

**Town of New Boston
Master Plan Energy Chapter**



New Boston, New Hampshire
Town Hall

1. Introduction

1.1. Purpose

Energy efficiency has become a key issue to communities, as energy costs continue to increase and concern grows over the environmental and health costs of major forms of energy production. The purpose of this chapter is to provide guidance and tools and to identify strategies, policies and actions, as well as a vision for achieving energy efficiency and conservation in the Town of New Boston. Promoting and incorporating energy efficient measures in town buildings, activities and ordinances has many benefits to the town, including reducing operating costs and cutting 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.

The 1970 National Environmental Policy Act (NEPA) formally established as a national goal the creation and maintenance of conditions under which humans and nature “can exist in productive harmony, and fulfill the social, economic and other requirements of *present and future generations of Americans*”, and this has become an accepted definition of sustainability.

Energy efficiency serves many purposes which include:

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

1.3. New Boston Energy Goals

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

1. Reduce municipal energy costs by reducing energy consumption.
2. Increase community awareness, advise and educate residents on reducing energy costs and consumption.
3. Consider ways to decrease energy expenditures, fossil fuel consumption and associated pollution.

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 shall include, at a minimum, the following required 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).

2.1. New Hampshire Climate Action Plan

The 2009 NH Climate Action Plan was developed by the state-authorized, bipartisan Climate Change Policy Task Force composed of representatives from all sectors of New Hampshire. It 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.

It is envisioned that with participation from all communities, the NH Climate Action Plan will benefit the economy, increase state and regional energy security, and improve environmental quality. In order to meet the recommended goal of reductions in greenhouse gas emissions statewide, it states that NH communities must engage in local energy planning that includes strategies for decreasing their overall emissions.

3. Existing Conditions

3.1. State Energy Supply and Consumption

New Hampshire citizens, businesses, and industries spent almost \$5 billion on energy in 2009¹.

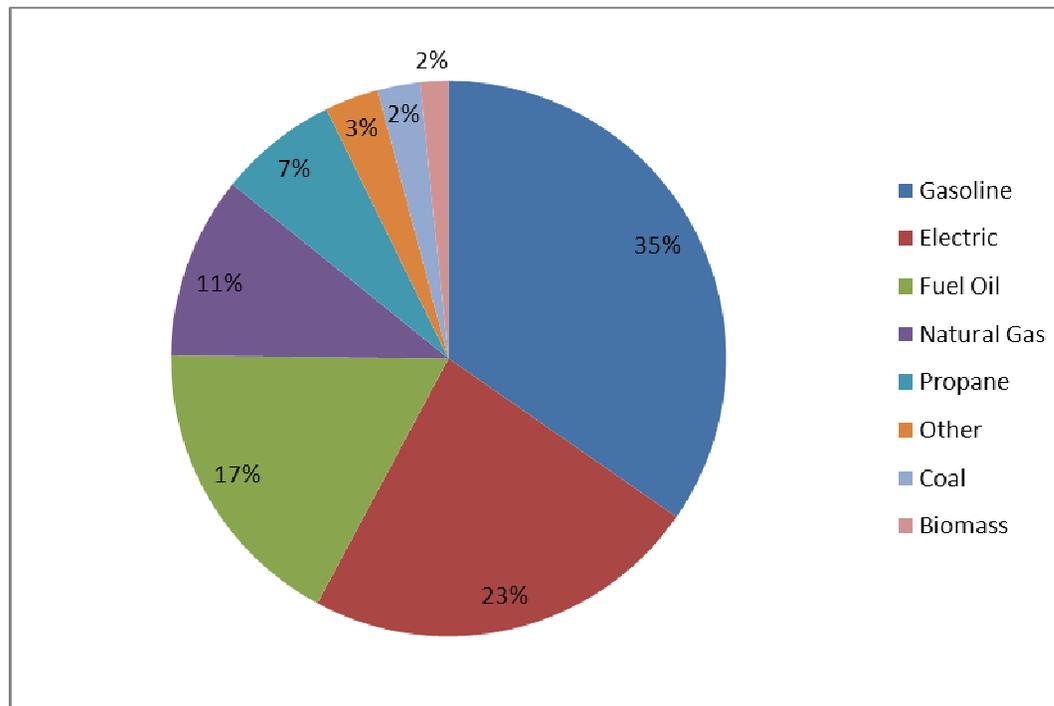


Figure 1.1

Of this money, more than 2/3 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% 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.

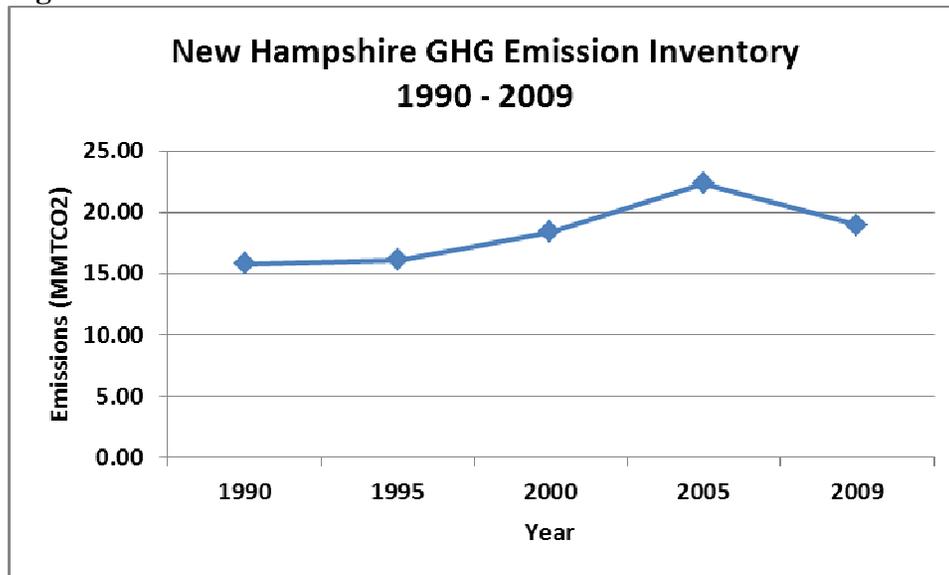
² New Hampshire Office of Energy and Planning, “2007 New Hampshire Energy Facts,”

<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

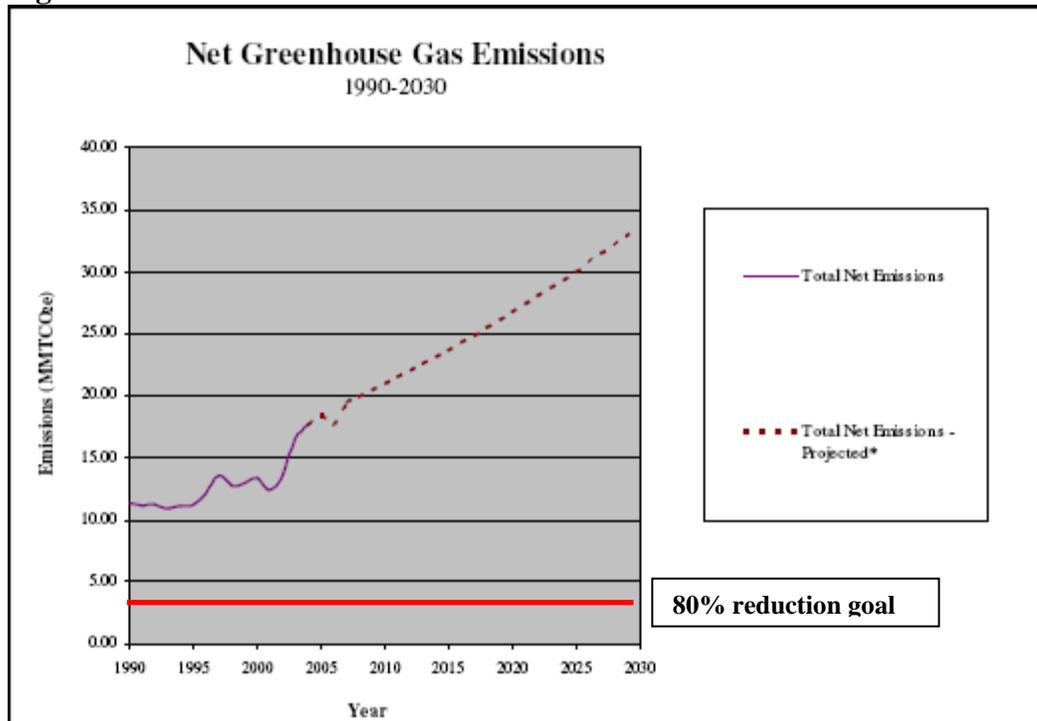


Source: NHDES, An analysis of EIA Energy Consumption Estimates By Sector for New Hampshire from 1960-2009 using EIA emission factors for all fossil fuels with NON-ENERGY emission calculations developed through the EPA’s State Inventory Tool.

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.⁵

⁵ 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. New Boston Energy Inventories/Audits

New Boston participated in the Energy Technical Assistance and Planning (ETAP) Program during 2010-2011 administered by the New Hampshire Office of Energy and Planning. The town received an initial high level energy assessment of six 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, Central Fire Station, the Wason Building, the Highway Garage and the Transfer Station. Table 1⁶ shows the annual utility use and energy density of these six buildings based on data collected from 2009-2011. The highest energy use per square foot of the six municipal buildings assessed is the Wason Building, followed by the Town Hall. These two buildings have the most opportunity for energy reduction and savings in town.

Table 1 – 2009-2011 Annual Utility Use and Energy Density

Building	Square feet	Electricity (kWh)	Oil or Propane Use (gallons)	Total Annual Utility Cost	Electric kBtu/SF(1)	Oil kBtu/SF	Total kBtu/SF
Town Hall	6,720	41,052	2,878 oil	\$12,892	21	60	81
Wason	2,958	4,687	2,122 oil	\$4,859	5	100	105
Central Fire	5,728	18,104	2,069 oil	\$4,859	11	50	61
Police Station	5,148	31,296	783 oil	\$6,632	21	21	42
Highway	3,300	22,490	1,075 oil	\$5,905	23	45	69
Transfer Station	2,713	31,209	129 prop.	\$5,596	NA	NA	NA

¹ Thousand Btu per square foot of gross floor area, reported separately for oil, electricity, and total. ENERGYSTAR reports that total values can range from 30 kBtu/Sf to 340 kBtu/SF.

⁶ Appendix B: Peregrine Energy Group. *Energy Efficiency Improvements for New Boston Town Buildings Memorandum*. August 11, 2011.

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 Improvements for New Boston Buildings Technical Memorandum, dated April 29, 2011⁷.

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

Town Hall								
	Description	Approximate Implementation Cost	Utility Incentive Available ¹	Other Benefits ²	Potential Utility Savings		Annual Cost Avoidance	Simple Payback Yr
					Electric kWh/yr	Oil Gallons/yr		
1	Install boiler controls	\$3,840				230	\$ 500	7-8
2	Insulate hot water pipes	\$3,600				132	\$ 300	10-14
3	IR scan walls, insulate voids	\$2,600		A		121	\$ 300	8-10
4	Air seal & insulate attic	\$6,432		A		414	\$ 900	6-8
5	Air seal basement & insulate perimeter	\$3,660		A		238	\$ 500	6-8
6	Update lighting to super T8	\$2,400	\$400	D	2,538		\$ 400	4-6
	Estimated Program	\$22,532	\$400		2,538	1,135	\$2,900	7.6

Notes

(1) Subject to Utility Incentive Policy and Screening Analysis

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

Current Utility Budget: \$12,892 /yr

Percent Reduction: 22 percent

⁷ Appendix A

Wason Building – Historical Society (Old Library)

The Wason Building savings opportunities include:

1. Air seal and install insulation correctly
2. Install a programmable thermostat
3. Improve duct wrap and seal ducts

New Boston Central Fire Station

The Fire Station savings opportunities include:

1. Install boiler controls
2. Insulate hot water pipes
3. Install programmable thermostats and zone the second floor
4. Improve attic insulation and air seal

Table 3 – Summary of Energy Reduction Opportunities for the Police Station⁸

Police Station

	Description	Approximate Implementation Cost	Utility Incentive Available ¹	Other Benefits ²	Potential Utility Savings		Annual Cost Avoidance	Simple Payback Yr
					Electric kWh/yr	Oil Gallons/yr		
1	Install programmable thermostats	\$1,250		A, C	179	56	\$ 190	5-7
2	Replace tankless coil DHW	\$1,250				38	\$ 110	10-12
3	Insulate hot water pipes	\$1,200		A		39	\$ 110	10-12
4	Install boiler controls	\$1,500		A		61	\$ 170	8-10
Estimated Program		\$5,200	\$0		179	194	\$580	9.0

Notes

(1) Subject to Utility Incentive Policy and Screening Analysis

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

Current Utility Budget: \$7,032 /yr

Percent Reduction: 8 percent

⁸ Appendix B

Table 4 – Summary of Energy Reduction Opportunities for the Highway Garage⁹

Highway Garage								
	Description	Approximate Implementation Cost	Utility Incentive Available ¹	Other Benefits ²	Potential Utility Savings		Annual Cost Avoidance	Simple Payback Yr
					Electric kWh/yr	Oil Gallons/yr		
1	Insulate attic	\$3,960		A		202	\$ 560	6-8
2	Seal and insulate ducts	\$1,500		A		73	\$ 200	6-8
3	Replace overhead door gaskets	\$300		A		38	\$ 110	2-3
4	Install point-of-use DHW heaters	\$700			1,197		\$ 190	3-4
	Estimated Program	\$6,460	\$0		1,197	313	\$1,060	6.1

Notes

(1) Subject to Utility Incentive Policy and Screening Analysis

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

Current Utility Budget: \$6,454 /yr

Percent Reduction: 16 percent

Table 5 – Summary of Energy Reduction Opportunities for the Transfer Station

Transfer Station								
	Description	Approximate Implementation Cost	Utility Incentive Available ¹	Other Benefits ²	Potential Utility Savings		Annual Cost Avoidance	Simple Payback Yr
					Electric kWh/yr	Propane Gallons/yr		
1	Install point-of-use DHW heater	\$700			994		\$ 150	4-6
2	Install occupancy sensor for 24/7 lights	\$215			710		\$ 110	1-3
	Estimated Program	\$915	\$0		1,704	-	\$260	3.5

Notes

(1) Subject to Utility Incentive Policy and Screening Analysis

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

Current Utility Budget: \$5,596 /yr

Percent Reduction: 5 percent

⁹ Appendix B

A number of the buildings assessed have similar recommendations for energy savings and the town might consider aggregating these projects over several buildings to get better pricing on the work. The following recommendations are similar for multiple buildings.

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

Recommended for:

- Town Hall
- Wason Building
- New Boston Central Fire Station
- Highway Garage

2. Heating system efficiency - install boiler reset controls, programmable thermostats, insulate hot water pipes

Recommended for:

- Town Hall
- Wason Building
- New Boston Central Fire Station
- Police Station

3. Convert to more efficient domestic hot water production.

Recommended for:

- Police Station
- Highway Garage
- Transfer Station

3.3. Renewable Energy

Renewable energy flows involve natural phenomena such as sunlight, wind, tides, plant growth, and geothermal heat, as the International Energy Agency explains:¹⁰

“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 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 sources. 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. The Town of New Boston has shown its support for renewable energy through the adoption of property tax exemptions for solar and wind power energy installations in 2008.

3.4. 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. This practice is energy and resource inefficient and promotes unsustainable future transportation, land and energy use trends. Strategies for reducing vehicle miles traveled and reliance on automobiles can help to create a more sustainable, energy efficient transportation network. These strategies can also create transportation systems that better serve more people while fostering economic vitality for both businesses and communities. Strategies include providing multiple routes and multiple types of transportation, providing access to public transportation, implementing complete streets design standards and planning more mixed-use and compact development where appropriate.

¹⁰ IEA Renewable Energy Working Party (2002). *Renewable Energy... into the mainstream*, p. 9.

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.¹¹

Major streets with moderate to high volumes of traffic should be transformed into “complete streets.” Bike lanes, bike trails, sidewalks, streetscaping, curb extensions, mid-block crossings and other tools are applied.

The June 2011 Technical Memo, *Toward a More Walkable and Livable Manchester*, by the Walkable and Livable Communities Institute suggests:

“Traffic calming and traffic management techniques should be used. On-street parking can be striped, and curb extensions, tree wells and medians can be added. Such improvements not only bring down speeds, they improve town centers and connect streets by reducing noise and perceived danger.

Most principal streets should have lanes narrower than today, especially when combined with bike lanes. Bike lanes add a buffer to parking and sidewalks.

Sidewalk construction and maintenance should be a priority, especially within a quarter-mile or half-mile of town centers and schools.

Ramps should comply with the Americans with Disabilities Act and “universal design” standards.”¹²

Complete streets options for New Boston might be most appropriate for the town center area and could include traffic calming and traffic management techniques, narrowing streets with striping techniques, crossing islands or raised intersections and making linkages and connections between walking trails and destinations in town.

3.5. Land Use

The way communities are designed, planned, and built has significant influence over 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. This can be achieved by promoting Traditional Neighborhood Developments, Village Plan Alternatives (VPA) and conservation subdivisions that promote a mix of uses in larger new

¹¹ 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](http://www.usatoday.com/news/nation/2007-07-29-complete-streets_N.htm). Retrieved 2011-09-07.

¹² Walkable and Livable Communities Institute. “Toward a More Walkable and Livable Manchester Technical Memorandum.” June 2011.

developments. Other ways to promote energy efficiency and conservation in land use planning include:

- Initiating impact fees that require developers to pay for the increased demands on infrastructure they generate.
- 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.¹³

3.6. Building Codes

Building codes can be used to promote sustainable, energy-efficient construction in the built environment. 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.¹⁴

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.¹⁵

4. Planning Roles

More often than not, energy initiatives cut across jurisdictional and political boundaries, requiring the cooperation and coordination of many different actors. Thus, for towns such as New Boston, it is essential to understand the various interests involved, as well as the many opportunities available, at the both the state and local levels.

¹³ Model ordinance language can be found in *Innovative Land Use Planning Techniques*. October 2008.

¹⁴ Urban Land Institute, 2000

¹⁵ NHDES. *Innovative Land Use Planning Techniques, A Handbook for Sustainable Development*. October 2008.

4.1. State-Level Energy Agencies

- **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”
 - 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 Public Utilities Commission (PUC):** A watchdog agency also affiliated with the Executive Branch, whose job is to make sure that customers of regulated utilities 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 agency, 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

4.2. 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 to RMANH members
- **NH Community Loan Fund:** Has provided deep energy efficiency retrofits in approximately 425 manufactured homes located in a score of resident-owned communities throughout the state
- **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 energy consumption.
- **Systems Benefits Charge (SBC):** The SBC is a tax on all public utilities, a portion of which is used to fund energy efficiency projects.
- **CORE Energy Star Program:** Helps homes and businesses reach the Energy Star standards adopted by the federal government. So far, approximately 4 percent of NH households have participated in this program with the help of their public utilities provider
- **Electric Assistance Program (EAP):** Provides low-income residents with assistance on their electric bill
- **Property Assessed Clean Energy (PACE):** On May 12, 2010 the NH Senate passed HB 1554, AKA the "PACE Bill." PACE is an acronym for Property Assessed Clean Energy—its final passage will enable municipalities to establish revolving loan funds to finance energy efficiency and renewable energy projects for both residential and commercial properties. HB 1554 will provide an important tool for financing energy efficiency improvements in existing homes and businesses in a manner that is consistent with the local control ethic of New Hampshire government. It will enable the State's municipalities to provide access to bond-based or other capital for the residents' and businesses' clean energy projects. Eligible projects include weatherization and a variety of innovative renewable energy projects. Financing for these improvements will be achieved through mechanisms that provide for a positive cash flow for the property owner,

based on demonstrable energy efficiency savings. (The arrangement authorized by the bill is similar to special assessment or betterment district mechanisms used to finance street upgrades, utility line burial or other improvements benefitting certain properties, except that participation by property owners in energy efficiency and clean energy districts would be purely voluntary)

4.3. Energy and Sustainability agencies in New Boston

- **Town Board of Selectmen:** The Executive body of New Boston charged with carrying out town policies.
- **Town Planning Board:** Develops and helps to implement the Town's Master Plan, including its Energy Chapter, which reflects the vision of New Boston residents for growth, development and planning.
- **New Boston Energy Commission:** A non-partisan, inclusive, voluntary citizen's commission seeking solutions to reduce carbon emissions and reduce energy costs in New Boston.
- **New Boston Conservation Commission:** A voluntary citizen's commission who works to preserve, protect, and enhance the Town's scenic, recreational, open space and natural resources, as well as its environmentally sensitive areas, and where appropriate, to encourage the enjoyment thereof.
- **New Boston Forestry Committee:** A group of volunteers from the town appointed by the Selectmen, which manages the town forests.
- **New Boston Open Space Committee:** A voluntary citizen's committee working to preserve New Boston's natural resources and rural character

4.4. Current New Boston Initiatives

- **New Boston Energy Commission**

The New Boston Energy Commission (NBEC) started as a committee in 2007 after the citizens of New Boston supported a warrant article for the creation of an energy committee. The committee became a commission in 2010. The mission and goals of the NBEC are as follows:

- To promote energy conservation, efficiency and renewables to reduce energy consumption, save money, strengthen the local economy and improve the environment.
- To study, advise and educate the citizens and town officials on policy and actions to reduce carbon emission.
- To support, encourage and celebrate actions that will lead to carbon emission reductions, while protecting the economy and natural resources.

Goals

- To align with the State renewable energy initiative of 25 X 25 (25 percent renewable energy by 2025)
- To advise and implement actions in accordance with the mission
- To increase community awareness and participation in energy and environmental issues
- To increase renewables
- To decrease energy expenditures, fossil fuel consumption and associated pollution
- To have New Boston move forward looking through the lens of sustainable practices

- **Tax incentives for solar and wind power**
 - In 2008 the citizens of New Boston adopted property tax exemptions for solar and wind power energy installations per RSA 72:61 and RSA 72:65

- **Recycling**
 - In 1993 the Town of New Boston became a 100 percent recycling town
 - The New Boston school recycling program has gained state recognition

- **Community events and outreach**
 - The NBEC periodically coordinates energy savings workshops and events, movie viewings and community discussion
 - The NBEC periodically publishes articles in the paper about what citizens can do for energy efficiency and savings
 - The NBEC helped establish the New Boston Central School recycling program in 2009

- **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. The program is open to all NH towns, cities, and counties. ETAP aims to achieve the following objectives:
 - Assist participating NH communities to track and understand energy consumption in municipal and county buildings and other major energy uses
 - Provide a web-based tool to communities to benchmark energy performance
 - Work with communities to identify and prioritize energy cost reduction opportunities

- Help develop strategies for energy cost reduction and secure technical and financial resources needed to realize energy savings

5. Issues and Concerns

Over the past several years, the Town of New Boston has made important progress in the areas of energy efficiency and sustainability. However, as the town enters the second decade of the 21st Century, there are still many challenges to overcome.

5.1. Extant Challenges

Many of the problems faced by New Boston are **extant challenges**: challenges which arise from conditions in the outside world. Whether related to climate change, energy consumption, or population growth, extant challenges are tangible and can generally be expressed in quantitative terms. Some examples of extant challenges in New Hampshire and the Town of New Boston include:

- 1.) **Volatile 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 2011¹⁶
- 2.) **Commuter-driven Patterns of Development:** In recent decades, development in the United States has been characterized by sprawl: the tendency of communities to fracture into residential and commercial zones, accessible to each other only by automobile
- 3.) **Lack of adequate Public Transit:** Like many other rural towns, New Boston lacks access to major public transit lines such as rail or bus
- 4.) **Lack of funding for Energy Efficiency programs:** Between 2009 and 2012, much of NH's energy and sustainability funding came from the ARRA. With stimulus funding scheduled to end by 2012, NH communities will be forced to deal with deep spending cuts in a tough economic climate

5.2. Systemic Challenges

Unlike extant challenges, **systemic challenges** arise from problems within the planning process itself, and thus are not as easy to quantify. Systemic challenges require, not just policy fixes, but also changes in mindset and the way that energy planning is carried out.

- 1.) **Transactional complexity:** 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

¹⁶ New Hampshire Heating Oil Dealers and Price Guide. < <http://www.heatingoilnh.com/lowest-prices.htm>
> Retrieved 2011-10-06

- had little to no idea about where to go for sustainable energy loans, rebates, or grants¹⁷
- 2.) **Lack of Start-up Capital:** Although cost-effective in the long run, many energy efficiency projects require significant up-front costs that businesses and individuals cannot afford
 - 3.) **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)
 - 4.) **Lack of residential interest and education:** Depending on the project, energy efficiency projects can seem daunting and complex. 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. New Opportunities for Energy Efficiency

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

6.1. Opportunities in Renewable Energy

Solar

New Hampshire has an average solar energy density of 4.0-4.5 kWh/m²/day¹⁸, 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/W¹⁹

- **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.

¹⁷ *Independent Study of Policy Issues:* Prepared by the Vermont Investment Corporation, June 2011. Appendix A: Page 3.

¹⁸ *Independent Study of Policy Issues:* Prepared by the Vermont Investment Corporation, June 2011. Section 10: Page 28

¹⁹ See above

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.²⁰

- 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 percent²¹
- 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 percent of total New Hampshire electric production and just over 4 percent of residential and commercial & industrial energy consumption.²²

- 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.

²⁰ *Independent Study of Policy Issues*: Prepared by the Vermont Investment Corporation, June 2011. Section 10: Page 31.

²¹ See above

²² *Independent Study of Policy Issues*: Prepared by the Vermont Investment Corporation, June 2011. Section 10: Page 36.

- 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.²³
- 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.²⁴

6.2. Other Energy-Efficiency and Sustainability Opportunities

Direct

- New Building Codes
- More mixed-use/Village districts
- Walk-able and Bike-able Streets

Indirect

- Provision of free sustainability workshops and seminars
- Encouragement of carpooling and alternative transportation methods
- Festivals or parades with a sustainability focus
- Increased cooperation and collaboration between public and private sectors

²³*Independent Study of Policy Issues*: Prepared by the Vermont Investment Corporation, June 2011. Section 10: Page 36.

²⁴*Independent Study of Policy Issues*: Prepared by the Vermont Investment Corporation, June 2011. Section 10: Page 38

7. Recommendations

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

7.1 Reduce municipal energy costs by reducing energy consumption.

- 1a. Prioritize energy efficiency recommendations from the April 29, 2011, and August 11, 2011, ETAP Technical memorandums²⁵ developed for the building assessments done on the Town Hall, Wason Building, Central Fire Station, Police Station, Highway Garage and Transfer Station.
- 1b. Track energy use in municipal buildings using the inventory tool or a similar tracking tool
- 1c. Require quarterly reporting on energy use in municipal buildings to the BOS, Town Administrator and/or Finance Committee
- 1d. Appoint a responsible party for energy management in town facilities and who will be responsible for exploring and applying for grants or funding that will help the town to implement the prioritized energy efficiency projects and recommendations
- 1e. Consider establishing a green building ordinance for municipal buildings and vehicles which requires new construction or major renovations for town buildings to meet US Green Building Council LEED standards when possible without increasing the budget for a given project
- 1f. Encourage department heads to consider energy efficiency projects and possibilities for cost savings as well as coordination on projects between departments which will increase energy efficiency for town facilities
- 1g. Explore single energy performance contract with neighboring communities

7.2 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
- 2b. Create a page for the New Boston Energy Commission on the Town website and post energy efficiency tips (provided by the NBEC) on the homepage periodically
- 2c. Continue to publish energy efficiency tips in the local newspaper through the NBEC
- 2d. Continue to work with the NBEC to hold free sustainability workshops/seminars and to hold events with a sustainability focus

²⁵ Appendix A and B

7.3 Consider ways to decrease energy expenditures, fossil fuel consumption and associated pollution.

- 3a. Appoint a BOS representative to the NBEC to work with and coordinate on energy efficiency projects in the Town of New Boston
- 3b. Consider innovative land use planning techniques such as
 - i. Energy efficient development planning principles upheld and implemented in subdivision regulations and site plan review, zoning ordinances and building codes
 - ii. Village plan alternative
- 3c. Consider adopting more stringent building codes than State codes to increase energy efficiency and decrease energy costs for development in town
- 3d. Consider ways to encourage alternative transportation methods such as ridesharing, public transportation options and expanding trails and bicycle lanes in town

8. Action Plan

New Boston Master Plan Energy Chapter Action Plan

	Recommendation	Who (Leadership)	When (Suggested Deadline)	How (Resources)
1a	Prioritize energy efficiency recommendations from the April 29, 2011, and August 11, 2011, ETAP Technical memorandums developed for the building assessments done on the Town Hall, Wason Building, Central Fire Station, Police Station, Highway Garage and Transfer Station.	<i>Board of Selectmen, CIP Committee, Finance Committee</i>	2012-2013	N/A
1b	Track energy use in municipal buildings using the inventory tool or a similar tracking tool	<i>Tax Collector, Selectmen's Assistant</i>	Ongoing	Staff
1c	Require quarterly reporting on energy use in municipal buildings to the BOS, Town Administrator and/or Finance Committee	<i>Tax Collector, Energy Manager</i>	Ongoing	Staff
1d	Explore appointing a responsible party for energy management in town facilities and who will also be responsible for exploring and applying for grants or funding that will help the town to implement the prioritized energy efficiency projects and recommendations	<i>Board of Selectmen</i>	April 2012	N/A
1e	Consider establishing a green building ordinance for municipal buildings which requires new construction or major renovations for town buildings to meet US Green Building Council LEED standards when possible without increasing the budget for a given project	<i>Board of Selectmen, Department Managers</i>	April 2012	N/A

New Boston Master Plan Energy Chapter Action Plan

	Recommendation	Who (Leadership)	When (Suggested Deadline)	How (Resources)
1f	Encourage department heads to consider energy efficiency projects and possibilities for cost savings as well as coordination on projects between departments which will increase energy efficiency for town facilities	<i>Department Heads, Board of Selectmen, Local Energy Commission</i>	<i>Ongoing</i>	<i>Staff</i>
1g	Explore single energy performance contract with neighboring communities	<i>Town Administrator</i>	<i>Ongoing</i>	<i>Staff</i>
2a	Publicize energy savings measures the town is taking for municipal buildings and progress on reducing municipal energy and costs	<i>Energy Manager, Local Energy Commission</i>	<i>Ongoing</i>	<i>Staff</i>
2b	Create a page for the New Boston Energy Commission on the Town website and post energy efficiency tips (provided by the NBEC) on the homepage periodically	<i>Local Energy Commission, Website Manager, Town Administrator</i>	<i>December 2011</i>	<i>Staff</i>
2c	Continue to publish energy efficiency tips in the local newspaper through the NBEC	<i>Local Energy Commission</i>	<i>Ongoing</i>	<i>N/A</i>
2d	Continue to work with the NBEC to hold free sustainability workshops/seminars and to hold events with a sustainability focus	<i>Energy Manager, Local Energy Commission</i>	<i>Ongoing</i>	<i>Staff</i>
3a	Appoint a BOS representative to the NBEC to work with and coordinate on energy efficiency projects in the Town of New Boston	<i>Board of Selectmen, Local Energy Commission</i>	<i>May 2012</i>	<i>N/A</i>
3b	Consider innovative land use planning techniques such as i. Energy efficient development planning principles upheld and implemented in subdivision regulations and site plan review, zoning ordinances and building codes ii. Village plan alternative	<i>Planning Board</i>	<i>2012</i>	<i>N/A</i>

New Boston Master Plan Energy Chapter Action Plan

	Recommendation	Who (Leadership)	When (Suggested Deadline)	How (Resources)
3c	Consider adopting more stringent building codes than State codes to increase energy efficiency and decrease energy costs for development in town	<i>Planning Board</i>	2012	N/A
3d	Consider ways to encourage alternative transportation methods such as ridesharing, public transportation options and expanding trails and bicycle lanes in town	<i>Planning Board</i>	2012	N/A

Appendices

Appendix A

Definitions

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.

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.²⁶

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.²⁷

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.²⁸

Carbon sequestration - Carbon that is removed from the atmosphere and retained in a carbon sink (such as a growing tree or in soil).²⁹

GDP – Gross Domestic Product.

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

²⁶ US Dept. of Energy. Federal Energy Management Program.

²⁷ Diesendorf, Mark (2007). Greenhouse Solutions with Sustainable Energy, UNSW Press, p. 86.

²⁸ International Energy Agency

²⁹ [Energy Terms Glossary](http://www.neo.ne.gov/statshhtml/glossarys.htm). Nebraska Energy Office. <http://www.neo.ne.gov/statshhtml/glossarys.htm>. Retrieved 2011-11-15.

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.³⁰

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.³¹

IR – Infrared

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

DHW – Domestic Hot Water

kWh/yr – Kilowatt hours per year

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.

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.

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.

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.³²

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

³⁰ US EPA. Clean Air Act Section 211(o)(1)

³¹ US Dept. of Energy. Federal Energy Management Program

³² 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](http://www.usatoday.com/news/nation/2007-07-29-complete-streets_N.htm). Retrieved 2011-09-07.

are located within walking distance of homes. Community identity, civic spaces and walkability are emphasized.³³

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.³⁴

ARRA – American Reinvestment and Recovery Act

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.

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

Light Emitting Diodes (LED) - A light-emitting diode (LED) is a semiconductor light source.³⁵ LEDs are used as indicator lamps in many devices and are increasingly used for other lighting. Introduced as a practical electronic component in 1962,³⁶ early LEDs emitted low-intensity red light, but modern versions are available across the visible, ultraviolet and infrared wavelengths, with very high brightness.

³³Natural Lands Trust. Conservation Tools. <http://conservationtools.org/guides/show/46> Retrieved 2011-11-15

³⁴NHDES. Innovative Land Use Planning Techniques Handbook. October 2008.

³⁵"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

³⁶"Nick Holonyak, Jr. 2004 Lemelson-MIT Prize Winner". Lemelson-MIT Program. <http://web.mit.edu/invent/a-winners/a-holonyak.html>. Retrieved 2007-08-13.

Appendix B

Appendix C

