**VII. Energy**

**Background:**

Sound local planning can play a positive and effective role in guiding energy use by promoting appropriate land use patterns, participating in energy development decisions, facilitating alternative transportation options, and encouraging energy conservation strategies. ~~Sustainable~~ Renewable energy use can maintain a healthy environment and build a foundation for economic health and stability. The energy security of Bradford depends on being able to provide consistently and sustainable energy services such as heat for our homes, affordable transportation, and light and energy for our homes and workplaces. Sustainability must be the basic principle of a long-term energy plan. ~~Bradford cannot rely on non-renewable energy sources indefinitely, as non-renewable sources are by definition unsustainable.~~

As patterns of settlement affect energy use, so the implementation of energy goals and policies affect patterns of settlement in Bradford. Highly dispersed and unplanned patterns of land use result in inefficient and uneconomic use of land and energy resources. Land use policies and provisions adopted by Bradford relative to employment location and other facilities can encourage the use of public transportation and carpooling, ~~thus~~ reducing the consumption of energy and the need for additional parking ~~facilities~~.

Bradford residents have expressed concern over the impact of industrial scale energy developments, fearing that ~~it~~ they could destroy the character of the town. Therefore, industrial-scale power generation and transmission facilities are inappropriate in the town. This includes, but is not limited to, industrial-scale wind turbines and their associated transmission facilities. Development of industrial wind turbines generally occurs at higher elevations, often along ridgelines. In Bradford, these areas are among the town’s most sensitive ecological areas, most wild and unfragmented lands, and are highly visible from conservation lands, scenic roads and dwellings. Such large-scale energy transmission facilities are inconsistent with the town’s vision and goals.

### VERMONT ENERGY QUICK FACTS

* One in six Vermont households uses wood products, such as wood pellets, as their primary heating source.
* Vermont produces less than 35% of the electricity it consumes and depends on power from the New England grid and Canada.
* In 2016, nearly all of Vermont's in-state net electricity generation was produced by renewable energy, including hydroelectric, biomass, wind, and solar resources.
* In the years 2011 through 2016, Vermont installed 59.2 megawatts of commercial-scale solar photovoltaic capacity, 26.8 megawatts in 2016 alone.
* Vermont has enacted the nation's first integrated renewable energy standard (RES), which makes utilities responsible both for supplying renewable electricity and for supporting reductions in customers' fossil fuel use.

Source: <https://www.eia.gov> – June 15, 2017

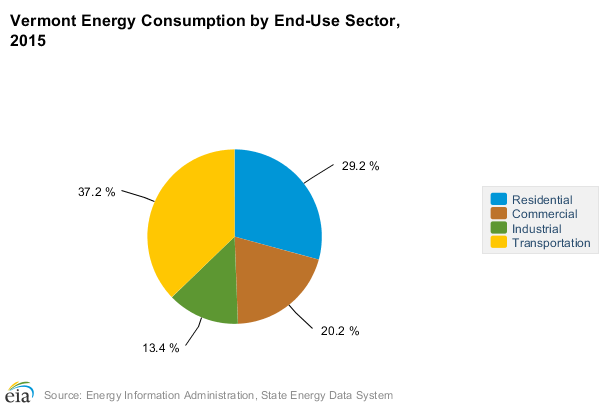
**Analysis and Targets:**

The 2011 and 2016 Vermont Comprehensive Energy Plan (CEP) describe how Vermont aims to reduce reliance on fossil fuels and secure energy independence by improving energy efficiency and conservation and utilizing in-state renewable energy resources. The CEP addresses the state’s energy future for electricity, thermal energy, transportation and land use by setting a long-term statewide goal of obtaining 90% of Vermont’s energy needs from renewable sources by 2050. Expanding on the statutory goal of 25% renewable energy by 2025 (10 V.S.A. § 580(a)), the CEP established the following set of goals:

* Reduce total energy consumption per capita by 15% by 2025, and by more than one third by 2050
* Meet 25% of the remaining energy need from renewable sources by 2025, 40% by 2035, and 90% by 2050
* Three end-use sector goals for 2025: 10% renewable transportation, 30% renewable buildings, and 67% renewable electric power

The primary purpose of the analysis and targets section is to provide a framework of tracking progress to support local pathways towards meeting these statewide goals outlined in the CEP.

**Transportation**

Transportation consumes the largest share of energy in Vermont, as seen in the chart below. Similarly, transportation in Bradford is responsible for a large share of overall energy consumption. The rural character and decentralized settlement patterns of Bradford create difficult circumstances in which to minimize the consumption of traditional transportation fuels. Nevertheless, strategies can be employed at the Bradford Town level. 

Bradford should continue to 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, river, van-pooling, ride-sharing, electric vehicles, walking, and bicycling, will not only decrease energy consumption, but will also reduce infrastructure expenditures associated with automobile travel. Bradford is fortunate to have access to existing rail lines, some bus service, and the Connecticut River.

Another strategy to reduce the demand for transportation is to develop settlement patterns that require less travel. Concentrated settlement makes it more feasible to provide public transit, park and ride facilities, ride-share programs and similar incentives that reduce dependency on the automobile. Because transportation is such a substantial portion of local energy use, it is in the interest of the community to encourage any new developments that are proposed in Bradford to be located adjacent to existing roads. In particular, dense residential developments should be located within or adjacent to existing village centers or within designated growth areas. Commercial development that requires trucking and freight handling should only be located on roads which can effectively handle the size of vehicle needed.

The I-91 Park and Ride lot should be monitored as necessary to accommodate increased use of car pool, bus, electric vehicles, and non-motorized transport in order to accommodate all who seek to use it. Additional commuter transit including rail needs to be developed. The concentration of employment opportunities, housing, municipal and social services, the expansion of telecommunication capacity, and the increased use of local informational handouts will help to achieve this objective. ~~The expansion of the Park and Ride should enable further increase in its use.~~

Bradford should continue to research and determine how to reduce municipal use of fossil fuels for its operations, including the highway and police departments, in order to produce a net energy savings. Bradford should develop a policy requiring that new Town highway vehicle purchases begin with a comparison of the costs of fuel required for the vehicles being contemplated, calculated over the life of the vehicle

Table A uses data from the American Community Survey (ACS) and Vermont Agency of Transportation (VTrans) to calculate current transportation energy use and energy costs. The rural nature of this region leads to longer commutes for work, shopping and services. This impacts the number of vehicle miles traveled which directly relates to how much fossil fuel is being burned to power all the cars in the region. The transportation sector is responsible for 37% of the total energy consumed in Vermont, powered mostly from gasoline (76%) and diesel (20%).

|  |  |
| --- | --- |
| **A. Current Transportation Energy Use** | |
| **Transportation Data** | **Municipal Data** |
| Total # of Vehicles (ACS 2011-2015) | 1,672 |
| Average Miles per Vehicle (Vtrans) | 11,356 |
| Total Miles Traveled | 18,987,232 |
| Realized MPG (2013 - VTrans 2015 Energy Profile) | 18.6 |
| **Total Gallons Use per Year** | 1,020,819 |
| **Transportation BTUs (Billion)** | 123 |
| Average Cost per Gallon of Gasoline (RPC) | 2 |
| **Gasoline Cost per Year** | 2,358,092 |

Table B establishes targets for transportation fuel and mode switching. To reach local, regional and statewide renewable energy goals, residents will need to shift away from petroleum powered vehicles to electricity and biofuels as well switch the modes in which one travels through carpooling, public transit, or walking.

There are several sources of information that can provide information on electric vehicles including https://greenercars.org and www.driveelectricvt.com.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **B. Transportation Switching Goals** | **2015**  (Estimated Current Total) | **2025** | **2035** | **2050** |
| Electric Vehicles | 12 | 155 | 1,097 | 2,283 |
| Biodiesel municipal fleet/  commercial trucks | 69 | 272 | 512 | 865 |
| Carpooling |  |  |  |  |
| Public Transit |  |  |  |  |
| Municipal Fleet (Police Cars, DPW fleet, School Busses) | (Get Number) |  |  |  |
| Park & Ride |  |  |  |  |

Insert Photo of electric vehicle charging at Hanford or Bradford Park and Ride

Table C represents the percentage of items 1 and 2 from Table B shown above

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **C. Renewables – Transportation Goals** | **2015** | **2025** | **2035** | **2050** |
| Renewable Energy Use - Transportation | 1.83% | 9.6% | 23.1% | 90.3% |

**Residential and Commercial Heating**

Because heating contributes to a significant portion of Vermont's energy consumption, especially at the residential level, installing cold climate heat pumps and weatherizing the shell of a home can lead to significant reductions in heating costs and the use of fossil fuels. Table D displays data from ACS that estimates current municipal residential heating energy use, with the highest percentages of Bradford residents using fuel oil (52.9%) or propane (18%) to heat their homes.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **D. Current Residential Heating Energy Use** | | | | |
| **Fuel Source** | **Bradford Households (ACS 2011-2015)** | **Bradford % of Households** | **Bradford BTU’s** | **Bradford BTU (in Billions)** |
| Natural Gas | 37 | 3.1% | 3,775,800,000 | 4 |
| Propane | 343 | 28.9% | 31,543,320,000 | 32 |
| Electricity | 100 | 8.4% | 7,727,040,000 | 8 |
| Fuel Oil | 449 | 37.9% | 43,483,320,000 | 43 |
| Coal | 0 | 0.0% | 0 | 0 |
| Wood | 240 | 20.3% | 26,377,800,000 | 26 |
| Solar | 0 | 0.0% | 0 | 0 |
| Other | 16 | 1.4% | 1,540,680,000 | 2 |
| No Fuel | 0 | 0.0% | 0 | 0 |
| **Total** | **1185** | **100.0%** | **114,447,960,000** | **114** |

Bradford residents rely on a variety of heating sources including wood, fuel oil, propane, and natural gas. The variability in heating costs can pose financial hardships for residents. To help limited income residents with the costs of weatherization upgrades and heating costs, programs through Efficiency Vermont and Capstone Community Action agencies provide assistance (see sidebar.) There are several websites that can help homeowners make cost effective weatherization upgrades, including Efficiency Vermont (www.efficiencyvermont.com) and Smarter House (https://smarterhouse.org).



Capstone’s Weatherization programs:

* Decrease a home’s energy consumption
* Reduce a client’s carbon footprint
* Save a household money
* Show homeowner’s how they can save energy
* Increase comfort
* Increase property value

Capstone can perform energy savings renovations to stop heat from leaking out buildings and reducing the loss of heat through the walls and roofs of your home (also known as weatherization).  For income qualified individuals there is no charge through the **Weatherization Assistance Program**. For those that do not qualify under the no-cost program, Capstone can still help through the **EnergySmart program**.  Capstone offers these services to all homes – from single family to multifamily households.

New residential development in the State of Vermont is required to comply with Vermont Residential Building Energy Standards (RBES). Commercial development is subject to similar code regulations. Some examples of the types of development the RBES applies to include detached one- and two-family dwellings, multi-family and other residential buildings three stories or fewer in height, additions, alterations, renovations and repairs and factory-built modular homes (not including mobile homes).

In order to comply with the RBES, a built home must meet all of the Basic Requirements and the Performance Requirements for one of several possible compliance methods. If the home meets the technical requirements of the RBES, a Vermont Residential Building Energy Standards Certificate must be completed, filed with the Town Clerk and posted in the home. If a home required by law to meet the RBES does not comply, a homeowner may seek damages in court against the builder.

**Efficiency Vermont**

Efficiency Vermont is Vermont’s statewide energy efficiency utility. The Vermont Public Utility Commission and the Vermont Legislature created Efficiency Vermont in response to a request from the Vermont Department of Public Service, the state’s twenty-two electric utilities, and a dozen consumer and environmental groups. Efficiency Vermont is funded by an energy efficiency charge on a consumer’s electric bill; it is managed by the Vermont Energy Investment Corporation (VEIC), an independent non-profit energy services organization that is under contract to the Vermont Public Utility Commission. Efficiency Vermont helps Vermonters reduce energy costs by making their homes and businesses energy-efficient. It provides technical assistance and financial incentives to help Vermonters identify and pay for cost-effective approaches to energy-efficient building design, construction, renovation, equipment, lighting and appliances.

**Energy Committee**

Bradford ~~has an active~~ should work to revive the town energy committee that was formed for the purpose of establishing and implementing the town’s energy goals. The work that ~~has been~~ was done in partnership with the EC includes conducting energy audits on municipal buildings, tracking energy use for these buildings and providing outreach to homeowners on energy efficiency and renewable energy generation. Most importantly, an active EC can help the town and residents save money while saving energy.

**Auditing Municipally Owned Buildings**

Many towns in Vermont own buildings that are old and inefficient in many respects. For instance, older buildings often have insufficient insulation, wasteful heating and cooling systems, and out-of-date lighting. These kinds of infrastructure problems result in higher energy use with the resulting cost passed onto taxpayers. Bradford has implemented energy conservation methods that have resulted in reduced fuel consumption and is continuing to look for opportunities to conserve.

Table E is an estimate of the heating energy used in commercial establishments in Bradford with all fuel sources combined

|  |  |  |  |
| --- | --- | --- | --- |
| **E. Current Commercial Heating Use** | | | |
|  | **Commercial Establishments  in Bradford (VT DOL)** | **Estimated Thermal Energy BTUs per Commercial Establishment  (in Billions) (VT Dept. of Public Service)** | **Estimated Thermal Energy BTUs by Commercial Establishments in Bradford (in Billions)** |
| Municipal Commercial Energy Use | 17 | 0.725 | 12 |

Insert photo or information about weatherization projects completed on town buildings. 

**Capital Budget Planning**

Given the potential expense of energy efficiency improvements, it is essential to wisely budget town funding to cover these costs. State statute enables communities to create a Capital Budget and Program for the purposes of planning and investing in long-range capital planning. Although most communities have some form of capital account where they save money, many do not have a true Capital Budget and Program. A capital budget outlines the capital projects that are to be undertaken in the coming fiscal years over a five-year period. It includes estimated costs and a proposed method of financing those costs. Also outlined in the Program is an indication of priority of need and the order in which these investments will be made. Any Capital Budget and Program must be consistent with the Town Plan and shall include an analysis of what effect capital investments might have on the operating costs of the community.

When planning for routine major facility investments, such as roof replacements, foundation repairs, etc., it is important to consider making energy efficiency improvements simultaneously. The cost to replace or renovate a community facility will only be slightly higher if energy efficiency improvements are done at the same time, rather than on their own.

**Energy Efficient Purchasing Policy**

A policy of this nature would require energy efficiency to be considered when purchasing or planning for other town investments. For example, purchasing Energy Star-rated equipment is a well-documented way to increase energy efficiency. Devices carrying the Energy Star logo, such as computer products and peripherals, kitchen appliances, buildings and other products, generally use 20%–30% less energy than required by federal standards.

**Energy and Land Use Policy**

The Vermont Municipal and Regional Planning and Development Act (24 V.S.A. Chapter 117) does not allow communities to impose land use regulations that prohibit or has the effect of prohibiting the installation of solar collectors or other renewable energy devices. However, statute does enable Vermont's municipalities to adopt regulatory bylaws (such as zoning and subdivision ordinances) to implement the energy provisions contained in their town plan. Bradford does not have subdivision regulations at this time.

Zoning bylaws can be designed to control the type and density of development. It is important to acknowledge the connection between land use, transportation, and energy, and creating zoning ordinances and subdivision regulations that encourage energy efficiency and conservation. 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, and the increased use of renewable energy.

Zoning bylaws may contain provisions for planned unit developments (PUDs). PUDs 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 a zoning Area may be varied 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 wind breaks, and attached structures), and to encourage the construction of energy efficient buildings.

Subdivision regulations are one of the most effective tools for encouraging energy efficiency and conservation. Subdivision regulations, like PUDs, involve town review (through the Development Review Board) in the design process. Because subdivision regulations govern the creation of new building lots, as well as the provision of access and other facilities and services to those lots, a community can impose requirements that a developer site their building to maximize solar gain. Likewise, subdivision regulations can require that landscaping be utilized to reduce thermal loss.

Table F displays targets for thermal efficiency for residential structures based on a methodology developed by DPS using data available from the regional LEAP analysis and ACS. The data in this table represents the percentage of municipal households and commercial establishments that will need to be weatherized in the target years. Base line 2015 data is based on LEAP analysis.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **F. Heating Efficiency Targets** | **2015** | **2025** | **2035** | **2050** |
| Residential - Increased Efficiency and Conservation  (% of municipal households to be weatherized) | 7% | 33% | 67% | 100% |
| Commercial - Increased Efficiency and Conservation  (% of commercial establishments to be weatherized) | 2% | 6% | 9% | 18% |

While residential weatherization updates are not tracked for every property, one way to currently track the direction that Bradford is moving towards those targets is through data provided by Efficiency Vermont. The data on weatherization upgrades is based on the various rebates that they provide. Through the *Home Performance with Energy Star* program, Efficiency Vermont matches home improvement contractors with property owners. The contractors provide an assessment which includes heating and cooling systems, windows, insulation, air circulation, and a safety check of gas appliances. Based on this assessment, participating contractors offer solutions to fix comfort problems and address high energy bills. Unlike typical energy audit programs, the goal of Home Performance with ENERGY STAR is to turn recommendations into improved, more efficient homes.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **G. Efficiency Vermont: Home Performance with ENERGY STAR® Leads** | | | | |
|  | **2014** | **2015** | **2016** | **Total** |
| Home Performance with ENERGY STAR® Leads | 10 | 4 | 2 | 16 |
| Home Performance with ENERGY STAR® Projects | 5 | 0 | 1 | 6 |
| Total Residential Projects (includes Home Performance with ENERGY STAR® projects) | 20 | 36 | 33 | 89 |



Pellet Stove

www.vermontpelletstoves.com

http://www.vermontpelletstoves.com/

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | **2014** | **2015** | **2016** | **Total** |
| Bradford | **Commercial & Industrial Customer Served** | **5** | **7** | **77** | **89** |
| **Commercial & Industrial Projects** | 38 | 59 | **61** | **158** |

In order to meet the various overall targets below, residents and business will need to convert to more efficient technologies. Table I sets the targets for the percentage of heating energy use coming from renewable sources. The targets in Table J were calculated using data from LEAP and ACS. This table provides a snapshot for two ways to meet the renewable energy use heating target through efficient wood heating systems as well as heat pumps for residential and commercial structures in the municipality for each target year.

|  |  |  |  |
| --- | --- | --- | --- |
| **I. Renewables – Heating Goals** | **2025** | **2035** | **2050** |
| Renewable Energy Use - Heating | 48.6% | 61.2% | 93.2% |

|  |  |  |  |
| --- | --- | --- | --- |
| **J. Heating Fuel Switching Targets**  **Residential and Commercial** | **2025** | **2035** | **2050** |
| Efficient Wood Heat Systems (in units) | 0 | 0 | 0 |
| New Heat Pumps (in units) | 120 | 315 | 666 |

Many Bradford homes use biomass for primary or supplemental heating. According to the 2016 Vermont Comprehensive Energy Plan, those using wood for primary heating consumed about 4.8 cords in 2014-15, while those using wood as a supplementary source used 2.1 cords. In that same year, Vermont households burned about 126,000 tons of wood pellets, with primary-heat-source consumers burning 4.4 tons and supplementary-heat-source consumers burning 3.3 tons for the season. A slight reduction in the number of cords of wood burned from 2007-08 data could be a reflection of Vermonters installing more efficient wood heating systems. A recent increase in the use of wood pellets illustrates a growing demand for wood resources as heating fuel.

Homeowners can receive financial assistance for weatherization and efficient home heating solutions through the Heat Saver Loan program, NeighborWorks of Vermont energy loans, and Vermont State Employees Credit Union Energy Savings Loans. Many times, weatherization improvements financed through low interest loans will provide immediate positive cash flow.

**Electricity**

Note Bradford has an average annual residential uses of electricity, just over 6,000 kWh. Source: Green Mountain Power

Two electric power companies serve Bradford. Green Mountain Power (GMP), the region’s largest provider of electric power, serves the majority of the Town. GMP owns and operates the Waits River Hydroelectric Station and maintains contracts with Hydro Quebec. The Washington Electric Cooperative (WEC) serves the rural western part of the Town. WEC has invested in a landfill methane plant in Coventry, Vermont, which provides nearly 60% of its power needs. WEC has been at the forefront of demand side energy management, reducing its members’ average energy usage to well below the state average, and is currently qualified as 100% renewable.

The electric residential energy demand in Bradford has declined slightly over the last three years, while the commercial and industrial demand has increased. Currently, only 4% of the electricity need is being met by renewable energy generation. As more renewable energy generation is produced in Sharon to meet the 2050 targets, Green Mountain Power will need to increase the pace of system-wide updates. These include line upgrades and storage technologies such as Tesla’s Powerwall battery system. Electric savings are possible through energy efficiency improvements. According to Efficiency Vermont, Bradford electric customers saved 123,725 kWh (kilowatt hours) in 2016 through measures such as hot water efficiencies, light bulb swaps, and appliance and space heating replacements. Gains in efficiency can be made through improved appliance standards, building energy codes, consumer purchasing decisions, and publicly funded programs.

Table K displays current electricity use within the municipality with data from the utility companies, showing that residential use has decreased over the past three years. Despite this decrease, on a per residential unit basis the average Bradford resident is using more electricity than others throughout the region (Graph 1). This could be in part due to inefficient electric uses in the household. On the other end it could be a reflection that residents in Bradford are early adopters of fuel switching methods such as increased use of heat pumps or electric vehicles.

|  |  |  |  |
| --- | --- | --- | --- |
| **K. Electricity Use** | | | |
| **Sector** | **2014** | **2015** | **2016** |
| Commercial & Industrial (kWh) | 9,535,580 | 10,150,436 | 10,519,132 |
| Residential (kWh) | 7,589,053 | 7,560,119 | 7,465,564 |
| Total | **17,124,633** | **17,710,555** | **17,984,695** |
| Count of Residential Premises | **1,232** | **1,228** | **1,228** |
| Average Residential Usage | **6,160** | **6,156** | **6,079** |

Table L contains targets towards increased electric efficiency and conservation. This data is based on LEAP modeling which combines existing electric energy use, projected electric energy use, population changes as well as projected trends that will either increase or decrease electric consumption. In this modeling the timing of some of the trends means that the efficiency trends outpace the electrification trends in some middle years, which causes the dip.

|  |  |  |  |
| --- | --- | --- | --- |
| **L. Electricity Efficiency Targets** | **2025** | **2035** | **2050** |
| Increase Efficiency and Conservation  (change wording on this) | -0.6% | 5.7% | 9.9% |

TABLE M: Table M shows existing renewable generation in Bradford, in MW and MWh, based on information available from the Vermont Department of Public Service. This data represents both off site as well as any net metered project that was built or permitted as of September 2016. Any new renewable energy generation systems after September 2016 will count towards meeting Bradford’s renewable energy goal in Table O.

|  |  |  |
| --- | --- | --- |
| **M. Existing Renewable Generation** | **MW** | **MWh** |
| Solar (Net Metering) | 0.37 | 454 |
| Solar (Not Connected) |  |  |
| Wind | 0.00 | 0 |
| Hydro | 1.50 | 5256 |
| Biomass | 0.00 | 0 |
| Other | 0.00 | 0 |
| **Total Existing Generation** | 1.87 | 5710 |

Vermont’s electricity comes in large part from renewable resources, although the majority of Vermont’s energy is generated through Hydro-Quebec. Additional sources of renewable energy in Vermont include several utility-owned commercial scale wind and solar farms, in-state hydro facilities and landfill and on-farm methane projects. Although initial set-up costs for renewable energy generation systems can be high, these systems can save users money over the long term and reduce the consumption of fossil fuels, helping to protect our environment and reduce our reliance on centralized energy. In Vermont, some of these energy sources are more readily available than others, and some are more cost-effective for the individual energy producer.

Commercial scale renewable energy generation systems are a growing business in Vermont, increasing the percentage of locally generated power. However, the energy generated commercially is deposited into the national grid system, which means that the power generated here may not be utilized locally. Renewable energy generation systems are regulated through the State of Vermont, requiring a Certificate of Public Good from the Public Utility Commission. State statute forbids the creation of land use regulations that prohibit renewable energy generation. Distributed power generation facilities, such as hydropower dams, fossil fuel plants, and wind power or solar systems owned by utilities, are subject to review and approval by the Vermont Public Service Board (30 VSA §248). Under this law, prior to the construction of a generation facility, the Board must issue a Certificate of Public Good. A Section 248 review addresses environmental, economic, and social impacts associated with a particular project, similar to Act 250. In making its determination, the Board must give due consideration to the recommendations of municipal and regional planning commissions and their respective plans. Accordingly, it is appropriate that this Town Plan address these land uses and provide guidance to town officials, regulators, and utilities. Act 174 established a new set of municipal and regional energy planning standards, which if met, allow those plans to carry greater weight – substantial deference- in the Section 248 siting process for energy generation.

The town is concerned about plans for major development within Bradford and in neighboring towns. These types of developments could threaten the environment and quality of life that Bradford residents value. ~~The town would like to have the option to be represented at the Public Utility Commission as an interested and/or average person in any and all future plans before the Public Utility Commission.~~ By completing enhanced energy planning, and receiving a “determination of energy compliance,” Bradford will be given “substantial deference” in the Public Service Board’s review of whether and energy project meets the orderly development criterion in the Section 248 process.

For all commercial energy generation facilities, the following policies shall apply:

1. Preferred Locations: New generation and transmission facilities shall be sited in locations that reinforce Bradford’s traditional patterns of growth - compact village centers surrounded by a rural countryside, including farm and forest land.
2. Prohibited Locations: Because of their distinctive natural, historic or scenic value, energy facility development shall be excluded from the following areas:
   1. Floodways shown on FEMA Flood Insurance Rate Maps;
   2. Fluvial erosion hazard areas shown on Fluvial Erosion Hazard Area maps;
   3. Wetlands as indicated on Vermont State Wetlands Inventory maps or identified through site analysis; and
   4. Rare, threatened or endangered species habitat or communities.
   5. The Bradford Town Forests
3. Significant Areas: All new generation, transmission, and distribution facilities shall be sited and designed to avoid or, if no other reasonable alternative exists, to otherwise minimize and mitigate adverse impacts to the following:
   1. Historic Areas, landmarks, sites and structures listed, or eligible for listing, on state or national registers.
   2. Public parks and recreation areas, including state and municipal parks, forests and trail networks.
   3. Municipally designated scenic roads and viewsheds (see Natural Resources).
   4. Special flood hazard areas identified by National Flood Insurance Program maps.
   5. Public and private drinking water supplies, including mapped source protection areas.
   6. Necessary wildlife habitat identified by the state or through analysis, including core habitat areas, migration and travel corridors.
4. Natural Resource Protection: New generation and transmission facilities must be sited to avoid the fragmentation of, and undue adverse impacts to, the town’s working landscape, including large tracts of undeveloped forestland and core forest habitat areas, open farm land, and primary agricultural soils mapped by the U.S. Natural Resource Conservation Service.
5. Protection of Wildlife: Designers must gather information about natural and wildlife habitats that exist in the project area and take measures to avoid any undue adverse impact on the resource. Consideration shall be given to the effects of the project on: natural communities, wildlife residing in the area and their migratory routes; the impacts of human activities at or near habitat areas; and any loss of vegetative cover or food sources for critical habitats.
6. Site Selection: Site selection should not be limited to generation facilities alone; other elements of the facility need to be considered as well. These include access roads, site clearing, onsite power lines, substations, lighting, and off-site power lines. Development of these elements shall be done in such a way as to minimize negative impacts. Site clearing and roadways can have greater visual impacts than the energy generation facility itself. In planning for facilities, designers should take steps to mitigate the project’s impact on natural, scenic and historic resources and improve its harmony with the surroundings.

Vermont’s net-metering laws were updated in Act 99, Rule 5.100, effective January 1, 2017. This rule established the standards and procedures governing application for, and issuance or revocation of a certificate of public good for net metering systems. Net metering systems means a plant for generation of electricity that is of no more than 500 kW capacity. Rule 5.100 defines preferred locations for solar generation facilities, giving financial benefits. These sites are:

1. A new or existing structure
2. A parking lot canopy over a paved parking lot
3. A tract previously developed on which a structure or impervious surface was lawfully in existence
4. Land certified by the Secretary of Natural Resources to be a brownfield site
5. A sanitary landfill
6. The disturbed portion of a gravel pit, quarry, or similar site
7. A specific location designated in a duly adopted municipal plan
8. A site listed on the National Priorities List (NPL)
9. On the same parcel as, or directly adjacent to, a customer that has been allocated more than 50 percent of the net-metering system’s electrical output. The allocation to the host customer may not be less than 50 percent during each of the first 10 years of the net-metering system’s operation.

The Town of Bradford supports responsibly sited and developed renewable energy projects within its boundaries. It recognizes that to maximize profits, developers desire projects to be located in close proximity to electric power lines capable of transmitting the load proposed to be generated and easy access from major transportation networks for construction. However, the town desires to maintain the working landscape, adopted conservation and habitat protection measures and scenic rural views important to its economy and rural cultural aesthetics. Not all commercial or community scale solar projects proposed can meet this standard. Projects must meet the following community standards in order to be considered “orderly development” supported by this plan and in order to not unduly impact the aesthetics of the rural countryside this plan intends to protect. In particular, these standards should be considered when the development falls under Section 248 of Title 30 of the Vermont Statutes.

1. Community Standards
   1. Siting: Where a project is placed on the landscape constitutes the most critical element in the aesthetic siting of a project. Poor siting cannot be adequately mitigated. Accordingly, all renewable energy projects must evaluate and address the proposed site’s aesthetic impact on the surrounding landscape.
      1. Good sites have one or more of the following characteristics:
         1. Roof-mounted systems (except in the historic Area)
         2. Systems located in close proximity to existing larger scale, commercial, industrial or agricultural buildings.
         3. Proximity to existing hedgerows or other topographical features that naturally screen the proposed array from view from at least two sides.
         4. Reuse of former brownfields or otherwise impacted property.
      2. Poor sites have one or more of the following characteristics:
         1. No natural screening
         2. Topography that causes the arrays to be visible against the skyline from common vantage points like roads or neighborhoods.
         3. A location in proximity to and interfering with a significant viewshed (significant viewsheds within the Town of Bradford include I91, Route 5, Route 25, South Road, Goshen Road, Fairground Road, along the Waits River and Connecticut River
         4. The removal of productive agricultural land from agricultural use.
         5. Sites that require public investment in transmission and distribution infrastructure in order to function properly.
   2. Mass and Scale: The historical working landscape that defines Bradford currently and that Bradford desires to preserve is dominated by viewsheds across open fields to wooded hillsides. Rural structures like barns fit into the landscape because their scale and mass generally do not impact large tracts of otherwise open land. All commercial scale solar arrays shall also be limited in mass and scale, and/ or have their mass and scale broken by screening, to fit in with the landscape. Commercial solar projects larger than an acre are larger than any other structure within the Town of Bradford. If they cannot be adequately screened or mitigated to blend into the municipality’s landscape and are therefore prohibited.
2. Average Person For the purposes of this plan, either the Selectboard or the Planning Commission shall be deemed to represent the voice of the “average person” with respect to the “Quechee Test” when evaluating the aesthetics of a proposed solar array.
3. Mitigation methods:
   1. In addition to properly siting a project, solar developers must take the following action to mitigate all project sites:
      1. Locate the structures on the site to keep them from being “skylines” above the horizon from public and private vantage points.
      2. Shorter panels may be more appropriate in certain spaces than taller panels to keep the project lower on the landscape.
      3. At a minimum all solar arrays must observe the setback restrictions contained in Act 56 governing solar installations. However developers are encouraged to increase setbacks to at least those listed in the Town Zoning Regulations within the Zoning Area in which it lies.
      4. Use the existing topography, development or vegetation on the site to screen and or break the mass of the array.
      5. In the absence of existing natural vegetation, the commercial development must be screened by native plantings beneficial to wildlife and pollinators that will grow to a sufficient height and depth to provide effective screening within a period of 5 years. Partial screening to break the mass of the site and to protect public and private views of the project may be appropriate.
      6. Practice a “good neighbor policy”. The siting of the array should be done in such a manner that the array creates no greater burden on neighboring property owners or public infrastructure than it does on the property on which it is sited. As an example, a landowner may not site an array on his or her property in a location calculated to diminish the visual impact of the array from his or her residence, but places the array immediately within their neighbor’s or the public’s viewshed. Locating a solar array in such a manner designed to reduce impacts on neighbors or public viewsheds constitutes reasonable mitigation.
      7. Use black or earth tone materials (panels, supports fences) that blend into the landscape instead of metallic or other brighter colors.
   2. Decommissioning and Restoration: All projects shall be decommissioned at the end of their useful life and the property shall be restored to its pre-project condition. Developers of all projects ~~100kW~~ 150kW and greater shall provide the town with appropriate assurances to guarantee funding exists to decommission the project such as a bond. In keeping with the Town of Bradford’s desires to retain our agricultural land base, a solar array’s useful life shall be deemed to be at the end of the initial contract for services with the power company.

**Wind**

Similar to solar, wind energy is an intermittent resource and its generation fluctuates in response to environmental conditions. The amount of energy produced by a specific wind tower can depend greatly on location, height of the tower, and proximity to other obstructions. Nevertheless, most modern wind turbines (when properly sited) are able to generate electricity 95% of the time. There are multiple levels of potential wind energy generation, ranging from Class 1 (10-11 mph) to Class 7 (19-25 mph).

In the 2007 Town Plan Survey, just over 80% of respondents indicated that they would encourage wind power in Bradford. Bradford’s topography does not make it a desirable location for large-scale wind energy generation. Instead, it is better suited to small-scale residential wind energy generation. Wind technologies are changing rapidly, however, and smaller units may be feasible at some locations in Bradford. The location of lower scaled home or cooperatively based wind energy turbines and associated facilities may be appropriate at some locations in Bradford. Not all means of wind generation are appropriate to every setting and due consideration must be given to wildlife habitats.

**Biomass**

There are no biomass energy generation facilities in Bradford. Community-scale biomass has the potential to offer cost-effective heating in small, clustered areas. Some towns have implemented combined heat and power systems that run on biomass to heat multiple municipal buildings.

**Biofuels**

In addition to using biomass for heating, the use of biofuels, particularly biodiesel, is becoming an increasingly popular option for municipalities attempting to cut costs and reduce the environmental impacts associated with vehicle emissions. The Town of Bradford could revisit the possibility of using biofuels in their road crew fleet. According to the Vermont BioFuels Association, biodiesel is a clean-burning alternative fuel, produced from domestic, renewable resources, such as soybeans, sunflowers, canola, waste cooking oil, or animal fats. Biodiesel contains no petroleum, but it can be blended at any level with petroleum diesel to create a biodiesel blend, which can be used in colder weather. It can be used in compression-ignition (diesel) engines or oil-fired boilers or furnaces with little or no modifications. Growing biomass to use in biofuels may be a viable way to encourage farming or forestry in Bradford as well; however, balance should be sought for land used for energy demands vs. human and animal consumption.

**Hydropower**

Many locations in Vermont, including Bradford, once depended on hydropower to grind grain, run mills and even supply electricity to homes. But, with the onset of centralized power, most of these small-scale power generation facilities have been replaced by massive hydro facilities, such as those owned by Hydro Quebec. There is one operational hydropower facility in Bradford which annual produces 4,335 MWh of electricity. The Vermont Energy Atlas also identifies potential hydro site on Roaring Brook (located on the Blodgett property) that could have 10-49KW of undeveloped potential.

**Landfill Methane**

Decay of organic materials in landfills produces significant amounts of methane, a potent greenhouse gas and potential energy source. Use of methane may provide an alternative to conventional energy production sources. Capture technologies have experienced tremendous growth in recent years rendering methane a valuable energy source, as developed by the Washington Electric Cooperative.

**Demand Side Energy Management Programs**

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. 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 options” (Vermont CEP).

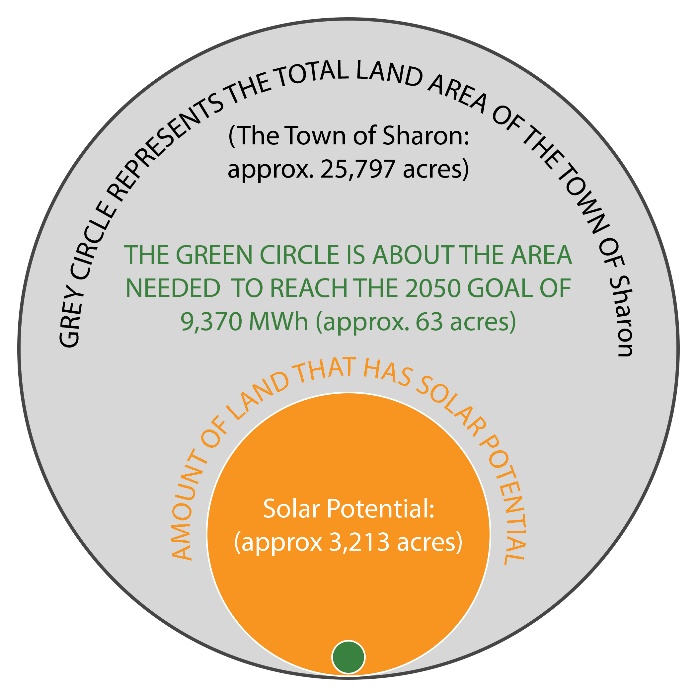
Demand Side Management Programs promote the conservation of energy as an energy source available for future demand. Through these programs, the region’s utilities have provided various incentives including financing and partial payment of certain efficiency improvements, energy audits, and design services. As the creation of excess generating capacity can be used to meet future electrical needs for Vermont, conservation also can be viewed as a source of electricity. Conservation generally is the least expensive and environmentally benign “source” of electricity.

TABLE N: Renewable generation potential is based on mapping completed by the regional planning commission that is based on the Municipal Determination Standards and associated guidance documents developed by DPS. The renewable generation potential is expressed in MW and MWh by the type of renewable resource (solar, commercial wind, hydro, etc.).

|  |  |  |
| --- | --- | --- |
| **N. Renewable Generation Potential** | **MW** | **MWh** |
| Rooftop Solar | 1 | 1,558 |
| Ground-mounted Solar | 539 | 661,030 |
| Wind | 30 | 91,214 |
| Hydro | 0 | 39 |
| Biomass and Methane | 0 | 0 |
| Other | 0 | 0 |
| **Total Renewable Generation Potential** | 570 | 753,839 |

TABLE O: This target for Bradford represents the amount of renewable energy generation that needs to be developed within town to help meet the overall CEP goals. This target is representative of Bradford’s population share within the region.

|  |  |  |  |
| --- | --- | --- | --- |
| **O. Renewable Generation Goals** | **2025** | **2035** | **2050** |
| Total Renewable Generation Target (in MWh) |  |  | 15,703-19,193 |

TABLE P: This table shows there is sufficient land in Bradford to meet the renewable generation targets based on the renewable generation potential in Bradford. Revisit this after mapping

|  |  |
| --- | --- |
| **P. Sufficient Land to Meet Generation Goals?** | **Y/N** |
| Renewable Sources | Y |
| Surplus of Generation | 4,220% |

## Goals, Policies and Recommendations

Goals

1. To increase energy efficiency in the Town of Bradford.
2. To decrease the use of non-renewable energy resources, while increasing the use

of renewable energy resources, particularly those of sustainable local origin.

1. To reduce energy consumption in all Town and school buildings.
2. To reduce greenhouse gas emissions, acid rain precursor, and other environmental toxins.
3. To encourage patterns of land use and development that use energy most efficiently, and that do not increase the use of non-renewable energy.
4. To promote the construction of energy efficient homes and buildings to lessen or postpone the need for sources of costly additional energy.
5. To increase the use of public transportation in coordination with other modes of transport, including electric vehicles.
6. To increase the use of non-motorized transportation.
7. To participate in regional and statewide strategies and approval processes which reduce the requirement for non-renewable energy.
8. To increase awareness and use of energy conservation practices.

Policies

1. It is the policy of the Town of Bradford to reduce energy consumption in all municipal activities, including buildings, transportation, and Town services.
2. It is the policy of the Town to participate in the Public Utility Commission’s Certificate of Public Good application process to ensure that local energy, resource conservation, and development objectives are identified and considered in future utility development.
3. It is the policy of the Town that any commercial energy generation facility proposed in Bradford should be developed so as to avoid negative impacts on the rural character, water quality, or habitat of the area in which they are proposed to be located. Developers should make all possible efforts to minimize damage to important natural areas as identified in the Natural Resource section of this Plan. Additionally, such facilities should be located as close to existing roads as possible to avoid any increase in the services provided by the town.
4. It is the policy of the Town that generation, transmission, and distribution facilities or service areas shall be encouraged only when they complement the recommended land use patterns set forth in this plan and can demonstrate that such pubic investments are justified to improve efficiency and promote energy conservation for the consumer and for the Town.
5. It is the policy of the Town to support the development and use of renewable energy resources including, but not limited to solar, biomass, wind, micro-hydro and biofuels – at an appropriate scale; that enhances energy system capacity and security; that promotes cleaner and more affordable energy technologies; that increases the locally available energy options; and that avoids undue adverse impacts of energy development on the local community and environment.
6. It is the policy of the Town to have the maximum tower height for net-metered or similar off-grid wind energy facility to not exceed 125 feet in total height.
7. It is the policy of the town that power generating facilities and accessory structures must meet the minimum setback requirements for the zoning area in which they are located.
8. It is the policy of the Town that ground mounted solar and wind generation facilities shall not be located within the 100-year flood hazard area or fluvial erosion hazard area or within 50 feet from the top of bank of any watercourse.
9. Expansion and efficiency improvements to the Waits River Dam hydro generators and transmission facilities are encouraged where such investments clearly benefit Town residents.
10. It is the policy of the Town to promote statewide programs designed to make energy efficiency improvements affordable and likely to be implemented. Town officials will support efforts to educate homeowners and businesses about available resources for energy efficiency improvements.
11. It is the policy of the Town that rehabilitation or development of new buildings and equipment should use proven design principles, in compliance with Vermont Building Energy Codes, and practices with the lowest life cycle costs (cost of owning, operating, maintaining, and disposing of a building or a building system over a period of time).
12. Where land development or subdivisions are proposed, design plans shall reflect sound energy use minimization principles, such as solar and slope orientation and protective wind barriers. An example would be the cluster planning concept, which is an approach that encourages energy conservation and efficiency.
13. It is the policy of the Town that major public investments, such as schools, public recreational areas, and municipal facilities, as well as major commercial or residential developments need to be situated within or in close proximity the village, and shall utilize existing roads whenever possible.
14. It is the policy of the Town to reduce commuting, promote the development of broadband services, and to support energy efficient home occupations and small-scale home business.
15. It is the policy of the Town to promote energy efficient travel by encouraging walking, biking, carpooling, the increased use of public transportation, electric vehicles, telecommuting and home businesses.

Recommendations

1. The Town should support the Bradford Energy Committee to increase public awareness and education of energy conservation practices and weatherization programs.
2. The Town, with help from the Energy Committee, should develop municipal procurement and purchasing policies that encourage the use energy efficient and Energy Star rated products.
3. The Selectboard should authorize the Energy Committee to track municipal energy use and costs and develop an energy budget with periodic energy audits to manage Town energy consumption.
4. The town should incorporate renewable energy heating systems, energy efficiency, and weatherization projects into the municipal Capital Budget and Program.
5. The Town should consider municipal or community renewable energy generation to serve town facilities, with funding by third-party financing, municipal funds, bonds, grants and/or government incentives.
6. The Town should continue to develop facility maintenance, efficiency measures, and operations policies to maximize energy efficiency while maintaining comfort levels for employees and visitors.
7. The Town should evaluate the installation of a municipal or downtown renewable biomass heating or energy system.
8. The Town should participate in programs such as the Vermont Climate Pledge Coalition to commit to meeting Vermont’s energy and climate goals.
9. The Town should pursue grants to promote energy efficiency and renewable energy projects.
10. The Town should consider requiring a reimbursable fee to ensure that developers properly file their Residential Building Energy Standard Certificate.
11. The Town should consider revising the guidelines for its Revolving Loan Fund to allow low interest capital to homeowners, landlords, non-profit organizations, and businesses to assist in making cost effective investments in energy efficiency and renewable energy.
12. The Town should encourage Bradford schools to include walking, cycling and other transportation alternatives.
13. The town should support K-12 schools to bring energy ideas and solutions into the classroom by working with organizations such as Vermont Energy Education Program (<http://veep.org>)
14. The Town, with help from the Energy Committee, should support programs such as Vital Communities’ Weatherize Upper Valley to help provide outreach and education to residents about ways to conserve energy and to facilitate the increased use of heat pumps and advanced wood heating.
15. The Town should pursue sidewalk, recreation paths, bicycle lanes and other Complete Streets projects and grants to reduce local transportation energy use and promote healthy lifestyles.
16. The Town should install electric vehicle charging stations on municipally owned property.