

Energy Element

The 2003 Central Vermont Regional Plan Energy Element began with the following statement:

“The environmental and economic implications of energy use have become critical factors in nearly all public policy decisions and in many private actions as well. Energy costs are a major line item in government, business, and personal budgets.”

Just five years later, this reads as a gross understatement. The situation now seems far more critical than we could have imagined then. Consider that:

- Energy costs have sky-rocketed. (Oil was \$25 per barrel when the previous Plan was adopted. It is now, as of June 2008, approaching \$150 per barrel and it appears that price increase will continue.) Consumer fuel costs have more than doubled since 2003)
- War, terrorism, and political uncertainty plague the Middle East
- Global climate change is now universally accepted as a scientific fact and major threat to our environment and economy
- Global oil production has probably either peaked, or is close to peaking, but global demand (particularly in developing countries) grows exponentially
- The Nation’s trade deficit has grown exponentially , primarily due to increasing oil imports at ever higher prices
- Vermont’s biggest energy contracts are five years closer to expiration
- Inadequacies in the State’s electrical transmission and distribution systems are becoming ever more apparent as they approach capacity.

Although the energy picture often appears abstract and beyond the influence of communities, the times call for decisive action and bold policies and programs that look well beyond the five year time frame of this Plan. Sound Regional and local planning can play a positive and effective role in guiding energy decisions. In fact, by promoting appropriate land use patterns, participating in energy development decisions, facilitating alternative transportation options, and encouraging energy conservation strategies, Vermont communities can lead the Nation toward a position of sustainable energy use which will not only maintain a healthy environment, but will also build a foundation for economic health and stability.

24 VSA, Chapter 117, Section 4347 requires that the Regional Plan contain an energy element "...which may include an analysis of energy resources, needs, scarcities, costs and problems within the Region, a statement of policy on the conserva-

tion of energy and the development of renewable energy resources, and a statement of policy on patterns and densities of land use and control devices likely to result in conservation of energy." Chapter 117 further requires that the Regional Plan "promote an efficient and economic utilization of drainage, energy, sanitary and other facilities and resources; promote the conservation of the supply of food, water, energy and minerals;" and "promote the production of food and fiber resources and the reasonable use of mineral, water and renewable energy resources."¹

The Energy Element of the Regional Plan seeks, in part, to satisfy these mandates. Title 30 VSA, Section 248 empowers CVRPC to appear before the Public Service Board to aid the Board in making determinations in Certificate of Public Good hearings. Title 10 VSA, Section 6068(a) empowers CVRPC to testify before the District Environmental Commission and Environmental Board (Act 250) regarding conformance of subdivisions and developments with criteria concerning energy conservation, private utility services, and public utility services and more generally with the Regional Plan.

Thus, the Energy Element of the Central Vermont Regional Plan is designed to assist in the decision making processes of state and local government, and to enhance the economic and environmental health of the Region.

DISCUSSION: TRENDS

Our society uses energy to heat homes and offices, to power an industrial economy and to transport people, goods and services from place to place. About 40% of the world's energy consumption occurs in the United States. Vermont is one of the nation's least energy intensive states; yet the average resident of Vermont consumes approximately 8.1 KW of energy each year, nearly two times more than the average Japanese or German citizen.

In Vermont, the primary sources of energy are fossil fuels (oil, gas, coal and liquid petroleum gas), nuclear generated electricity, local and imported hydro-electricity, and biomass (fuel wood). Renewable energy sources such as solar and wind currently account for only a negligible proportion of total energy use. Fossil fuels are used primarily for transportation and heating, while nuclear power (supplied from the Vermont Yankee Facility in Vernon, Vermont) and out of state hydro-power (supplied by facilities in New York state and Quebec) provide for the lion's share of our electricity demand.

¹ State of Vermont. Title 24 Vermont Statutes Chapter 177: Vermont Municipal and Regional Planning and Development Act. 1967

Statewide Energy Demand- All Sectors, by Fuel (KW/year)

	Fossil Fuels	Electric	Biomass	Solar
1980	2112	427	344	.3
	73.2%	14.8%	12.0%	0.0%
1990	2406	567	263	.2
	74.3%	17.5%	8.1%	0.1%
2010	3623	817	292	.7
(estimated)	76.5%	17.3%	6.1%	0.1%

Statewide Energy Demand- All Fuels, by Sector (KW/year)

	Residential	Commercial	Industrial	Transportation
1980	1000	364	387	1134
	35%	13%	13%	39%
1990	962	393	440	1444
	29.7%	12.1%	14%	44.6%
2010	1339	568	601	2229
(estimated)	28.3%	12.0%	12.7%	47.0%

SOURCE: Vermont. Public Service Department. Vermont Comprehensive Energy Plan, 1998

Although analyses of energy demand by fuel and by sector are not available for Central Vermont specifically, data generated for the State as a whole can be interpolated for planning at the Regional level.

Transportation stands as the sector where energy use has grown substantially during the past 30 years. During that time energy consumption in the transportation sector grew 97% primarily due to increased commercial and industrial uses. The transportation sector now accounts for over 45% of all energy, and approximately 60% of all fossil fuels, consumed in Vermont.²

Residential use, while decreasing as a percentage of total energy demand, is projected to have increased by over 334 KW/yr (34 %) between 1980 and 2010, presumably due to the significant increase in the State's total number of housing units and the trend towards larger homes with more gadgets. While fossil fuel use in the commercial and industrial sectors has been less pronounced, the total projected increase between 1980 and 2010 is projected to add up to over 334 KW/yr. (See map: *Energy & Communications* and for more discussion: Utilities, Facilities & Ser-

² Union of Concerned Scientists. Energy and National Security. December, 1990.

vices Element.)

Fossil Fuels

As shown in the above tables, fossil fuels account for over 3/4's of all energy consumed in Vermont. Approximately 65% of the oil consumed in the U.S. is imported , up from only 10% in 1960.³ In fact, oil imports account for approximately 50% of the total U.S. trade deficit. and the cost of U.S oil imports has increased. over 300% in this decade to a level of about \$340 billion in 2007.

Our economic system is so tied to the availability of fossil fuels that even modest increases in price can lead to high inflation, lagging economic growth and monetary instability. Dependence on fossil fuels inflates an already record high national deficit. It is estimated that as much as 90% of every household energy dollar permanently leaves the community.⁴ The remainder stays in the local economy to pay the overhead costs associated with the distribution system and to pay for locally produced forms of energy. As fossil fuel costs rise, a greater proportion of our income will leave the Region.

This situation can only become more critical as we approach peak oil production (Some experts believe we have already passed or reached it). The U.S Department of Energy's 2005 report "Peaking of World Oil Production: Impacts, Mitigation and Risk Management" states that:

"The peaking of world oil production presents the U.S. and the world with an unprecedented risk management problem. As peaking is approached, liquid fuel prices and price volatility will increase dramatically, and, without timely mitigation, the economic, social and political costs will be unprecedented. Viable mitigation options exist on both the supply and demand side, but to have substantial impact, they must be initiated more than a decade in advance of peaking."

The economic and social consequences of intensive fossil fuel use are only part of the story. The combustion of fossil fuels is by far the largest contributor of atmospheric "greenhouse gases" (primarily carbon dioxide). There is strong consensus in the scientific community that continued accumulation of "greenhouse gases" within the earth's atmosphere is creating a warming of the atmosphere, or "greenhouse effect." Such warming could cause severe coastal flooding and unpredictable climate shifts, threatening the viability of the earth's most significant urban and agri-

³ Union of Concerned Scientists. The Global Warming Debate: Answers to Controversial Questions. March 1990.

⁴ Kinsley, Michael J., Economic Renewal Program: An Introduction. (7). Rocky Mountain Institute.1989.

cultural centers. In Vermont, significant warming could cause irreparable harm to the State's largest industry, tourism. Reduced snowfall and a die-off of sugar maples could spell disaster for ski areas, syrup producers, and our fall foliage season.

Further, fossil fuel combustion is also directly linked to the acidification of rivers, lakes and soil, and human health hazards resulting from declining air quality. For reasons highlighted above, and because fossil fuels are an exhaustible natural resource, we must begin now to drastically reduce the magnitude of fossil fuel consumption in our society.

Nuclear

Over one hundred commercial nuclear reactors across the country supply about 20% of our nation's electric power. The Vermont Yankee Nuclear Power Plant in Vernon provides about 35% or one third of the current electrical power in Vermont. However, it is only licensed to operate until 2012⁵ and its future beyond that is uncertain.

The generation of electricity via nuclear fission is one of the more controversial energy issues in the U.S. Some view nuclear power as a clean and renewable choice, while others regard it a threat to the public health, safety and welfare. Although recent polling shows that most Vermonter's hold the latter view, it is gaining traction at the national (and international) level as an alternative to fossil fuels.

While there were no plants ordered in the U.S. between 1979 and 2005, there are currently several sites under consideration, nationwide, for new or expanded plants. Chief among opponents' concerns is the issue of spent fuel. Nuclear generated electricity produces various long-lived radio nucleotide wastes which are highly toxic and require extraordinary precautions for safe storage. Existing technology does not guarantee safe disposal. Further, the industry has not yet resolved safety issues regarding fuel storage and the decommissioning of commercial nuclear power plants. These problems are in evidence at The Vermont Yankee Nuclear Power Plant in Vernon, as stated on its own web site:

"U.S. nuclear plants were designed under the assumption that the federal government would remove the used fuel in a timely manner throughout operation. The government however, has not yet begun removing the fuel. Not unexpectedly, a growing number of plants – including Vermont Yankee- have fuel pools that are nearing their storage capacity. In order to continue operating, these plants need to

⁵ Vermont. Department of Public Service. Electric Plan. 2005.

supplement their fuel pools.”

Yankee has requested, and received, approval from the Vermont Legislature to construct a dry cask fuel storage facility scheduled to be in place in 2008. The Facility will need the Legislature’s help once again if it is to continue operating into the future. The plant, scheduled to be decommissioned in 2012, has applied to the Nuclear Regulatory Commission for a 20 year license extension, and will likely receive a decision this year. However, in accordance with Vermont Act 160 (2006), the plant may not operate after its current termination date unless the State’s General Assembly finds that its continued operation will “promote the general welfare.”

Hydro-power

Currently, Vermont gets about half of its energy from hydro-power (about 10% from small, in-state sources; or about 50 private and utility owned sites) and the remainder from Hydro-Quebec and New York Power Authority.⁶ The Hydro Quebec contract is scheduled to expire in 2015.

It is estimated that Vermont has at least 174,000 KW of undeveloped hydroelectric potential. This represents about 22% of current use. Most of the sites constituting this additional capacity are classified a “mini-hydro” (under 1000KW) developable at existing, but unused, dam sites.

Hydroelectric development will require a balancing of priorities. While the benefits of generating electricity from local, renewable resources are evident, they are not without associate costs. The power output captured from a given stream must be moderated by environmental considerations. A minimum stream flow, adequate to support aquatic life forms, must be maintained and impoundments must be designed with water quality and land use/recreation considerations in mind

Hydropower potential lies not only within naturally flowing streams and rivers, but to some extent in potable water systems, as well. In fact, the City of Barre has recently contracted with a consultant to conduct a feasibility study for the development of “small scale, low impact hydroelectric systems to provide a source of local, renewable power that would reduce the cost of electricity for the City” within its water system. The first phases of this study have identified three sites (the Nolan Street PRV Regulation Vault, the Dix Reservoir and the Orange Dam) as having “no technical barriers” and being “worthy of more intensive study”. The City is continuing to pursue these possibilities.

⁶ Vermont. Department of Public Service. Biennial Report. July, 2000- June, 2004.

Wood Biomass

Forest land covers approximately 77% of Vermont's total land area. Total forest inventory amounts to approximately 475.5 million tons of living biomass and an estimated additional 80 million tons of salvageable dead wood. Estimated annual growth of forest biomass is approximately 12 million tons. In 1989 about 2.8 million tons were harvested from Vermont forests. While ownership patterns, ecological and physical constraints, public sentiment and market pressures will likely drive future forest harvests, consideration should be given to expanding the use of biomass to generate electricity and provide direct heat.

Unfortunately, biomass electricity has been decreasing as a percentage of Vermont's power mix (from 10% in 1980 to about 6% currently), and fewer homes are being heated with wood. However, the generation of electricity from biomass is a phenomenon that continues to hold the potential to benefit both the economy and natural environment of Vermont. Under proper management and replacing fossil fuel combustion, the generation of electricity from biomass could reduce greenhouse emissions. Importantly, this would also stimulate local economies. According to the Northeast Foresters Association, "The biomass market provides an important outlet for low grade wood, a material neither suitable nor economical to process as lumber or paper. Revenues from the sales of biomass chips in 2005 in Vermont totaled nearly 5 million dollars." The organization also estimates that annual cordwood sales (about 270,000 cords) net landowners about \$1.4 million in stumpage. These sales are good for the economy as estimates show that approximately 80% of each dollar spent on wood remains in the State while only 20% of each dollar spent on nonrenewable energy sources remains in the State.⁷

Intensive biomass extraction does carry ecological risks such as air pollution and depletion of soil nutrients. Before the expansion of biomass electricity occurs, careful analysis of the long term impact of large scale and sustained harvest should take place.

Currently, less than one-third of Vermont homeowners use fuel wood as a heat source. Increased use of fuel wood for heating would stimulate local economies and, if harvest and burning is executed in an environmentally sound manner, would decrease the environmental impacts of existing patterns of energy consumption. New technology is expanding the potential for implementing high-efficiency wood burning in buildings as a primary heat source. While wood burning does contribute a large proportion of atmospheric particulate pollution - pollution directly associated with respiratory damage - new wood burning technology and stricter EPA emissions

⁷ Vermont. Department of Public Service. Comprehensive Energy Plan.

standards are resulting in increased efficiency and reduced particulate emission.

Vermont also has two large scale wood-fired generators (Ryegate and Burlington) which produce about 244 GWh, or 4% to 6% of Vermont's electrical energy, one of which is capable of using natural gas as an alternative fuel. Between them, they use nearly one million tons of wood chips annually. Vermont also leads the nation in small-scale applications of biomass energy. The State of Vermont operates wood chip heating systems at the State Capitol complex and the Waterbury office complex. Such systems have also been installed in at least twenty-six educational settings, including U-32 High School and the Green Acres Housing project in Barre.⁸

Vegetable Biofuels

Biofuels are renewable, agriculturally derived liquid fuels that can be used to run vehicles and heat buildings. They include biodiesel, ethanol, and even straight vegetable oils. A variety of plants with high oil or cellulose content can be employed to produce these products. Some, including corn, sunflower, canola, soy and hemp, could be grown and processed in Vermont. Doing so could help keep money circulating in the community, creating jobs and sustaining local agriculture, while helping to avoid the external costs associated with fossil fuels. However, it may also take farmland out of food production.

Biodiesel, in particular, appears to be catching on in Vermont (and elsewhere), as it can be used in many existing vehicles and furnaces with minimal equipment modification. Furthermore, it is blended with petroleum fuels. As of January 2007, biodiesel fuel was available at about two dozen locations throughout Vermont.

Methane Production

The decaying organic materials of landfills, manure pits, and waste water treatment systems produce significant amounts of methane; a greenhouse gas 20 times more potent than carbon dioxide and a potential energy source. It has been estimated that methane from U.S landfills alone accounts for as much as 2% of global greenhouse gas build-up. Capture technologies have experienced tremendous growth in recent years rendering methane a valuable energy source.

Nationally, 415 Landfill Gas to Energy (LFTGE) projects are in operation, according to the EPA. However, Vermont currently has only two such systems, and a cow manure methane generating system, on line. A third landfill system proposed for the Moretown Landfill, has received CVRPC's tentative endorsement. This project would

⁸ Vermont. Department of Public Service. Utility Facts.

use captured methane to produce electricity in two generator sets with a combined capacity of 3.2MW and would connect to GMP's nearby 35KV line.

In the past several years, the Department of Public Service and the Department of Agriculture received a \$695,000 Federal appropriation to promote the use of methane recovery technology on Vermont dairy farms.

Wind-power

Essentially a form of solar power created by pressure and temperature differences across our planet, wind-power is one of the oldest and most environmentally benign sources of energy. In recent years it has experienced resurgence in its application, which is certain to continue. In fact, it is the fastest growing energy source in the world and a major contributor to the power portfolios of several European nations. Wind turbines are among the most economical of contemporary renewable energy technologies, and have become cost competitive with most conventional electricity sources (especially when indirect, avoided costs are factored in).

Although Vermont has potential for wind power, it is estimated that only 10 to 15% of Vermont's electrical power could be generated by wind because of its intermittent nature. Viable sites for wind turbines exist primarily between 2,500 and 3,500 feet in elevation. Some such locations, particularly those without existing development, may be aesthetically or ecologically sensitive.



Wind farm, Searsburg, Southern Vermont. Photo courtesy of Dan Emery.

The modern industrial wind turbine is not an insignificant piece of machinery. Mounted on towers ranging from 150 to 260 feet tall, with blades that can extend an additional 150 feet, they can be imposing structures. Consequently, wind generation proposals in Vermont have faced some opposition on aesthetic grounds. Other concerns raised have included noise, habitat issues, collateral bird and bat kill, and "ice throws" from the blades. Still, it is important to note that a recent poll conducted by the Vermont Public Service Board revealed that a majority of Vermont

survey respondents say they would support the technology, even if turbines were visible from their homes.

Currently, Vermont produces only 6MW of power (enough for about 2000 homes) by way of commercial wind power at an 11 turbine "farm" in Searsburg. However, over a dozen proposals which could supply as much as 500MW have been approved or proposed throughout the State. While none of these sites are in the Central Vermont Region, this does not suggest that we do not possess viable sites.

Finally, it should be noted that advances in small scale wind turbine technology figure to make them an increasingly viable option for private individuals or groups of individuals. State law restricts the regulation through zoning of turbines with blades less than 20-feet in diameter. Furthermore, any small scale turbine that returns energy to the power grid is exempt from local bylaws and is instead reviewed by the Public Service Board under Act 248.

Solar-power

Solar energy has tremendous potential for providing clean, reliable and safe energy, even in Vermont's climate. The application of both active (systems which collect, store and distribute solar energy within a building) and passive (systems which utilize a building's structure to trap sunlight and store it as heat) solar technologies have demonstrated their cost effectiveness in Vermont.

Solar-tempered buildings are buildings that have their long axis oriented within 30 degrees of true south and have an unobstructed net south facing window area equal to at least 7% of the total floor area. Solar-tempering coupled with proper insulating can offset heat costs in a building by 40%. Although solar-tempering at initial construction generally requires no additional investment, experts suggest that a majority of new buildings in Vermont do not incorporate such design principles.

Contemporary solar technologies have proven their value in Vermont, particularly in rural areas. As the technologies improve and costs decrease, solar thermal collectors and photovoltaics (technologies which can convert sunlight to electricity) will become more competitive in the marketplace even in less remote areas. As the power source of solar technologies is inexhaustible, and solar energy neither contributes pollutants to the atmosphere nor to our reliance on foreign energy suppliers, strategies should be developed to encourage its use.

Natural Gas

At present, there are no natural gas transmission lines in Central Vermont. How-

ever, natural gas use in Vermont is increasing at about 4-5% a year. Natural gas is the least carbon intensive of all the fossil fuels and therefore releases relatively small amounts of carbon dioxide upon combustion. Moreover, the combustion of natural gas produces no SO₂ and low NO_x. Both are acid rain precursors. Natural gas could be most appropriately applied in residential and commercial water heating, cooking and space heating, in various industrial processes, and in a small amount of electrical generation. Enabling the use of natural gas in Central Vermont will mean increasing and extending load capacity and is encouraged, where technically feasible and economically and environmentally appropriate, in the transition to clean fuels.

Demand Side Management

In 1990 the Public Service Board required the state's regulated utilities to carry out Least Cost Integrated Planning and implement Demand Side Management programs. In Central Vermont those utilities are investor owned municipal and cooperative electric utilities. Least Cost Integrated Planning requires that each utility "...meet the needs of its customers at the lowest total long term cost and...do so by giving equal consideration to all generation, transmission and energy efficiency options..." Demand Side Management programs promote the conservation of energy as an energy source available for future demand. Through their Demand Side Management programs, the Region's utilities will likely provide various incentives including financing and partial payment of certain efficiency improvements, energy audits and design services.

As the creation of excess generating capacity can be used to meet future electrical needs for Vermont, conservation must continue to be viewed as a source of electricity. Conservation is our least expensive and most environmentally benign source of electricity.

SUMMARY OF TRENDS

Despite the compelling need to change both the pattern and magnitude of energy consumption, the Vermont Department of Public Service predicts that energy consumption in Vermont will increase and that fossil fuel consumption will continue to grow as a proportion of total energy consumption. It is projected that the bulk of the increase in energy consumption will be for space and water heating and for transportation.

Fossil fuels must be replaced by renewable energy resources. As long as present patterns of energy consumption are continued, prices will rise, the nation's trade deficit will increase, pollution will continue and the potential for severe atmospheric

changes will grow. Sustained economic health and avoidance of continued environmental degradation will require a dramatic shift to renewable energy resources and improved energy efficiency. This shift will require not only strong market pressure, but also creative policy initiatives.

Besides the predicted increase in energy consumption, Vermont must plan ahead for expected energy source loss, as Vermont Yankee's license expires in 2012 and our contract with Hydro-Quebec ends in 2015. It is important that Vermont, and especially Central Vermont, begins to look for energy options before these events occur.

Because the external costs (i.e. the hidden social and environmental costs) of energy are not reflected in the current market, renewable technologies are forced to compete at a disadvantage. In effect, energy consumption is subsidized by the public (i.e. health insurance costs and environmental degradation). These circumstances must be altered in order to facilitate the emergence of a renewable energy economy.

IMPLICATIONS FOR LOCAL/REGIONAL PLANNING

Planning ordinances

Through the planning process, Vermont's municipalities are able to influence patterns of land development, guide capital investments, and impact the use of natural resources. A planning effort sensitive to energy issues will promote settlement patterns that minimize transportation requirements, encourage land use that conserves energy, and develop a policy which encourages the efficient use of energy resources.

The Vermont Planning and Development Act (V.S.A. 24, Chapter 117) enables Vermont's municipalities to adopt regulatory bylaws for implementing their town plan. Zoning bylaws and subdivision regulations are the most commonly used bylaws in Central Vermont. Each affords the opportunity to promote energy efficient development at the local level.

Zoning bylaws control the type and density of development. Encouraging high density and diverse uses in and around existing built-up areas will lead to more compact settlement patterns, thereby minimizing travel requirements. At the same time, zoning bylaws must be flexible enough to recognize and allow for the emergence of technological advancements which encourage decreased energy consumption, such as increased use of solar and wind-power and telecommunications technology.

Through setback and height requirements, zoning also controls the size and relative location of new structures. Chapter 117 permits communities to exempt moderately sized wind and solar energy devices from these restrictions. A zoning bylaw may allow for the consideration of solar access (exposure to sun) in reviewing projects at the local level.

Local zoning bylaws may also permit the creation of planned unit or planned residential developments (PUD/PRD). These are a grouping of mixed use or residential structures, pre-planned and developed on a single parcel of land. The setback, frontage and density requirements of the zoning district may be varied, in consultation with the town planning commission, to allow creative and energy efficient design (i.e. east-west orientation of roads to encourage southern exposure of structures, solar access protection, use of land forms or vegetation for windbreaks, and attached structures).

Subdivision regulations govern the creation of new building lots, as well as the provision of access and other services and facilities to those lots. Subdivision regulations, like the PUD/PRD, involve the town planning commission in the design process. As with the PUD/PRD, the planning commission should use the opportunity to ensure that the conservation of energy is considered in subdivision development. Except through the Act 250 process, there is no regulation of energy efficiency in new construction in the Central Vermont Region (about 1/3 of new residential and 3/4 of new non-residential construction go through Act 250.) Act 250 requires that "best available technology" for energy efficiency and recovery be used in construction.

In its review of development proposals, Act 250 applies a life cycle cost test to determine the "appropriate level" of energy efficiency. The "appropriate level" requires the developer to invest in energy efficiency up to the economic break even point for a particular structure, occupant and usage pattern. This standard allows for flexibility in design without sacrificing the energy efficiency of specific measures.

Transportation

According to the Vermont Comprehensive Energy Plan, the transportation sector accounts for over 45% of total energy demand and approximately two-thirds of all fossil fuels used in Vermont. As discussed in previous pages this situation imposes a tremendous economic and ecological detriment. Environmental degradation resulting from heavy petroleum use is well documented, as is the fact that the lion's share of money spent on fuel and automobiles leaves the state, thus undermining the local economy.

The rural character and decentralized settlement patterns of Central Vermont, the very qualities which render Central Vermont an extraordinary living environment, create difficult circumstances in which to minimize the consumption of traditional fuels in the transportation sector. Nevertheless, there are strategies which can be employed at the local, Regional and state levels which will bear influence within this context.

Because any gains in energy efficiency will be at least partially offset by increases in population, it is important that the Region and member municipalities plan for and promote alternative and public transportation options. Improved access to, and increased use of, alternative and public transportation options such as rail, bus, van-pooling, ride-sharing and bicycling, will not only decrease energy consumption, but will also reduce the infrastructure expenditures that are associated with the "car culture."

Another strategy by which the demand for transportation can be reduced is through encouraging settlement patterns which require less physical travel. The concentration of employment opportunities, housing and social services, the expansion of telecommunications potential, and the increased use of local resources may help achieve this objective.

Other important strategies, for reducing energy demand in the transportation sector include: promoting research and development of alternative fuels, incentives for the retirement of less efficient vehicles, and promoting increased efficiency standards for new automobiles. In the future, bio fuels are likely to be important sources of energy in the transportation sector, a phenomenon which could have a beneficial impact upon Vermont's economy.

For our part, CVRPC participates in and promotes the Way to Go! Commuter Challenge, an annual one week promotional event designed to encourage alternatives to the solo commute. We also work with our municipalities in identifying and implementing projects for VTtrans' Safe Routes to School Program whereby pedestrian infrastructure improvements are promoted and funded.

Buildings and Structures

According to the Vermont Comprehensive Energy Plan, approximately 30% of the total amount of energy consumed in Vermont is used for residential purposes. The Plan shows that growth in energy demand in the residential sector will be driven by increases in population and housing, and a corresponding increase in demand for space and water heating. This demand, when considered with the energy demand

associated with the space and water heating requirements of commercial and industrial buildings, represents tremendous potential energy savings.

Investments in energy efficiency improvements in new and existing buildings and appropriate site design in new development will result in the realization of this savings, and will demonstrate a significant impact on total energy demand. Ultimately, such investments will reduce the percent of income residents spend on energy, per capita energy consumption and environmental degradation.

Although investments in energy efficient technology often require a significant commitment of resources, initial expenditure generally more than pays for itself over the life-time of the technology. In almost all cases, it is cheaper for the homeowner to invest in energy efficient designs, materials, and weatherization projects than pay inflated operating expenses over the life of the mortgage. Nevertheless, current building practices, both new construction and renovation, do not include substantial investment in energy efficiency and conservation measures. Such investment, coupled with the increased use of renewables such as biomass, solar and wind-power, will stimulate local economies and will afford a measure of environmental protection.

Creative financing and investment schemes (both private and public) might provide builders and homeowners the incentive necessary to capitalize on energy efficiency and conservation technologies. Because increasing the energy efficiency of buildings is most effectively accomplished during initial construction or major renovation, local review procedures are a useful mechanism in promoting energy conservation.

Often rental occupants lack the incentive and/or financing necessary to reduce energy consumption for space heating. In many instances rental occupants are paying their energy costs directly, or their rents are adjusted to cover these expenses. Thus, the owners of the apartment buildings also have little incentive to retrofit their buildings for energy conservation. In fact, dis-incentives such as the ability of a landlord to deduct fuel costs as operating expense on federal tax returns and the possibility of increased municipal tax assessments if retrofit improvements are made may encourage the status quo in buildings that are energy gluttons.

Energy Programs and Resources

A variety of organizations and programs exist to provide assistance to citizens and local government in the realm of energy conservation and development. A partial list of Vermont based resources follows:

- The Alliance for Climate Action/10% Challenge – Community energy organizing

and programs. www.10percentchallenge.org

- Apollo Alliance Vermont – Coalition of labor , business and community groups dedication to energy independence. www.apolloalliance.org/state
- Biomass Energy Resource Center – Consults on biomass and cogeneration projects. 802-223-7779
- Efficiency Vermont – Financial and technical assistance for energy savings. EnergySmart home energy analysis. www.encyvermont.org
- Renewable Energy Vermont – Trade association for renewable energy dealers. www.REVermont.org
- School Energy Management Program – Provides free energy assessments for schools. www.vtvsa.org
- Sustainable Energy Resource Group - Consults with communities on energy planning/programs. www.SERG-info.org
- Vermont Biodeisel Project – Collaboration designed to help accelerate emergence of industry in Vermont. www.vtbiodeiselproject.org
- Vermont Green Building Network – Promotes green building in Vermont. www.vgbn.org
- Vermont Energy Education Program. – Provides in school energy curriculum. www.veep.org
- Vermont Energy Investment Corp – Promotes energy efficiency and renewable technologies. www.veic.org
- Vermont Energy Star Homes – Technical assistance to build energy efficient homes. www.Vtenergystarhomes.com
- Vermont Peak Oil Network – Network of groups and individuals working on energy sustainability. www.vtpeakoil.net
- Vermont Rideshare- Promotes commuter carpooling. www.VermontRideShare.org
- Vermont Energy and Climate Action Network- Collaborative of organizations involved in energy and climate issues.
- Vermont Fuel Dealers Association – Trade association of fuel marketers. www.vermontfuel.com
- Vermont Biofuel Partnership – Resource for producers, wholesalers, retailers and users of bioheat and biodiesel fuel. www.vtbio.org

ENERGY GOALS AND POLICIES

Goal 1:

The efficiency with which energy is used should be increased.

Policies:

1. Before the construction, expansion or upgrading of new or existing public generation or transmission utilities and/or facilities, utilities shall demonstrate having employed reasonable measures to improve efficiency and promote energy conservation for consumers, as stated in Docket 5270.
2. Municipalities are encouraged to form a Town Energy or Climate Action Committee.
3. Municipalities and/or groups of municipalities are encouraged to consider the establishment of local, publically owned and operated bulk storage fuel facilities, as authorized under 24 VSA, Chapter 107, Section 3701, as a means of containing fuel costs for Central Vermont residents.
4. The conservation of energy should be integrated into local planning efforts. CVRPC will continue to provide technical assistance to municipalities and will encourage that municipal bylaws promote energy conservation and the development of renewable energy resources.
5. CVRPC will promote the conservation of energy, use of renewable energy resources and energy efficient design through participation in the Act 250 process.
6. Municipalities are encouraged to establish local energy codes requiring or promoting energy efficient design and renewable fuel use in new construction while promoting technological innovation and efficiency; thus increasing energy conservation in non-Act 250 projects.
7. CVRPC recommends that practical energy conservation measures be taken during the citing, design, construction or renovation, and maintenance of buildings. Building designs which incorporate the use of solar energy and other renewable energy technologies are encouraged.
8. Individuals are encouraged to consider the impact of their lifestyle choices on energy use and conservation. Factors such as the size and location of ones home can have a profound impact on energy use. Smaller homes, closer to jobs, resources and infrastructure use less energy and have less of an environ-

mental impact than larger more remote ones.

9. Towns and school districts should include energy efficiency and conservation in their plans and daily operations.
10. Supports efforts to create a fund to provide low interest capital to home owners, landlords, institutions, and businesses to assist in making cost effective investments in energy efficiency and renewable energy.
11. CVRPC encourages Regional lending institutions to adopt energy efficiency standards for new construction as well as for existing housing coming on the market.
12. CVRPC supports efforts to expand the Home Weatherization Program for low income Vermonters.
13. Municipalities are encouraged to review the Town Energy and Climate Guide (Vermont Energy and Climate Action Network, 2006) for ideas and suggestions on energy conservation and development.

Goal 2:

The use of non-renewable energy resources should be decreased, while the use of renewable energy resources, particularly those of local origin, should be increased.

Policies:

1. The Commission supports implementation of Least Cost Integrated Planning (as called for by Vermont's Twenty Year Electric Plan, PSB Final Order in Docket 5270, and the Vermont Comprehensive Energy Plan) and recommends that thorough consideration of the benefits of utilizing local energy resources be applied to all future LCIP analyses.
2. CVRPC will promote the development and use of renewable sources of energy, particularly those of local origin, through public education efforts and participation in Act 250 and Section 248 hearings.
3. CVRPC encourages State and federal funding targeting research and development of renewable energy and energy efficiency technologies.
4. CVRPC encourages efforts to determine the potential for sustainable large scale biomass/biofuel production in Vermont and Central Vermont in particular, and encourages concurrent efforts to evaluate the ecological impacts associated with long term, large scale biomass production and harvest.

5. Large scale wood using projects, such as power generators and wood pellet production, proposed for Central Vermont and adjacent Regions are encouraged. However, they must demonstrate that the project's demand for wood will not ultimately lend to Regional supply shortages. In the event that a wood energy plant is proposed within the Region, that proposal shall include a forest management plan which ensures that timber harvesting will occur in a sustainable manner.
6. CVRPC supports State funding to the Vermont Use Value Appraisal ("Current Use") Program.
7. The Agency of Natural Resources Comprehensive Rivers Program identifies river segments that should be targeted for protection. This program should be expanded to address the potential for hydro-power.
8. Expansions and efficiency improvements to existing hydro-power generators and transmission facilities are encouraged where such investments clearly benefit the residents of the Region.
9. CVRPC supports Barre City's efforts to identify and develop hydroelectric power sites for local needs and will assist in implementing the same as appropriate and possible.
10. Hydro-power development should not diminish water quality, habitat, or recreational opportunities. "Run-of-the-river" projects are preferred to projects which require impoundments with low or minimum flows. Fish ladders should be installed where appropriate and necessary.
11. CVRPC encourages the recovery of methane for use as an energy source from solid-waste, agriculture sites, or waste water treatment facilities wherever economically feasible. New landfills should be designed to enable the capture of gases during decomposition.
12. CVRPC encourages the development of biofuels to reduce gasoline consumption, which can be produced from local renewable resources. Local regulations should encourage alternative fuel businesses in local land use regulations.
13. CVRPC supports the use of biofuels and/or electric power in government and public transit vehicles.
14. In evaluating any commercial wind power generation proposals, CVRPC will con-

sider the economic, social, and environmental benefits (i.e. costs avoided) in addition to potential environmental/aesthetic impacts. CVRPC will help to identify those locations where wind turbines might be feasible and appropriate, as well as those sites where turbines would be considered inappropriate. For the life of this Plan, the Washington County portion of the Worcester Range and Camel's Hump are considered inappropriate locations for industrial turbines due to their inaccessibility, wilderness values, and aesthetic features. Conversely, the presence/proximity of existing development should be considered as a positive in evaluating potential wind sites.

15. CVRPC encourages the development of small scale wind, solar, or hydro power by individuals, or groups of individuals, to offset fossil fuel consumption and promote self-sufficiency. For this reason, it encourages municipalities to make provisions for the same in local plans and bylaws.

Goal 3:

Emissions of greenhouse gases, acid rain precursors, and other environmental toxins must be decreased.

Policies:

1. In considering public benefits of any construction, expansion or upgrading of existing public generation or transmission utilities and/or facilities, consideration shall be given to the external costs (economic, social and ecological) of any decision, and those external costs shall be reflected in the decision as the Public Service Board has recently recommended.
2. CVRPC supports proposals to deliver natural gas to the Region where such proposals are technically feasible, and economically, socially, and ecologically appropriate in the gradual transition to clean resources.
3. CVRPC encourages that the development of existing transportation systems incorporate design and location principles so as to:
 - complement the recommendations set forth in the Land Use and Transportation Elements of this Plan and in the Region's municipal plans;
 - encourage the concentration of social and civic services, employment and housing opportunities, and retail centers within or adjacent to planned or existing community centers; and
 - support the expansion of telecommuting, teleconferencing, and public transit.
4. CVRPC urges that land use planning and implementation programs promote planning for efficient non-motorized alternatives to the automobile by:

- provision of cycling and walking paths between or within population centers;
 - creation and maintenance of sidewalks or other pedestrian modes in areas of concentrated settlement; and
 - development of commuter parking lots, particularly on limited access highways.
 - accordingly, the Commission will continue our participation in the Safe Routes to School and Way to Go programs and will support the above measures whenever possible.
5. CVRPC encourages the maintenance, continued operation and expansion of the Region's railways.
 6. CVRPC encourages the establishment of incentives for developers and municipalities to accommodate public transit in their plans.
 7. The Commission encourages employers to support the use of public transit by their employees.

