

Chapter 15: Energy

INTRODUCTION

This chapter of the *Regional Plan* focuses on the link between energy supply, local energy use, and land development patterns. It also discusses construction methods that help to curb energy expenditures. A number of publications can be found that provide extensive information about energy production methods and other information not covered in detail here. Some of these are listed under "Additional Resources."

CURRENT CONDITIONS

Energy use in the Rutland Region parallels patterns throughout the State and the country. Transportation, heating, lighting, and industrial processes are the primary draws on fuel and electricity. End users (residential, commercial, and industrial buildings, manufacturing and farming operations, as well as transportation across all sectors) consume energy primarily in the form of electricity and petroleum-related fuels.

The Region is a net importer of energy. A limited amount of hydroelectricity and wood for fuel are harvested within the Region for use in the electric grid. A small amount of electricity is also being produced through methane digestion via a contract with the local electric utility. Additional power generation within the Region is limited to small-scale sources such as wood, solar, wind, biomass, and hydroelectric, established to serve specific residential, governmental, agricultural or industrial users. The balance is produced elsewhere in Vermont, New England, Quebec, and/or overseas.

Petroleum Fuel

Transportation

Transportation has become the leading consumer of petroleum energy in our

Region, accounting for 31 percent of *all* energy consumed in 2000. Private automobile use is the primary source, far exceeding fuel consumption for the movement of goods.

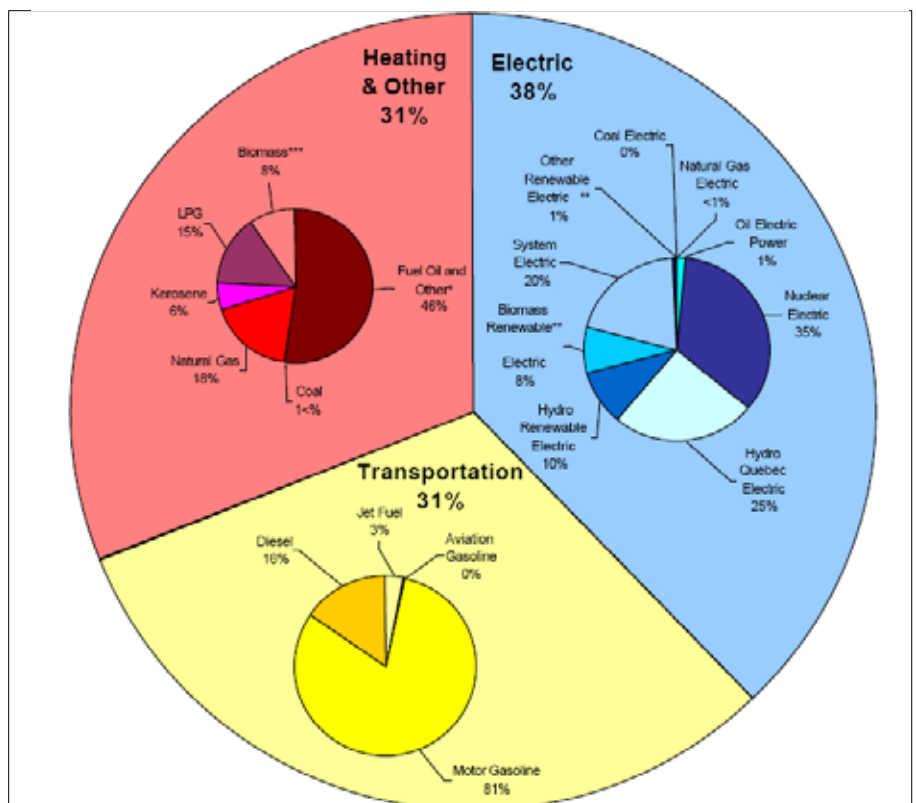
According to the Vermont Department of Public Service, energy consumption in the transportation sector increased by 23% between 1990 and 2001, resulting in a proportional increase in CO₂ emissions generated by transportation. For example, Sudbury, a town with few local jobs and located a distance from any major employment center, is ranked among the worst 30 communities in the State for its level of emissions per person. On the other hand, Rutland City and Rutland Town rank among the least consumptive communities in the State in residents' per-capita commuter fuel use. In fact, in comparison to other communities throughout Vermont, six towns in the



This section is closely linked to the Transportation, Future Land Use and Economic Activity sections of the plan.

Additionally, as new technologies develop, such as ethanol and biomass, the role of farmlands and forests as a source of fuel stock could increase. The Agriculture and Forestry section does not reflect this change, but may in the future as this trend develops.

**VERMONT ENERGY SUPPLY 2004
PERCENT OF TOTAL BTU CONSUMED**



Source: Vermont Department of Public Service, *Utility Facts*

Region – Rutland City, Rutland Town, West Rutland, Clarendon, Ira, and Proctor – rank among the lowest per-capita energy users for trips to work. This underscores the fact that in the Rutland Region, many people who live in those six communities live next to or near their work – a more sustainable development scenario when considering energy use into the future.

Residential Heating

Heating and other related household activities (such as cooking and water heating) accounts for 31% of all energy use in the State. About half of this use is generated from fuel oil, the remainder from natural gas, kerosene, LPG and biomass.

According to the 2000 Census, fuel oil heated 75% of all homes in the County. Bottled, tank, and LP gas ranked second at 12%, followed by wood and electricity. In the Rutland Region, heating oil is distributed by a network of private companies. There are no natural gas pipelines in the Region. Anecdotally, many of the Region’s rural homes also

have wood as a secondary source of heat. Up to half of the homes in some of these communities may have this option, which, with rising fuel costs in 2005 and 2006, has created greater demand for wood products.

Other Users

Commercial and Industrial sector activities use most of the remaining petroleum fuel in the Region. As will be discussed below, electricity generation accounts for only a very small portion of fossil fuel use in the Region.

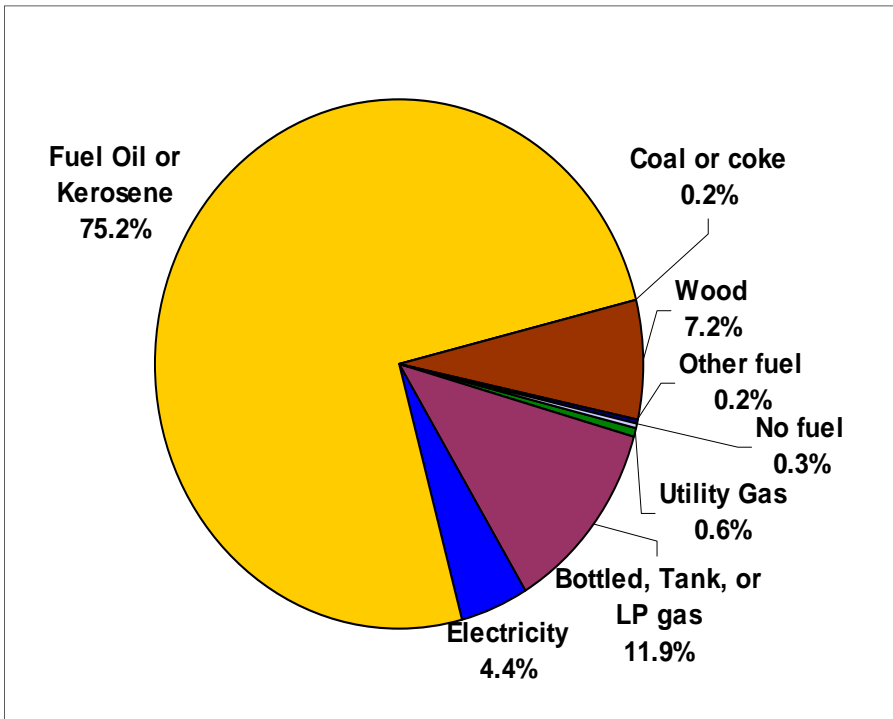
Electricity

Nearly 40% of the energy consumed in Vermont comes from electricity. Central Vermont Public Service, the largest electric utility in Vermont, serves virtually all of Rutland County, with the exception of central Proctor and eastern Mount Holly, which are served by Vermont Marble and Ludlow Light and Power, respectively.

High-voltage transmission takes place over a network of lines, with the primary link running from Ludlow and Mount Holly to West Rutland, and then northwards through Brandon into Addison County. Electricity use in the Rutland Region has increased slowly over the past 15 years, essentially in tune with population growth. Early evidence also suggests that overall electricity demand per user has kept fairly steady since the late 1990s, when the Efficiency Vermont program was initiated statewide.

The fuel types used to supply electricity can vary widely. Throughout CVPS’s territory, electricity sources are as shown on the chart to the right.

RUTLAND COUNTY HOUSE HEATING FUEL, 2000



Source: US Census Bureau, 2000, SF 3

UNMET NEEDS

Current unmet needs in the Region’s energy profile include: full consideration of environmental impacts of production; reducing emissions from energy use; rising

costs of fuel; and widespread availability and use of alternative energy sources.

Other challenges being faced by energy producers and users are sources of long-term supplies, costs, and demands, and the solutions thereto.

Environmental Impact of Production

The most significant by-product of energy production and use is pollution. As increased awareness is raised about this issue, there is a push to move toward energy sources with the least environmental impact.

In assessing these issues, users within the Rutland Region must keep in mind that energy used here must have been produced *somewhere*, and that impacts of generating the supply for our use are felt in those source communities. For example, the hydroelectricity used from Quebec comes at the expense of significant flooding, habitat loss, and displacement of people in the northern parts of the province. Electricity generated from Vermont Yankee brings with it nuclear byproducts with residual contamination that must be safely managed for generations in areas designated for their disposal. Oil, coal, and natural gas must be extracted from the earth around the world with significant environmental impacts.

Sources that have the least environmental impact (often known as “renewables”) are desirable, but can be more costly. Education is needed to help energy users understand the trade-offs and to make informed choices on this issue.

Emissions from Energy Use

Air pollution is a difficult issue for a Region to address. With the exception of very localized emissions affecting an individual town or city the majority of the air pollution generated in the Region affects communities east of Rutland County. And, by the same token, energy

produced and/or used west of Vermont is the primary source of air pollutants here. As noted above, transportation is the largest single source of energy consumption in the Region.

Rising Costs of Fuel

Fuel costs – especially for home heating and transportation – are a paramount concern to residents and businesses in the Rutland Region because of the cold winters and our rural settlement, both of which drive the demand for and reliance upon fuel for heat and automobile travel.

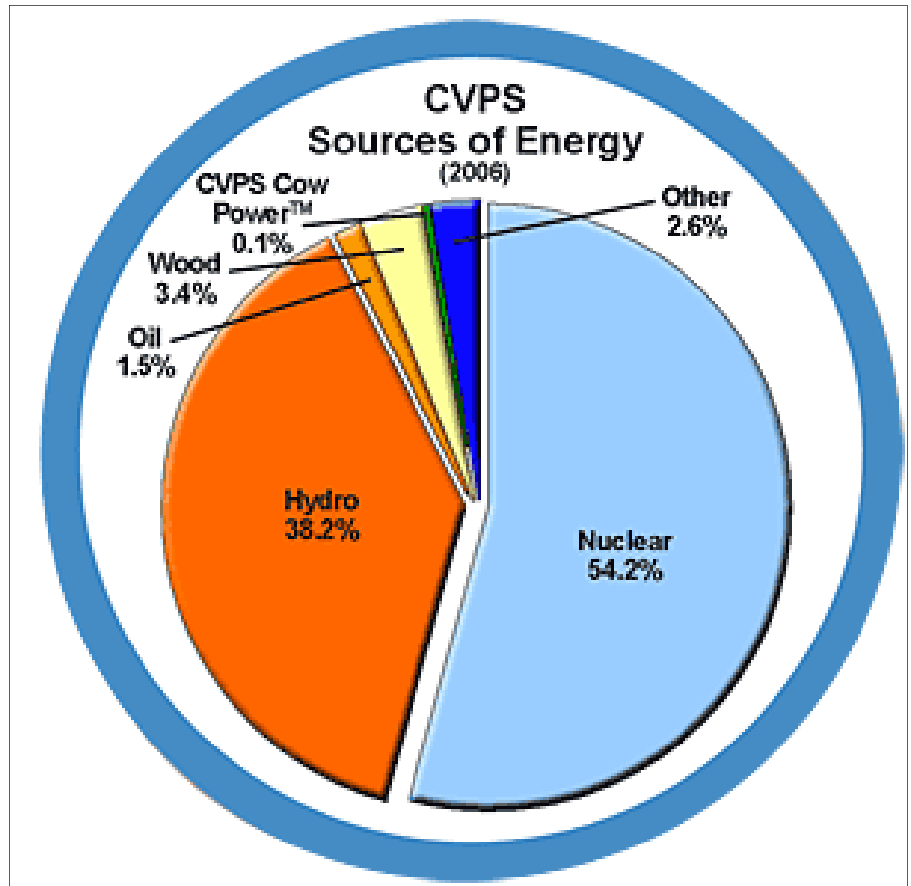
The need is simple: reduced costs for residents and businesses for fuel. The solutions are more complex as cutting costs will entail conservation measures such as using more fuel efficient vehicles, combining trips to save on fuel, better



FAST FACT

The total number of vehicular miles traveled in Vermont is projected to increase by 21 percent from 2005 to 2020 and a correspondingly large increase in carbon dioxide emissions from the transportation sector is anticipated.

SOURCES OF ELECTRICITY FOR CENTRAL VERMONT PUBLIC SERVICE



Source: Central Vermont Public Service



FAST FACT

Long-term contracts with major suppliers of electrical energy (Vermont Yankee and HydroQuebec) are set to expire within the next few years.

As new contracts are being considered, public discussion and debate is occurring throughout the state which could result in significant changes. This section will need to be updated as those matters are decided upon.

insulating homes, improved public transportation and pedestrian facilities, and better land use planning that allows people to reach jobs, goods and services in shorter trips, perhaps even making walking or biking to those destinations possible.

FUTURE TRENDS

Trends in fuel availability and cost are difficult to predict and beyond the control of communities within the Rutland Region to manage. With that in mind, there are a handful of key future trends that we can expect to see in the coming 5-20 years.

Increased Use of Electricity

While electricity demand has been held consistent in the residential sector since the introduction of Efficiency Vermont, demand in the commercial and industrial sectors has increased. CVPS expects that in the coming years, demand – especially in the summer – is likely to continue to increase at a slow pace. For these sectors, demand for is not consistent throughout the year, or even on a daily basis.

Peaks in demand (which typically occur in the summer) are important issues for electric providers. Unlike other fuel sources, electricity must be produced and consumed at the same time; large-scale storage is not a viable option. It must therefore be managed continually. Exacerbating the problem is that local sources of electricity – hydro and wind power – are generally at their least productive during the summer months.

Increased Use of Fossil Fuel Energy

Demand for fossil fuel energy is likely to increase, at least in the short term, in step with population and economic growth and potentially from increased travel as visitors from the northeastern United States decide to take vacation trips closer to home.

Our built environment and current transportation network are not designed with a great deal of flexibility for travelers. In effect, this means that regardless of the cost of gasoline and heating oil, demand is not likely to drop substantially in the Region in the near future. Alternative modes of transportation — either for people, or for goods and services — are



A LOT OF FOOD FOR THOUGHT

Various fuel types are used to supply energy in the region. Nuclear power and Hydroelectricity make up a majority of these sources, along with minor contributions from wood, oil, Cow Power, and others.

• **Nuclear power**, supplying 54.2% of our energy, has been said to be the cleanest non-renewable energy source available today. The industry claims nuclear is clean burning and efficient, the only significant green

house gas emissions from a nuclear power plant is non-radioactive water vapor. However, the waste byproducts require long-term storage with potential environmental and health effects extended into future generations.

• **Hydroelectricity** brings us 38.2% of the electricity we use today. Unlike most energy sources, Hydroelectricity is immune from changes in the cost and availability of fossil fuels.

ENERGY SOURCES SUPPLYING THE RUTLAND REGION

They also tend to have longer economic lives than fuel-fired generation.

Hydroelectric plants are not without their disadvantages. Aside from changing the ecological makeup of the environment, especially aquatic ecosystems, dams also relocate populations and have been known to emit the greenhouse gases methane and carbon dioxide from their reservoirs.

• **Renewable energy** sources, such as wood and Cow Power, make up

approximately 3.5% of the electricity we use. Independent home and business owners have chosen to use geothermal electric and solar electric mechanisms to create a self-sufficient style of life.

As tax credits and other financial incentives evolve, including the rising cost of other energy options, installation of renewable energy technology will become increasingly attractive to individual homeowners and businesses.

not in place in any competitive form. The Region's (and greater northeast's) rail system does not currently encourage passengers or businesses to move away from cars or trucks.

Unstable Energy Supplies and Associated Cost Increases

Worldwide energy supplies are likely to continue to be unstable. Increasing global demand and limited supplies (new sources of oil are not being discovered at their previous frequency) will continue to cause prices for oil products to rise.

Electricity Uncertainty

Vermont has been spared some of the recent fluctuations in prices for electricity thanks to its long-term contracts with Vermont Yankee and Hydro-Quebec, two resources which remain relatively immune to fossil fuel costs. Elsewhere in the country, where power plants are fueled by natural gas or oil, consumer electricity prices have risen sharply in recent years. However, questions remain about the Region's primary suppliers into the future; contracts with Hydro-Quebec and Vermont Yankee are set to expire within the next five years.

Should these not be renewed, local distributors such as CVPS could be forced to buy electricity on the open market. This will translate into more fluctuating rates for consumers. In addition, Vermont Yankee is aging (as compared to the life-expectancy for nuclear reactors). As such, there is a need to look beyond the next contract extension and find ways of replacing the energy supplied by it.

MEETING CURRENT AND FUTURE NEEDS

Increased Interest in Renewables Such as Wind and Solar

Given the trends described above, there has been increased interest in exploring

the use of renewable energy both regionally and statewide. This interest is being expressed by individuals, businesses, and municipalities. Related programs and businesses are growing to respond to the need for information, technical assistance, and manufacturing of the technology.

Efficient Use of Electricity

Efficiency Vermont offers programs that moderate public demand for electricity. A major initiative of this program is to encourage and subsidize swapping incandescent light bulbs for higher energy efficient fluorescent bulbs. There is also assistance for municipalities and businesses to examine their overall energy use and identify steps toward greater energy efficiency. Outdoor lighting is a related issue: many businesses and communities use inefficient and poorly targeted light sources, costing extra money and having negative impacts on Vermont's rural character.

Many state, regional and private organizations run programs to conduct energy audits and implement cost-saving measures to residential and commercial buildings. The Bennington-Rutland Opportunity Council's Community Action in Southwestern Vermont runs a program titled "SAVES," in which staff inspects the building and create a list of solutions in order of highest impact in energy savings.

Efficient Building Design

Air conditioning has become increasingly popular in recent years and heating has always been a major energy use in this Region. Much of the climate control these systems are used for can be achieved (or at least contributed toward) through sensitive building design.

The most prevalent feature of the Region's landscape, deciduous trees, can offer big energy savings. They provide shade in the summer months and allow sunlight through in winter, while buffering homes from winter winds. Other options



FOOD FOR THOUGHT

Public utility power generators in the Rutland Region include: Glen Dam, Patch Dam, Chittenden Dam, Proctor Dam, Carver Falls Dam, and the gas turbine in Rutland. Deer Flat Farms in Pawlet is the first in the county who signed-on to CVPS's Cow Power in 2006.

Mount Holly school has a windmill on the property which produces 10% of the school's energy.

Towns throughout the state are attempting to re-establish old, retired dams. In Fair Haven, talks have progressed regarding the re-establishment of the Micro-Hydro Dam.



FAST FACT

Heating oil blended with biodiesel is now being sold to customers within Rutland County.

for greener design include passive solar collection through south-facing windows to save on heating demand, and off-peak thermal energy storage to save on air conditioner usage. A national standard for building design known as LEED (Leadership in Energy and Environmental Design) addresses these issues as well as water conservation, recycling of building materials and more.

Geothermal heat pumps are another efficient building design system consisting of heating and/or cooling mechanisms that are driven by “thermal masses” in the ground. These systems can be run by electricity from renewable energy sources, and generally do not require high-tech

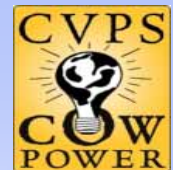
components. Green building design, while initially more expensive, can be expected to return the cost in energy savings within 5-10 years. (Source: US EERE).

Supporting and Modeling Traditional Land Use Patterns

Transportation is the leading source of energy use in the Region. This is directly related to how our communities are laid out and how we can (or cannot) easily get from place to place. Our older village areas are a good model for pedestrian friendly building which not only encourages people to walk between stores, but also between home and work

CASE STUDY:

Cow Power at Work in Rutland County



In an effort to support renewable energy sources and Vermont farms, Central Vermont Public Service offers CVPS Cow Power™, a program that turns the waste from dairy-farms into useable electrical energy.

In Cow Power production, cow manure that is typically collected and used for fertilization is stored in an anaerobic digester, wherein methane (conventionally released into the environment) is captured and directed to a generator where electricity is created and distributed back to the utility.

There are several environmental and economical benefits to the Cow Power program. Along with a significant decrease in methane gas emissions, when manure is stored and heated to release the gas, pathogens like e. coli which would otherwise flow into water bodies are destroyed. Heating of manure also significantly reduces the odors inherent in dairy farming. Utilizing Cow Power also reduces our dependency on non-renewable resources, and supports the

farms in our Region.

On October 26, 2006, Green Mountain College became the nation's first “cow-powered” campus. The environmental liberal arts school in Poultney committed to designate 50% of the main campus electric usage and 100% of all other accounts to Cow Power, which will effectively reduce the college's carbon emissions by approximately 3500 metric tons per year (the equivalent of removing 758 passenger cars from use for a year).

On Town Meeting Day, 2007, citizens from the Town of Benson voted to designate 50% of the electrical usage in municipal buildings to the Cow Power program.

In Spring of 2006, Deer Flat Farms in Pawlet became one of four Vermont dairy farms to receive a Renewable Development Fund grant from CVPS, used to purchase the equipment necessary to capture and harness the methane released from cow manure.

or school, or between our homes and those of our neighbors.

Supporting this land use pattern by allowing additional housing in those areas as well as new commercial uses in areas that are exclusively residential would likely have the greatest impact on energy consumption of any that could be done in the Region.

How land is developed in the Region also greatly influences whether areas can be well-served by public transit.

Local Energy Production: Wind Power, Biomass, Solar, and Beyond

In order to increase the stability and security of our energy sources and lower environmental impacts, some states and communities are seeking ways of generating localized energy supplies through alternative methods. These range from capturing methane released from large dairy farms and landfills, to investigating the possible re-establishment of hydroelectric dams which have fallen into disuse. Solar, wind, biomass, biodiesel and other energy systems are being installed in a variety of settings, from individual homes to schools and farms.

Large scale wind energy generation, a topic of much debate, is a renewable source of energy that has relatively few negative environmental impacts (though development of any kind on ridgelines must be undertaken with extreme caution). It is also a land consumptive and visually apparent form of energy production. In Vermont, the greatest potential for large-scale, consistent wind power is along the State's many ridgelines. Elsewhere in the country, coasts and flat expanses are often the most productive sites.

A study of wind speeds in Vermont indicated that the spines of the Green Mountains and parts of the Taconic Mountains in the Rutland Region have the most potential for wind energy generation. The Green Mountains are not likely to be developed for this purpose, as the

National Forest has just released its master plan, a document that does not call for this type of activity. This leaves a handful of unconserved peaks in the Taconic range as potential sites for local power generation. No serious or formal debate on the subject has yet taken place in the Region, though a company has begun to explore the use of ridge lines extending across several communities west of Rutland, including Grandpa's Knob, as a location for wind turbines.

Local residents will need to carefully assess the need for energy and help decide if they can accept new energy production facilities and the change of



FAST FACT

Vermont has a wealth of private and public resources geared toward renewable energy. Many of these resources can be found on Renewable Energy Vermont's website: www.revermont.org

Resources include technical assistance and education as well as a guide to financial incentives such as tax credits for installing certain technologies.



www.echovermont.org. Photo Credit: Nick LaVecchia

The Echo Lake Aquarium and Science Center, located at the Leahy Center for Lake Champlain, is one of several LEED Certified buildings in Vermont.



FOOD FOR THOUGHT

Efficiency Vermont is a statewide supplier of energy efficiency services, providing technical assistance and financial incentives to Vermont households and businesses to use more energy efficient practices.

Efficiency Vermont provides information and tools for households and businesses to reduce energy costs through energy-efficient equipment, lighting, and approaches to construction and renovation.

www.encyvermont.com
1-888-921-5990

land use for the purpose of helping to contribute to the Region's energy needs.

Individual Energy Production

Since 1998, the Vermont Public Service Board has issued "Certificates of Public Good for Interconnected Net Metered Power Systems," permitting electrical utility customers in Vermont to generate their own power using small-scale renewable energy systems. In the "net metering" program, any excess power generated that is not used by the customer is fed back to the utilities, and customers are credited on their next monthly bill.

This program is also available to farmers who generate up to 150 kilowatts. This limit offers an opportunity to farms to economically generate their own power and reduce demand from utilities.

- Establish criteria towns can use to review renewable energy technology installations in their towns
- Work with towns to identify the most suitable locations for wind power production or other commercial scale power generation
- Work with towns to develop incentives for developers to build compact development
- Help towns establish local energy coordinators working to reduce municipal energy use and encourage development of renewable energy
- Encourage towns in Rutland Region to take advantage of the State funds to establish biomass co-generation facilities to provide heat and energy in local schools and other public facilities.
- Help educate and encourage local architects, engineers and developers about Green Building techniques and LEED standards
- Work with towns to develop plans and regulations that call for compact development
- Provide information to individuals seeking to reduce their own energy consumption and reliance on fossil fuels.

RUTLAND RPC ACTIONS

- Engage the public in a Region-wide discussion about energy needs and the benefits and drawback to energy production within the Rutland Region.
- Work with local planning commissions and communities to encourage the development of renewable sources of energy and efficient building design in public and private projects.

ADDITIONAL RESOURCES

- *The Vermont Energy Digest: An Inventory of Renewable Energy and Efficiency (Vermont Council on Rural Development, April 2007)*
- *Strengthening Vermont's Energy Economy: Final Report and Recommendations of the Vermont Rural Energy Council (Vermont Council on Rural Development, August 2007)*
- *Guide to Municipal Energy Planning (Vermont Department of Public Service, April 1993)*
- *Vermont Fuel for Schools: A Renewable Energy-Use Initiative (Biomass Energy Resource Center, Montpelier)*