

# Brandon Enhanced Energy Plan

*Submitted by the Brandon Town Energy Committee*

## Table of Contents

1. Overview of Vermont Energy Goals
2. Overview of Brandon Energy Goals
3. Current and Future Energy Use
4. Transportation Energy Use
5. Residential and Commercial Energy Use
  - a. Brandon Residential Heating Energy Use
  - b. Brandon Commercial Heating Energy Use
6. Electricity
  - a. Brandon kWh usage by year
7. Development and Siting of Renewable Energy Sources
8. Brandon Renewable Energy Targets
9. Brandon Planning Commission Criteria for Siting Renewable Energy
10. Mapping and Managing Resources
  - a. Known Constraints
  - b. Possible Constraints
  - c. Local Constraints
  - d. Primary Resource Areas
  - e. Secondary Resource Areas
  - f. Wind Resource Area
  - g. Solar Resource Area
  - h. Hydro Resource Area
  - i. Biomass Resource Area
  - j. Preferred Areas
  - k. Department of Public Service Preferred Areas
  - l. Grid Infrastructure
11. Energy Strategies and Policies to Achieve Town Targets
  - a. Conservation and Efficient Use of Energy
  - b. Transportation
  - c. Land Use
12. Conclusion
13. Sources
14. Appendix (Form)

### **Overview of Vermont Energy Goals**

The State of Vermont has adopted a set of ambitious energy goals through statute and the Comprehensive Energy Plan (CEP), which was last updated in 2016. To help communities reach the sustainable energy future envisioned by the CEP, the state's central goals include:

- Meeting 90% of Vermont's total energy needs with renewable sources by 2050.
- Reducing greenhouse gas emissions by the following amount:
  - 40% reduction below GHG levels in 1990 by 2030, and
  - 80% to 95% reduction below 1990 levels by 2050.

### **Overview of Brandon Energy Goals**

- Decrease overall energy consumption through conservation and efficiency;
- Reduce reliance on fossil fuels and imported energy sources; and
- Develop renewable energy resources locally.

The purpose of the Brandon Enhanced Energy Plan is to conduct comprehensive energy planning at the local level while also achieving state energy goals – most importantly, the goal to have renewable energy sources meet 90% of the town's energy needs by 2050.

This in-depth energy planning helps ensure energy security for the Town of Brandon, while pursuing the economic opportunities inherent in conservation, energy efficiency and renewable energy initiatives, all the while protecting the beautiful environment in and around the town of Brandon.

Brandon recognizes that as conventional fuel resources dwindle, future resilience relies on lowering dependence on imported, non-renewable fuels, tapping local energy sources for enhanced self-reliance, and improving efficiency while maintaining a standard of living to which residents are accustomed.

A critical facet of improved efficiency will be a greater reliance on electricity to power everyday needs. Since electricity can be generated from renewable resources, and since electric-powered technologies such as heat pumps and electric vehicles are highly efficient, switching to electricity will help lower overall energy consumption while at the same time maintaining current lifestyles in Brandon.

According to the Vermont Comprehensive Energy Plan, growth in electricity consumption is expected to rise to 47% of all energy use by 2050. Though this major shift in energy use is substantial, there are opportunities to lower costs and bolster the local economy through a transformation of the energy sector, which currently costs Brandon more than \$21 million a year or \$4,273 per person each year (U.S. Energy Information Administration estimates).

Since nearly all this energy sector-related money flows out of Brandon and Vermont, redirecting expenditures for electricity, space and water heating and transportation to local energy businesses and employers will keep more wealth in the community.

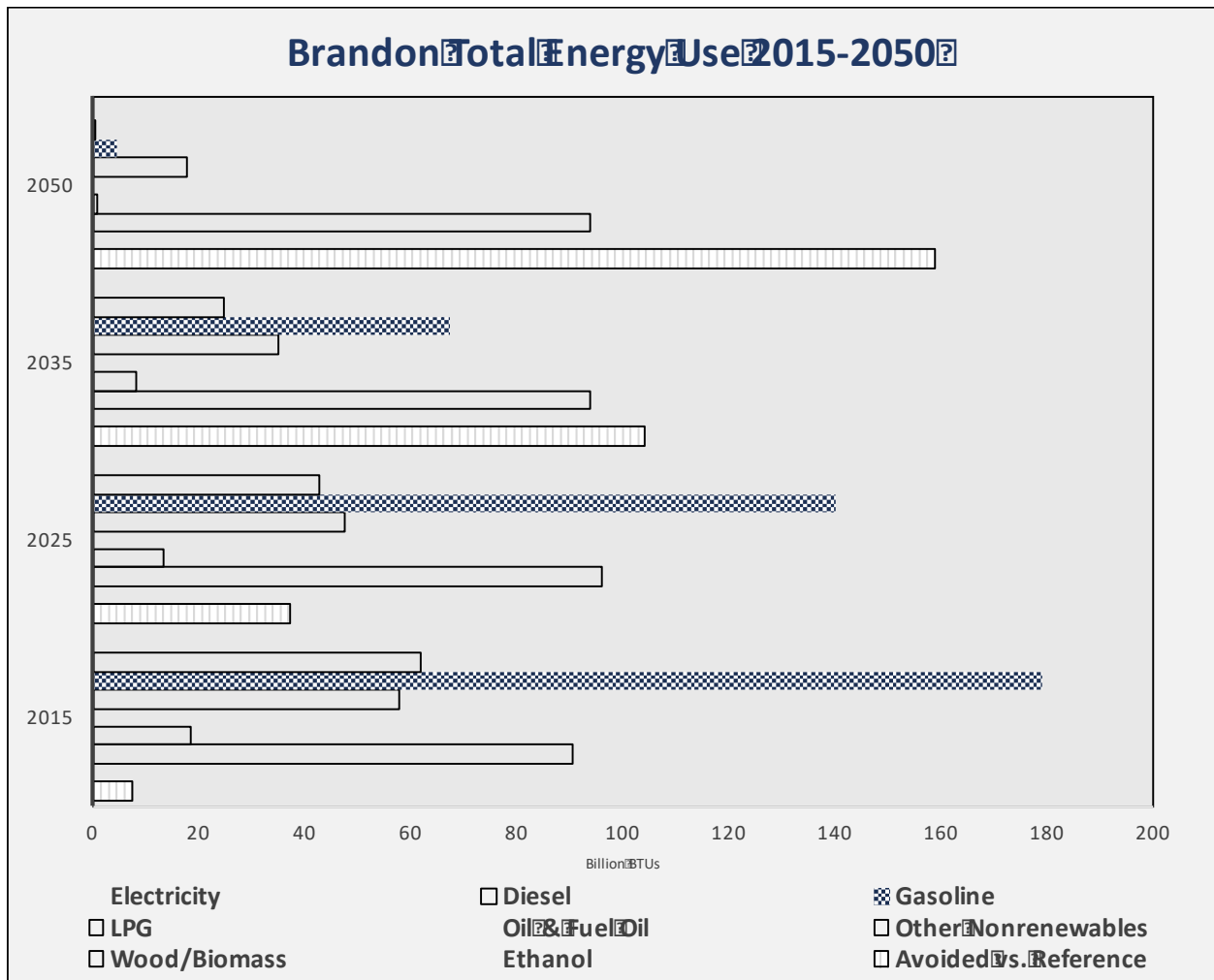
This energy plan is intended to provide the residents and local leadership of Brandon with the information and strategies needed to maintain a vibrant community in coming decades while the energy sector is transformed to better preserve the environment, lower energy costs, promote local renewable energy development, and enhance the town's self-reliance.

**Current and Future Energy Use**

The Rutland Regional Planning Commission Energy Plan (2018) estimates current and future regional energy consumption using a computer modeling program known as LEAP (Long Range Energy Alternatives Planning System) that is used around the globe and was developed for Vermont by the Vermont Energy Investment Corporation. Brandon’s estimates are based on these projections.

The Town of Brandon uses nearly 704 Billion BTUs (British Thermal Units) per year and should aim to reduce consumption to almost a third of that or 261 Billion BTUs by 2050. The LEAP chart below shows the Town of Brandon’s current energy use and the energy trajectory that the Town of Brandon should aim to achieve by 2050.

The LEAP model (below) also provides the “avoidance” amount, or the difference between the “reference scenario” and the “90x50 VEIC scenario” in total energy demand. Looked at another way, this avoided energy indicates how much weatherization, conservation, and greater efficiency needs to occur if Brandon is to meet the targets set in the LEAP model.



Energy use can be grouped into three major sectors: 1) transportation, 2) heating and cooling, and 3) electricity. Brandon's 1,661 households and 86 commercial entities consume significant amounts of energy for transportation and to power equipment, heat space and water, and power lights and appliances with electricity.

Brandon could see significant savings in energy consumption and costs by adopting conservation strategies, replacing outdated appliances and switching to more efficient technologies, and participating in weatherization programs.

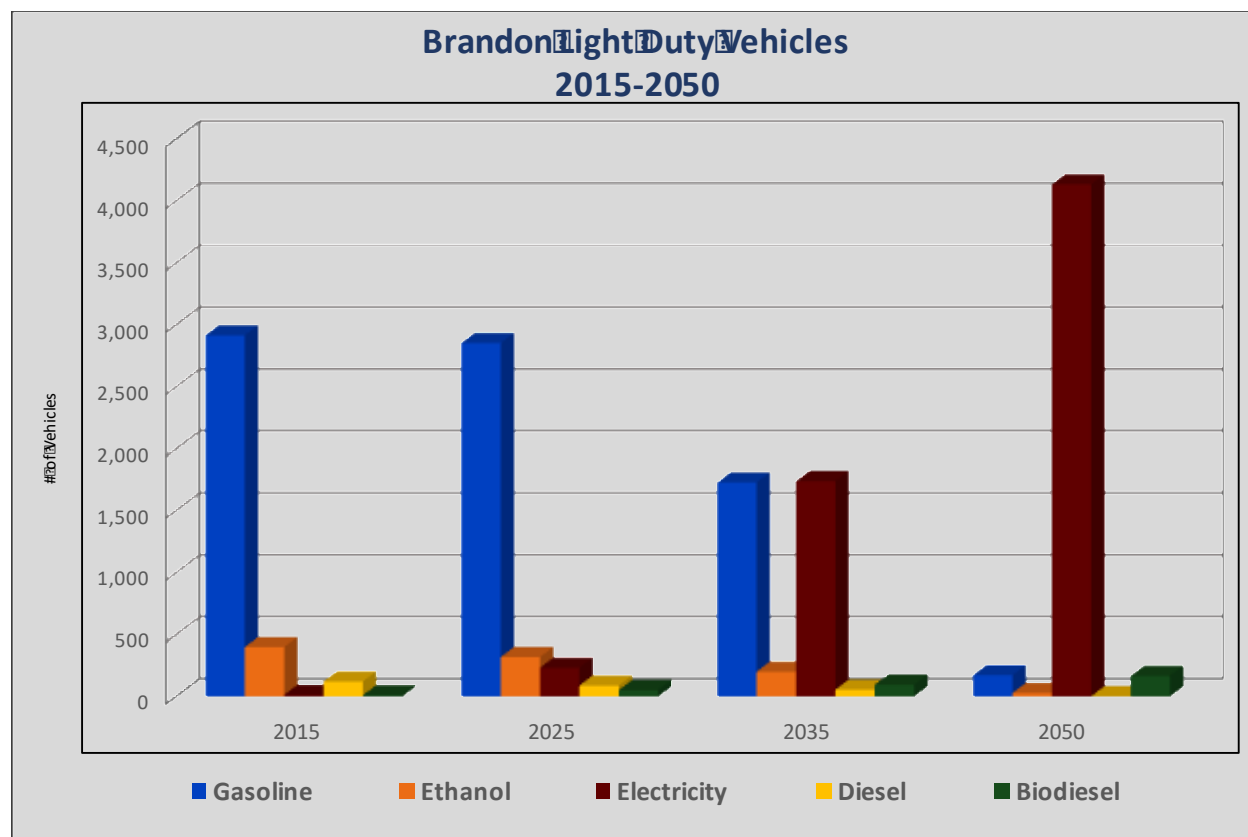
By looking at consumption in three categories within these sectors – light-duty transportation, residential and commercial heating, and electricity use – a clearer picture emerges about what impact Brandon can have on overall energy use and in meeting Vermont's energy goals.

### **Transportation Energy Use**

In Brandon, as in other municipalities in Vermont, transportation consumes the most energy of any sector. There are an estimated 2,813 light-duty vehicles in the town traveling 33.7 million miles a year - at a cost of more than \$4.2 million a year in gasoline alone. Of the 1,871 residents in the labor force, 1,511 (or 81%) drive to work alone.

In the next few decades, it's anticipated that total energy for transportation will fall gradually to about 35% of current levels for light-duty vehicles. The efficiencies of electrification and a switch to biodiesel will account for much of this reduction.

By 2050, electric and biodiesel vehicles are estimated to comprise 95% of the light-duty fleet in Brandon. It is expected that by 2050, there will be 4,135 electric and 166 biodiesel-powered light-duty vehicles in the town. By targeted year, this increase jumps dramatically from 9% of the fleet of light-duty vehicles in 2025 to 47% in 2035 to 95% in 2050.



Requiring more compact land use patterns is an excellent means for the town to reduce vehicle mileage and consumption of fuel. Brandon is committed to promoting multi-use land use (housing mixed with commercial) in future development. The town is also committed to reducing energy use in transportation and will lead by example by purchasing electric or biodiesel vehicles (when feasible), encouraging the use of public transit, offering more park-and-ride opportunities and installing EV charging stations.

**Residential and Commercial Energy Use**

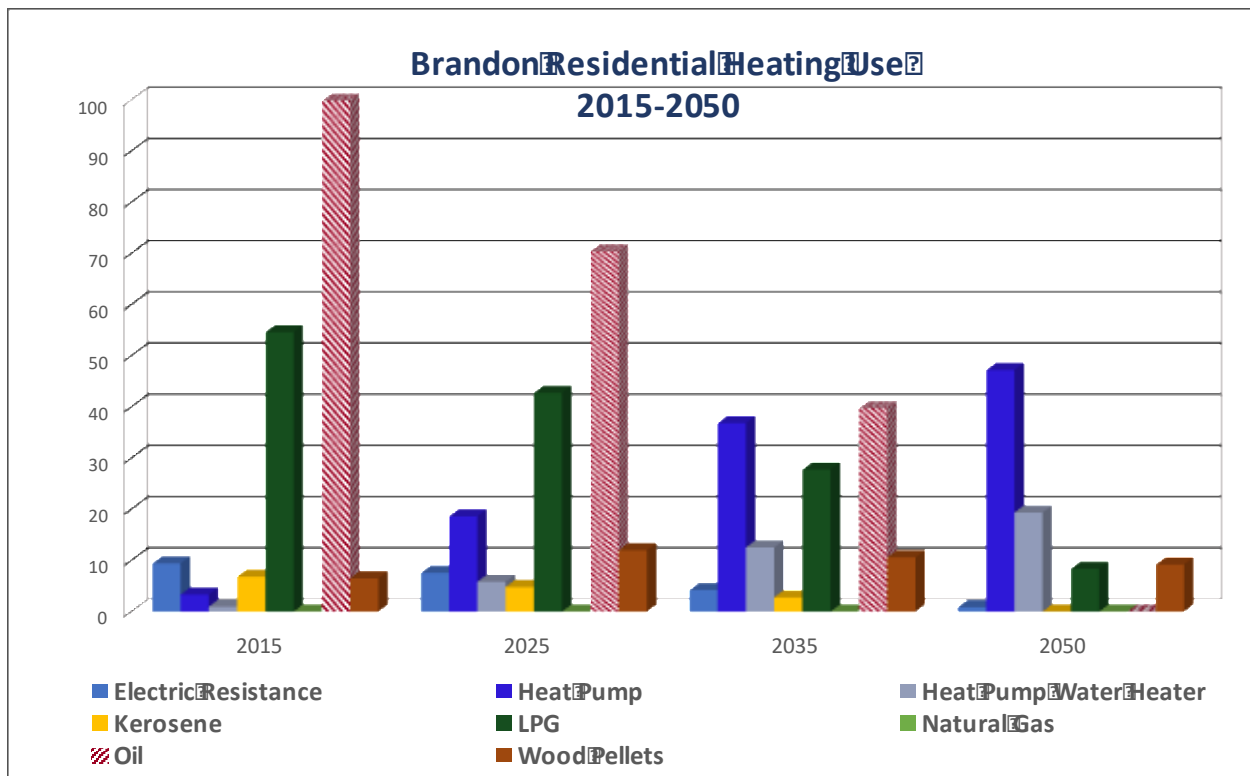
More than 81% of Brandon homes are heated with oil and other fossil fuels during the heating season. With the projected future shortage of fossil fuels, it will be in the town’s best interest to become less reliant on these sources of heating fuel and switch to efficient heating systems powered by local resources.

**Brandon Residential Heating Energy Use (American Community Survey, US Census, 2011-2015)**

| Fuel        | # of Households | % of Households | BTUs (in billions) |
|-------------|-----------------|-----------------|--------------------|
| Natural Gas | 33              | 2%              | 3                  |
| Propane     | 252             | 15.2%           | 22                 |
| Electricity | 16              | 1%              | 1                  |
| Fuel Oil    | 1,053           | 63.4%           | 108                |

|              |              |               |            |
|--------------|--------------|---------------|------------|
| Coal         | 9            | 0.5%          | 1          |
| Wood         | 269          | 16.2%         | 32         |
| Solar        | 0            | 0%            | 0          |
| Other        | 29           | 1.7%          | 3          |
| No Fuel      | 0            | 0%            | 0          |
| <b>Total</b> | <b>1,661</b> | <b>100.0%</b> | <b>171</b> |

LEAP modeling shows how Brandon can make the transition to renewable energy sources for both residential and commercial structures through the increased use of bio-distillates and electricity. The use of fuel oil for heating drops precipitously in this modeling.



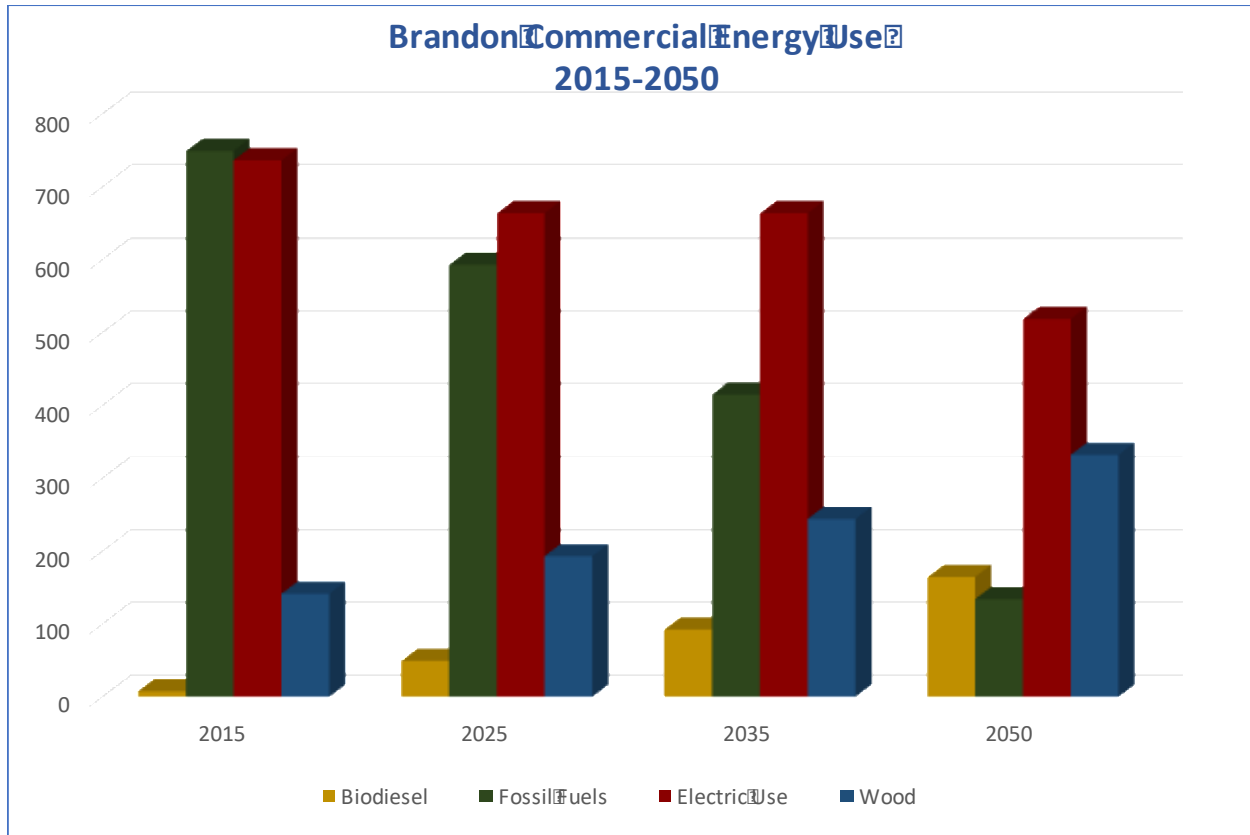
Residential Heating Goals

|                    | 2025 | 2035 | 2050  |
|--------------------|------|------|-------|
| Renewable BTUs     | 98.4 | 113  | 118.3 |
| Non-Renewable BTUs | 118  | 70.3 | 8.4   |

**Brandon Commercial Heating Energy Use**

Currently there is an estimated 86 commercial establishments using 0.725 Billion BTUs of thermal energy each, for a total of 68 Billion BTUs a year in Brandon. Energy use is projected to decrease

39 Billion BTUs due to a decreased use of fossil fuels and a heavier reliance on more efficient renewable sources such as biodiesel. Due to efficiencies, overall energy use declines, but as a percentage of overall energy use, electricity increases by 2050.



By switching fuels and relying on efficient heat pumps systems for both residential and commercial, the town’s target is 170 units by 2025; 444 by 2035; and 862 by 2050. Conversions to new efficient wood heat systems are projected to increase from 16 units in 2025; then decrease by -17 in 2035; and by -30 in 2050 for both residential and commercial uses.

The projected growth in the percentage of heating energy use coming from renewable sources is sharp: rising from 52% in 2025 to 92% in 2050.

Brandon is committed to meeting its residential and commercial thermal targets through increased efficiency and conservation. The percentage of Brandon households that will need to be weatherized between now and 2050 to meet the state’s goals is: 14% by 2025; 39% by 2035; and 85% by 2050. For commercial structures, weatherization targets are 29% by 2025; 47% by 2035; and 84% by 2050.

**Electricity**

Electricity, produced mostly by more expensive fossil fuel, is the third major sector of energy use so reducing usage and converting to renewable sources is critical to meeting the state’s energy goals. Although electricity use will increase dramatically in the future since it is a conduit for making local renewable energy sources available for use, widespread adoption of efficient

appliances, vehicles and thermal technologies powered by electricity is critical to achieving the state’s energy goals for efficiency.

**Brandon kWh Usage by Year (Efficiency Vermont)**

| <b>Sector</b>             | <b>2014</b>       | <b>2015</b>       | <b>2016</b>       |
|---------------------------|-------------------|-------------------|-------------------|
| Commercial & Industrial   | 10,251,390        | 10,830,470        | 10,235,545        |
| Residential               | 12,179,211        | 12,929,098        | 12,808,455        |
| <b>Total</b>              | <b>22,430,601</b> | <b>23,759,568</b> | <b>23,044,000</b> |
| Average Residential Usage | 6,666             | 7,057             | 6,988             |

Data show that overall electrical use in Brandon is affected by electric efficiencies. Figures from Efficiency Vermont indicate that the town is seeing dramatic electric savings from efficiency measures, particularly in the commercial and industrial sectors. For instance, from 2014 to 2016, the commercial and industrial sectors went from saving 148,495 kWh to saving 1,033,048 kWh a year.

Further electricity efficiency savings are included in the LEAP modeling. The town’s targets are 12.1% by 2025; 39% by 2035; and 69.8% by 2050. The MWh targets for the use of renewable sources for this electricity are 1,585 in 2025; 4,742 in 2035; and 14,369 in 2050.

Brandon is committed to energy conservation and will take advantage of Efficiency Vermont initiatives to upgrade the insulation of home and buildings to reduce heating and cooling energy consumption. The town also will lead by example by ensuring all municipal buildings, including the Town Office, fire stations, town garage, and schools, are audited for energy use and upgraded.

**Development and Siting of Renewable Energy Sources**

| <b>Renewable Type</b>            | <b>MW</b>   | <b>MWh</b>    |
|----------------------------------|-------------|---------------|
| Solar                            | 2.86        | 3414.3        |
| Wind                             | 0           | 0             |
| Hydro                            | 0           | 0             |
| Biomass                          | 0           | 0             |
| Other                            | 0           | 0             |
| <b>Total Existing Generation</b> | <b>2.86</b> | <b>3414.3</b> |

As of January 2019, Brandon has 2.86 MW of total renewable energy generation. The data in this table are based on information available from the Vermont Department of Public Service and the Vermont Community Energy Dashboard. The town currently has 100 solar sites and two biomass sites which includes Otter Valley Union High School and Neshobe School’s wood pellet heating.



This chart below is the estimated renewable energy generation potential for the town. These data were based on mapping completed by the Rutland Regional Planning Commission (RRPC), which was based on the Municipal Determination Standards and associated guidance documents developed by the Vermont Department of Public Service.

| Renewable Type                              | MW           | MWh              |
|---------------------------------------------|--------------|------------------|
| Rooftop Solar                               | 4            | 5,131            |
| Ground-Mounted Solar                        | 860          | 1,054,551        |
| Wind (small scale)                          | 784          | 1,567,420        |
| Hydro                                       | 0            | 0                |
| Biomass & Methane                           | 0            | 0                |
| Other                                       | 0            | 0                |
| <b>Total Renewable Generation Potential</b> | <b>1,648</b> | <b>2,627,102</b> |

RRPC has suggested the following targets (in MWh) for Brandon for total renewable energy generation to meet the state’s 90x50 renewables goal. The target of 14,369 MWh by 2050 is a fraction of the town’s generation potential of 2,627,102 MWh. The Brandon Energy Committee recognizes that the Town of Brandon is well on its way to meeting its 2050 target and has already met the 2025 target and pledges to continue this pace in order to meet or exceed the 2050 target.

**Brandon Renewable Energy Targets (MWh)**

| 2025  | 2035  | 2050   |
|-------|-------|--------|
| 1,585 | 4,742 | 14,369 |

According to estimates by the RRPC, Brandon has sufficient land to reach 2050 targets for solar and wind based on the renewable generation potential in the town. For solar alone, there are 793.7 acres of prime solar which equates to 128,960 MWh of generation potential ( $793.7 \div 8 = 99.2 \times 1,300 = 128,960$ ).

The potential for energy generation is more than enough to meet the town’s target (above). Even though Brandon has 3,134.85 acres identified as wind resources, much of that along ridgelines, developing these lands will not be needed to meet generation targets.

Brandon is maximizing its potential for renewable energy generation by identifying preferred areas for solar energy generation as well as adding more potential sites on impervious surfaces such as rooftops. The town is leading by example by already installing solar panels on its school rooftop and it is considering the addition of solar panels on other municipally-owned sites.

The Brandon Enhanced Energy Plan allows for the siting of all types of renewable generation technologies, wind, solar, hydro and biomass energy generation, but not necessarily all scales of a given technology.

The town is certain that, if applied regionally, this is a fair and equitable approach that follows town and state priorities and still allows for sufficient land area to meet the town's and Vermont's energy targets and goals.

### **Brandon Planning Commission Criteria for Siting Renewable Energy**

Below is the Town of Brandon's Planning Commission's process for reviewing potential large-scale solar and other renewable energy generation projects within Brandon, and further, how the Town plans influence state regulatory proceedings:

- Act 250 applications must conform to the municipal plan.
- Applications for a Section 248 Certificate of Public Good must give due consideration to the municipal plan; with an enhanced energy plan considered compliant, it has substantial deference.

For uniformity, Brandon adopts these standards used by the State of Vermont for system classifications and supports the RES standards developed by the State as well as other statutory requirements and Comprehensive Energy Plan (CEP) goals for emissions reduction and renewable generation:

- State goal of having 90% of all energy use -- transportation, thermal and electricity -- come from renewables by the year 2050.
- The RES for Vermont utilities requiring that 75% of electricity sold in Vermont in 2032 be obtained from renewables.
- State and local and property tax statutes.
- 15 kW or less as the definition of small residential systems.
- Access requirement to firefighters and other emergency responders.

Furthermore, every renewable energy project larger than 15 kW shall include a proposed site plan, a statement of compliance with all known and possible constraints, a project budget and scope, a qualified assessment by an energy professional as to the viability of the project, an action plan and a guaranteed funding source for decommissioning to ensure the site is safe, stable and free of structures and hazardous materials.

The following questionnaire will be sent to companies considering construction of renewable energy projects in/around the Town of Brandon (see appendix for proper form).

#### 1. Owner information

A. Owner intends to construct a \_\_\_ kW (sites >15kW need to fill out the form below; the form is not necessary for sites <15kW) at the following address or legal description (system site):

B. This site is on (circle one):

- Public Land
- Private land

C. Is this a residential or commercial installation?

D. This site does or does not require local permits or improvements in public roads/infrastructure improvements to access/operate the installation? If yes, please describe.

- E. Has owner secured rights to use the above-mentioned site?  
 F. Please describe what benefits this project would bring to the Brandon community.  
 G. This installation will be (circle one):
- net metered
  - grid tied
- H. If net metered who will be receiving the generation credits?  
 I. If this is a secure or restricted access site, how will security be handled? Will emergency personnel be able to access this site?  
 J. Who owns the RECs (Renewable Energy Credits)? Will the RECs be sold?

The Town of Brandon has identified a list of preferred sites below that offer potential renewable energy investments in areas that avoid the known and possible constraints. This list is a proactive approach to help make investments in the district and enable Brandon to meet the local and state goals of renewable energy generation by 2050. The town has made investments in utilities to support residential and higher density population areas. A commercial project that would not make use of those utility services would limit the town's ability to recover utility investments.

## 2. Known and Possible Constraints

A. There are state and regional constraints on locating renewable energy installations. Please indicate if this site does or does not conflict with these known or possible constraints.

1. *Known Constraints: vernal pools; DEC river Corridors; FEMA floodways; State-significant Natural Communities and Rare, Threatened and Endangered species areas; National Wilderness Areas; Class 1 and Class 2 wetlands.*
2. *Possible Constraints: Agricultural soils; FEMA Special Flood Hazard Areas; Protected lands (state fee lands and private conservation lands); Act 250 Agricultural Soil Mitigation Areas; Deer wintering areas; ANR's Vermont Conservation Design Highest Priority Forest Blocks; Hydric soils.*

B. The Town of Brandon has preferences based on the above-mentioned list. Please include a site plan that shows location of renewable energy project in relation to the parcel boundaries, the converters and necessary power infrastructure to access the grid from this location. Indicate what utilities or services would be required by the City.

Brandon infrastructure and population density plans strive to concentrate residential growth to limit the impact of service infrastructure required. Any commercial proposals within these targeted population centers would need to be weighed against the future use of these spaces for population and municipal needs. Project will need to follow existing zoning procedures and practices.

## 3. Project details

- A. Type of generation:  
 B. Expected kW/kWh annual generation:  
 C. Is this a project that might be done in phases?  
 D. Are there any other phases planned for this site in the future?  
 E. Zoning variance required?  
 F. If located on public land, are public approvals required?

- G. Expected construction start date:
- H. Expected completion date:
- I. Expected site maintenance plan:
- J. Town of Brandon project timeline:

- Completed review by developer and town manager and planning commission
- Pre-construction site visit
- Final visit after PUC certificate of good issued and review of scope of project changes
- Midpoint construction visit
- Final preoperational visit
- Annual operational visits (to ensure best possible service to investors, the Town of Brandon will request economic and energy updates from the company on an annual basis)

#### 4. References and Tools:

- The Vermont Community Energy Dashboard: <https://www.vtenergydashboard.org/>
- VT Energy Dashboard (Brandon's baseline): <https://www.vtenergydashboard.org/my-community/brandon/progress>
- The Renewable Energy Atlas: <https://www.vtenergydashboard.org/energy-atlas>. This is a helpful tool for communities and people interested in exploring and identifying energy projects, known or possible constraints, and sites best suited for renewable energy deployment. Search for Brandon and find the energy resources deployed and select Layers on the right-hand side of the Atlas to see the Act 174 constraints.
- Vermont energy committees network: <https://vecan.net/>

## Mapping and Managing Resources

### Known Constraints

*High priority constraints that limit where energy can be generated.*

Energy generation facilities are not very likely to be developed in Known Constraints areas due to the presence of natural resources that are regulated at the federal, state or local level. Accordingly, these constraints have been removed from the raw resource potential mapping layers. Site-specific study, by the town manager and the town planning commission, is required to ascertain whether one of the mapped constraints truly exists on the site and some sites not captured by the Known Constraints mapping may have such high-priority constraints, depending on the results of site-specific study. The maps are good indicators, but not definitive siting tools. Included:

- Vernal Pools
- DEC River Corridors
- FEMA Floodways
- State-significant Natural Communities and Rare, Threatened, and Endangered Species
- National Wilderness Areas
- Class 1 and Class 2 Wetlands

### Possible Constraints

*Lower priority constraints that may limit where energy can be generated.*

Possible constraints can impact the siting process for generation facilities and should always be considered in planning for these facilities, but do not necessarily preclude placement in corresponding areas. Site-specific solutions are often possible when one of these conditions exists. Site-specific study, by the town manager and town planning commission, is required to ascertain whether one of the mapped constraints truly exists on the site and some sites not captured by the Possible Constraints mapping may have such lower priority constraints, depending on the results of site-specific study. The maps are good indicators, but not definitive siting tools. Included but not limited to:

- Agricultural soils (prime farmland, additional farmland of statewide importance, and additional farmland of local importance)
- FEMA Special Flood Hazard Areas
- Protected Lands (State fee lands and private conservation lands)
- Act 250 Agricultural Soil Mitigation Areas
- Deer Wintering Areas
- ANR's Vermont Conservation Design Highest Priority Forest Blocks (Habitat Blocks 9 & 10)
- Hydric Soils

#### **Local Constraints (see map below)**

*Areas where Brandon discourages renewable energy generation.*

In addition to the known and possible state/regional constraints mentioned above, see Brandon Town Plan (see *Natural Resources* section on pages 47-48), which includes a statement of policies on the preservation of rare and irreplaceable natural areas.

The Town of Brandon has an abundance and variety of valuable natural resources. The environment has played an important role in shaping Brandon's image and provides a continuing public and economic benefit to the community. Economic activities dependent on natural resources, including agriculture and forestry, are described in the Town Plan with policies related to their use and conservation.

In 2019, the Town of Brandon will undertake a community-wide viewshed analysis, to determine which scenic resources it's keen to protect from development. Once that list of scenic resources is generated and included as an appendix to this plan, all proposed renewable energy generation development in these scenic resource areas shall have site specific aesthetic impact analyses completed by a certified landscape professional and paid for by the developer.

Site specific aesthetic analyses will determine whether a proposed generation project will have an undue adverse effect on aesthetics, historic sites, air and water quality, the natural environment, the use of natural resources, and public health and safety.

The Town of Brandon desires to protect its most important landscapes (to be identified as scenic resources or "viewsheds" and eventually listed in its Municipal Plan). In the meantime, all proposed projects, as with other non-energy generation land use, should have a comparable or less of a negative impact on Brandon's pastoral and scenic views of mountains, ridges, and valleys.

#### **Prime Resource Areas**

*Areas with high resource potential and no identified constraints (Known or Possible).*

**Secondary Resource Areas**

*Areas with high resource potential and no Known Constraints, but where at least one Possible Constraint exists.*

**Wind Resource Area (see map below)**

*Areas where there is likely to be sufficient wind at specified heights for utility scale wind energy development.*

The analysis used digital wind speed at various heights (30, 50, and 70 meters) and identified areas with the highest wind speeds at each of those heights. The mapping also considers various other conditions, such as ecological zones that may impact the feasibility of renewable energy development. These conditions are known as constraints. The strongest wind resources are generally located at higher elevations and that is where the state's utility-scale installations are located. But Vermont does have nearly 200 small-scale wind projects ranging from 0.95 kW to 100 kW of generating capacity.

Brandon has decided not to include utility scale wind (greater than 1 MW) in its renewable energy generation targets. Instead of looking at the areas identified on the wind resource map, the town envisions residential scale and commercial scale turbines or windmills in areas throughout Brandon.

This scale of wind generation is referred to as Distributed Wind. Small Distributed Wind turbines can range from 1kW to 100kW (located at homes and farms). Medium turbines range from 101kW to 1MW (at manufacturing plants, schools or other institutions).

Due to anticipated technological advances, small and medium scale wind generation is projected to be feasible throughout most of the town at lower elevations in coming decades.

Brandon is not saying "no" to wind generation. Instead, following town land use policy, it would be most appropriate if small scale and commercial systems were encouraged at low elevations and on towers preferably not to exceed 150 feet in height since most of the identified wind resources are in residential areas of the town.

**Solar Resource Area (see map below)**

*Areas where there is likely to be sufficient solar radiation for solar energy development (solar photovoltaic or PV).*

Brandon is projected to meet its renewable energy generation target with mostly non-utility and non-Standard Offer Program scale solar ( $\leq 500$  kW). Because of the rapid pace of technological advances in the field of PV solar, it is expected that residential, commercial and industrial scale projects will dominate the region's solar generation by 2050.

The GIS-based analysis factored in direction, slope and location of land to mapped areas with high solar radiation potential. Certain areas where development was not possible – such as rivers and roads – were removed. The mapping also considers various other conditions, such as ecological zones that may impact the feasibility of renewable energy development. These conditions are known as constraints. The Town encourages the following when considering solar:

Community Solar: Community solar is a solar PV generation system that provides electricity, net metering, and return on investment to multiple participants. A community solar project—referred to as a solar farm, garden or shared renewable energy plant—is a solar power plant whose electricity is shared by more than one household. Participants subscribe to a portion of the energy produced in the community solar project, along with other residents (or investors). It could be a viable option for some of Brandon’s neighborhoods and businesses.

Screening for Solar: Screening can be natural vegetation and helps block solar arrays from roadside viewing. To keep wildlife corridors open, fencing is not always required. There is precedent in Vermont for non-fenced solar arrays; the posts supporting solar panels are specially protected so that they’re not safety hazards.

Setbacks for Solar: Brandon endorses the minimum setbacks required for ground-mounted solar generation facilities as enumerated in 30 VSA §248(s). See below:

| Minimum Setbacks for Solar                                           |                                                                                       |
|----------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| From a state or municipal highway                                    | 100 feet for capacity exceeding 150 kW;<br>40 feet for capacity between 15 and 150 kW |
| From each property boundary that is not a state or municipal highway | 50 feet for capacity exceeding 150 kW;<br>25 feet for capacity between 15 and 150 kW  |

Impervious Services for Solar: Solar generation facilities of a capacity less than 150 kW are highly encouraged throughout the town, especially on residential and commercial rooftops. Using the analysis provided in the Vermont Department of Public Service Guidance (2017), the 665.12 acres of impervious surface within one mile of existing 3-Phase power lines, can provide more than 83 MW of energy (552.8/ 8 acres per MW = 83.14 MW). The mapping analysis showed that there are 801 acres of impervious surfaces in the town not including residential rooftops. This should be more than enough area to accommodate small scale solar and meet the town’s renewable energy generation target. If the town were to rely only on solar energy generation (just one scenario), it would need just 11.72 MW to meet its municipal renewable generation goal (11.72 MW = 14,369 MWh). As much as 3.3 MW of solar energy that could be generated on residential rooftops: (1,661 homes / 25%) x 4 kW) using a methodology developed by the Bennington Regional Planning Commission.

**Hydro Resource Area (see map below)**

*Areas where there is likely to be capacity to accommodate hydroelectric energy development.*

The mapping shows areas of potential electricity generation from hydro; locations where renewable energy generation would likely be most feasible according to the natural conditions of an area. Existing, powered and existing non-powered dam sites where a generator could be installed or existing hydropower sites where equipment could be upgraded or expanded to provide additional generation (with potential production) were mapped.

The mapping also considers various other conditions, such as ecological zones that may impact the feasibility of renewable energy development. These conditions are known as constraints.

It is important to note that there is considerable time and expense involved with permitting hydropower projects, which are reviewed at the federal level.

**Biomass Resource Area (see map below)**

*Areas where there is likely to be sufficient biomass resources for biomass energy development.*

The mapping shows areas of potential electricity generation from biomass totaling 3,918 acres of prime and secondary biomass resource - locations with high woody biomass potential and where renewable energy generation would likely be most feasible according to the natural conditions of an area.

The mapping also considers various other conditions, such as ecological zones that may impact the feasibility of renewable energy development. These conditions are identified as Known and Possible Constraints in the maps' legends.

**Preferred Areas (see map below)**

*Areas where Brandon encourages solar energy generation.*

As mentioned earlier in this plan, solar generation facilities with a capacity of less than 150 kW are highly encouraged throughout Brandon, especially on residential and commercial rooftops. The town also has selected the following preferred areas for the potential use as utility and Standard Offer Program scale solar (≥ 500 kW):

| <b>Parcel ID</b>   | <b>Grand List ID</b> | <b>Total Acres</b> |
|--------------------|----------------------|--------------------|
| <b>06-01-08.01</b> | 0079-2085            | 21.52 acres        |
| <b>04-01-19</b>    | 0101-0182            | 12.28 acres        |
| <b>02-01-16</b>    | 0001-0520            | 42.82 acres        |
| Totals:            |                      | <b>76.62 acres</b> |

This acreage, plus the 2.8 MW of solar already installed in Brandon, gives the town the potential of 16,120 MWh of renewable energy, which is more than its target of 14,369 MWh. It also does not include several large commercial solar developments that are being proposed in the town which would add to the total of MWh.

**Department of Public Service Preferred Areas**

Where applicable, parcels containing any of these state-preferred areas for renewable energy generation:

- roof-mounted systems
- former brownfield sites
- disturbed areas such as gravel or sand pits
- sealed and sanitary landfills and former quarries and mineral extraction sites



- junk yards
- parking lots
- parking lot canopies over paved parking lots
- previously developed sites
- brownfields and Superfund sites
- areas adjacent to large-scale commercial or industrial buildings
- areas where topographical features or vegetation naturally screen a site from common view

There are an estimated 801 acres of state-defined impervious surfaces in Brandon which is 100 MW/130,000 MWh of potential energy generation that could be added using a solar conversion.

**Grid Infrastructure (see map below)**

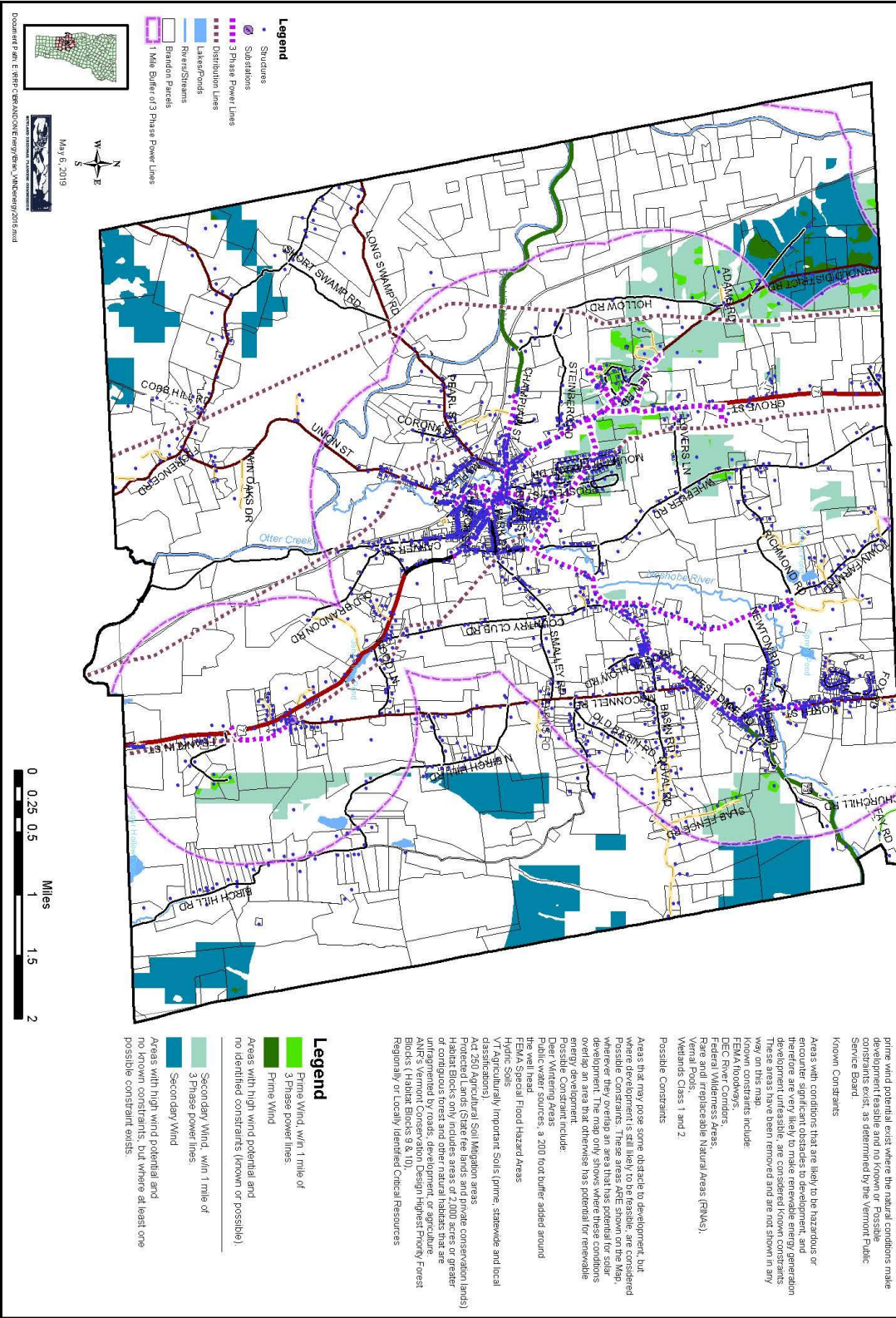
*Current Green Mountain Power grid infrastructure.*

Another key element of the Resource Maps is the location of electric grid infrastructure, including three-phase and other high-capacity distribution lines. The location of transmission and distribution infrastructure was not specifically factored into the mapping analysis or the development of energy generation goals at the regional scale. However, grid infrastructure location and capacity will play a vital role in determining the economic feasibility and timetable for development of a certain site for a renewable energy generation facility.

For more detailed information on grid infrastructure and capacity, Green Mountain Power's "Solar Map" shows the specific capacity of each section of the utility's grid. Red distribution lines indicate there is less than 10% capacity remaining; yellow lines show 10-20% capacity remaining; and green lines indicate more than 20% capacity remaining.

# WIND ENERGY POTENTIAL

Based on Public Service Department Requirements  
Brandon, Vermont



**Methodology**

This map shows areas of potential electricity generation from wind energy. Areas with high potential for energy generation would likely be most feasible according to the natural conditions of an area. This map also considers various other conditions, such as ecological zones, that may impact the feasibility of renewable energy development. These conditions are referred to as constraints. Areas of high potential for energy generation that do not have any development feasible and no known or possible constraints exist, as determined by the Vermont Public Service Board.

**Known Constraints**

Areas with conditions that are likely to be hazardous or encounter significant obstacles to development, and therefore are very likely to make renewable energy generation development unfeasible, are considered known constraints. These areas are shown on the map as follows: Areas that have been shown to be in any way on this map. Known constraints include: FEMA floodways, DEC River Corridors, PDES and Business Areas, Rare and Irreplaceable Natural Areas (RINAs), Wetland Class 1 and 2.

**Possible Constraints**

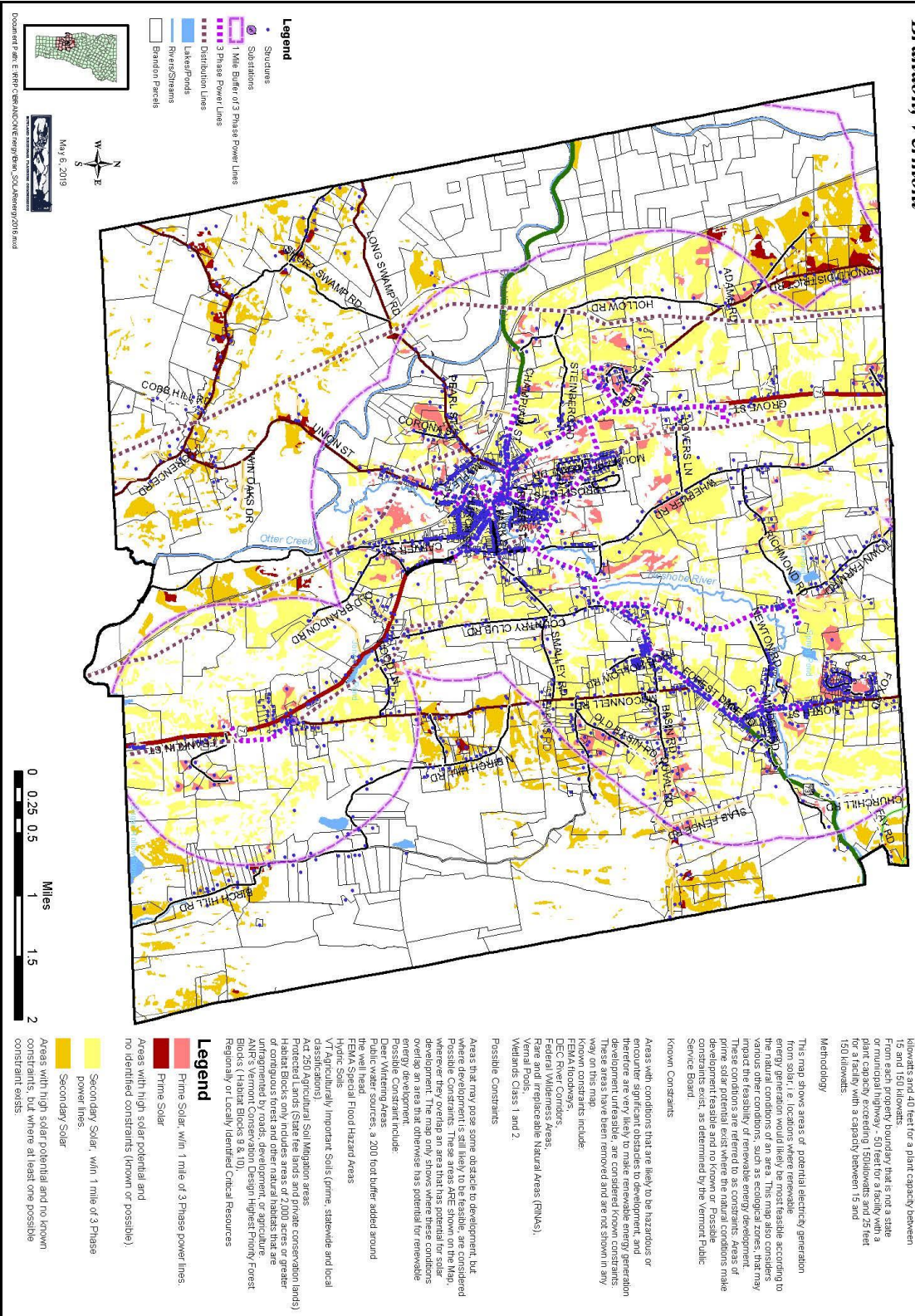
Areas that may pose some obstacle to development, but where development is still likely to be feasible, are considered possible constraints. These areas are shown on the map as follows: Areas that have been shown to be in any way on this map that otherwise has potential for renewable energy development. Possible constraints include: Deer Wintering Areas, Dotted Areas, 200-foot buffer around FEMA Special Flood Hazard Areas, Hydric Soils, VT Agriculturally Important Soils (prime, statewide and local designations), Vermont Agricultural Soil Mapping areas, PDES and Business Areas, State Fee Lands, and State Fee Lands. Habitat blocks only includes areas of 2,000 acres or greater of contiguous forest and other natural habitats that are unfragmented by roads, development, or agriculture. AINR's Vermont Conservation Design Highest Priority Forest Areas (1 Habitat Status 3 & 10) and Vermont Critical Resources Responsibility or Identity Identified Critical Resources.

**Legend**

- Prime Wind, within 1 mile of 3 Phase power lines
- Prime Wind
- Areas with high wind potential and no identified constraints (known or possible).
- Secondary Wind, within 1 mile of 3 Phase power lines
- Secondary Wind
- Areas with high wind potential and no known constraints, but where at least one possible constraint exists.

# SOLAR ENERGY POTENTIAL

Based on Public Service Department Requirements  
Brandon, Vermont



**Setbacks**

Under H 440 passed in 2015, minimum setbacks for solar, ground-mounted systems for public, ground-mounted systems for utility approved from a state or municipal highway - 100 feet for a facility with a plant capacity exceeding 150 kilowatts and 40 feet for a plant capacity between 50 and 150 kilowatts. Boundary that is not a state or municipal highway - 50 feet for a facility with a plant capacity exceeding 150 kilowatts and 25 feet for a facility with a capacity between 15 and 150 kilowatts.

**Methodology**

This map shows areas of potential electricity generation from solar, i.e. locations where renewable energy generation would likely be most feasible according to the various conditions and constraints. Various other conditions, such as ecological zones, that may impact the feasibility of renewable energy development. These conditions are referred to as constraints. Areas of prime solar potential exist where the natural conditions make development feasible and no known or possible constraints exist, as determined by the Vermont Public Service Board.

**Known Constraints**

Areas with conditions that are likely to be hazardous or encounter significant obstacles to development, and therefore are very likely to make renewable energy generation development unfeasible, are considered known constraints. These areas have been removed and are not shown in any way on this map. These include:

- FEMA floodways
- DEC River Corridors
- Federal Wilderness Areas
- Rare and Irreplaceable Natural Areas (RINAs), Wetlands Class 1 and 2

**Possible Constraints**

Areas that may pose some obstacle to development, but are not considered known constraints, are referred to as possible constraints. These areas are shown on the map wherever they overlap an area that has potential for solar development. The map only shows where these conditions overlap an area that otherwise has potential for renewable energy development. These include:

- Public water sources, a 200 foot buffer added around the well head
- FEMA Special Flood Hazard Areas
- Hydric Soils
- Hydric Soils (Regionally Important Soils: statewide and local designations)
- Act 250 Agricultural Soil Mitigation areas
- Protected Lands (State fee lands and private conservation lands)
- Habitat Blocks (only includes areas of 2,000 acres or greater of contiguous forest and other natural habitats that are eligible for the Vermont Conservation Design Highest Priority Forest Blocks (Habitat Blocks 8 & 10), Regionally or Locally Identified Critical Resources

**Legend**

Prime Solar, within 1 mile of 3 Phase power lines.

Prime Solar

Areas with high solar potential and no identified constraints (known or possible).

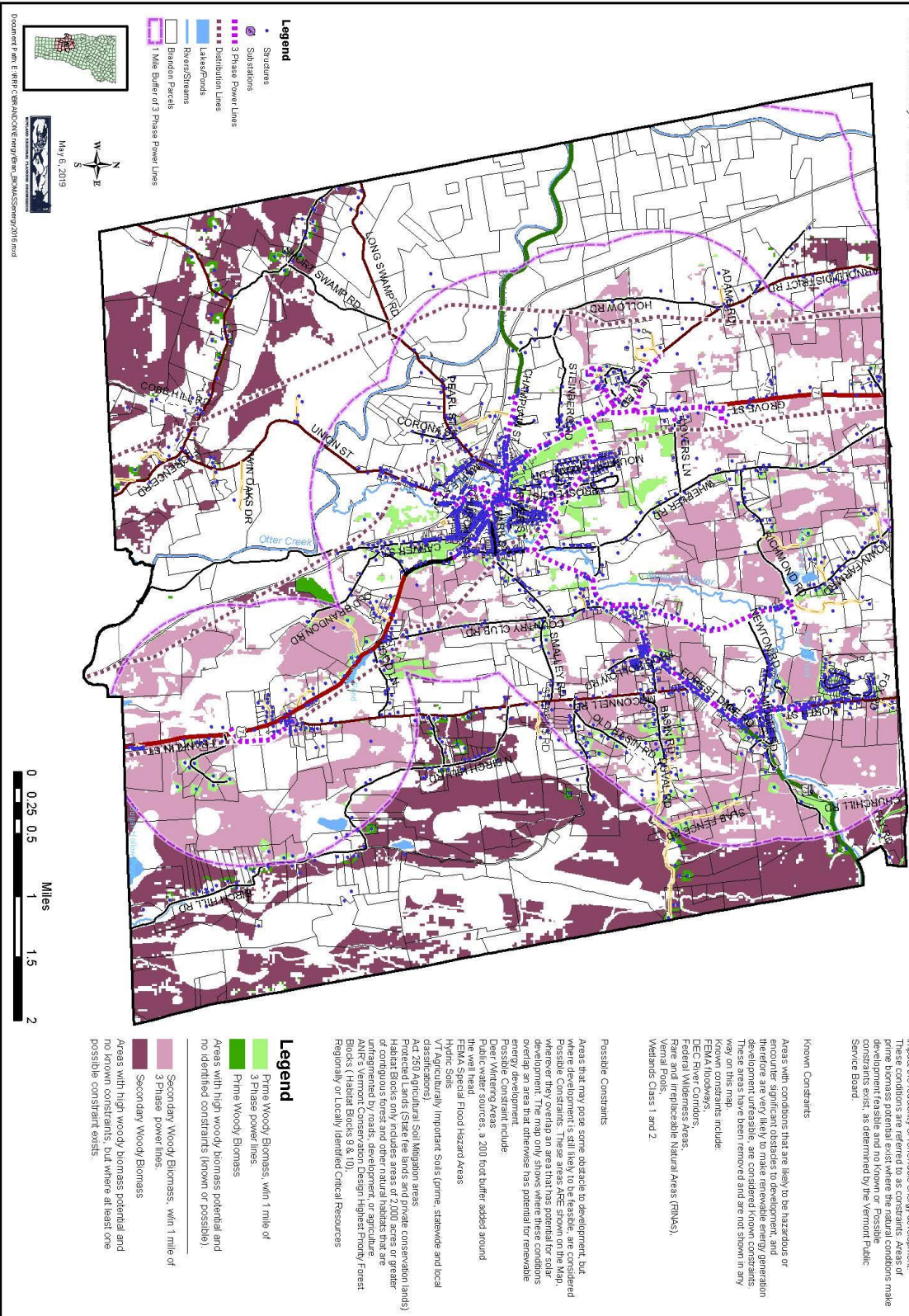
Secondary Solar, within 1 mile of 3 Phase power lines.

Secondary Solar

Areas with high solar potential and no known constraints, but where at least one possible constraint exists.

# BIOMASS ENERGY POTENTIAL

Based on Public Service Department Requirements  
 Brandon, Vermont



**Methodology**

This map shows areas of potential electricity generation from biomass, i.e. locations where renewable energy generation would likely be most feasible according to the natural conditions of an area. This map also considers various other factors that may impact the feasibility of renewable energy development. These conditions are referred to as constraints. Areas of prime biomass potential exist where the natural conditions make development feasible and no known or Possible constraints exist, as determined by the Vermont Public Service Board.

**Known Constraints**

Areas with conditions that are likely to be hazardous or encounter significant obstacles to development, and where development is still likely to be feasible, are considered Possible Constraints. These areas ARE shown on the map, whereas they overlap an area that has potential for solar or wind energy, only the area that overlaps has potential for renewable energy development.

Possible Constraint include:

- Deer Wintering Areas
- Public water sources, a 200' foot buffer added around
- FEMA Special Flood Hazard Areas
- Hydro Soils
- VT Agriculturally Important Soils (prime, statewide and local classifications)
- Act 250 Agricultural Soil Mitigation areas
- Historic Lands (State lands and private conservation lands)
- Historic Sites (State lands and private conservation lands)
- Historic Districts (State lands and private conservation lands)
- Adjacent to contiguous forest and other natural habitats that are unfragmented by roads, development, or agriculture
- ANR's Vermont Conservation Design Highest Priority Forest Blocks (Habitat Blocks 9 & 10),
- Regionally or Locally Identified Critical Resources

**Possible Constraints**

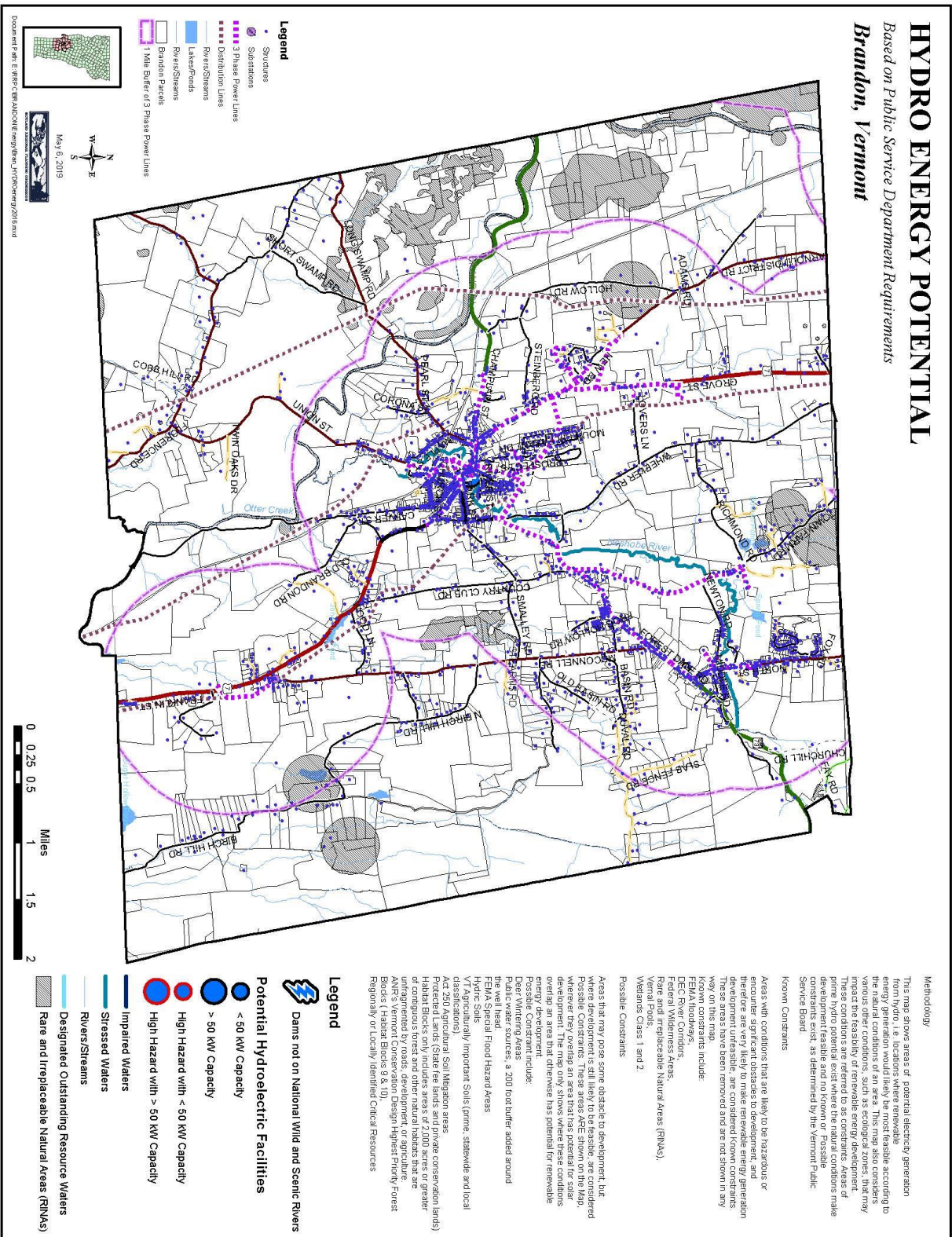
Areas that may pose some obstacle to development, but where development is still likely to be feasible, are considered Possible Constraints. These areas ARE shown on the map, whereas they overlap an area that has potential for solar or wind energy, only the area that overlaps has potential for renewable energy development.

Possible Constraint include:

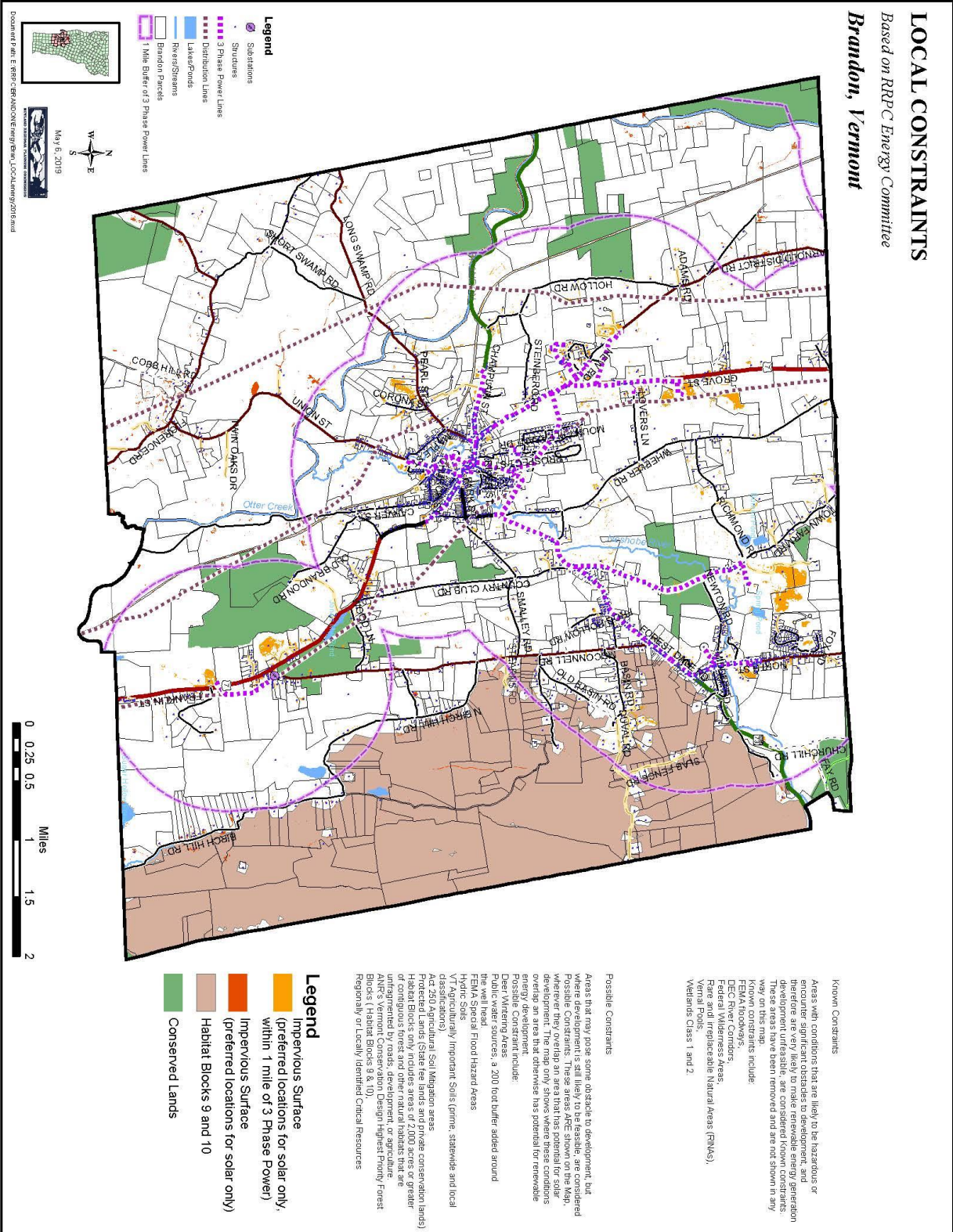
- Deer Wintering Areas
- Public water sources, a 200' foot buffer added around
- FEMA Special Flood Hazard Areas
- Hydro Soils
- VT Agriculturally Important Soils (prime, statewide and local classifications)
- Act 250 Agricultural Soil Mitigation areas
- Historic Lands (State lands and private conservation lands)
- Historic Sites (State lands and private conservation lands)
- Historic Districts (State lands and private conservation lands)
- Adjacent to contiguous forest and other natural habitats that are unfragmented by roads, development, or agriculture
- ANR's Vermont Conservation Design Highest Priority Forest Blocks (Habitat Blocks 9 & 10),
- Regionally or Locally Identified Critical Resources

**Legend**

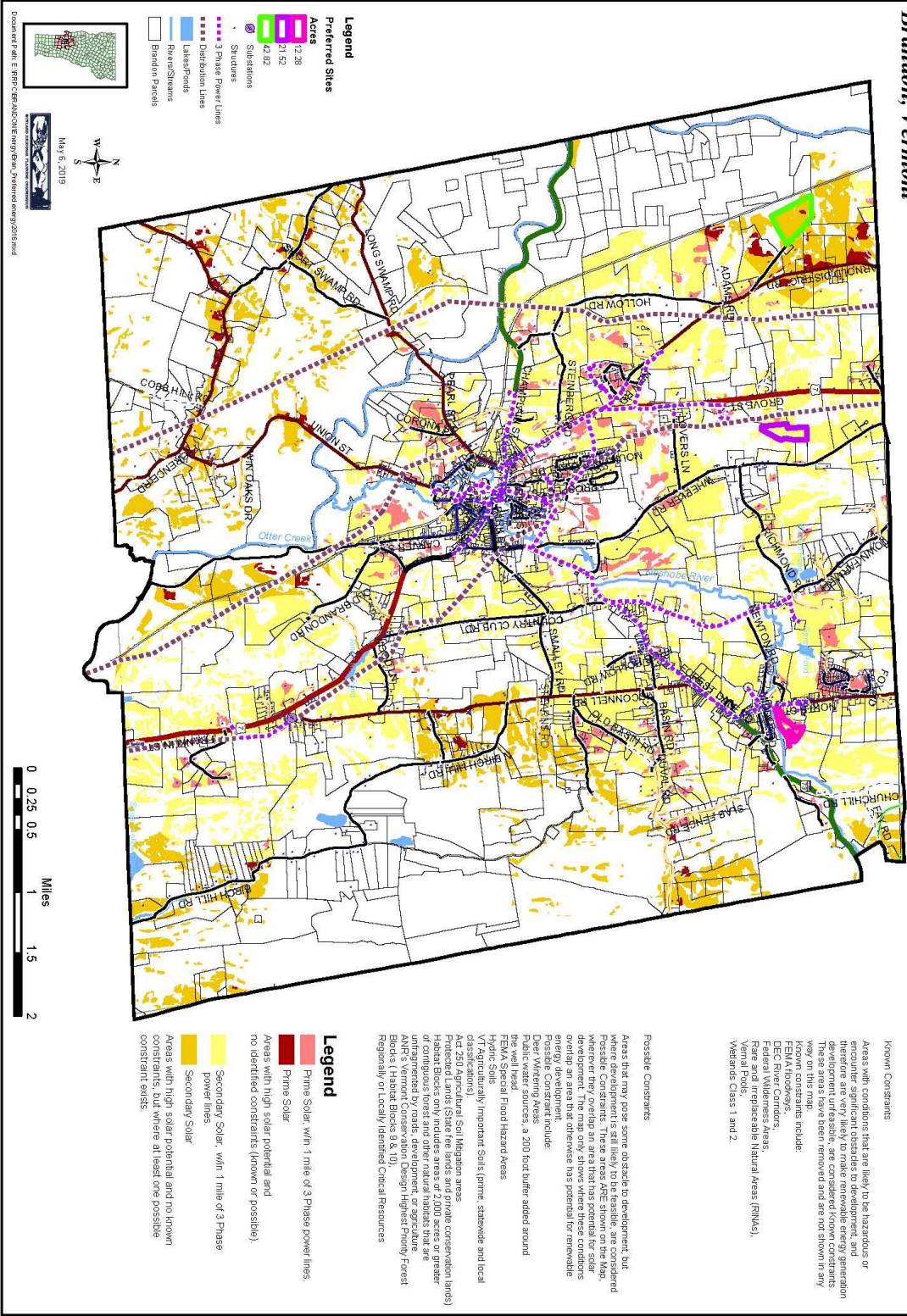
- Prime Woody Biomass, with 1 mile of 3 Phase power lines.
- Prime Woody Biomass
- Areas with high woody biomass potential and no identified constraints (known or possible).
- Secondary Woody Biomass, with 1 mile of 3 Phase power lines.
- Secondary Woody Biomass
- Areas with high woody biomass potential and no known constraints, but where at least one possible constraint exists.

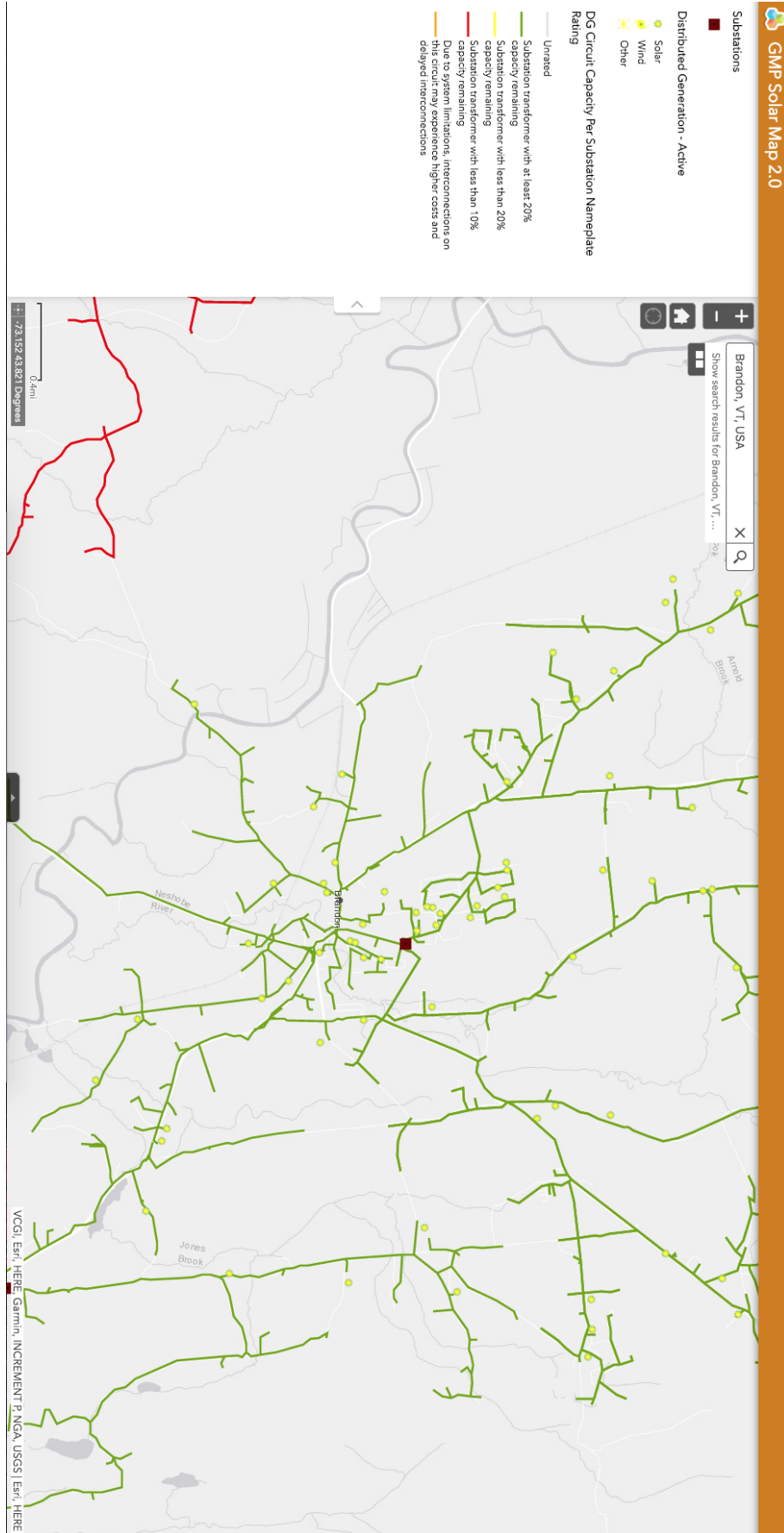


**LOCAL CONSTRAINTS**  
Based on RRPC Energy Committee  
**Brandon, Vermont**



**LOCALLY PREFERRED LOCATIONS**  
 Based on Local Energy Committee  
 Brandon, Vermont







## Energy Strategies and Policies to Achieve Town Targets

The purpose of this section is to identify specific actions that have the greatest potential for Brandon to greatly reduce fossil fuel use in a sustainable manner. Specifically, the following are strategies and policies to advance conservation and efficiency in space and water heating (thermal), and transportation and related land use changes.

In 2018, an Energy Committee was named for the Town of Brandon. The committee and other town officials shall be responsible for the assigned tasks below:

### Conservation and Efficient Use of Energy

*To encourage energy conservation, efficient buildings and the efficient use of energy by individuals and the municipality, the Planning Commission with the assistance of the Energy Committee shall:*

- Implement this plan and track progress on the policies and actions in this plan. This committee's task shall be to promote local residential and commercial efficiency and conservation improvements through coordination of information and technical assistance. This committee shall advocate for appropriate renewable energy generation throughout the town. This committee shall report regularly to the town Select Board. Committee tasks include:
  - Co-sponsor and organize weatherization workshops for homes and businesses for new construction, retrofits, and existing structures.
  - Work with local vendors, state and national programs to facilitate solar /renewable energy options for middle and lower income households.
  - Coordinate with the following programs:
    - "Energy Star" building performance rating system.
    - Education programming and appliance upgrade rebates through Efficiency Vermont.
    - Weatherization assistance provided by BROCC Community Action in Southwestern Vermont and NeighborWorks of Western Vermont.
    - Provide information/resources to promote strategic tree planting to maximize energy benefits.
    - Promote the use of landscaping for energy efficiency.
    - Promote the use of cold climate heat pumps with education/presentations in coordination with Efficiency Vermont and electric utilities.
    - Support the use of ground-source heat pump heating and cooling systems for new construction.
    - Promote municipal solar, school solar, and community solar or other renewable energy projects on town land and take steps to help viable projects move forward.

*The Town of Brandon, including the Town Manager and Zoning Administrator, shall:*

- Promote the use of the residential and commercial building energy standards by distributing code information.
- Encourage new municipal and existing town buildings to meet Leadership in Energy and Environmental Design (LEED) standards and encourage current structures to become more energy efficient.

*To promote the decreased use of fossil fuels for heating, the Planning Commission with the assistance of the Energy Committee shall:*

- Address fossil fuel reductions between 2015 and 2050 by incorporating solar production in order to reach its 2050 municipal target for renewable energy generation. All other alternative sources of energy would reduce fossil fuel consumption beyond the 90by50 target. Other renewable sources of energy may include small hydro projects, biomass and small wind.
- Support viable large-scale, regional, wood-fired heating districts and identify resource partners that make, sell and/or transport wood chips and/or wood pellets that could be used in a district heating system.
- Research the possible development of appropriately sited, cost-effective bio-methane facilities and related infrastructure.

*To demonstrate the town's leadership by example with respect to the efficiency of municipal buildings, the Town Office shall:*

- Distribute (in person and via the town's website) utility energy transformation (reduction) information to promote greater energy efficiency as well as information regarding residential and group/community solar generation.

## **Transportation**

*To promote reduced transportation energy demand and reduced single-occupancy vehicle use, increased use of renewable or lower-emission energy sources for transportation, and the increased use of public transit, Brandon shall:*

- Promote the expansion of service of the Marble Valley Regional Transit District in the town.
- Continue close collaboration and promotion with the MVRTD to encourage greater ridership by town residents.
- Make public transportation information/resources available at town buildings and facilities.
- Promote the Go Vermont webpage, which provides rideshare, vanpool, public transit, and park-and-ride options.
- Encourage municipal employers to have the necessary equipment and training to facilitate conference calls, webinars, and other virtual meetings and information sharing.

*To encourage a shift away from gas/diesel vehicles to electric or other non-fossil fuel transportation options, the Energy Committee shall:*

- Promote the Drive Electric Vermont webpage which connects users to financial incentives, dealers, and recharging stations for EVs.
- Encourage major employers in the community that operate private fleets to switch some of their vehicles to alternative fuels, such as electric or biodiesel.
- Use town-wide events to promote different kinds of EVs and provide people interested in purchasing them an opportunity to talk with fellow community members who own them.
- Partner with Drive Electric Vermont, the Vermont Clean Cities Coalition, and other organizations to promote the expansion of workplace charging.
- Promote the installation of DC fast-charging infrastructure at strategic locations throughout town.
- Promote the installation of EV charging infrastructure as part of new development or redevelopment, especially for developments subject to Act 250.
- Encourage the installation of EV charging infrastructure that is accessible to school buses, municipal vehicles, snow plows, fire and other emergency vehicles, and farm vehicles.

- Encourage the development of additional refueling stations for alternative fuels, such as biodiesel and renewable natural gas (a form of biogas from methane), for both private and public transportation fleets by sharing station development costs between public and private interests.

*To encourage the development of walking and biking infrastructure, the Select Board, the Planning Commission and the Town Manager shall:*

- Encourage local planners, public works department, and others to implement complete streets concepts and provide sample language to include in municipal ordinances, regulations and bylaws to ensure that site plan reviews include pedestrian and bicycle access as well as safety and traffic-calming measures.
- Assess existing roads for their ability to accommodate safe and convenient walking and biking. Areas for improvement shall be prioritized and funding sought to align these areas with Complete Streets guidelines.
- Extend sidewalks and other types of bicycle and pedestrian facilities to high use areas and areas of new development.
- To better accommodate travel by bicycles, maintain a smooth roadway surfaces and sweep to remove sand, dirt, and trash as needed.
- Review state transportation projects in the town to ensure that Complete Streets are implemented.
- Use the Act 250 hearing process to ensure that local site plans include adequate bike and pedestrian infrastructure and safety measures.
- Close gaps in the transportation network by providing shared use corridors between important school and work destinations and nearby housing or between schools and downtowns or village centers and commercial districts.

*To lead by example by making municipal transportation more efficient, the Select Board and the Town Manager shall:*

- Purchase energy efficient municipal vehicles when practical.
- Encourage the installation of EV charging stations at the Town Office and other town buildings and facilities.

## **Land Use**

*Brandon is committed to land use policies that result in the conservation of energy, demonstrate a commitment to reducing sprawl/strip development, minimizing low-density development and making compact development more feasible. The Planning Commission, with the assistance of the Energy Committee, shall:*

- Promote low-impact development and green infrastructure practices for new development.
- Provide water and sewer services to areas that would allow infill development in existing developed residential, commercial and industrial areas.
- Prepare a plan for improving pedestrian and bike connections and for the consideration of funding through a capital budget and program.
- Review and update the town Future Land Use Map to reflect the vision and goals of this municipal plan.
- Work with the Select Board to develop a long-term master plan to address the infrastructure necessary for compact development, e.g., sewer and water, pedestrian and biking facilities and parking.
- Work with regional planning groups such as REDC and RRPC to promote Brandon as a site for energy efficient business development and green transportation.

- Accommodate the safe and effective use of renewable energy systems (residential and commercial scale) and consider town policies that address design, height, safety, siting, sound and decommissioning.

### Conclusion

The Town of Brandon's Energy Committee is hopeful that this document will provide energy benchmarking and a renewable roadmap for a more sustainable Brandon and, ultimately, a more sustainable Vermont. This Energy Plan is meant to be a living document that is updated with new data and, as technology advances, new roadmaps to reach Vermont's 90% renewable energy goal by 2050. In order to measure impact in the short, medium and long term, the Energy Committee commits to annually reviewing the aforementioned energy policies and strategies and their impact on the town and its residents.

### Sources

#### Data Sources

Efficiency Vermont, 2016  
LEAP (Long-range Energy Alternatives Planning), 2017  
U.S. Census American Community Survey, 2011-2015  
U.S. Energy Information Administration, 2017  
Vermont Department of Labor, 2016  
Vermont Department of Public Service, 2017  
VTrans (Vermont Department of Transportation), 2016  
Vermont Community Energy Dashboard, Energy Action Network, 2017

**Appendix - QUESTIONNAIRE****1. Owner Information**

A. Owner intends to construct a \_\_\_ kW (sites >15kW need to fill out the form below; the form is not necessary for sites <15kW) at the following address or legal description (system site):

B. This site is on (circle one):

- Public Land
- Private land

C. Is this a residential or commercial installation?

D. This site does or does not require local permits or improvements in public roads/infrastructure improvements to access/operate the installation? If yes, please describe.

E. Has owner secured rights to use the above-mentioned site?

F. Please describe what benefits this project would bring to the Brandon community.

G. This installation will be (circle one):

- net metered
- grid tied

H. If net metered who will be receiving the generation credits?

I. If this is a secure or restricted access site, how will security be handled? Will emergency personnel be able to access this site?

J. Who owns the RECs (Renewable Energy Credits)? Will the RECs be sold?

## **2. Known and Possible Constraints**

A. There are state and regional constraints on locating renewable energy installations. Please indicate if this site does or does not conflict with these known or possible constraints.

1. *Known Constraints: vernal pools; DEC river Corridors; FEMA floodways; State-significant Natural Communities and Rare, Threatened and Endangered species areas; National Wilderness Areas; Class 1 and Class 2 wetlands.*
2. *Possible Constraints: Agricultural soils; FEMA Special Flood Hazard Areas; Protected lands (state fee lands and private conservation lands); Act 250 Agricultural Soil Mitigation Areas; Deer wintering areas; ANR's Vermont Conservation Design Highest Priority Forest Blocks; Hydric soils.*

B. The Town of Brandon has preferences based on the above-mentioned list. **Please include a site plan that shows location of renewable energy project in relation to the parcel boundaries, the converters and necessary power infrastructure to access the grid from this location. Indicate here what utilities or services would be required by the City:**

Brandon infrastructure and population density plans strive to concentrate residential growth to limit the impact of service infrastructure required. Any commercial proposals within these targeted population centers would need to be weighed against the future use of these spaces for population and municipal needs. Project will need to follow existing zoning procedures and practices.

## **3. Project Details**

A. Type of generation:

B. Expected kW/kWh annual generation:

C. Is this a project that might be done in phases?

D. Are there any other phases planned for this site in the future?

E. Zoning variance required?

F. If located on public land, are public approvals required?

G. Expected construction start date:

H. Expected completion date:

I. Expected site maintenance plan:

J. Town of Brandon project timeline:

- Completed review by developer and town manager and planning commission
- Pre-construction site visit
- Final visit after PUC certificate of good issued and review of scope of project changes
- Midpoint construction visit
- Final preoperational visit
- Annual operational visits (to ensure best possible service to investors, the Town of Brandon will request economic and energy updates from the company on an annual basis)

#### **4. References and Tools**

- The Vermont Community Energy Dashboard: <https://www.vtenergydashboard.org/>
- VT Energy Dashboard (Brandon's baseline): <https://www.vtenergydashboard.org/my-community/brandon/progress>
- The Renewable Energy Atlas: <https://www.vtenergydashboard.org/energy-atlas>. This is a helpful tool for communities and people interested in exploring and identifying energy projects, known or possible constraints, and sites best suited for renewable energy deployment. Search for Brandon and find the energy resources deployed and select Layers on the right-hand side of the Atlas to see the Act 174 constraints.
- Vermont energy committees network: <https://vecan.net/>