DRAFT for Public Review
(January 12, 2015)

UVLSRPC Regional Plan 2014

Chapter 8

Energy Efficient Communities

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8.1 ENERGY EFFICIENT COMMUNITIES

Vision

The region's built environment will become increasingly energy efficient through existing building retrofits, energy efficient new construction, and energy-conscious site development practices. Local governments will be leaders in energy conscious policies and practices and renewable energy initiatives.

Statewide Energy Overview

Energy use, conservation, and renewable energy generation are increasingly important topics in New Hampshire communities. This state has a broad range of challenges and opportunities to secure a future energy supply that is both abundant and affordable.

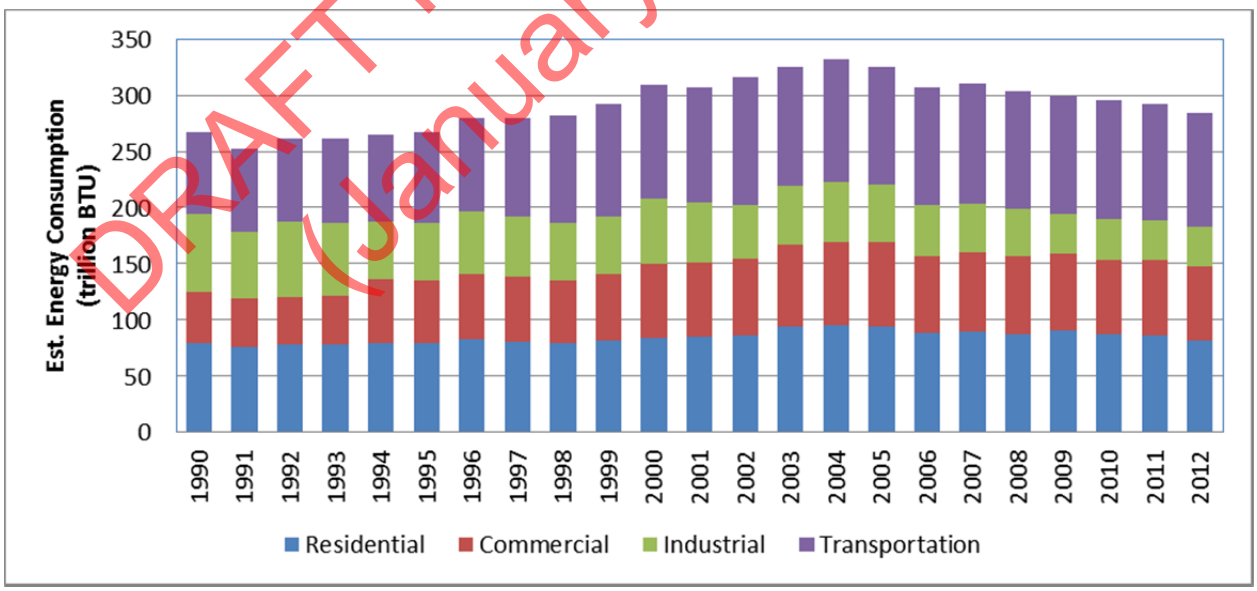
The *New Hampshire 10-Year State Energy Strategy* (2014) developed by the NH Office of Energy and Planning presents an in-depth analysis surrounding energy supply and demand issues for the State. The *NH State Energy Strategy* serves as a good reference for communities and individuals seeking information not contained in this chapter.

Statewide Energy Trends

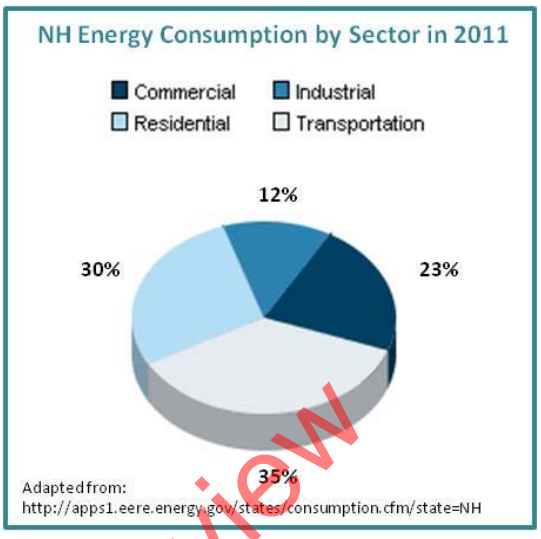
The existing energy circumstances for New Hampshire present concerning trends, particularly with regard to affordability and reliability. In 2012, New Hampshire ranked eighth nationally among all states in per capita consumption of energy, but ranked 23rd for per capita energy expenditures. These rankings indicate a disproportionately high cost for energy on the national level. In 2013, statewide energy expenditures totaled nearly $5.9 billion, which is approximately 9% of State GDP. Much of that money left the state to pay for imported fuels.

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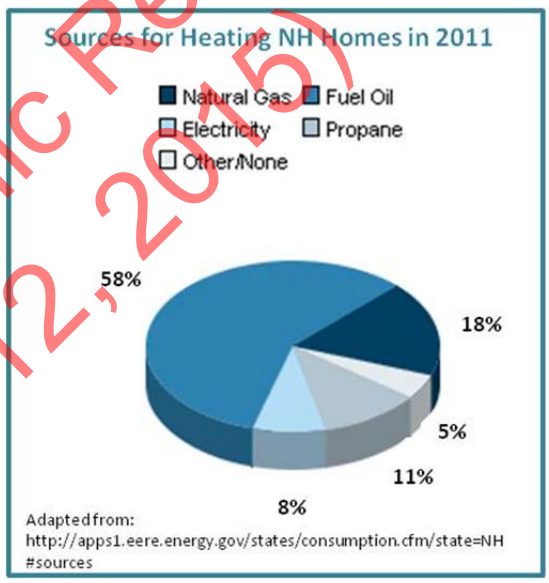
Figure 8.1.1- History of New Hampshire Statewide Energy Consumption by Sector[1]



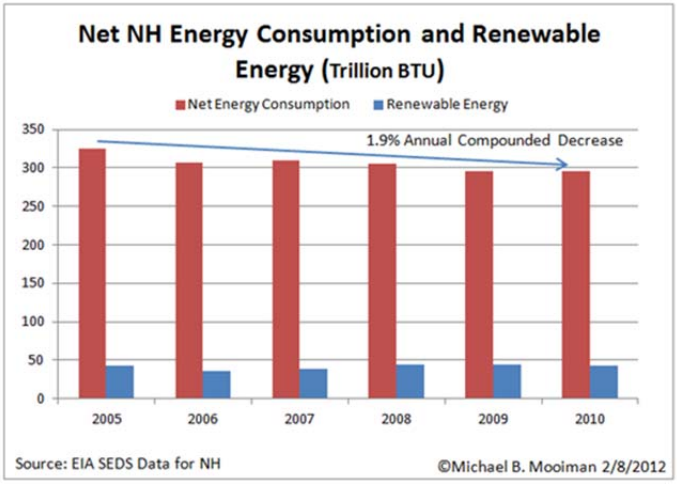
New Hampshire faces many challenges in planning for its energy future. A critical challenge is the rural nature of the state. New England is at the end of the energy pipeline and the energy distribution networks, electrical or otherwise, are more susceptible to disruptions in service and cost volatility because of the need to maintain network capacity, particularly when demand is high. Network vulnerabilities to severe weather events also cause substantial public safety and economic issues when energy supplies cannot reach customers.



In 2011, the transportation sector accounted for 35% of statewide energy consumption and residential energy followed closely, at 30%.[1] Advances in technology and state and federal policies and initiatives have resulted in greater efficiency across many sectors including vehicle fuel efficiency, energy efficient building construction and renovation materials and practices, appliances, and equipment. A "business as usual" analysis projects overall statewide energy demand will decline at a moderate rate over the next 20 years, largely due to increased efficiency in the transportation sector. Energy costs, however, will likely continue to increase over this period resulting in a net increase in energy costs to consumers.[2]



Home heating contributes significantly to residential energy consumption. It is estimated that the vast majority (nearly 90%) of New Hampshire homes use imported heating fuel and energy sources. Seasonal heating is a critical issue for individual quality of life, and reliance on imported energy sources underscores



[1] U.S. Energy Information Administration, http://www.eia.gov/state/?sid=NH

[2] *New Hampshire 10-Year Energy Strategy, Appendix A: Baseline Energy Forecast*, 2014, NH Office of Energy and Planning

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vulnerability to national and international markets and political events.

As total energy consumption declined from 2005 to 2010, the proportion of renewable energy consumption increased. In 2013, 16% of the state's net electricity generation came from renewable energy with hydroelectric facilities providing slightly more than half of the electricity, and biomass facilities supplying most of the rest (largely supplied by wood products sourced locally from within the state).

NH Electricity Rate Increases Shock Residents (Valley News, Jan. 5, 2015)

Residents and business owners across New Hampshire are facing increased electricity rates up to 100 percent due to seasonal rate increases by electric utilities. The increased electricity costs are due to various factors including spikes in the cost of fuels used to generate electricity and the closure of major regional power plants. Regional households and businesses are trying to cope with the increased costs.

There are opportunities for increased use of renewable energy resources (e.g. biomass, geothermal heat, hydroelectric, wind, solar, etc.) in New Hampshire as they become more economically viable. Renewable energy resources, which are often locally or regionally available, are an important long-term consideration to introduce diversity into the array of energy resources for the state. Currently, renewable energy sources comprise a small share of the state's energy portfolio and are increasing annually. New Hampshire's Renewable Portfolio Standard (RPS) requires 24.8% of electricity sold to come from renewable energy resources by 2025.

The use of energy for electricity, heating, and transportation is inextricably linked to community planning and environmental quality. Many communities have begun taking action to manage energy consumption and promote renewable energy generation. Energy, which was once assumed to be a limitless resource beyond local or regional control or influence, has become a resource to be managed by communities, large institutions, and individual residents. Motives for these actions include:

- Economic Benefits – Energy efficiency practices and local or regional renewable energy supplies translate to lower energy costs over time and retaining energy expenditures in the local and regional economy.
- Environmental Benefits – Reduced energy demand and increased local renewable energy supplies reduce the emission of greenhouse gases. Promoting regional renewable biomass (wood and organic materials) energy industry encourages retention of forestlands as an economic resource.
- Resiliency and Stability – A diverse local energy supply portfolio mitigates the volatility of national and international energy supply chains.

Achieving the Statewide Energy Vision

The *NH State Energy Strategy* included a gap analysis to identify the most promising means to overcome a "business as usual" energy scenario and achieve the Statewide Energy Vision.[3] The following bullets summarize opportunities that are both economically justified and technically feasible across the state.

[3] *New Hampshire 10-Year Energy Strategy, Appendix C: Resource Potential Analysis*, 2014, NH Office of Energy and Planning

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Below: Lempster Windmills as Viewed from Mount Cardigan



- *Increase Energy Efficiency:* Increase energy efficiency of residential and commercial buildings and maximize opportunities to take advantage of new heating technologies. Increase transportation fuel efficiency and reduce vehicle miles traveled.
- *Expand Thermal & Transportation Fuels:* Expand the available fuel types for heating and transportation fuels. Opportunities for heating fuels include renewables (e.g. biomass and solar) and new technologies (e.g. ground source or air source heat pumps). Expand available alternative transportation fuel sources like electricity and natural gas.
- E*xpand Renewable Power Generation & Energy Infrastructure*: Expand solar and wind generation, either as utility-scale developments or for on-site residential and commercial use. Incorporating heating (e.g. district heating) and power generating facilities also has significant potential for improving the energy infrastructure.

Regional Energy Overview

The Upper Valley Lake Sunapee Region is rural and is situated a fair distance from major energy and fuel production and distribution points. Except for electrical power utilities and local foresters supplying cordwood to residents, the region imports nearly all of its energy. Based on information provided in the *NH State Energy Strategy,* the region is particularly vulnerable to disruptions in energy supply or fluctuations in energy costs.

Regional Energy Supply

There are a number of regional electrical generators that are of sufficient size (1 MW capacity or larger) to be considered of regional significance. The majority of these facilities are fueled by renewable energy sources. These sites include:[4]

- Lempster Wind, LLC – Lempster, NH: Wind, 24 MW capacity
- Springfield Power, LLC – Springfield, NH: Wood, 16.1 MW capacity
- Dartmouth College Heating Plant – Hanover, NH: Petroleum, 7 MW capacity
- Wilder Dam, TransCanada Hydro Northeast Inc.: Hydro, 41.3 MW capacity
- Mascoma Hydro Corp, Lebanon, NH: Hydro, 1.5 MW capacity
- Lower Village Water Power Project, Marlborough Hydro Corp – Claremont, NH: Hydro, 1.2 MW capacity

[4] US Energy Information Administration, http://www.eia.gov/state/?sid=NH

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- Wheelabrator Claremont Facility, Wheelabrator Environmental Systems – Claremont, NH: Biomass, 4.5 MW capacity (Note: This facility is presently not operational.)

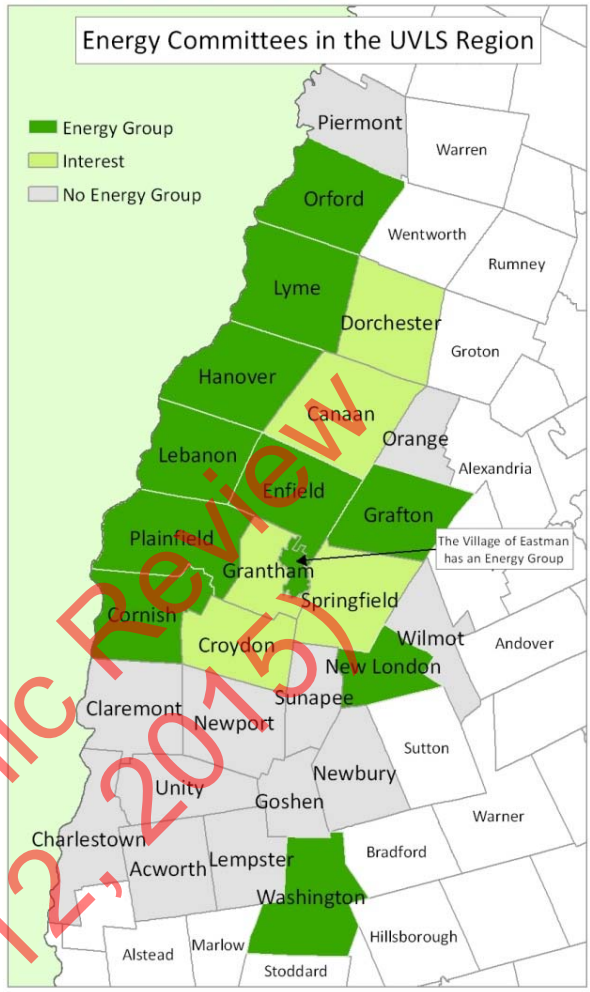
The economic potential for electricity generated from terrestrial wind is higher than from any other source and the technology continues to be developed, making wind power an economically viable opportunity to expand renewable power generation in the near term.

Regional Energy Committees

Approximately half the communities in the region either have an active volunteer group focusing on energy issues or have stated an interest in developing such a group over the past year. The functions of these groups may be advisory to the municipal government, or be authorized to maintain a fund to conduct energy studies or implement energy-related projects on behalf of the municipality. Per RSA 38-D:4, an energy committee, commission, or advisory group (however organized by the municipality) may "research municipal energy use and cost and make such information available to the town," and "[m]ake recommendations to local boards and committees pertaining to municipal energy plans and sustainable practices such as energy conservation, energy efficiency, energy generation, and zoning practices."

Regional Energy Opportunities and Challenges

The Sustainable Energy Resource Group (SERG) and Vital Communities, two regional non-profit organizations with a focus on promoting local energy action, host an annual Upper Valley Energy Roundtable for energy committees in Vermont and New Hampshire to convene and discuss current energy projects and initiatives. During the 2013 roundtable event, the attendees conducted a strategic analysis of the region's energy supply and demand. Specifically, the attendees identified Strengths, Weaknesses, Opportunities and Threats, otherwise known as a SWOT Analysis, of energy supply and demand topics. A summary report of the analysis results is included in Appendix A of this chapter.



The SWOT analyses for energy supply and demand track closely with the *NH State Energy Strategy*, but provide a more informed local perspective on these issues. Regional energy-related opportunities include:

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- Encouraging renewable energy sources, both utility-scale electrical power generation and on-site residential and commercial-scale facilities;
- Harnessing local expertise and the spirit of innovation at regional research facilities and educational institutions;
- Promoting rural public transportation services and rideshare programs to reduce vehicle miles traveled by commuters;
- Promoting local economic opportunities by supporting local industries, agriculture, and services. Local economic activity reduces reliance upon external resources;
- Continuing with educational efforts to increase local understanding of energy conservation and renewable energy supply opportunities;
- Increasing the local electric vehicle charging station infrastructure.

Regional energy-related challenges include:

- The upfront cost of energy efficiency retrofits or renewable energy facilities are difficult for some residents or businesses to cover.
- Consumer understanding or knowledge of the benefits of energy efficient products requires more education.
- The rural landscape makes energy distribution, both on roads and through power lines, costly and vulnerable to disruption.
- The rural landscape limits the availability of viable transportation choices. Travel distances or seasonal limitations are often barriers to walking or biking on a regular basis and rural public transportation is not feasible for all communities.
- Building and housing stock are old and require substantial improvements to meet current energy efficiency standards.
- Low energy costs offset the desire for individuals or organizations to implement energy conservation measures.
- "Not in my back yard" – local resistance against new electrical generator utilities.

Land Use and Energy Efficiency

Much of the region's growth over the last 40 years occurred as dispersed, rural and suburban development. This low-density growth pattern has resulted in increasing travel distances and commuting costs for residents.

It is important to recognize the impact that land use can have on energy efficiency and energy consumption at the community level. Energy-efficient land use planning for developed areas may include broadening potential land uses and encouraging infill development to allow an appropriate mix of uses. Examples of such benefits include allowing small-scale commercial retail uses in a traditionally residential area, which could encourage residents to walk or bike to neighborhood stores rather than drive to regional malls; or encouraging redevelopment of existing buildings that may result in private investment in improving a building's energy efficiency.

On a regional scale, municipalities should have regional discussions to coordinate land use patterns that reduce vehicle miles travelled for residents, commuters, and visitors.[5]

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[5] *New Hampshire Climate Action* Plan, 2009, New Hampshire Department of Environmental Services

Strategies for Energy Efficient Communities

- Provide technical assistance to communities in evaluating their energy resources and developing local Energy Plans (either as part of the Master Plan or as a standalone Energy Plan). Regular review and updates of an Energy Plan should be on the same schedule as the Master Plan.

- Assist communities in maximizing energy efficiency in municipal buildings and facilities. Benchmarking, tracking, and reporting energy use and savings to community members and decision makers will demonstrate the benefits of energy efficiency and energy management practices.

- Support expansion of renewable energy facilities for both private use and utilities. Municipalities should address renewable energy facilities within their master plans and place reasonable regulatory standards for development of private and utility-scale facilities.

- Encourage mixed use development and village development, conservation/open space subdivision, alternative transportation access, and preservation of agricultural lands.

- Pursue opportunities for public-private partnerships to further local energy priorities and initiatives, which may include grant opportunities and aggregated purchasing programs. An example is the Vital Communities Solarize program.

- Continue supporting rural public transportation services and transportation demand management initiatives to reduce per capita vehicle miles traveled.

- Conduct public outreach and education on energy topics. Seek opportunities to utilize or promote federal and state programs to fund outreach and education in collaboration with regional energy committees and energy-focused non-profits.

- Promote community initiatives to reduce collective energy consumption through community-based energy challenges.

- Review and incorporate recommended policies and strategies addressed in the *NH State Energy Strategy* in local master plans.

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8.2 ENERGY EFFICIENT CONSTRUCTION

Energy Use in the Residential Sector

The *New Hampshire Climate Action Plan* (2009) identified that much economic and environmental benefit could come from action to make *existing* residential buildings 70% more efficient. This increased efficiency would reduce the very high projected CO^2 emissions for the state and would produce the very high projected overall net economic benefits.[6]

Energy conservation, the act of changing habits to reduce consumption, can certainly contribute to energy savings without an initial investment. Turning the water off when brushing teeth or doing the dishes, turning off the TV and radio when not watching or listening, and turning lights off when you leave a room are all ways to reduce energy consumption. There are also many energy saving lighting choices available including energy-saving incandescent lighting (aka Halogen), LED lighting, and CFL lighting. However, in order to significantly reduce overall energy costs it often involves going beyond conservation and moving toward improving efficiency.

To improve the efficiency of an existing home, focus on the whole-house system and tighten the building envelope. The greatest amount, about 45%, of energy in a home is used for heating. Sealing leaks and insulating are the most cost-effective ways to increase energy efficiency and maintain heat.[7] Address air leaks by caulking windows and sealing cracks to the outside that may be around fireplace flues, electrical outlets, doors, and plumbing fixtures before insulating. Once completed, add or replace poor insulation in the attic, basement, walls, and floors. Insulating the attic in particular, can help maintain heat in the winter and keep it cooler in the summer.

For those needing financial assistance to achieve energy savings, the Upper Valley Region has a variety of non-profit resources. The Sustainable Energy Resource Group (SERG) is a leading voice and resource for residential and municipal energy assessments, education, and technical assistance. They provide public "Button Up" workshops to the region which focus on the importance of weatherizing and insulating homes, *buttoning up* the building envelope. Weatherization projects and other building repairs are completed by COVER's volunteer-led on-the-ground crews throughout the year, assisting low-income residents throughout the region.

Once the building envelope is tight, addressing the heating may be important. There are federal and state incentives focused on just that. New Hampshire's Office of Engineering and Planning is a good resource for a current list of statewide incentives (http://www.nh.gov/oep/energy/saving-energy/incentives.htm). Look for furnaces with high

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[6] *The New Hampshire Climate Action Plan: A Plan for New Hampshire's Energy, Environmental and Economic Development Future.* March 2009. NH Department of Environmental Services

[7] *EnergySavers: Tips on Saving Money & Energy at Home.*US Department of Energy. energysavers.gov

Annual Fuel Utilization Efficiency (AFUE). The national minimum is 78%, but some Energy Star® models are greater than 90%.[8] Nearly 2/3 of the homes in NH are heated using natural gas, but there are a number of renewable alternative.[9] Heat pumps are currently the most efficient form of heating providing up to three times more heat than energy they use and can reduce electricity consumed for heating by as much as 40%.[10] There are three different types of heat pumps: air to water, air to air and ground source heat pumps.[11] Heat pumps don't burn fuels they are powered by electricity, but can even be powered by solar electricity. [12] Whatever method of heating that is chosen, all can be as much as 10% more efficient by installing programmable thermostats.

Water heating is the second greatest amount of energy expended in a residence, accounting for as much as 18% of the total.[13] There are several ways to reduce the energy input to heating household water that don't require much investment if any at all. For example, by turning down the thermostat on the water tank heater to a lesser temperature, the tank will work less and be more efficient. Insulating the water tank will help reduce thermal heat loss. Replacing an old, inefficient water tank with an Energy Star® model or consider a tankless water heater will have a larger initial investment but could save as much as 30% in energy savings.[14] Adding aerators to bathroom and kitchen faucets can reduce the amount of water used as well.

Best Energy Efficiency Upgrades for Residences	
1.	Improve insulation in attic, walls, basement and crawlspace
2.	Upgrade your heating system to a high efficiency Energy Star® rated model
3.	Upgrade hot water heating system to the most efficient possible and install low-flow showerheads and faucet aerators.
4.	Make home as airtight as possible with air sealing and weather stripping while adding proper ventilation systems.
5.	Apply for related grants & incentives to help you lower the up-front cost of energy efficient renovations.

http://www.citygreen.ca/best-practices-energy-efficiency-homes-and-buildings#model

Windows are also an important component to a home's energy system. Single pane windows should be replaced with double-pane windows with low-e coatings to reduce heat loss.[15] However, it can be very costly to replace windows, so if that isn't possible install tight fitting, insulating window shades and close them at night to protect against cold drafts or install storm windows which can reduce heat loss by as much as 50%.[16]

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[8] *EIbid*
[9] http://apps1.eere.energy.gov/states/residential.cfm/state=NH#sources
[10] *EnergySavers: Tips on Saving Money & Energy at Home*.US Department of Energy. energysavers.gov
[11] http://www.revisionenergy.com/solar-space-heating-maine-new-hampshire.php
[12] Ibid.
[13] *EnergySavers: Tips on Saving Money & Energy at Home*.US Department of Energy. energysavers.gov
[14] *Ibid.*
[15] *Ibid.*
[16] *Ibid*

Municipal Retrofits

The long-term goal of the Building Technologies Office of the US Department of Energy is to reduce energy use by 50%, compared to a 2010 baseline.[17] One way the DOE has spearheaded this reduction is with the Better Buildings Challenge, a public-private partnership committed to a 20% reduction in commercial building energy use by 2020. With $10 million in funding from the DOE, the NH Better Buildings program was established to reduce energy use in the state by a minimum of 15% through residential and commercial energy efficiency upgrades.[18] The state also offers State Energy Program (SEP) grants for a variety of projects including building improvements and electric power and renewable energy.[19]

In 2012, the Union Block Project in the City of Claremont included retrofitting this historic building built in 1888. The project was completed with funding from the NH Community Development Finance Authority, Southwest Community Services and the Retail Merchants Association. The retrofit included: installing new low-e insulated glass and doors at some of the storefront, refurbishing an historic skylight with low-e insulated glass, adding spray foam and blown in cellulose to the attic for an R-value of 60, and air sealing the basement. HVAC work included adding ventilation and solar thermal hot water system. The most significant part of the project was changing the heating system from a one zone steam system to a multi-zone forced hot water system, fired by wood pellet boilers. A solar hot water system was also installed. This project resulted in a 60% reduction in energy demand and 75% reduction in energy cost while keeping Union Block an historic center to Claremont's business district. Tot total energy project cost was $572,225 which resulted in an annual $58,658 energy cost savings and 406,310 CO^2/lbs per year emissions reduction.[20]

Schools

Schools in the Region have also undertaken energy retrofit projects. The EnergySmart Schools Program supported K-12 public and private schools pursuing energy efficiency initiatives by helping them understand where their energy dollars were being spent and identifying opportunities for improving operations and reducing costs.[21] In the Region, Plainfield Elementary School, the Kearsarge Regional Middle School, New London Elementary School and the Piermont Village School utilized this program.

The Plainfield Elementary School has completed some retrofit projects: The exit signs were replaced with high efficiency LED signs throughout the school; New high efficiency lights were installed in the gym; A school-wide energy management system was implemented including installing controls for the HVAC system: Occupancy sensors were installed in the

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17 http://energy.gov/eere/buildings/building-technologies-office
18 http://www.nh.gov/oep/energy/programs/betterbuildings/index.htm
19 http://www.nh.gov/oep/energy/programs/sep/index.htm
20 http://www.nhenergy.org/uploads/1/6/7/3/16738072/union_block_2013.pdf
21 http://www.nhschoolbenchmarking.com/

classrooms, gym, offices and restrooms to turn off lights when the rooms are vacant; Timers were installed on juice vending machines to moderate energy use; and 15 classrooms were modified using air sealing, heat recovery ventilation and super insulation. Since 2005, energy use at Plainfield Elementary School has dropped by 45%. Last year they saved $35,241 in energy costs.[22]

Additionally, solar panels were installed on the roof of the Lyme Elementary School in 2009 with the hope of providing 10-20% of the energy for the school. The output today is about 15 kWh.

The cost of energy upgrades and retrofits often prohibit or limit the scale of projects for municipalities as well as residents. There are a large number of financial incentives available to municipalities, businesses, schools and residences in the state of NH that wish to move to cleaner energy. The Clean Energy Authority (http://www.cleanenergyauthority.com/) is a great resource for available funding and incentive programs. Additionally, many towns in the Region have organized energy committees which facilitate residential educational programs and often act as a resource for finding financial incentives that are available. Energy committees also have assisted in recent and ongoing town-wide *Solarize* events.

The Sustainable Energy Resource Group (SERG) surveyed Upper Valley Energy Committees in May 2014 to get updates on what activities their communities were undertaking. Generally, the NH towns in the Upper Valley reported focusing on *Solarize* projects (Plainfield, Lyme, Hanover, Cornish) and streetlight plans (Lebanon, Orford, Grafton).

Municipalities in the Region are also incorporating Energy into their Master Planning process. Beginning in 2010, the UVLSRPC and partners received an Energy Technical Assistance & Planning (ETAP) Grant - a two year, federally funded program developed by the NH Office of Energy and Planning under the Energy Efficiency Conservation Block Grant (EECBG). Through this program the UVLSRPC has assisted eight towns, and completed six Energy Chapters for the town's Master Plans.

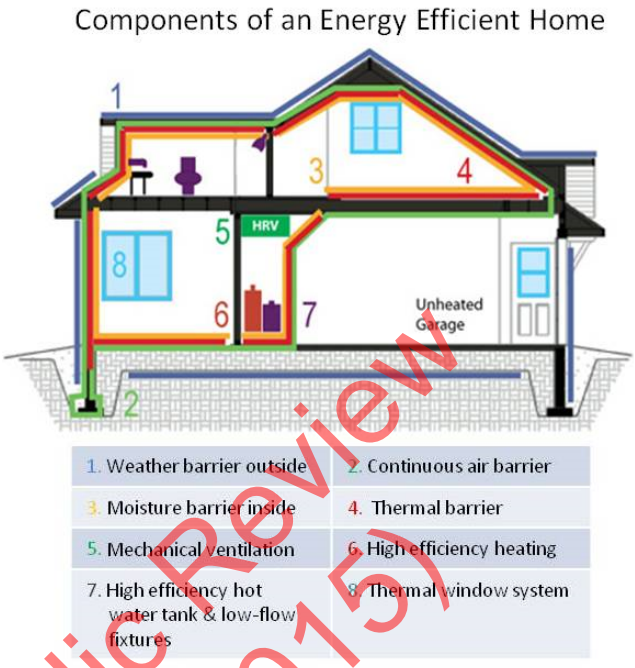
In 2012, the City of Lebanon adopted a comprehensive Energy Plan for the City initiated by Lebanon's Energy Advisory Committee. This undertaking was accomplished with the assistance of Vital Communities and the UVLSRPC. The Plan is an important tool with which the City can use for guidance and a tool for prioritizing projects. The Plan evaluated the existing condition of municipal buildings, the City's transportation network, and other related infrastructure such as the location of the City's streetlights.

The State Office of Energy & Planning recommends that municipalities establish energy efficiency goals and improve coordination and design efficiency programs. Adopting green energy ordinances and adopting the newest building codes are also good tools to decrease energy use. It is important to improve access to financing for the low income population who wish or need to make energy improvements.

[22] http://www.nhenergy.org/uploads/1/6/7/3/16738072/project_profile_plainfield_elementary_school.pdf

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New Construction



There are a variety of energy efficient methods that have been developed to guide green construction of new buildings. The two most commonly used for green design and construction are the US Green Building Council's (USGB) Leadership in Energy & Environmental Design (LEED) and US Environmental Protection Agency's (EPA) Energy Star® Program. Each standard provides a framework which must meet strict energy efficiency guidelines for certification.[23]

Some important considerations in green design and construction projects that are common among all methods include considerations about the scope of the entire project as a whole, from site planning and design, sustainable construction (minimizing energy and material waste throughout the building cycle), efficient design of the building envelope, consideration of environmental air and light quality to maximize health and utilization of solar and other renewable on-site technologies for electricity and heating.[24]

Net Zero Construction, also known as zero energy building, is the process of constructing a highly energy efficient home which supplies an energy output to the grid equal to the amount of energy required for the house system management. This typically requires that renewable on-site resources are available to supply more than half of the energy to the house and that zero-energy and renewable energy concepts are integrated into the design and site plan. Because this is not easily achieved, there are not too many of these buildings constructed at this time, but continued advances in the renewable energy sector may provide greater opportunities for this to be achieved more easily in the future.

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[23] http://www.usgbc.org/leed
[24] http://www.epa.gov/oaintrnt/projects/policy.htm

APPENDIX A- REGIONAL SWOT ANALYSIS

A Strengths, Weaknesses, Opportunities, and Threats Analysis (SWOT) is a strategic planning tool to evaluate internal and external influences upon a common vision or specific goal. SWOT analyses are a common method for a company or organization to assess its capacity to execute a plan or achieve an attainable goal. In the context of regional planning, and regional visioning for the future of sustainable energy resources, the SWOT analysis evaluates the internal and external factors as they may pertain to the region's inherent assets and likely areas of need. The following notes and summary text are based on a dynamic and fast-paced exercise conducted at the May 8, 2013 Upper Valley Energy Roundtable; an annual, bi-state event convening local energy committees together to support and promote energy-related initiatives.

The following pages summarize the collective inputs from the attendees at the roundtable. These notes are intended as the beginning of local and regional visioning discussions addressing energy supplies and demand to promote the overall vision of sustainable and vibrant communities.

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REGIONAL ENERGY VISIONING—A SWOT ANALYSIS FOR THE UPPER VALLEY'S ENERGY FUTURE

DISCUSSION ABOUT THE CURRENT AND FUTURE ENERGY SUPPLY

Upper Valley Energy Roundtable, Wednesday, May 8, 2013

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STRENGTHS: What internal factors, or assets, in the Upper Valley support reliable and sustainable energy supplies?

- Available renewable energy resources:
  - Hydro, wind, solar, biomass, and geothermal energy sources.
- Spirit of innovation:
  - Regional commercial/industrial/institutional in research and development of new technologies
  - Engaged and involved local individuals who are knowledgeable, caring, and clever
- Progressive and improving energy supply resources
  - Harvesting methane and biomass from landfills
  - Improving renewable technologies

OPPORTUNITIES: What external factors to the Upper Valley could support reliable and sustainable energy supplies?

- Expand use of local renewable energy supplies
  - Hydro, wind, solar
- Improve existing distribution technologies
  - Smart Grid implementation
  - Increase number of local power generation sites using local fuels
  - Improve efficiencies of transmission lines and transportation networks
- Local/Regional/Statewide initiatives:
  - Carbon tax
  - Energy efficiency and local renewables incentive programs
  - Develop an electric vehicle infrastructure (charging stations)

WEAKNESSES: What internal factors in the Upper Valley may have a negative impact on reliable and sustainable energy supplies?

- Energy supply network:
  - Principally imported from outside the region and the U.S.
  - Electrical power line loss over long distances
  - Reliance on fossil fuels
  - Higher costs for most energy sources—transportation costly
- Limited local energy sources
  - Region not great for wind generation
  - Limited diversity in local fuel sources
  - High cost to maintain renewable energy facilities
- Barriers to expanding local energy supply:
  - High cost
  - Limited capital, financing, or incentives
  - Substantial permitting and regulatory requirements
  - Rural region increases basic costs

THREATS: What external factors may have a negative impact on the Upper Valley's reliable and sustainable energy supplies?

- Lack of public/political support:
  - Not in my back yard—resistance to having projects next door
  - Public opinion/apathy
  - Lack of funding (nationally) for technological advancement
- Vulnerability of energy resources:
  - Centralized energy supply/distribution (national/international)
  - Resource shortages and military conflicts impact local supplies
  - Resource depletion
  - Aging infrastructure
- Climate change—extreme weather conditions impacting supply chains and possible future availability of fuel sources

REGIONAL ENERGY VISIONING—A SWOT ANALYSIS FOR THE UPPER VALLEY'S ENERGY FUTURE

DISCUSSION ABOUT THE CURRENT AND FUTURE ENERGY DEMAND

Upper Valley Energy Roundtable, Wednesday, May 8, 2013

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STRENGTHS: What internal factors, or assets, in the Upper Valley improve efficient energy demands?

- Communities working to reduce energy demands
  - Energy conservation initiatives
  - Modifying land use regulations to increase energy efficiency (e.g. transportation options)
  - Strong community groups advocating energy efficiency
- Growing public interest in local agriculture and local businesses:
  - Limits required travel distances for goods/services
  - Focuses on local economic gain
- Public and commercial transportation
  - Successful transit programs in the region
  - Local interest in regional bus, passenger train
  - Rail freight in use in the region

OPPORTUNITIES: What external factors to the Upper Valley could increase or promote efficient energy use?

- Modify individual/community behaviors
  - Utilize emerging technologies to improve monitoring/managing use of energy (e.g. Smart Grid)
  - Educate the public and businesses about energy conservation
- Increase energy efficiency standards and practices
  - Develop energy efficiency standards in land use regulations
  - Adopt local energy building codes that exceed statewide or national standards
- Promote local economic opportunities
  - Focus on local/regional products and services
  - Reduce transportation costs/energy expenditure
  - Local production and consumption
  - Seek opportunities to improve the local energy economy

WEAKNESSES: What internal factors in the Upper Valley may have a negative impact on the level of energy consumption?

- Consumer choices lack of awareness regarding conserving energy:
  - Resistance to behavior changes that may cause perceived inconvenience
  - Up-front costs to adopting energy efficient practices not compared with long-term benefits
  - Consumer awareness or desire to employ energy efficient needs more work
- High cost and more effort to implement energy conservation practices:
  - Limited capital or incentives to improve efficiency
  - Rural landscape makes transit, walking, biking difficult as transportation options
  - Old building/housing stock may need substantial improvements

THREATS: What external factors may have a negative impact on the Upper Valley's energy consumption?

- Policies and cheap power
  - Energy prices kept artificially low
  - Low energy costs offset desire of the individual to conserve energy resources
  - Possible long-term detrimental impacts to the local and national economies
- Rural areas have sparse population
  - Geography—the distances between communities
  - Technological limitations (e.g. effective range of electric vehicles) limit opportunities to reduce energy consumption
- Old housing stock—cost of increasing energy efficiency of housing may be cost prohibitive for residents.
- Climate change may have a detrimental impact on some fuel supplies like hydro power (drought) or biomass