

## 9 | Energy

### 9.A OVERVIEW

Historically most of Waitsfield's energy needs were met locally—forests were felled for fuel, the Mad River was dammed for hydropower, and annual harvests required the physical labors of man and beast. Twentieth century modernization, in the form of the electric light bulb and the internal combustion engine, transformed society and national patterns of energy consumption. Rural electrification connected the town to an expanding power grid, and an ever growing reliance on fossil fuels locked the valley, and the nation, into a global energy market.

International events, disruptions in oil supplies, and the rising costs of gasoline and heating oil are harsh reminders that such heavy reliance on these finite energy sources is not sustainable. Local businesses and residents of limited means are especially vulnerable to market conditions and fuel shortages.

The cost of energy derived from fossil fuels has and will continue to increase. With 85% of the money spent by Vermonters on energy going out of state or the country, most of the money spent on energy is exported from our local economy and does not return to create jobs or buy goods locally. In addition, foreign fuel sources are unstable, and subject to huge price swings and supply shortages beyond our control.

Recognition of the threat of climate change has accelerated the move away from fossil fuels in the last 10 years and heightened interest in solar, wind and other renewable non-carbon based energy resources. Current patterns of energy consumption also contribute to global warming trends that, if left unchecked, will dramatically affect Vermont's climate and economy over the next few decades.

Reliable, affordable and sustainable sources of energy are vital to Waitsfield's economy, social well-being, and future development. At present, factors influencing energy cost and availability are largely beyond the control of the local community. The town's energy future is inextricably linked with energy policies and economic forces at the state, federal, and international levels. Waitsfield, however, can take steps to influence the community's energy outlook.

### 9.B ENERGY DEMAND

**Trends.** While there is limited information on local energy consumption, Waitsfield has been consuming between 16 and 16.500 million kWh of electricity in the recent years. Generally, local demand likely tracks state and national trends. More detailed information regarding statewide energy use is reported in the Vermont Public Service Department's 20-year energy plan, *Fueling Vermont's Future*, released in 1998 and currently being updated.

In Vermont, overall energy demand continues to escalate despite increasing efficiency resulting from technological improvements. This increase is largely due to transportation fuel consumption. As shown in Figure 9-1, during the past decade the number of registered vehicles in Vermont and total miles driven by Vermonters has increased. Light trucks (pick-ups, vans and sports utility vehicles), with their lower fuel efficiency as compared to automobiles, now comprise a larger percentage of vehicles on the road.

The impacts of our energy consumption on the environment are increasingly well-documented. Motor vehicles are the state's largest source of toxic and carcinogenic air pollutants—the average vehicle emits around a half a ton of pollution each year. Vehicle emissions, even at low levels, pose a health threat locally, contribute to acid rain, and can cause widespread damage to crops and forests.

Green house gases such as carbon dioxide, emitted from motor vehicles and oil-fired furnaces, also contribute to climate change. Over the past century, average temperatures (as measured in Burlington) have increased by 0.4°F, and precipitation has increased by up to five percent in many parts of the state.

**Vehicle Use.** Available data suggests that Waitsfield residents are driving more. The number of households reporting one or more vehicles increased in the 1990s. As shown in Figure 9-4, Census data also indicate that fewer Waitsfield residents are carpooling, following regional and statewide trends.

More trips by town residents and visitors to the valley, as well as increases in general through traffic, have resulted in more total vehicles miles traveled each year. As Waitsfield develops as the valley's primary

commercial and job center, local trips, vehicle miles traveled—and local fuel consumption—are expected to increase accordingly.

**Home Heating.** Census data also provide limited information on the types of fuel used by town residents for home heating. The data suggest a major shift during the 1990s from the use of wood as a primary heating source to the use of gas (utility, bottled, tank or LP). By 2000, more than 50 percent of occupied housing units were heated with relatively clean and efficient gas heat. The use of wood tends to fluctuate in relation to the price of oil and gas, and local availability. It likely remains an important supplemental source of heat for many Waitsfield households.

As noted for Waitsfield, the use of electricity, fuel oil and wood for space heating is decreasing statewide in relation to the use of gas. This reflects in part new home construction, which is incorporating cleaner, more energy efficient fuels and heating systems, and passive solar design. Many homes built in the 1960s and 1970s relied on inefficient electric heat, a practice that is generally no longer allowed under state energy standards for residential construction. These standards apply to all new homes, and additions over 500 square feet.

**Electricity.** As of the writing of this plan, the Valley Future Network's Energy Group was working to develop an energy action plan. The group completed a summary of electricity usage in the valley over a two-year period from 2006 to 2008. Their study showed that electric customers in Waitsfield use approximately 16.3 million kWh of power each year, which is evenly split between the residential and commercial/industrial sectors. The average residential customer in the valley consumes approximately 7,000 kWh of electricity annually.

The electric usage profile of the Mad River Valley reflects both challenges for meeting generation demands on the supply side, such as high peaking winter season load, as well as opportunities for significant load reduction through energy efficiency and site generated power production. Many efficiency potential studies conclude that the technical and economic feasibility for energy savings is in the range of 30 to 50 percent potential reduction in usage through aggressive demand side management efforts.

According to these estimates, however, the potential for energy savings could be in the range of 20,000 to

33,000 MWh per year, which represents an electric cost savings of \$2 to \$3 million per year. Given the current Vermont electricity generation mix, this savings would also reduce annual greenhouse gas emissions in Vermont by 2,000 to 3,300 tons of CO<sub>2</sub>. However, if the Vermont electricity mix was the same as the national average, then the reduction in greenhouse gases would be in the range of 15,500 to 25,500 tons of CO<sub>2</sub> per year.

## 9.C ENERGY SUPPLY

**Electricity.** Green Mountain Power Corporation (GMP), the second largest electric utility in the state, is the primary supplier of electricity to the town. GMP serves all of Waitsfield except for a small area along the North Fayston and Airport Roads, which is supplied by Washington Electric Coop. The primary transmission line serving the valley enters Waitsfield from Northfield, in the vicinity of the Northfield Gap Road, and is distributed locally through a substation located in Waitsfield village.

As of the writing of this plan, it appears that Vermont has successfully negotiated a contract to purchase power from HydroQuebec through 2038. This agreement will ensure a future supply of relatively low-cost electricity in the state as compared to prices paid in neighboring states.

**Fossil Fuels.** Vermont has no petroleum infrastructure, and relies on tanker trucks for supplies. Waitsfield residences and businesses are supplied by three local oil and gas distributors. Several gas stations in town serve local motorists and the traveling public.

Fuel prices are typically higher in northern New England, and while fluctuating widely in recent years, are generally increasing, as shown in Figure 9-5. Local businesses and residents, particularly low income residents, are very vulnerable to fuel shortages and price fluctuations.

The economic, social and environmental costs of such heavy reliance on fossil fuels are prompting state efforts to diversify Vermont's energy portfolio, to include in the mix more efficient natural gas systems, cogeneration systems that produce electricity and heat, and greater reliance on renewable energy sources, including wood and wind power.

## 9.D RENEWABLE ENERGY

Renewable energy resources found in Waitsfield include wood, wind, and limited solar and hydro power. Rising fuel prices, new technologies, and the ability of utility customers with small-scale renewable energy systems to sell excess power generated back to the utility may promote increased use of renewable sources.

**Wood.** Wood is the town’s most abundant, indigenous energy source. For much of Waitsfield’s history, it was the principal source of heat locally. Though currently only 10 percent of local households use wood as their primary heating source, it is a relatively low cost fuel.

Waitsfield has a large amount of forested land that under effective management could supply a sustainable source of energy. Extensive harvesting, however, if not properly managed, can cause increased storm water runoff and soil erosion, sedimentation, water pollution, and habitat loss. Woodlot management, and adherence to accepted state management practices for logging operations, reduce the adverse impacts of harvesting, and can enhance local timber stands to meet a variety of landowner objectives.

New wood stoves and furnaces, if properly installed and maintained, provide effective and efficient home heating. Stoves sold since 1990 must be air tight and meet EPA emission requirements. Though wood-burning technologies have improved, wood heat remains less convenient than oil or gas heat. If oil prices continue to rise, however, more households may turn to wood as their primary heating source.

Several Washington County schools have shifted over to wood (chip or pellet) heating systems under state-sponsored programs, which could be considered for use locally. Automated wood-fired systems are proving to be an affordable heating alternative to conventional systems in such settings.

**Hydropower.** The Mad River and its tributaries once supplied water power for Waitsfield’s earliest industries. Today these industries are gone, and while a hydro facility still exists downstream in Moretown, none currently operate in town.

There may be limited potential for very small scale “micro-hydro” development that supplies individual users; but the Mad River through town lacks the deep gorges and falls that are needed to support larger, commercial operations. Also, while hydropower is of-

ten cited as a clean energy source, the environmental impacts of dam construction, operation and management—including the effects of changing water levels on river flow, stream habitat, and water quality, and on adjoining riparian areas—are now given much more weight in state and federal licensing proceedings.



**Solar.** The contribution of solar energy to Waitsfield’s total energy supply is growing. More structures are being sited, oriented and designed to incorporate passive solar construction techniques for space heating and natural lighting. Passive solar building design can significantly increase energy efficiencies and reduce costs.

Up-front costs for materials and installation of photovoltaic (PV) systems have been relatively expensive for the average homeowner, but emerging technologies and financing models are making them increasingly affordable. Technological advances, including the incorporation of photovoltaic components in roofing and siding materials, may make solar power an even more viable source of electricity in the near future.

Energy generation systems that are linked to the grid are preempted from local land use regulations and are instead regulated by the Public Service Board. The board, however, must find that such projects conform to the municipal and regional plan. This plan recommends that net-metered solar systems:

- ◆ Are sited to the edge, rather than in the middle of scenic views (e.g., an open field) so that they are not prominent focal points (as viewed from neighboring and public vantage points);

- ◆ Are limited in height to the minimum required for functional operation;
- ◆ Are sited to avoid impacts on significant natural and cultural features;
- ◆ Incorporate a clean, simple design without logos or symbols; and
- ◆ Use unobtrusive colors.

At minimum, recommended scoring system criteria should be applied to all such projects to evaluate and minimize potential impacts from public vantage points and neighboring properties. Other factors also may be considered as appropriate.

**Wind Power.** Wind power, like hydro and solar power, is an emission free energy source that is not depleted with use. As a result of recent improvements in turbine technology, wind power is now receiving a significant amount of attention statewide for utility and small-scale electrical generation.

The Vermont Department of Public Service has conducted a statewide wind resource assessment, including the mapping of Vermont's most favorable wind resource areas. The optimum sites are high elevation areas with steady, moderate to high winds (16+ mph) in proximity to access roads and transmission lines. From this initial assessment, the most favorable site for large-scale generation locally is in the Northfield Range near the transmission line. Based on wind speeds, there is also some potential for development in the Green Mountain Range to the west.

Recent community survey results suggest that local residents may be amenable to wind generating facilities, but still have concerns regarding their potential visual and environmental impacts. Some local financial benefits also may result from wind generators, such as property tax revenues, although those benefits could be outweighed by impacts to natural resources associated with the extension of roads and support facilities to serve high-elevation tower sites, and by the potential harm to the valley's landscape, one of its most important economic assets.

Consistent with the town's policy regarding all land development in its sensitive upland areas, wind development within the Forest Reserve District is not supported by this plan. Such development would have adverse impacts on the town's scenic character (which supports the valley's tourism sector) and environmental quality (disturbance of slopes and shallow soils, erosion and run-off, reduced water quality,

fragmentation of wildlife habitat, etc.). The upgraded roads and transmission corridors that would be required to support large-scale wind could facilitate other incompatible development in the Forest Reserve, which currently cannot support development due to a lack of infrastructure.

Wind generation facilities regulated by the Public Service Board (including individual, net-metered wind systems) are preempted from local review. The board, however, must find that such projects conform to the municipal and regional plan.

The Department of Public Service has published a manual and scoring system, *Siting a Wind Turbine on Your Property*, for the siting of small wind turbines designed for individual residential or business use. These are typically under 15 kW, with a blade diameter of 20 to 24 feet, and an average tower height of 80 to 120 feet.

Net-metered turbines regulated by the PSB do not require a local permit, but the PSB will consider local standards in its review. It is recommended that such systems:

- ◆ Incorporate a clean, simple turbine design without logos or symbols;
- ◆ Use unobtrusive colors (e.g., flat gray);
- ◆ Use guyed monopole rather than free-standing lattice towers;
- ◆ Have a low noise rating;
- ◆ Are sited to the edge, rather than in the middle of scenic views (e.g., an open field) so that they are not prominent focal points (as viewed from neighboring and public vantage points);
- ◆ Are limited in height to the minimum required for functional operation (e.g., 40 to 60 feet above nearby trees or other obstructions); and
- ◆ Are sited to avoid impacts on significant natural and cultural features, including views from the town's designated scenic roads.

At minimum, recommended scoring system criteria should be applied to all such projects to evaluate and minimize potential impacts from public vantage points and neighboring properties. Other factors also may be considered as appropriate.

## 9.E ENERGY CONSERVATION

The state's energy conservation efforts in recent years have focused on demand side management to increase energy efficiency, reduce energy demand, and in effect increase available energy supplies. The state has enacted energy standards for commercial and residential construction, which are administered and enforced through the Department of Labor and Industry. The state also promotes greater energy efficiency and renewable power through the use of tax credits and other incentive programs.

The need for energy conservation, to reduce energy demand and use, is also recognized locally. A number of programs are available to the municipality, and to local businesses and residents, to increase energy efficiencies and reduce costs.

**Efficiency Vermont.** Created by the Public Service Board in 1999, Efficiency Vermont is a statewide energy efficiency utility, the first in the nation. Energy conservation programs are financed by the state's electric utilities through an energy efficiency charge that is passed on to rate payers. Current programs available to Waitsfield residents and businesses include:

- ◆ Efficient Products—energy efficient product information and discount coupons.
- ◆ Vermont Energy Star® Homes Program — technical assistance and rebates to home builders and buyers who build energy efficient homes.
- ◆ Commercial Energy Opportunities—technical and financial assistance to commercial and industrial businesses to improve the efficiency of existing and new facilities.
- ◆ Dairy Farm Program—technical assistance, financial incentives and low-interest financing for energy efficient farm equipment.
- ◆ Residential Energy Efficiency Program (REEP)—technical and financial assistance to developers, owners and managers of low income multi-family housing to reduce energy costs.
- ◆ Income-Eligible Services—technical and financial assistance to low-income Vermonters who are participating in the state's weatherization program to make additional electricity-saving improvements.

- ◆ Emerging Market Initiatives Program—identifies, evaluates and tests innovating energy efficiency technologies, and practices to promote their use.



**Transportation.** Currently few transportation alternatives exist that would allow Waitsfield residents to become less dependent on motor vehicles to get around. Nevertheless, as gasoline prices climb and vehicle emissions continue to erode air quality, reasonable efforts should be made locally to promote ride sharing, alternative modes of transportation, and less auto-oriented patterns of development.

The Central Vermont Transportation Authority provides information on car-pooling, ride sharing, van-pooling, and special public transportation needs. Waitsfield continues to financially support, through annual appropriations, the Mad River Valley Transit system, including the MadBus. Local initiatives that could help reduce the number of vehicle miles traveled include the completion of proposed sidewalk projects in the village, and the development of a local park and ride facility.

Waitsfield could also take advantage of municipal programs offered through EVermont, a nonprofit affiliated with the Agency of Natural Resources, which advocates for the use of cleaner, more energy efficient alternative fuel vehicles. Alternatives include vehicles powered by electricity, compressed natural gas, propane, and bio-diesel fuels. EVermont, in association with the Agency of Transportation, currently offers an electric vehicle leasing programs to municipalities, businesses and institutions. It is also involved in testing a variety of alternative fuel technologies for use in Vermont.

**Land Use & Development Patterns.** Compact, mixed-use development, as envisioned for Irasville, can reduce reliance on the automobile, vehicle miles traveled, and inherent system energy costs—including energy costs associated with maintaining roads and related infrastructure. Targeting economic and residential growth within areas intended for more concentrated development allows people to walk to their destinations, and makes public transit services between growth centers more economically feasible.

At the site level, a south-facing building orientation and landscaping can effectively reduce energy demand. Clustering, and other energy efficient development patterns can be encouraged, and/or required through local zoning and subdivision regulations.

**Buildings & Equipment.** In addition to energy codes for new residential, commercial and public buildings, there are number of other programs offered by the state to promote municipal energy efficiency and the use of renewable energy resources. These include but are not limited to the various programs offered through Efficiency Vermont, EVermont electric vehicle leases, the School Energy Management Program targeted to school administrators, and programs that support the conversion of school heating systems to wood-burning systems.

Municipal energy savings can be realized through regular energy audits of municipal buildings and the use of “life cycle costing” practices that incorporate long-term energy savings in the fiscal analysis of facility construction and equipment purchases. Such costing methods often demonstrate that long-term energy savings more than offset the higher initial purchase or construction cost of energy efficient equipment and building improvements. In recent years, the town has installed (historically compatible) storm windows in the Wait House and Joslin Library and added insulation in the attic.

**Energy Assistance Programs.** Rising energy costs, for heat, electricity, and transportation are particularly hard on low income households who can least afford them. Programs administered through the Central Vermont Community Action Council, which are specifically targeted to help income-eligible residents, include seasonal and emergency fuel assistance, supported in part through the WARMTH donations collected by private utilities, and free weatherization services to help reduce heating costs. As noted, Efficiency Vermont also offers additional income-eligible services to weatherization program participants. Waitsfield can help in these efforts by providing program information locally, and by continuing to support Central Vermont Community Action.

Figure 9-1: Vehicle Miles Driven and Vehicle Registrations in Vermont

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total Miles (millions)	6,596	6,543	6,811	6,811	9,677	8,309	7,855	7,713	7,832	7,694
Miles Per Capita	10,993	11,020	11,167	11,166	15,729	13,421	12,641	12,379	12,553	12,385
Total Vehicles Registered				548,000		532,000	540,000	521,000	603,000	581,000
% Automobiles				55%		51%	51%	51%	51%	51%
% Trucks				41%		44%	43%	44%	45%	45%
% Other				4%		5%	6%	5%	4%	4%

Source: US Bureau of Transportation Statistics

Figure 9-2: Waitsfield Households by Number of Vehicles

	1990	2000	2010
0 Vehicles	2%	30	4%
1 Vehicle	38%	245	33%
2 Vehicles	41%	349	48%
3+ Vehicles	19%	110	15%

Source: US Census

Figure 9-3: Waitsfield Home Heating Fuel

	1990	2000	2010
Gas	144 25%	373 51%	
Electricity	89 16%	86 12%	
Fuel Oil / Kerosene	176 31%	198 27%	
Coal	0 0%	0 0%	
Wood	161 28%	77 10%	
Solar	0 0%	0 0%	

Source: US Census

Figure 9-4: Mode of Travel to Work for Waitsfield Residents

	1980	1990	2000	2010
Work at Home	57 9%	107 13%	100 10%	
Drove Alone	375 58%	577 71%	723 74%	
Carpool	129 20%	90 11%	104 11%	
Transit	0 0%	8 1%	0 0%	
Walk	74 11%	27 3%	40 4%	
Other	10 2%	3 0%	10 1%	

Source: US Census

Figure 9-5: Average Fuel Price per Gallon in Vermont

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Fuel Oil	\$1.44	\$1.34	\$1.24	\$1.44	\$1.65	\$2.27	\$2.61	\$2.72	\$3.74	\$2.41
Kerosene	\$1.65	\$1.65	\$1.44	\$1.65	\$1.96	\$2.58	\$2.95	\$3.05	\$4.16	\$2.85
Propane	\$1.44	\$1.55	\$1.34	\$1.55	\$1.86	\$2.16	\$2.41	\$2.53	\$3.09	\$2.56
Gasoline	\$1.55	\$1.55	\$1.44	\$1.65	\$1.96	\$2.37	\$2.67	\$2.90	\$3.33	\$2.34
Diesel	\$1.75	\$1.65	\$1.55	\$1.75	\$2.06	\$2.68	\$2.94	\$3.12	\$4.10	\$2.70

Source: Vermont Department of Public Service (adjusted to 2009\$ using the CPI)

Figure 9-6: Retail Price of Electricity for Green Mountain Power Customers

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
All Sectors	12.08 ¢	11.79 ¢	12.56 ¢	11.96 ¢	11.84 ¢	11.47 ¢	11.33 ¢	11.09 ¢	11.71 ¢	11.56 ¢
Residential	15.75 ¢	15.47 ¢	16.04 ¢	15.35 ¢	14.94 ¢	14.51 ¢	14.33 ¢	14.01 ¢	14.78 ¢	14.68 ¢
Commercial	12.63 ¢	12.37 ¢	13.03 ¢	12.26 ¢	12.26 ¢	11.91 ¢	11.77 ¢	11.58 ¢	12.16 ¢	11.93 ¢
Industrial	8.38 ¢	8.06 ¢	9.26 ¢	8.62 ¢	8.58 ¢	8.33 ¢	8.26 ¢	8.00 ¢	8.59 ¢	8.46 ¢

Source: US Energy Information Administration Form EIA-861 Database. Expressed in cents per kWh adjusted to 2009\$ using the CPI.

## 9.F GOAL

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9.F-1 The availability of affordable energy supplies to meet the needs of current and future Waitsfield residents in a manner that maximizes energy conservation, the use of renewable resources, protects natural and cultural resources, and reinforces traditional land use patterns and municipal development policies.

## 9.G POLICIES

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9.G-1 Encourage energy efficiency and conservation as primary considerations in new municipal construction projects, equipment purchases and operations. Life cycle costing shall be used by the town in evaluating energy- related capital expenditures as appropriate.

9.G-2 Minimize the need for new facilities and minimize the reliance on the private automobile, development will be directed toward designated growth centers and limited in the least accessible areas of the community.

9.G-3 Support land use and conservation policies that encourage ongoing forest management to maintain a local source of fuel-wood, and that support local agriculture to maintain and increase the supply of locally produced food.

9.G-4 Encourage dispersed, small scale and appropriately sited development of renewable energy generators, including, but not necessarily limited to, solar panels, wind turbines and micro-hydro. Wind turbines shall be prohibited in the Forest Reserve District above 1,700 feet elevation.

9.G-5 Continue to ensure that expansion and development activities at Sugarbush do not exceed the current or planned capacity of local electrical supplies and transmission facilities through the Memorandum of Understanding administered by the MRVPD.

9.G-6 Discourage the use of electricity as a primary heating source.

9.G-7 Maintain an adequate land base for sustainable forest management through continued stewardship of public forests, support for current use tax abatement programs for managed woodland, and land use regulations which discourage the fragmentation of large tracts of productive forest.

9.G-8 Encourage, opportunities for walking, cycling and other energy efficient alternatives to the automobile.

9.G-9 Encourage, to the extent practical, the use of energy efficient municipal vehicles (e.g., hybrid, bio-diesel).