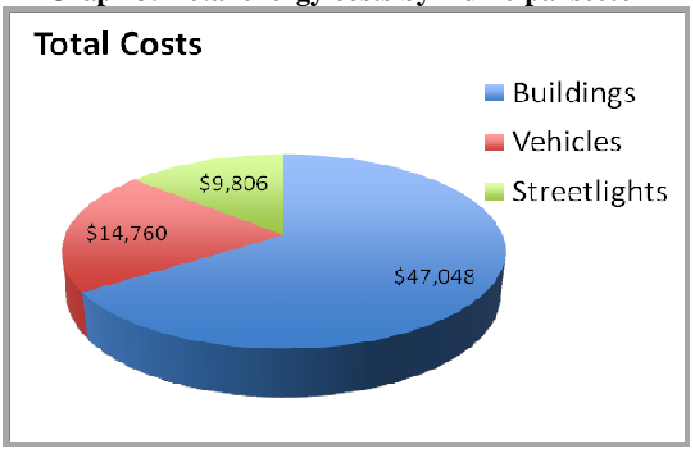
Graph 1. Total municipal energy use



Graph 2. Total municipal carbon dioxide emissions



Graph 3. Total energy costs by municipal sector



Carbon Dioxide Emissions estimated using the following conversion (from the Small Town Carbon Calculator program):

Electricity = 1 lb/kWH

No. 2 Heating Oil = 22.4 lbs/gallon

Propane = 12.7 1bs/gallon

The building sector is the most significant energy user, comprising 70% of energy use and 61% of energy costs, and contributing 70% of total carbon dioxide emissions. The vehicle sector is the other significant energy user, comprising 25% of energy use and 23% of the energy costs, and contributing 22% of total carbon dioxide emissions. While the streetlight sector contributes less to the town's energy use, streetlights comprised 5% of energy use, 15% of energy costs, and contributed 8% of total carbon dioxide emissions.

6.0 2008 MUNICIPAL BUILDING AND FACILITY PERFORMANCE

Energy data was gathered for each building and facility managed or supported financially by the municipality. The following table and graph presents data analysis from the STOCC software, including energy use, carbon dioxide emissions and costs by municipal building and facility.

Table 3. Energy use, carbon emissions, and costs by municipal buildings and facilities.

Municipal Buildings	Energy (MMBTu)	% Energy*	CO2 (lbs)	% CO2*	Cost $	% Cost*
Town Hall	361.7	26	62,799	24	10,195	27
Maude H. Trefethen Elem. School	725.47	53	128,888	51	16,116	43
House on the Common	28.28	2	6,355	2	1,358	4
Recreation Building/Library	190.04	14	42,036	16	6,916	18
Fire Station	75.51	5	17,850	7	2,785	7
Fire Station Alarm	0	0	0	0	260	1
Sub-Total	*1,381*	--	*257,928*		*$37,630*	--
DPW Facilities						
Sewer pump at Quarterdeck Lane	88.07	35	25,657	39	3,275	35
Sewer pump at Steamboat Lane	21.39	8	6,232	9	1,162	12
Sewer pump at River Road	83.53	33	24,333	37	3,563	38
Pump Station	26.77	10	4,318	7	461	5
Boat Storage Area	0	0	33	<1	105	1
DPW Maintenance	34.93	14	5,052	8	852	9
Sub-Total	*255*	--	*65,625*	--	*$9,418*	--
Buildings and Facilities	**1,636**	**--**	**323,553**	**--**	**$47,048**	**--**
Vehicles	**575**	**--**	**89,710**	**--**	**$14,760**	**--**
Streetlights	**111**	**--**	**32,288**	**--**	**$9,806**	**--**
Total	***2,322***	**--**	***445,551***	**--**	***$71,614***	**--**

* Percentage statistics reported for Municipal Buildings and DPW Facilities are based on the subtotals for these categories, not the total presented in the last line of the table.

Note: Town Hall and the elementary school use both electric and No. 2 heating oil.

As indicated by the data reported in Table 3, it appears that the Maude H. Trefethen Elementary School, Town Hall and the sewer pumps, may offer significant opportunities for energy savings as collectively these buildings and facilities represent nearly 88 percent of the total annual municipal energy costs. Graph 4 below compares the energy costs for all buildings and facilities.

Graph 4. Comparison of energy costs for all buildings and facilities.

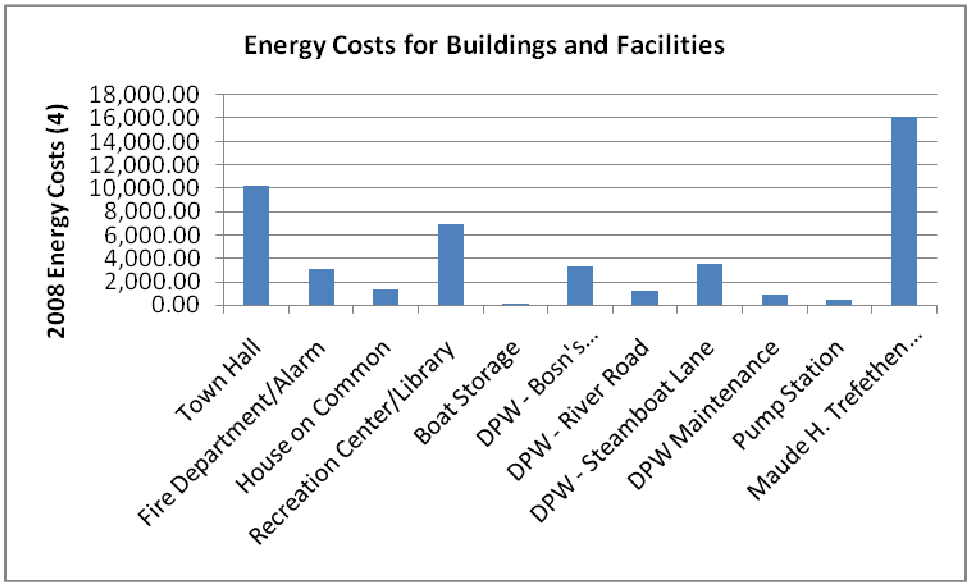


Table 4 and Graphs 5, 6 and 7 below report the energy cost, energy use intensity, and carbon dioxide emissions per square foot of building area for all municipal buildings in New Castle.

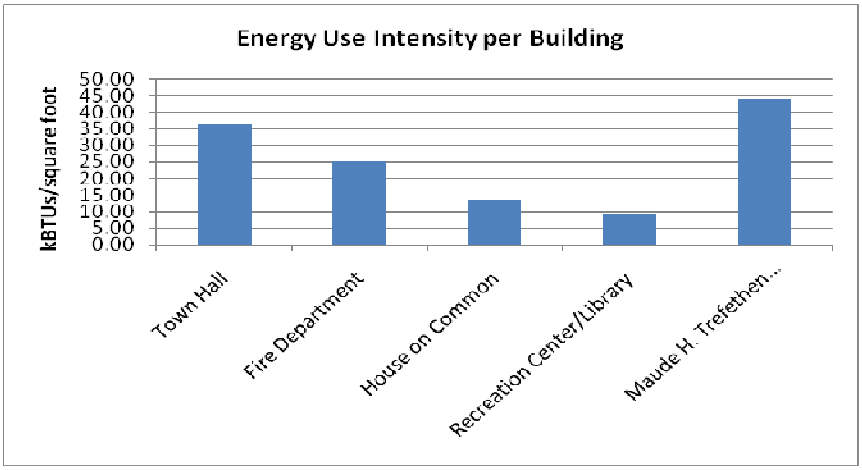
Overall, the Town Hall has the highest energy costs of building area of the municipal buildings, followed closely by the Maude H. Trefethen Elementary School. The Maude H. Trefethen Elementary School has the highest energy use intensity per square foot and the highest overall carbon dioxide emissions per square foot of building area of the municipal buildings.

Table 4. Energy use intensity for all buildings (excluding facilities)

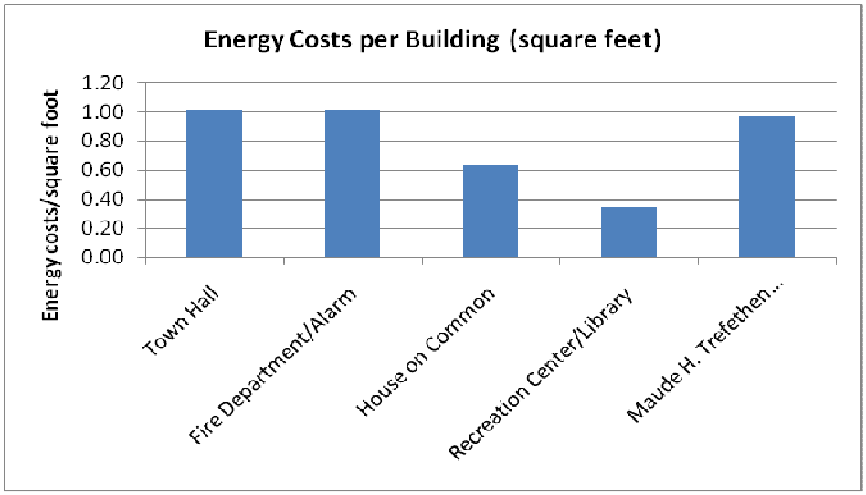
Municipal Building	Building Area	Energy Cost	Energy Cost (sq. ft.)	Energy Use Intensity (kbtu)	CO^2 (lbs)	CO^2 (sq. ft.)
Town Hall	10,033	$10,194.72	1.02	36.05	62,799	6.26
Fire Department/Alarm	3,033	$3,045.33	1.01	24.90	17,850	5.89
House on Common	2,123	$1,358.10	0.64	13.32	6,355	2.99
Recreation Center/Library	20,488	$6,915.42	0.34	9.28	42,036	2.05
Maude H. Trefethen Elem. School	16,575	$16,115.85	0.97	43.77	128,888	7.78
Total	***52,252***	***$37,629.42***	**--**	**--**	***257,928***	**--**

Energy Use Intensity
Energy use intensity is a measure of the units of energy (in thousands of BTUs) consumed per square foot of building space. Energy use intensity is a powerful tool available for measuring the relative energy efficiency of particular types of buildings.

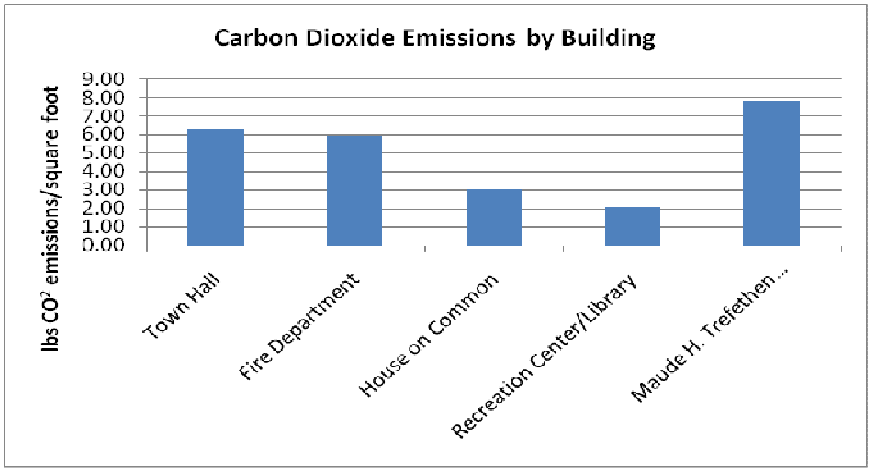
Graph 5. Comparison of energy use intensity for municipal buildings



Graph 6. Comparison of energy costs for municipal buildings



Graph 7. Comparison of carbon dioxide emissions for municipal buildings



Site Energy Intensity
Site energy intensity is the amount of energy expended per square foot *on site* to heat, cool, and electrify the area. This measure relates to the amount of energy being used on site, which corresponds directly with how much lighting is being used, temperature, thermostat controls, etc. The best opportunities for saving energy on site can involve implementation of several strategies including:

- behavioral changes such as keeping lights and computers turned off, turning down thermostats, and modifying hours of operation during peak energy use months;
- employing energy conserving technologies such as motion sensor lighting, programmable thermostats, energy efficient electronics and appliances.

Measures to save source energy would include converting to a different type of fuel for heating or cooling a building and asking your electricity provider to use green sources of energy.

Energy Findings

This energy use analysis produced the following findings regarding municipal energy use, costs and greenhouse gas emissions:

- The building sector is the most significant energy user, comprising 70% of energy use and 61% of energy costs, and contributing 70% of total carbon dioxide emissions.
- The vehicle sector is the other significant energy user, comprising 25% of energy use and 23% of the energy costs, and contributing 22% of total carbon dioxide emissions.
- While the streetlight sector contributes less to the town's energy use, streetlights comprised 5% of energy use, 15% of energy costs, and contributed 8% of total carbon dioxide emissions.
- The Maude H. Trefethen Elementary School, Town Hall and the sewer pumps, may offer significant opportunities for energy savings as collectively these buildings and facilities represent nearly 88 percent of the total annual municipal energy costs.
- Overall, the Town Hall has the highest energy costs of building area of the municipal buildings, followed closely by the Maude H. Trefethen Elementary School.
- The Maude H. Trefethen Elementary School has the highest energy use intensity per square foot and the highest overall carbon dioxide emissions per square foot of building area of the municipal buildings.

7.0 VALUE AND GOALS OF BUILDING ENERGY AUDITS

The municipal energy inventory described in Section 4.0 provides information to help prioritize which buildings and facilities are in most need of energy efficiency improvements.

As a next step beyond the inventory, an energy audit will provide a detailed analysis of energy systems and the energy efficiency of a building or facility. The purpose and value of conducting building energy audits is to reduce overall energy consumption by increasing energy efficiency and identifying energy conservation measures. Generally, the goals of an energy audit are:

- Secure/Safe Goal: Ensure that health and safety issues are addressed without creating new ones and a comfortable and healthy indoor air quality environment is maintained.
- Sustainable Goal: Install energy-saving measures that do not require further maintenance, with the possible exception of changing fluorescent lamps after 7-10 years and the yearly tune-up of the furnace(s).
- Functional Goal: Decrease the building's overall use of fossil fuels, either directly, such as oil consumed, or indirectly, such as electricity having been generated from the consumption of fossil fuels by the utility.
- Cost-Effective Goal: Make improvements that have product life cycles that assure the projected Savings to Investment Ratio (SIR) and reasonable Return on Investment (ROI), are met.

Energy Audit - Maude H. Trefethen Elem. School

A private consultant, Mr. Paul Button of Energy Audits Unlimited, performed specific analyses as part of an energy audit of the Maude T. Trefethen Elementary School. The auditor conducted an assessment of the building, utilizing the following diagnostic tools: a Minneapolis Blower Door, an Infrared thermal imaging camera, and a virtual model of the building using National Energy Audit Tool (NEAT) available from the US Department of the Interior. The audit assessment resulted in specific findings and recommendations to implement the following building improvements:

- Close off penetrations in the ceiling around the air handling diffusers
- Perform aggressive airsealing on all other pipe and wire penetrations
- Wrap the hydronic (hot water distribution) pipes with proper R-value wrap
- Apply spray foam to the overhanging soffits
- Redirect the ventilation path in the attic
- Seal off the leakage paths around the attic pull-down and replace pull-down door
- Add additional insulation to what exists in the attic
- Install weather-stripping all exterior fire exit doors
- Perform a thorough CTE (Clean, Tune, and Evaluation) on both boilers

Based on the results of the audit analysis, the combined building improvements recommended would cost an estimated $21,445 to implement and would save approximately 10-15 percent per year in heating and cooling costs.

8.0 FIINDINGS AND RECOMMENDATIONS

Findings of the NCEC:
The NCEC during their review of town records found the following and believe that these items could provide opportunities for cost savings for the Town.

1. Town buildings would benefit from general weatherization and, in some cases, improvements to the heating and cooling systems.
2. The Town does not have a Capital Improvement Plan (CIP) from which to fund and implement energy efficiency and conservation strategies, including planning improvements to municipal infrastructure and buildings, and purchase of energy efficient equipment and vehicles.
3. The Town has a manual system for tracking of energy usage and costs.
4. The Town has limited capacity to raise funds (i.e. grant proposal writing) to implement energy efficiency and conservation projects.
5. The Town currently has no regulatory measures or voluntary incentives to ensure energy efficiency for new and existing private (residential) and municipal construction.
6. Vehicular traffic increases significantly during the summer months, contributing to air pollution and energy consumption.
7. In order to reach long-term energy conservation goals, the town must consider the infrastructure necessary to support energy production and delivery systems.

The NCEC will continue to work with town officials and the Planning Board to ultimately develop a long-term energy plan for the Town.

NCEC Recommendations

The NCEC has developed the following recommendations and encourages the town to participate in their implementation.

<u>Municipal Facilities</u>

1. Provide input and recommendations regarding the town's budget process and appropriation of funds for municipal construction and energy conservation projects.

2. Develop funding sources and fundraising opportunities to implement energy efficiency improvements and energy conservation strategies for municipal buildings.

3. Develop a schedule and funding source(s) to implement the building improvements to the Maude H. Trefethen Elementary School, as recommended in the energy audit.

4. The Town should implement a tracking system which consolidates energy use records to better evaluate and manage energy costs.

5. Investigate the potential for installation of new energy efficient pumps (installed in 1976) for the community sewer system and alternative energy systems to power them.

6. Request and arrange to conduct a (free) municipal lighting survey and analysis by PSNH.

7. Develop a replacement plan to upgrade municipal lighting to ensure energy savings.

8. Conduct formal energy audits of municipal buildings specifically the Town Hall.

Land Use

9. Revise and or develop zoning ordinances and regulations to allow alternative energy production including but not limited to installation of wind, solar and geothermal systems.

Housing

10. Revise regulations and building codes to provide voluntary incentives to achieve energy efficiency for new construction and existing buildings and infrastructure.

Transportation

11. Evaluate bicycle and pedestrian improvements and or controls, and provide alternative transportation options to reduce vehicle use and vehicle emissions.

Utilities

12. Investigate opportunities to develop individual and community energy systems and energy distribution networks. This may include a consolidated energy system for the municipal complex.

Community

13. Develop an Energy Conservation Strategy for the community addressing municipal, private, school, business and residential interests. Prioritize actions based on results of the energy inventory and energy consumption profile developed for the town.

14. Conduct outreach and education in the community focused on energy efficiency and conservation and emission reductions.

15. Develop a volunteer services network to provide assistance in the community to implement energy efficient strategies and installations.

16. Reduce the overall carbon footprint of the community.

List of Acronyms

CACP	Clean Air Cool Planet
STOCC	Small Town Carbon Calculator
EPA	Environmental Protection Agency
GHG	Greenhouse Gases
kBtu	Kilo British Thermal Units
MMBtu	Million British Thermal Units
RPC	Rockingham Planning Commission