ENERGY

Energy and its impact on our communities in areas such as municipal expenditures, economic development, land use planning, and transportation is increasingly of interest to residents, local officials and business owners. Reliable, affordable sources of energy are critically important to our quality of life and the stability of the economy.

This Energy Chapter presents a framework that can be used to support Town efforts in the areas of energy use, efficiency and planning. The use of energy for electricity, heating, and transportation is tied to community planning, individual lifestyles, natural resource conservation, and environmental quality. The purpose of this Chapter is to provide some background on energy usage and issues and to identify strategies and tools for energy conservation, energy efficiency, and efficient development. After a brief introduction to the role of energy in planning, there is a summary of New Hampshire's energy profile and sources as well as a series of recommendations for achieving the overall vision of a resilient, efficient community through programs, operational practices, ordinances and regulations. There is also limited data on Loudon's energy profile, municipal energy consumption and an overview of potential opportunities for usage and cost savings, energy efficiency improvements and renewable energy options.

Many municipalities in New Hampshire, including Loudon, are taking action to reduce energy consumption, improve energy efficiency, and investigate renewable energy sources by developing energy chapters in the master plan. New Hampshire **RSA 674:2, III(n)** was adopted in 2008, authorizing municipalities to incorporate an energy section into their master plan that "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."

The Town is being proactive by preparing this Energy Chapter. Opportunities exist for Loudon to support energy efficiency efforts, including changes to land use policies, municipal operations, and public outreach. By implementing such changes, Loudon can save energy and taxpayer dollars, reduce pollutant emissions, and create a community with a strong quality of life. A community that supports energy efficiency efforts also supports sustaining settlement patterns that reduce transportation infrastructure, conserve natural resources and promote open space protection.

There is also the increasing concern for the aging population at both the local, regional and state levels and its impacts on our abilities to reach destinations - for recreation, health care and social services. This has a direct correlation to the land use patterns and infrastructure of our communities and how we need to get from point A to point B. The link between energy efficiency and transportation is a strong one.

VISION STATEMENT

The overall vision for Loudon is a community that supports and preserves its rural character while looking for opportunities to improve economic development, reduce municipal expenditures and promote efficient development that embraces the concept of energy efficiency. The development of Loudon's energy policies as they relate to energy generation, building standards, transportation and land use development patterns can have a direct impact on the community's vitality and long term sustainability.

CHAPTER OBJECTIVES

OBJECTIVE 1

To reduce municipal energy usages and costs and improve energy efficiency in municipal operations.

OBJECTIVE 2

To encourage and support energy-conscious development throughout Loudon.

OBJECTIVE 3

To inform Loudon residents and business owners on energy conservation, efficiency, and renewable energy measures and where to find additional information and funding.

THE ENERGY LANDSCAPE

Energy efficiency and renewable sources of energy continue to emerge as topics in discussions of energy usage and costs. Many view them as solutions to high energy costs and supply concerns as well as a response to environmental sustainability.

An important concept to remember is that New Hampshire is part of a region and really a world market when it comes to energy. Since 1997, ISO-NE (Independent System Operator of New England) has been managing the regional electricity demand and supply in New England; what we can do as a state and region is influence overall use and fuel choice.

Energy is a very broad topic and also has some specific terms that need to be understood, particularly in the area of renewable energy. Below is a list of definitions that clarify some of the terms used in this Chapter.

1. ***Energy conservation*** means reducing the overall use of energy, particularly wasted energy (such as installing programmed thermostats that turn on the heating or cooling only when a building is occupied).

2. ***Energy efficiency*** refers to the ability to produce the same output or benefit using less energy in the process (such as replacing an incandescent light bulb with a fluorescent one). Anywhere energy is used, there are opportunities to increase efficiency.

3. ***Renewable energy*** describes energy sources and systems that produce power from sources that are unlimited or can be cyclically renewed, such as solar, wind, geothermal, or biomass. Non-renewable energy sources are those with a finite supply, such as oil, natural gas, or coal.

4. ***Renewable Portfolio Standard (RPS)*** was established in May 2007 as RSA 362-F and requires the state's electricity providers -- with the exception of municipal utilities -- to acquire by 2025 renewable energy certificates (RECs) equivalent to 24.8% of retail

electricity sold to end-use customers. The RPS includes four distinct standards for different types of energy resources; these are classified as Class I (largest class and includes new and existing renewable facilities), Class II (solar), Class III (existing biomass and landfill gas facilities) and Class IV (existing, small hydro with certain restrictions). See the Public Utilities Commission's website for a detailed explanation of the classes. What an RPS does is establish a base level of demand but allows the market to determine which renewable energy resources will meet that demand. Initially proposed as a mechanism to support renewable energy development in competitively restructured electricity markets, the RPS model today is now seen to serve other functions such as encouraging fuel diversity and economic development.

5. ***Renewable Energy Credits or Certificates (RECs)*** – are sold separately from the underlying physical electricity and are tracked, traded and sold in the market. As renewable generators produce electricity, one REC is created for every 1 megawatt-hour (MWh) of electricity placed on the grid. RECs represent the "attributes" (environmental, social, and other non-power qualities of renewable electricity generation) of renewable electricity generation from the physical electricity produced, serving as "currency" for renewable energy markets. Since RECs only represent the non-power attributes, they are not subject to delivery constraints.

6. ***Alternative Compliance Payments (ACPs)*** are made to the state by utilities for every megawatt hour of energy for if their renewable energy quotas are not met. These alternative compliance payments are essentially an assessed fee to those utilities and competitive electricity providers that have not complied with the RPS. If RECs are not available or prices exceed the alternative compliance price, the electrical supplier will often elect to pay the fee, i.e., the alternative compliance payment.

Typically, it makes sense to strive for energy conservation first as using less energy has minimal costs and is fairly straightforward to implement. Improving energy efficiency can also reduce energy use, although it does not always result in lower consumption (for instance, a person who buys a more fuel efficient car may drive the same number of miles, thereby saving energy and money or he or she may drive *more*, which costs the same but does not reduce the amount of fuel used). Finally, constructing renewable energy systems, particularly those where the energy is used on-site, is a valuable strategy for long term energy cost savings and reduction in pollutant emissions.

STATEWIDE ENERGY USE OVERVIEW

Some Quick Facts from U.S. Energy Information Administration, June, 2017:

- New Hampshire was the tenth lowest per capita consumer of energy among the states in 2015.
- The Seabrook nuclear power reactor, the largest in New England, provided over half (56%) of New Hampshire's 2016 net electricity generation.
- New Hampshire's Renewable Portfolio Standard requires 24.8% of electricity sold to come from renewable energy resources by 2025; 16% of New Hampshire's 2013 net electricity generation came from renewable energy.
- Natural gas accounted for 25% of New Hampshire's net electricity generation in 2016; the record high share for natural gas generation was 37% in 2012.

- Nearly half of all New Hampshire households relied on fuel oil for heat in 2015, and another 14% depended on propane.
- Biomass provided nearly 9% of New Hampshire's 2016 net electricity generation.

Energy use in the Central NH Region parallels patterns throughout the state and the northeast. New Hampshire relies on a number of different types of energy supplies – each with its own unique costs. Some important facts to remember:

FACT: New Hampshire relies on external sources of energy for nearly 90% of its total energy consumption. Energy includes electricity, fuels for transportation, and fuels for heating.

FACT: Population growth has slowed but is still increasing. Household changes are also leading to changes in how energy is used – computers, phones, TVs. Any gains in efficiency may be partially offset by the increasing electric demand associated with the number of devices and appliances per household.

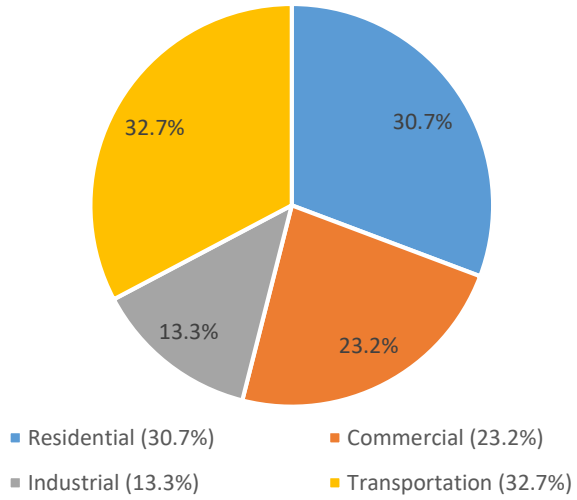
FACT: Energy costs and supply are dynamic; costs are not fixed.

FACT: Demand patterns for energy may decrease, BUT expenditures are increasing due to rising fuel prices.

FACT: Decisions concerning energy supply and usage directly impact individual energy bills and the overall economy.

The biggest challenge in understanding New Hampshire's energy profile is to correctly describe the flow of energy - from its supply, utilization and final usage - as there can often be a misunderstanding of the relationship between energy, generation, consumption, and the final disposition of energy once part of the supply has been converted to electricity and distributed to consumers. The following graph produced by the Energy Information Administration in 2015 shows New Hampshire's energy consumption by end-use sector. Residential, commercial and industrial sectors use energy for electricity as well as heating, cooling, and mechanical operations. The residential and commercial sector together use close to 54% of the total energy consumed in the state. The industrial sector uses 13.3% of energy consumed, and the transportation sector accounts for approximately 33% of energy use, the highest of all the sectors.

Figure 9.1: New Hampshire Energy Consumption by End-Use Sector, 2015



Source: Energy Information Administration, 2015

SOURCES

In this section, there is discussion of the major supply sources such as gas, petroleum coal, renewables and biomass/wood. Smaller sources such as kerosene and propane are not covered. It should be noted that Eversource is currently in the process of completing the sale of its power plants in New Hampshire. It is expected that the sale of the power plants, including three fossil fuel plants and nine hydropower facilities, will take place sometime in early 2018.

NATURAL GAS

In New Hampshire, there are four natural gas pipelines. The significant line for state residents is the Tennessee Gas Pipeline (TGP) which is owned by Kinder Morgan and brings gas from Texas, Louisiana, and the Gulf of Mexico into New England. This pipeline crosses New York and Massachusetts and distributes gas across a large section of Massachusetts. There are several tributaries off of the main line, one of which branches off near Lowell and heads north through the communities along the Merrimack River and into the Lakes Region.

According to the EIA, "about one in five New Hampshire households uses natural gas for primary home heating. Because of recent differences between natural gas and home heating oil prices, there has been an increase in the number of homeowners who have been switching to natural gas in New Hampshire and throughout New England. However, New Hampshire is still among the lowest states in per capita natural gas consumption, in part because large areas of the state do not have the natural gas distribution infrastructure." Some residents are also served by Liberty Utilities and are able to heat with natural gas.

Electricity generation from natural gas has increased markedly since 2003 with the commissioning of two large generating stations. As increasing amounts of natural gas are used for electricity, in New Hampshire and in New England as a whole, assurance of natural gas supply is becoming a critical strategic energy issue for the region.

PETROLEUM

According to the U.S. Census 20012-1016 data, nearly half (46%) of all New Hampshire households rely on petroleum as their primary heating fuel, making the state and the overall region particularly vulnerable to fuel oil shortages and price spikes during the winter months.

The transportation sector consumes more petroleum products than any other sector. State law requires the use of a biodiesel blend in state vehicles unless the blend costs more than all-petroleum fuel. The state also requires reformulated motor gasoline blended with ethanol in the populated areas of southeastern New Hampshire to limit ozone formation.

COAL (EIA Data)

New Hampshire has two coal-fired generating stations, Schiller at Portsmouth and one in the Central NH Region, Merrimack Station at Bow. Both are owned and operated by Eversource and the Merrimack Station is the utility's largest plant and generates approximately 439 megawatts (MW), enough to roughly supply 190,000 households. One unit of the plant was built in 1960; the other in 1968. In response to a 2006 state law (RSA 125-O), Eversource installed a scrubber system by 2011 that is targeted to capture 80% of the mercury from the coal and reduce sulfur dioxide emissions by roughly the same percentage. The cost of the scrubber system increased from an estimate cost of $250 million in 2006 to $422 million. The Public Utilities Commission (PUC) is currently examining what portion of that cost could be passed on to

ratepayers as part of the sale of these units. The Schiller station can burn either coal or oil, and one unit was converted in 2006 to burn woody biomass. Although coal's share of New Hampshire electricity generation has declined in the face of cheaper natural gas, it still typically provides up to one-seventh of net electricity generation in 2016, the lowest percentage in decades.

Renewable Energy

According to the U.S. Energy Information Administration, more than one-sixth of New Hampshire's net electricity generation comes from renewable resources, with biomass facilities providing more than half of that renewable power and hydro and wind facilities generating most of the rest.

Solar

According to the U.S. Department of Energy, demand for solar is at an all-time high; the amount of solar power installed in the U.S. has increased more than 23 times over the past eight years, from 1.2 GW in 2008 to an estimated 27.4 GW at the end of 2015. Once thought of as not practical in northern climates, solar energy has much potential for providing clean, reliable and safe energy. Solar technologies have proven to be successful in New Hampshire and continue to be a viable option both commercially and residentially. As technologies continue to improve and costs lower, solar thermal collectors and photovoltaics are becoming more competitive in the marketplace.

The Cost of Solar Energy

The challenges for solar installation include the installation costs and some of the "soft" costs such as permitting and interconnecting the system to the power grid. However, the cost of solar panels or solar modules has been falling significantly. According to the U.S. Department of Energy, since the beginning of 2010, the average cost of solar PV panels has dropped more than 60%, and the cost of a solar electric system has dropped more than 70%. Grid-tie (connected to your electrical utility company's power "grid") has not only become more mainstream but the decreasing price is attributed to many factors, including technology improvements such as the mini inverter. Each panel in an array has its own on-board inverter which eases the effects of partial shading on the panels.

The NH Office of Energy and Planning (OEP), now the Office of Strategic Initiatives (OSI), completed a project in 2015 with funds from the New England Solar Cost Reduction Partnership (NESCRP) from the US Department of Energy's Rooftop Solar Challenge II Program. The intent of this grant was to increase implementation of solar photovoltaic (PV) by driving down its associated costs. Under this grant, NH focused on the "soft costs" associated with residential permitting, zoning and interconnection. Statewide model permitting and zoning, a guide to the utility interconnection process, and additional educational resources, including training, were developed for use by municipalities and made available through OSI's website.

Solar Energy Use

In 2016, solar installations were 39% of all new electric generating capacity, topping all other technologies for the first time.in the U.S. accounted for 31% of new electricity generation installed. According to the Solar Energy Industries Association, nearly 45 GW of total solar capacity is installed, showing an average annual growth rate of 68% over the last ten years and generating enough electricity to power 8.7 million homes. Growth in this industry is driven by many factors and certainly varies by sector and state. The federal tax credit is still available, installed costs continue to decline and state and utility rebates all are contributing to the solar market growth.

The federal Investment Tax Credit was extended through 2021 and a "commence construction rule" was added, effectively providing the market with policy visibility through 2023. Growth in this industry is driven by many factors and certainly varies by sector and state. The federal tax credit availability, continued decline in installed costs and state and utility rebates are all contributing to solar market growth. By many standards, this is still an industry that is in its relative infancy when you consider that in 1985 annual solar installation was 21 MW.

In NH, the rebate programs for residential solar water heating issued over 485 rebates and 284 commercial and industrial solar rebates through June, 2016. The NH Public Utilities Commission (PUC) announced on July 14, 2017 that the Residential Solar Rebate Program and the Commercial & Industrial Solar Rebate Program are currently closed. Neither program is accepting applications for a wait list, as the residential program currently has a $500,000 wait list and the C&I Program has a $1 million wait list. It is expected to open up again sometime in early 2018.

The residential market for residential electrical renewable energy (PV and Wind) continues to grow as well with small units being installed in domestic homes to supply a proportion of the household electricity needs. More than 2,700 statewide systems have been installed since the PUC established the rebate program in 2009. A good source of information on solar energy for residential homes can be found in the publication: A Homebuilder's Guide to Going Solar.

Currently, the largest solar plant in NH is the 942 kW operation that is powering the wastewater treatment plant and other municipal buildings in Peterborough. Some interesting specifics about this plant include:

- It cost $ 2.4 million. Half of the funds came from the Renewable Energy Fund administered by the NH Public Utilities Commission; the remainder was funded by the developer and builder of the solar array, Borrego Solar.
- The array is built on land previously covered by a holding pond at the wastewater treatment pond.
- The plant consists of 3088 Canadian Solar modules, each
- The project went online in November 2015.
- The benefit to Peterborough is that there was no upfront capital investment and, per the power purchase agreement, the town buys all the electricity produced by the solar array at a cost of 8c/kWh (with a 1%/year increase for next 20 years). Previously, the cost for electricity from the utility was 14c/kWh. It has been estimated that this solar installation will produce savings of $ 250,000 to $ 500,000 over the 20-year term of the agreement.

As solar systems become more mainstream, there is developing interest in looking at the role of zoning and land use regulations to ensure that solar renewable energy projects are compatible with existing land use regulations. Looking at ways to support renewable energy projects that are not overly restrictive or contradictory to the installation of the systems within the framework of "sound" community development is important. Some potential considerations by communities include whether the systems are considered an accessory use or a conditional use in certain areas, height and setback limitations, scale, and aesthetics (i.e. glare).

Biomass

According to the U.S. Energy Information Administration, nearly 1 in 12 homes in New Hampshire depend on wood products as a

primary heat source. New Hampshire is still 84% percent forested and roughly 81% is considered viable timberland. Biomass products such as wood pellets and chips, logwood and briquettes, are an important part of the state's economy and can keep fuel dollars in the local economy.

Since biomass is part of the renewable energy market, there is the opportunity to sell the renewable energy attributes or RECS. As mentioned earlier in this Chapter, these renewable energy attributes or RECs are traded separately from the underlying electricity. New Hampshire was the first state in the nation to create RPS incentive provisions for thermal renewable systems that are equivalent in value to those for renewable electric technologies. Biomass provided nearly 9% of New Hampshire's 2016 net electricity generation.

Electricity in New Hampshire is also generated from the combustion of wood by six major power plants in New Hampshire. In the Central NH Region, Wheelabrator Concord Company operates a waste-to-energy plant that includes two furnace/boiler systems that processes up to 500 tons of solid waste per day. The plant produces high pressure steam capable of producing around 14 megawatts of electricity annually, close to supplying the electricity for 17,000 homes.

Interest in biomass as a source of heating has been increasing for residential, commercial, and municipal uses, thanks in part to rebate programs and other sources of funding the last few years. As of June, 2016, New Hampshire's commercial and industrial rebate program for wood pellet boilers has issued 43 rebates and the residential wood pellet/furnace program has issued 300. The residential wood pellet program is also active and links to the application is available through the Public Utilities Commission.

Wind Power

While New Hampshire may not have the wind power capacity or potential of other states, there have been three major wind projects approved by the state's Site Evaluation Committee (SEC) and others are in the queue. SEC functions as the state's permitting authority for the review, approval, monitoring and enforcement of compliance in the planning siting, construction and operation of energy facilities. See the SEC's website for more information on the Committee.

Most of the US wind power capacity is from Texas up to North Dakota and the west coast. While the "wind farm" development is an intensive undertaking, there have been advances in in community scale wind turbine technology and the interest continues, albeit on a limited scale when compared to other renewables such as solar and biomass. While Loudon has a wind ordinance, no applications have been received to date.

Hydropower

Hydropower, or hydroelectric power, is considered to be the most common and least expensive source of renewable electricity in the United States today. According to the U.S. Energy Information Administration, historically, all renewable electricity generated in the United States came from hydropower resources. In NH, close to 30% of renewable electricity is provided by hydropower.

Hydropower technologies use flowing water to create energy that can be captured and turned into electricity. There is a long history of hydro not only in the state but in the Central NH Region.

Below is a list of the current facilities operating in the Central NH Region.

- **Penacook**: upper and lower falls located on the Contoocook River, operated by Briar Hydro Associates.
- **Rolfe Canal**: operated by Briar Hydro Associates.
- **Jackman Hydro**: operated by Eversource, the parent company of PSNH, the facility is located in Hillsborough on the north branch of Contoocook River. (3.6MW)
- **Garvin Falls**: operated by Eversource, the parent company of PSNH, the facility is located on the Merrimack River. (12.4MW)

GEOTHERMAL

The common type of geothermal energy uses the more readily accessible soils where the temperature of the ground is 50 to 55°F at 4 or more feet below the surface (below the frostline). This utilization of energy in the ground is more correctly termed geothermal heat pump system, ground source heating or "geoexchange." There are two main components, the heat pump and the circulation system that is drawing the heat from the ground. These systems are becoming more popular but they do have some limitations that can restrict their use. The units can be very expensive with upfront costs in the range of $20,000-$35,000 or more. The differences between a closed loop and open loop system for well systems tend to be specific to the site in question and requires careful study of the site characteristics.

There are other hybrid type systems that use several different geothermal resources that won't be discussed here but can be found at the Department of Energy's website.

In New Hampshire, geothermal systems are regulated by the Department of Environmental Services (DES). The Environmental Protection Agency (EPA) requires states to inventory several classes of injection wells. Open loop wells are considered Class V injection wells which needs to be registered with DES. Closed loop systems also are required to register with DES. For more information, see the fact sheet prepared by DES.

An example of a large and successful geoexchange project in the Central NH Region is the Merrimack County Nursing Home (MCNH) in Boscawen, NH. This is a nursing facility that, on average, has about 290 residents and a staff of 425, and is roughly 235,000 square feet.

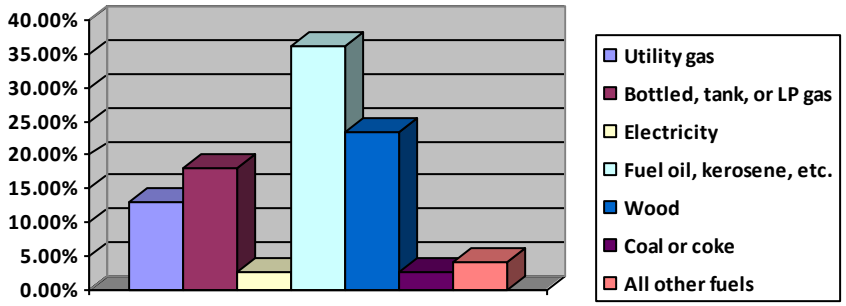
LOUDON'S ENERGY PROFILE

The first step toward reducing municipal energy use is to establish a baseline for comparison. Benchmarking energy use by completing an inventory of lighting, electrical, and heating fuel usage for several key municipal facilities is very important. With these data as a starting point, Loudon could then measure the effectiveness of future energy reduction efforts. These data should be collected over a twelve-month period that would show annual municipal energy demand and the cost for energy expended by the Town for these facilities. The buildings used in the analysis should be selected by the Town due to their level of use and availability of data. A complete energy inventory of all facilities, including any vacant buildings, is recommended for future benchmarking. Municipal vehicle fuel usage (DPW trucks, police cruisers, fire vehicles, etc.) should also be monitored and analyzed as part of the Town's total energy inventory. As far as utility providers, many of the Central NH Region's communities, including Loudon at 2,422 customers, are mostly served by Eversource. A small percentage of Loudon's residents are also served by Unitil (138 customers) and New Hampshire Electric Cooperative (4 customers).

Table 9.1: 2012 – 2016 House Heating Fuel, by Type in Loudon

HOUSE HEATING FUEL, Occupied Housing Units	
Utility gas	12.9%
Bottled, tank, or LP gas	18.0%
Electricity	2.6%
Fuel oil, kerosene, etc.	36.2%
Wood	23.4%
Coal or coke	2.8%
All other fuels	4.1%

Source: American Community Survey 2012-2016



Data on Loudon's heating sources (see Table 9.1) is provided in the following charts that show a typical Northeast profile of the heavy reliance on fuel oil for heating. Loudon has a slightly lower percentage at 36% for fuel oil than the state (46%).

Planning and Energy Policy

Energy planning continues to receive increasing attention at the policy level due to rising energy costs and the relationship between energy use, economic activity, and environmental impacts. The principles of "sustainability" support energy conservation and efficiency through thoughtful community design. Compact development patterns, open space preservation, and multi-modal transportation options are core elements which contribute to energy-conscious development while preserving traditional rural character. NH's communities are all experiencing the demographic trends of an aging population and being able to age in place is of great interest to residents. Energy conservation has the added benefit of supporting many of the accessibility needs of an aging population.

When communities are designed so that residential areas are convenient to businesses, services, and amenities, residents are able to complete daily tasks in fewer trips and using less fuel. Compact development allows for greater density while reducing the miles of roadway, water and sewer lines, and other infrastructure needed to serve homes and businesses. Providing pedestrian, bicycle, and ride sharing facilities means that people have less energy-intensive options for getting around town.

Efficient building construction can significantly reduce energy use and operating costs for the life of the building. Finally, local renewable energy production allows property owners to have control of their electricity, heating, and hot water generation without consuming additional non-renewable fuels. Local regulations can support and influence these elements as a way to encourage a more energy-conscious community.

While many energy issues are outside of local, regional and state jurisdiction, there are several key areas where there are opportunities to impact policy and weigh in on those policies that have a direct connection to municipal affairs. Awareness of state policies and how they can influence local energy planning and available program/project development is important as the region and its communities strive to achieve more energy efficiency.

Loudon can also audit its existing zoning and building/electrical permit policies to evaluate current support of renewable energy systems at the residential and commercial/industrial levels

STATE ENERGY STRATEGY (SB191)

In 2013, an Advisory Council was tasked with developing a revised 10-year statewide energy strategy, the aim of which is to provide forward-looking guidance on electric, gas, and thermal energy strategies and optimize the ready availability of energy supply, energy affordability, the state retention of energy expenditures, jobs, and the use of renewable energy sources and energy efficiency policies, including demand-side policies.

The four main categories that frame the energy strategy are:

1. Advance electric grid modernization;
2. Increase investments in cost effective energy efficiency;
3. Diversify fuel choice; and
4. Increase transportation options.

More detail on the recommendations is available in the final report prepared by the Office of Strategic Initiatives. As required by RSA 4-E, the Office of Strategic Initiatives shall consider updates to the initial strategy at least every three years with opportunities for public comment and consultation with state legislative committees. The revision cycle started in 2017.

ENERGY EFFICIENCY RESOURCE STANDARDS (EERS)

An EERS establishes specific targets for energy savings that utilities or non-utilities must meet through customer energy efficiency programs. As of January 2017, 26 states have fully funded policies in place that establish specific energy savings targets that utilities or non-utility administrators must meet through energy efficiency programs. All the New England states have an EERS with some of the strongest requirements in Massachusetts, Rhode Island and Vermont, which all require close to 2.5% savings annually. A long standing recommendation of earlier studies in New Hampshire, the PUC approved a new statewide utility-run EERS in 2016. This Program will go into effect in January of 2018 and will require utilities to increase their annual energy savings. Starting in 2018, electricity consumption must be reduced by .8% and natural gas consumption must be reduced by .7%. Higher savings are established starting in 2019. Parts of the plan include existing energy efficiency programs and new initiatives such as residential energy audits, financing options for moderate-income residents and multi-year energy planning to encourage long term energy savings for commercial customers. Funding for the EERS will come from increases to the system benefits charge (SBC) and the local distribution adjustment charge (LDAC), both current components of electric and gas bills, respectively.

CLIMATE CHANGE ACTION PLAN

A Climate Change Policy Task Force was convened in 2008 and developed a statewide Climate Action Plan in 2009.[1] According to the New Hampshire Climate Action Plan, the most significant reductions in both emissions and costs will come from substantially increasing energy efficiency in all sectors of our economy, continuing to increase sources of renewable energy, and designing

[1] *The New Hampshire Climate Action Plan: A Plan for New Hampshire's Energy, Environmental and Economic Development Future*, March 2009, available at http://des.nh.gov/organization/divisions/air/tsb/tps/climate/action_plan/nh_climate_action_plan.htm.

our communities to reduce our reliance on automobiles for transportation. As stated in the Plan, a response to climate change and our economic future is inextricably tied to how we produce our energy and how much energy we use. [2]

The Plan calls for long-term reductions in greenhouse gas emissions of 80% below 1990 levels by 2050, with an interim goal to reduce emissions by 20 % below 1990 levels by 2025. A total of 67 specific recommendations are made to achieve that goal. They include: direct energy savings in buildings, transportation, and electricity generation; natural resource protection; supporting regional initiatives; public education and workforce training; and adaptation to existing and potential climate impacts.

NET METERING

The Public Utilities Commission allows net metering which permits homeowners to receive credit for on-site electricity generation such as from a solar photovoltaic (PV) or wind turbine installation when the generation exceeds household or business consumption. This is accomplished by use of an electric meter that can run both forward and backward so that the host is billed only for the net reading on the meter. The 2012 data shows that over 1,000 installations have taken place through the four utilities, with the most by Eversource/PSNH.

The PUC recently issued a long-awaited order that lifts all existing limits on net metering, settling an issue that has been in dispute for several years, as utility interests and solar industry advocates debated the proper way to compensate those who own solar panels without imposing unfair costs on those who don't.

Many of the states with net metering laws have no limit on how many megawatts can be accommodated, and the PUC order lifts the current 100-megawatt limit on solar power eligible for net metering, put into place in 2016.

BUILDING ENERGY CODE

The New Hampshire State Building Code for residential and commercial buildings is now the 2009 International Energy Conservation Code (IECC). A part of the overall building code, the energy code establishes minimum requirements for energy efficient design and construction for both new and renovated buildings. By establishing the minimum requirements, the codes set the baseline for energy efficiency in new construction and major renovations to which further design upgrades and strategies may be compared. A structure built to the 2009 energy code requirements will be 14% more energy efficient than one built to the 2006 code. Likewise, the 2012 code represents a 30% improvement in energy performance over the 2006 code. These represent incremental steps toward the goal of net zero buildings by 2030. Only Durham has adopted the stricter 2012 code in New Hampshire.

Reducing energy usage in New Hampshire buildings is the main goal behind the NH Building Code Collaborative. The goal of the Collaborative was to achieve 90% building code compliance by 2017. There are online resources available through the NH Energy Code Challenge website as well as publicized training events statewide.

In New Hampshire, residential and commercial buildings represent 50% of the state's total energy consumption. New Hampshire buildings use more energy and emit more carbon dioxide than either the industrial or transportation sectors. (Source: New Hampshire Baseline Residential and Commercial Construction

[2] Ibid., p. 1.

Activity and Associated Market Actors Characterization prepared by GDS Associates, March 2011: Source: New Hampshire Baseline Residential and Commercial Construction Activity and Associated Market Actors Characterization prepared by GDS Associates, March 2011).

STATE LEGISLATION

In New Hampshire, municipalities possess legal powers as enabled by state legislation. A number of state statutes authorize municipalities to take action on energy matters:

- **RSA 672:1, III**: "Proper regulations enhance the public health, safety and general welfare and encourage the appropriate and wise use of land."

- **RSA 672:1, 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, the installation of solar, wind, or other renewable energy systems or the building of structures that facilitate the collection of renewable energy shall not be unreasonably limited by use of municipal zoning powers or by the unreasonable interpretation of such powers except where necessary to protect the public health, safety, and welfare."

- **RSA 674:17, I(j)** states that one of the primary purposes of zoning ordinances adopted by municipalities is "To encourage the installation and use of solar, wind, or other renewable energy systems and to protect access to energy sources."

- **RSA 155-A:2, VI** permits communities to adopt stricter measures than the New Hampshire State Building Code, such as requiring new buildings to use highly efficient insulation or to take advantage of passive solar energy.

- **RSA 72:61-72** allows municipalities to offer property tax exemptions on solar, wind, and wood heating energy systems, including solar hot water, solar photovoltaic, wind turbine, or central wood heating systems (not individual woodstoves). Over 100 municipalities in NH have exemptions with 11 of the Central NH Region's communities adopting renewable energy exemptions:

- **RSA 674:62-66** gives authority to municipalities to regulate the construction of small wind energy systems up to 100 MW and prevents municipalities from enforcing unreasonable limitations on their construction and operation.

- **RSA 53F -** In 2010, House Bill 1554 was signed into law and allowed municipalities to establish energy efficiency and clean energy districts. Once a district is adopted by a municipality, an innovative financing tool called Property Assessed Clean Energy (PACE) comes into play. PACE enables municipalities to set up programs to fund energy improvements in commercial buildings and allows repayment of the investments through property "tax" assessments. It is important to note that the financing is tied to the property, not the building owner(s) and paying for investment through property taxes can allow for more affordable and longer term paybacks.

Table 9.2: Renewable Energy Exemptions

MUNICIPALITY	SOLAR	WIND	WOOD
Boscawen	√	√	√
Bow	√		√
Bradford	√	√	
Canterbury	√		
Chichester	√		√
Deering	√		
Hillsborough	√	√	√
Hopkinton	√		
Henniker	√	√	√
Warner	√	√	
Webster	√		

Source: NH Office of Strategic Initiatives, 2016

LOCAL ENERGY PLANNING - LOUDON

The Innovative Land Use Planning Techniques Handbook, available on the NH Department of Environmental Services website, contains model ordinance and regulatory language for municipalities to implement a variety of measures addressing sprawl, environmental, and energy concerns. In addition, nearly 100 communities have formed local energy committees (LECs) to advise municipal officials and educate the public about energy issues. Through the statewide Energy Technical Assistance and Planning (ETAP) program, administered by the NH Office of Energy and Planning (OEP) in 2010-2011, many communities have undertaken municipal building energy assessments, master plan energy chapters, energy capital improvement planning, and other actions to achieve energy savings.

RECENT MUNICIPAL ENERGY ACTIONS

At the local policy level, the Town of Loudon adopted a Small Wind Energy Systems Ordinance that sets compliance standards, construction and removal procedures, and establishes a permitting process for small wind turbines.

An Open Space Development provision is also part of the Town's Zoning Ordinance. This allows new subdivisions to be designed so that homes are built closer together and blocks of open space are preserved. With smaller lot sizes and a more compact design, cluster developments can save energy on construction, infrastructure, and service provision. They also result, ideally, in a network of permanently conserved open space that is protected from future development and provides natural ecosystem services necessary for stormwater recharge, floodplain storage, wildlife habitat, and the like.

All of the actions taken to date by the Town demonstrate Loudon's interest in reducing energy use and costs. It is clear that effective facility management and the responsible use of public funds are a priority for municipal managers. With energy data benchmarking and continual monitoring, the results of such efforts will be measurable.

LOCAL ENERGY COMMITTEES

According to the NH Local Energy Workgroup, there are 61 Local Energy Committees statewide; seven are located in the Central NH region – Henniker, Hopkinton, Dunbarton, Concord, Pembroke, Warner and Webster. Some Committees are working on energy chapters in master plans, inventories or audits of municipal buildings and/or moving forward with special projects such as wood pellets for public facilities. Two communities moved forward with this earlier work and adopted energy chapters – Concord and Warner.

OBJECTIVES AND RECOMMENDATIONS

OBJECTIVE 1

To reduce municipal energy usage and costs and improve energy efficiency in municipal operations.

- → Pursue active monitoring of municipal energy usage and costs to track progress resulting from any energy saving initiatives.
- → Consider the adoption of energy policies to save energy through behavioral changes (such as programming thermostats, turning out unnecessary lights, and turning off electronic equipment when not in use).
- → Look for opportunities to implement building energy improvement plans to increase the efficiency of municipal buildings, and incorporate planned improvements into the municipal budgeting process.
- → Investigate renewable energy options for municipal buildings.

OBJECTIVE 2

To encourage and support energy-conscious development throughout Loudon.

- → Review and revise existing land use regulations as necessary to provide for energy-conscious development in site design and green building design.
- → Review adequacy of existing regulations for renewable energy installations such as solar arrays.
- → Continue to keep apprised of revisions to the Energy Building Code and opportunities for education and training offered for code enforcement officials.
- → Consider adopting RSA 72:61-72 to offer tax exemptions for renewable energy installations.

OBJECTIVE 3

To inform Loudon residents and business owners on energy conservation, efficiency, and renewable energy measures and where to find additional information and funding.

- → Encourage placing information and links on the Town of Loudon's website and at the Maxfield Public Library for residents and business owners on home energy saving strategies, renewable energy system installation, business energy programs, available financing, tax credits, green building design, etc.
- → Sponsor or co-sponsor and/or partner with others on workshops/events on energy conservation, efficiency, and renewable energy for residents.
- → Establish an Energy Committee to advise the Town on energy matters and provide resources to residents and business owners relating to energy improvements.

ENERGY OPPORTUNITIES

There are a number of actions that Loudon can take to implement some of the recommendations identified above. A comprehensive strategy could include municipal policy and operational changes, land use regulation revisions, and targeted outreach efforts. As identified in this Chapter, there are several informational resources and programs available that Loudon could pursue.

Installing renewable energy systems at municipal facilities would reduce the Town's expenditures and increase local energy independence. Other communities in New Hampshire have begun to harness such technologies, such as solar photovoltaics (PV), solar

hot water, and biomass systems. For example, the Town of Canterbury installed a solar PV array in 2010 which helps to power three municipal buildings. The City of Concord installed solar hot water panels in 2011 on several fire stations around the city. Renewable systems such as these could be considered for Loudon's municipal facilities, although site-specific conditions and building use patterns will dictate whether they are feasible and whether there is an attractive payback period from the initial investment.

ADDITIONAL STRATEGIES

The following actions are tied to the objectives and recommendations identified in this Chapter and contain specific tasks that the Town could consider in its continuing efforts to reduce energy consumption. These items address actions within the municipal government.

Municipal Policies and Operations: Strategies or action could include:

- → Purchase more fuel efficient vehicles, or conversion to cleaner burning fuels such as biodiesel where possible.
- → Eliminate unnecessary fixtures and retrofit with more efficient lighting where and when cost effective.
- → Streetlight retrofits.
- → Purchase of energy efficient equipment when replacing appliances or systems.
- → Reduction of solid waste through purchasing choices (choosing less packaging, reusing items, etc.), recycling, and composting.
- → Include energy improvements for municipal buildings and vehicle fleets in long-range capital improvements planning discussions, and prioritize such improvements during the annual budgeting process

This is not intended to be an exhaustive list. No single strategy or action will lead Loudon to achieving more energy efficiency. The pursuit of both small and large changes will be necessary to reach the desired level of savings. It is also important to note that policy shifts, planning considerations, and behavioral changes are just as important as making system or equipment improvements.

As tax credits, rebates and other incentives continue to evolve and hopefully stabilize with a consistent funding stream, it is expected that renewable energy installations will become more prevalent. While there are certainly challenges that still need to be addressed, there are also opportunities to improve on the status quo. A wide range of financial and informational resources exist to help municipalities, business owners, and residents make positive changes in their energy consumption. Taken together, these actions will contribute to statewide energy reduction goals and increased energy independence, while creating economic and environmental benefits.