TOWN OF BRISTOL- ENHANCED ENERGY PLAN

Approved by Bristol Planning Commission, 4 February 2020

Introduction

Intent of this Energy Plan

The Town of Bristol recognizes our individual and collective responsibility to use energy efficiently and reduce the impacts of that energy use. Bristol believes it serves its citizens' interests by conserving energy, reducing our consumption of non-renewable energy and shifting our usage to carbon free or carbon neutral renewable energy sources. It also believes the Bristol Town Plan must create a vision and clear policy statements for the town to follow concerning energy conservation renewable energy choices and energy generation. With this Plan, the Town of Bristol intends to demonstrate its commitment to achieving energy standards in both policies and implementation measures in clear, action-oriented language.

One way for Bristol to affect energy policies is to meet the municipal determination standards for enhanced energy planning enabled in 24 V.S.A. 4352. By pursuing enhanced energy planning Bristol agrees that its energy plan will further regional and state energy goals, including the target of having 90% of the energy used in Vermont obtained through renewable sources by 2050 ("90 x 50") and the following statutory requirements:

- **Vermont's greenhouse gas reduction goals under 10 V.S.A. § 578(a);**
- **Vermont's 25 by 25 goal for renewable energy under 10 V.S.A. § 580;**
- **Vermont's building efficiency goals under 10 V.S.A. § 581;**
- **State energy policy under 30 V.S.A. § 202a and the recommendations for regional and municipal energy planning pertaining to the efficient use of energy and the siting and development of renewable energy resources contained in the State energy plans adopted pursuant to 30 V.S.A. §§ 202 and 202b (State energy plans); and the**
- **Distributed renewable generation and energy transformation categories of resources to meet the requirements of the Renewable Energy Standard under 30 V.S.A. §§ 8004 & 8005;**

To receive a positive determination of energy compliance, an enhanced energy plan must be duly adopted, regionally approved and must contain the following information:

- An analysis of current energy resources, needs, scarcities, costs, and problems;
- Targets for future energy use and generation;
- "Pathways," or implementation actions, to help the municipality achieve the established targets;
- Mapping to help guide the conversation about the siting of renewables.

A positive determination of compliance with the requirements of enhanced energy planning will enable Bristol's Plan to achieve "substantial deference" from the Public Utilities Commission in Section 248 applications for energy generation facilities (ex. wind facilities, solar facilities, hydro facilities, etc.) under Criteria (b)(1)-Orderly Development of the criteria the Public Utilities Commission uses to evaluate generation and transmission projects seeking Certificates of Public Good authorizing the proposed construction of the proposed project. Substantial deference increases the respect the Public Utilities Commission will need to provide to clearly articulated policies in this plan (The current standard is "due consideration").

This enhanced energy plan includes required background data and analysis, targets, and associated mapping. Topics covered include energy conservation and efficiency as it relates to thermal and electrical energy usage, transportation and land use planning. The plan also includes energy generation and siting standards. In addition to satisfying the required criteria, this plan also contains a number of policies and statement proclaiming the type, size and locations in which Bristol will support energy generation and the goals, policies and actions Bristol will undertake to help implement conservation and efficiency policies to help meet the State's 2016 Comprehensive Energy Plan targets:

- **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.**

In accordance with the Addison County Regional Plan, the use of fossil fuels, including fuel oil, propane gas and non-renewable natural gas, will need to be significantly reduced by 2050. Over the last several years, the Vermont Gas company has extended a natural gas pipeline through Addison County, with the option to expand residential, commercial, and industrial service to the most densely populated areas of the region, including Bristol. As a result, the consumption of natural gas is projected to rise slightly in use as it becomes available in the Region. Nonrenewable natural gas is expected to serve as a short-term fuel for the Region as it replaces other fossil fuel sources and has been incorporated into the Long Range Energy Alternatives Planning (LEAP) 90x50 model conducted by the Vermont Energy Investment Corporation (VEIC). Vermont Gas is expected to utilize the infrastructure it offers to promote economic development for manufacturing, administer an aggressive weatherization program, and to incorporate renewable natural gas, made from composting agricultural waste from local farmers and food manufacturers, mainly cow manure and/or food waste. Whether consumers and businesses choose to convert to natural gas will be their own choice.

Bristol Energy Committee

The Bristol Energy Committee was established in 2007 by the Select Board with the mission to review the energy use in the Town of Bristol and make recommendations based on energy conservation and efficiency; consulting with and advising the town about energy related issues in zoning and alternative energy; assisting residents and businesses in understanding and reducing their energy use; working with the municipality in exploring energy conservation and efficiency; and exploring energy conservation and efficiency in transportation.

Outline of this Plan

This plan breaks Bristol's energy demand and usage into the following four chapters:

1. **Section I**, Introduction: Introduction and Summary of Bristol's Enhanced Energy Plan;
2. **Section II**, Thermal Use: This Chapter focuses on Energy used for space heating.
3. **Section III**, Electrical Use: This Chapter focuses mostly on energy used for operating equipment and facilities, but electrical use is predicted to expand significantly to include transportation and heating equipment as indicated in the first and fourth chapters.
4. **Section IV**, Transportation Use: This Chapter focuses on energy used for Transportation, and,
5. **Section V**, Land Use, Generation and Transmission: This Chapter focuses on planning land uses to reduce vehicle trips and to site energy generation and transmission resources.

Each chapter noted above will be broken into three subsections:

1) The first subsection, entitled, "Use Analysis" will analyze current usage data in Bristol for each of the four energy sectors. It includes charts of usage and a discussion concerning the usage data.
2) The second subsection will look at future projections. This subsection, entitled "Targets" contains projections of usage targets. In 2016 Addison County Regional Planning Commission worked with the Vermont Energy Investment Corporation (VEIC) and the Vermont Department of Public Service to develop regional targets for future energy use and generation. The intent of these targets is to meet the State of Vermont's 90 x 50 target. The targets in this plan represent one scenario of what meeting this target may look like. However, there could be numerous different ways for Bristol to achieve the 90 x 50 target. For more information about the regional targets, please see the Addison County Regional Energy Plan (http://acrpc.org/programs-services/energy/).
3) The third subsection in each chapter provides goals, policies and recommended actions to implement this plan. Additionally, the Land Use, Generation and Transmission chapter will include a mapping analysis of Bristol's energy resources and constraints and a siting policy for new generation.

Thermal Energy

Goals

1. **Reduce energy needs for heating structures.**
2. **Transition from non-renewable energy sources to renewable energy sources.**
3. **Maximize weatherization of residential households, commercial establishments and municipal facilities.**

Thermal Use Analysis

Thermal Use

An estimate of current residential thermal energy demand in Bristol, based on data from the American Community Survey (2011-2015), is shown in Table 1. The data shows that the largest number of residences in Bristol currently heat with fuel oil (about 55.9%), followed by propane (24.9%) and wood (18.2%). Together these three heating sources account for nearly all (over 99%) of residential thermal heating fuel usage in Bristol.

Table 1. Current Municipal Residential Heating Energy Use

Fuel Source	# Households Using (ACS 2017)	Municipal % of Households	Residential Square Footage Heated	BTU's used (in Billions)
Utility Gas (Natural Gas)[1]	10	0.6%	31,900	1.914
Propane	408	24.9%	507,596	30.456
Electricity	8	0.5%	18,432	1.106
Fuel Oil	917	55.9%	1,535,620	92.137
Coal	0	0.0%	0	0.000
Wood	299	18.2%	536,576	32.195
Solar	0	0.0%	0	0.000
Other	0	2.5%	60,912	3.655
No Fuel	0	0.0%	0	0.000
Total	**1642**	**100.0%**	**2,691,036**	**161.462**

[1] The survey shows that 0.6% of households' heat with natural gas. However, since that fuel source is not currently available in Bristol, this data is likely an error in response and those respondents likely heat with propane.

Both fuel oil and propane gas constitute fossil fuels. In order to meet the 90 x 50 goal, their use will need to be significantly reduced by 2050. Making homes more thermally efficient is one way to reduce fossil fuel use. Another is to improve the technology to make it work more efficiently. A final option is to replace fossil fuel sources with renewable energy sources; Wood constitutes a renewable resource that can be carbon-neutral when forests are managed to allow the recapture of released carbon. Productive forestland is abundant in much of Bristol and locally produced firewood is an important source of thermal energy. Electricity produced from renewable sources can also provide efficient thermal heat through heat pumps and other devices. The cost of these changes and limited financial programs, both for capital investment in new equipment and the price of the fuels being used, constitute the major barrier to transition. While the Town of Bristol has little control over the costs of energy production, it can work to encourage energy conservation, energy efficiency and lower local generation costs.

Estimates for commercial and industrial thermal energy use are difficult to calculate. An estimate of total commercial energy use (thermal and electricity) is provided in Table 2 and based on data from the Vermont Department of Labor (VT DOL) and the Vermont Department of Public Service (VT DPS).

Table 2. Current Town Commercial Energy Use

	# Commercial Establishments*	Estimated Thermal Energy used per Commercial Establishment ** (in Billions of BTUs)	Estimated Thermal Energy used by Commercial Establishments (in Billions of BTUs)
In Town of Bristol	109	0.725	79.03

* (VT Dept. of Labor data) **(VT Dept. of Public Service data)

As the table immediately above shows. Bristol has a limited number of commercial establishments. Further analysis of electrical use in the next Section and depicted in Table 3, below calculates that in total, residential structures consume twice as much electrical energy as the commercial entities within town. Accordingly, most of the thermal energy changes that will need to take place in Bristol to meet the targets will need to be done by individual homeowners.

Energy conservation is an important way to reduce energy use and costs in Vermont. Many homeowners in Bristol with older larger homes, particularly in the Village Area, face the challenge of working in finished and confined spaces that drive up weatherization costs. A wide variety of state and federal subsidies and rebates are currently available for Vermont residents to conserve energy. Efficiency Vermont, the nation's only efficiency utility, has an informative home page at www.Efficiencyvermont.com. Visit it to learn about their current programs, including energy audits, incentives for Home Performance with Energy Star, information on appliances and compact fluorescent and LED bulbs, building an Energy Star home, home heating help, rebate information, and Efficiency Vermont's reference library.

The state of Vermont has residential energy standards. Officially called the "Residential Building Energy Standards" (RBES), the Residential Energy Code is a minimum standard of energy efficiency for all new residential construction in Vermont. The Vermont Residential Energy Code Handbook edition 4.1 March 1, 2015. REBS encompasses two requirements:

1. A technical requirement that includes minimum standards for energy-efficient building components and construction practices, and,
2. A certification requirement for reporting compliance. Upon completion state law requires every Vermont builder to self-certify that the home complies with the Code as built. The builder must complete and sign a certificate and submit it to the Town Clerk for filing. This should be on record before the Zoning Administrator issues a Certificate of Occupancy.

Thermal Targets

Thermal targets for Bristol include increasing weatherization of homes, increasing use of efficient wood heat systems and switching to efficient heat pump systems. See tables below for calculations of changes necessary to meet the 90 X 50 State target.

Table 3A. Residential Thermal Efficiency Targets	2025	2035	2050
Residential - Increased Efficiency and Conservation (% of municipal households to be weatherized)	2%	9%	47%

Table 3B. Commercial Thermal Efficiency Targets	2025	2035	2050
Commercial - Increased Efficiency and Conservation (% of commercial establishments to be weatherized)	17%	25%	47%

Table 3C. Thermal Fuel Switching Targets (Residential and Commercial) - Wood Systems	2025	2035	2050
New Efficient Wood Heat Systems (in units)	6	11	69

Table 3D Thermal Fuel Switching Targets (Residential and Commercial) - Heat Pumps	2025	2035	2050
New Heat Pumps (in units)	160	386	761

To illustrate the magnitude of change necessary to meet the target of 90% renewable energy use in Bristol, targets have been calculated for each of the three major strategies to reduce or change the type of fuel used for residential and commercial space-heating. In order to hit the targets, by 2050 many property owners in Bristol will need to have made significant improvements to their homes and businesses. Almost half of the houses and businesses in Bristol will need to have been weatherized to conserve energy by using it more efficiently to heat those spaces. Additionally, at least a quarter of homes currently using wood as a heating source will need to invest in new technology to burn wood more efficiently.

Thermal Pathways to Implementation

Given the significant changes noted in the previous section, Bristol will need to promote the conservation of energy and switch fuels in order to meet statewide targets, the Town has identified the following statements of policy and implementation actions:

Statements of Policy

1. Support energy conservation efforts and the efficient use of energy by individuals and organizations.
2. Promote energy efficiency and increased use of renewable energy in all buildings.
3. Demonstrate the municipality's leadership by increasing the energy efficiency of municipal buildings.
4. Support the conversion of non-renewable energy sources.
5. Utilize wood as a renewable energy resource, balanced with support for conservation of forestland to assure regenerative growth to recapture carbon.

Implementation Actions

1. Coordinate with Efficiency Vermont and other weatherization service providers to encourage Bristol residents to participate in weatherization programs.
2. Promote the use of the residential and commercial building energy standards by asking the Zoning Administrator to distribute information about Vermont's Energy Codes to permit applicants and explaining options for energy efficiency.
3. Conduct an energy audit of municipal buildings to identify weatherization retrofits and consider the recommendations for incorporation into the municipal capital budget.
4. Explore opportunities and pursue funding to upgrade efficiencies in all municipal buildings. and encourage efficiency measures in private residential and commercial buildings
5. Pursue external funding to support the conversion of municipal buildings to efficient, and renewable heat sources.

Electrical Use

Goals

1. Conserve renewable and nonrenewable energy resources.
2. Reduce reliance on nonrenewable energy sources, and shift reliance to renewable electric energy sources.
3. Work with local electric and efficiency utilities to plan for increased electric demand.

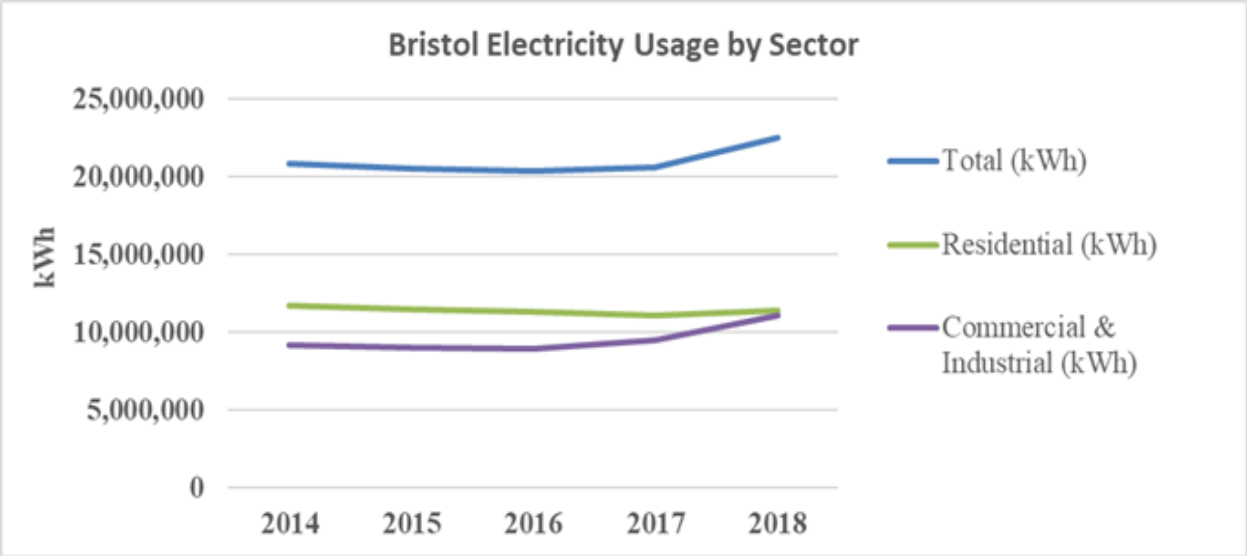
Electrical Use Analysis

Electricity in the town of Bristol is provided by Green Mountain Power Corporation. Electricity use reported by the utility for Bristol is shown in Table 4 and the accompanying figure.

Table 4. Electricity Use

Use Sector	2014	2015	2016	2017	2018
Commercial and Industrial (kWh)	9,151,385	9,011,409	8,966,766	9,527,660	11,082,129
Residential (kWh)	11,693,336	11,477,958	11,359,288	11,066,677	11,431,724
Total (kWh)	20,844,721	20,489,367	20,326,054	20,594,337	22,513,853

(Data from Efficiency Vermont and Green Mountain Power)



Electrical Targets

In order to reach state targets, Bristol will need to promote efficiency and conservation to impact the amount of electricity that it uses. Electrical consumption in Bristol is nearly evenly split by commercial and residential customers, so achieving the targets will require both individual home owners and businesses to increase the efficiency of the electrical fixtures, motors, bulbs, and appliances used in their homes and facilities.

However, even with significant efficiency steps taken by businesses and residents, Bristol's electrical usage may increase, in part because many of the new technologies needed to reduce fossil fuel consumption, like heat pumps and electric cars. This strategy only works to reduce greenhouse gases if the electricity is derived from renewable generation. Table 5, below, shows that Bristol must increase its efficiency and conservation by nearly 60% by 2050 to meet the proposed targets. Technological advances, like better fuel or motor efficiency may produce some of this efficiency. However, this plan recognizes that Bristol and its residents would need to make significant improvements to meet the targets.

Table 5. Electricity Efficiency Targets	**2025**	**2035**	**2050**
Increase Efficiency and Conservation	10.8%	37.2%	59.2%

Electricity Pathways to Implementation

Given the significant changes, noted above, Bristol will need to promote the conservation of energy and increase efficiency in order to meet statewide targets. The town has identified the following statements of policy and implementation actions:

Statements of Policy

1. Support energy conservation efforts and the most productive use of energy by promoting the installation of efficient electrical appliances and equipment.
2. Promote energy efficiency in all buildings, especially new and renovated structures.
3. Support the use of electric heat pump systems for heating and cooling.
4. Encourage LED lighting and the most current technology for lighting.
5. Encourage monitoring to evaluate and improve electricity use.

Implementation Actions

1. Promote the use of the residential and commercial building energy standards by asking the Zoning Administrator to distribute information about Vermont's Energy Codes to permit applicants and explaining options for energy efficiency.
2. Plan for and encourage electric vehicle charging infrastructure in the community.
3. Investigate the installation of municipal solar and/or wind net-metering facilities to offset municipal electric use.
4. Support installation of community-based renewable energy project(s) to allow Bristol's citizens to participate in the economic benefits of local energy production.
5. Explore opportunities and pursue funding to upgrade efficiencies in all municipal buildings.
6. Encourage the incorporation of electric vehicle ready standards into building code.

Transportation

Goals

1. **Reduce reliance on nonrenewable energy sources such as oil and gas, and shift reliance to renewable energy sources.**
2. **Reduce vehicle miles traveled per capita through promotion of rideshare, vanpooling, and car-sharing initiatives.**
3. **Encourage safe and convenient walking and biking.**
5. **Encourage use of public transportation to increase public transit ridership.**

Transportation Use Analysis

The largest portion of energy used in Addison County is for transportation. As a result, transportation simultaneously presents a great challenge and opportunity to affect energy use. In Vermont more than one-third of all energy consumed is for transportation, and 75% of that energy is consumed by passenger vehicles alone. Based on the number of registered vehicles in Bristol, assuming average vehicle miles travelled, gas mileage per vehicle and assumed gas prices at their current level, Bristol residents spend over $1.4 million dollars per year on residential vehicle trips. Adapting local infrastructure to provide for choices other than single family vehicles can reduce vehicle miles and increase efficiency savings for individuals. In addition, converting vehicles to renewable fuels like biodiesel produced locally could help reinvest some that money in the community. Table 6, below, estimates Bristol's fuel usage for passenger vehicles (not including heavy trucks or farm vehicles).

6. Current Municipal Transportation Energy Use

Variable	Quantity	Information Source
Total # of Vehicles	2,972	American Community Survey 2016
Average Annual Miles per Vehicle	11,356	VTrans 2017 Energy Profile
Approximate Total Miles Traveled	33,750,032	
Average Realized MPG	18.6	VTrans 2017 Energy Profile
Total Gallons Use per Year	1,814,518	
Transportation BTUs (Billion)	218	
Average Cost per Gallon Gasoline	$2.78	VTrans Fuel Prices 2018
Total Gasoline Cost per Year	$5,044,359	

On average, Bristol's citizens average almost two cars per household due to the relative rural nature of the Town and surrounding area. If we divide the total amount spent on gasoline by the number of households, it shows the average household spends approximately $3,000 per year on just gasoline.

Transportation Targets

As the Tables below show, to meet the proposed targets, by 2050, more than 4 out of 5 residential vehicles in Bristol will need to run on renewable energy. Additionally, most commercial vehicles and farm equipment will need to switch to renewable energy as well.

Table 7A. Use of Renewables - Transportation	2025	2035	2050
Renewable Energy Use - Transportation	2.7%	18.2%	83.5%

Table 7B. Transportation Fuel Switching Target - Electric Vehicles	2025	2035	2050
Electric Vehicles	265	1804	3,518

Table 7C. Transportation Fuel Switching Target - Biodiesel Vehicles	2025	2035	2050
Biodiesel Vehicles	58	99	142

However, converting fuels, but primarily relying on single family vehicles can only produce limited reductions in energy use. In order to reduce vehicles miles travelled, Bristol should consider actions that support personal choices to reduce driving, including supporting local high-paying jobs, building alternative transportation infrastructure and promoting more compact building options in specific areas close to necessary services.

More than half of Bristol's employed residents travelled to work outside of town – many to Middlebury (~20%), Vergennes (~5%), and Burlington or South Burlington (~14%)- a pattern that is expected to continue. Carpooling would be beneficial for these residents not only in fuel conservation, but also in reduced wear and tear and maintenance on vehicles. ACTR offers a Rideshare program that allows area residents to match their commuting needs with neighbors interested in carpooling. Based on 2011 survey results of 84 residents, 50 residents never carpool, and 33 said they wouldn't consider it, even if it were an option. Giving up flexibility, having small children, and having a varying schedule were reasons why residents would not consider this option.

Offering increased public transportation options is an important way for residents and the whole region to cut down on transportation costs and energy consumption. Bristol is serviced by Addison County Transit Resources (ACTR) and more recently by ACTR's 116 Commuter and Tri-Town Shuttle bus routes operating Monday through Friday.

Maintaining and enhancing a village center with services and shopping opportunities for Bristol's residents is an additional way to reduce the community's reliance on single occupancy vehicular travel. Providing infrastructure that promotes biking and walking can also reduce a limited number of driving trips for some local commuters, shoppers, and recreationists.

Transportation Pathways to Implementation

Given the significant changes necessary to meet statewide targets, noted above, Bristol will support fuel switching to non-carbon and renewable energy sources. The Town has identified the following statements of policy and implementation actions:

Statements of Policy

1. Support the reduction of transportation energy demand, reduction of single-occupancy vehicle use, and the transition to renewable and lower-emission energy sources for transportation.
2. Support regional efforts to increase access to safe every day walking and cycling within and across municipal borders, including route 116 N to Lincoln Rd in Rockydale and Plank Rd to New Haven's North Street.
3. Promote walking and biking paths in the village and town, especially in any new developments.
4. Support state and regional public transportation programs serving Bristol and encourage major employers wishing to construct or expand businesses in the region to promote energy efficient commuting.
5. Support a Park and Ride in Bristol and encourage residents to consider using ride-sharing programs in order to reduce the use of fossil fuels.

Recommended Actions

1. Work with ACTR to understand the ways in which service to Bristol could be improved.
2. Encourage the installation of electric vehicle charging infrastructure.
3. Review municipal road standards to ensure that they reflect all “complete streets” principles applicable to our village and rural roads in order to enable safe access for all users, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities.
4. Nominate a Bristol representative to sit on the *Walk-Bike Council of Addison County* to foster safe and accessible opportunities for walking and cycling as an alternative to single occupancy vehicles.
5. Support and educate citizens about Vermont’s motor idling law (23 V.S.A. § 1110)

Land Use, Generation and Transmission

Goal

Produce renewable energy while maintaining the working and open landscapes, habitat protection measures, and scenic rural views important to Bristol's quality of life.

Land Use, Generation and Transmission Analyses

Land Use

The town of Bristol is made up of a compact village area surrounded by forested mountain areas and rolling farmland. Because of its existing settlement patterns and lack of a significant number of commercial or industrial facilities, Bristol residents are as dependent on their cars, and the energy they use, as many Vermont towns. While Bristol desires to retain its rural feel, it can adopt land use policies that encourage more densely settled areas that have the capacity to allow for more transportation alternatives within those areas, potentially saving energy and promoting healthier options, like walking or biking. As with other conservation goals, conserving energy by reducing the overall need for car transportation can be more cost effective for Bristol's citizens than fuel-switching to electric vehicles discussed in the previous chapter. Therefore, the Land Use Section of this Plan promotes greater density and housing options in Bristol's downtown village area. Other Land Use policies to guide energy use are listed in the Policy Section below.

Current Energy Generation

Although Bristol's energy supply is largely consistent with statewide patterns, Bristol does have a number of alternative energy installations that tap local energy resources (Table 8). A growing number of homes have photovoltaic systems that supply a portion of their electrical energy. Due to Vermont's net-metering law, owners of these systems can sell excess power back to the grid during periods of high solar production, and purchase grid power when needed.

As Table 8A illustrates, 114 different sites create most of the documented renewable solar power within Bristol.

Table 8A. Existing Renewable Generation

Type	Sites	Total Generation (kW)	Total Generation (kWh/year)	Capacity installed since 2016 (kW)	Additional Generation since 2016 (MWh/year)
Solar	112	1,222.56	1,499,347	154.21	189,123.1
Wind	0	0	0	0	0
Hydro	0	0	0	0	0
Biomass	2	450	1,840,914	0	0
Total Existing Generation	114	1,672.56	3,340,261	154.21	189,123.1

(Data from https://www.vtenergydashboard.org/my-community/bristol/statistics as of 5 March 2019. Capacity installed since 12/2016 calculated from installation date or Certificate of Public Good issuance date).

Bristol's existing electricity generation resources are primarily from solar power, which are primarily roof-mounted photo-voltaic panels at a fixed angle, with some fixed and tracker ground-mounted photovoltaic arrays (Table 8B). In addition, several additional homes have solar domestic hot water systems.

Table 8B. Existing Solar Generation Sites in Bristol

Type	Total Sites (2016)	Total Capacity (kW) (2016)	Total Generation (kWh/year) (2016)	Capacity installed since 2016 (kW)	Additional Generation since 2016 (kWh/year)
Ground-mounted PV	8	46.99	57,628.5	27	33,112.8
Ground-mounted PV: Tracker	5	533.40	654,161.8	24	29,433.6
Roof-Mounted PV	99	642.17	787,557.3	103.21	126,576.7
Total Solar Energy Generation	110	1,222.56	1,499,348	154.21	189,123.1

Types of Generation Potential

There are a number of different types of renewable generation potentially available to Bristol's residents that they might harness to meet statewide generation targets for the community.

Solar Energy

Globally, the sun supplies energy to Earth at some 10,000 times the rate at which humankind uses energy. However, this energy is not distributed equally, and Bristol's location and climate mean our share of solar energy is less than average. Nevertheless, the rate of solar energy input to Bristol ranges from about 500 kilowatts per acre in January to 900 kilowatts per acre in June; these are for solar collectors tilted at an angle equal to its 44˚latitude (National Renewable Energy Laboratory, Solar Radiation Data Manual for Flat-Plate and Concentrating Collectors).

Given the town's current total electrical energy consumption rate of 22,514 MWh (Table 4), this means that even in January Bristol could, in principle, meet its average energy demand with solar energy (18.4 MW), using just 150 acres. Inefficiencies could raise this figure many times over, as would the increased energy consumption in January. Nevertheless, it's clear that the solar resource at Bristol is theoretically more than adequate for their energy needs.

Although the technology exists to convert solar energy into heat and electricity, at this point it would be impractical to supply all of Bristol's energy with in-town solar installations. However, the use of solar energy for electricity and/or heat in individual homes and for charging electric vehicles is technologically feasible. Solar energy facilities ranging from 150 kW to 5MW are starting to be constructed in neighboring Addison County towns with varying visual and other impacts. Table 8B, 'Existing Solar Generation in Bristol' describes some of the town's current solar installations.

As noted earlier, Bristol supports renewable energy generation installations sized, sited and constructed pursuant to the community Siting Standards contained later in this section. Bristol believes the best commercial/industrial solar sites in town would be in the area Bristol has designated for rural-agricultural use in the town plan, and has identified a "Preferred Area" to support these sites.

Biomass

Biomass energy produced by trees is a renewable resource, however burning wood still releases carbon, stored over the previous decades, back into the atmosphere. For an equal amount of heat or electricity, it releases more CO_2 than burning gas, oil and even some types of coal. Recovering this carbon in forest regrowth may take 80 to 120 years under optimal conditions in Vermont. Many homes in Bristol use wood either as the primary heating fuel or to supplement another heat source, usually oil, but sometimes solar or geothermal. As Table 1 shows, about 17% of Bristol's households burn wood for heat, generating approximately 32 Billion BTUs. Burning wood for heat in Bristol certainly makes a significant dent in the town's fossil fuel consumption. County foresters project that each acre of Addison County forest might sustainably yield about one-third of a cord of firewood each year. Given that most of the eastern half of Bristol is wooded, if we assumed that 3,000 of Bristol's forested acres were sustainably harvested for firewood, that could yield nearly 1,000 cords per year, a little more than 3 cords per wood-burning household.

In 2006, Mt. Abraham Union High School in Bristol installed a woodchip heating system with a heating capacity of 1.8MW (6 MMBtu/hr). The fuel is obtained by two local woodchip producers- Lathrop's and the A. Johnson Company- located within a mile of the school. The $1.5 million system reduced annual fuel oil usage by almost 40,000 gallons. By the end of the first year after switching to wood heat, the community saved approximately $27,000, nearly 30%, on the school-heating bill.

Bristol also has an opportunity to produce biomass energy from its dairy farms and land area devoted to farming. Four Hills Farm began electricity production from a methane digester in 2012. It has a total Electricity Capacity of 450 kW and provides a model for future energy production on dairy farms. While not currently economical, biomass crops, for both space heating and as a liquid alternative to diesel fuel could support Bristol's farming economy in the future.

Accordingly, Bristol **encourages** the use of biomass for residential and small commercial heating applications within town, and as a renewable biodiesel alternative to diesel fuel. As a cautionary note, widespread use of wood and other biomass materials as a heat-producing or energy producing fuel might result in unacceptable levels of airborne particulates and other forms of air pollution. Therefore, while supportive, Bristol should consider biomass in the context of public health impacts in addition to whether supplies are sustainable and effective to meet short and long term demands for renewable heat source energy.

Wind
A small portion of Bristol, most of which is located on mountain ridges in the Bristol Cliffs Wilderness area of the Green Mountain National Forest, has wind speeds considered good to excellent for larger-scale wind installations (see Map 2). Other parts of Bristol may be capable of producing wind energy at the smaller scales of individual- or multiple-home wind turbines.

Accordingly, Bristol **supports** residential and community scale wind projects that meet its siting standards contained later in this chapter. Residential-scale wind consists of a single tower less than 120 feet high generating less than 15kW of energy. Community-scale wind consists of 1 or more towers all less than 200 feet high (so as not to require night lighting) and producing less than 1 MW of electricity. Industrial-scale wind projects that have towers over 200 feet or generate over 1 MW of power are **prohibited** in the Town of Bristol.

Geothermal Energy
Energy moves from Earth's interior to the surface at a modest average rate of about 350 watts per acre, far less than the solar input. For Bristol, far from major geological activity, that number is almost certainly significantly lower. In addition, solar energy warms the Earth, especially in the summer, and some of that energy is stored as heat in the upper layers of soil and rock. The result of these geothermal and solar effects is that soil temperatures just a few yards deep under Vermont average around 45º F to 50º F year-round. This temperature is too low for direct heating, although it can help with summer cooling. Nevertheless, the constant ground temperature represents a significant energy resource, and with appropriate technology it can be used as a heat source.

To date, no one has used geo-thermal systems relying on heat pump technology in Bristol. However, the technology is potentially viable and therefore included above.

Energy Storage
Should Bristol permit large-scale generation in its jurisdiction, it should also negotiate to include some type of battery storage facility to supplement the power generated to improve its short-term resiliency. Battery storage, while expensive, is decreasing in price, is commercially available to support homeowners and may work well with generation assets.

Generation – Potential and Targets

Renewable Generation Potential

As part of the mapping protocols described below, ACRPC created maps of places where resources were available to generate renewable generation resources within the Town of Bristol.

Map 7, "State and Local Known Constraints" at the end of this plan depicts natural resource layers that will preclude renewable energy development. These "Known Constraints" depict places where because of the natural resources located in the area it would be prohibitive to secure a permit for energy development. Map 8, entitled "State and Local Possible Constraints" depicts places where natural resources exist, but may not prohibit development. Prime agricultural soils would be an example of a possible constraint. A lot of Prime Agricultural resources exist within Bristol. However, it may or may not prevent wind or solar development.

The next set of maps show the location of where solar resources exist, wind resources and biomass resources exist in quantities that would support generation. These maps are depicted below as Map 4 Potential Solar Resources, Map 5 Potential Wind Resources, and Map 6 Potential Biomass Resources. While these maps depict where resources exist, they depict baseline resources, not necessarily the "best" resources in the area. So, for example, the Wind Resource Map depicts where the wind blows at the minimum velocity necessary to support wind power. As noted in the wind discussion above, while many places may meet the minimum criteria for wind development, the best area of Bristol is probably located within the Bristol Cliffs Wilderness of the Green Mountain National Forest, which appears to have class 3 winds (around 12 miles/hour at 100 meters above the ground), considered marginally suitable for larger-scale wind installations. Accordingly, users are cautioned to read the maps in this context.

Mapping

Mapping Energy Resources and Constraints

The town of Bristol has developed maps with the assistance of ACRPC. These maps show data as required by the Department of Public Service Determination Standards, including access to energy resources, and constraints to renewable development, and are a required element of enhanced energy planning.

The maps show areas that are potentially appropriate or inappropriate locations for future renewable generation facilities. The maps are a planning tool only and may not precisely indicate locations where siting a facility is acceptable. When a generation facility is proposed, the presence of all natural resources and other specific characteristics of the site shall be verified as a part of the application.

Mapping Methodology

Spatial data showing the location of potential energy resources (solar, wind, hydro, and biomass) formed the basis of the maps developed by ACRPC.

“Known” and “possible” constraints were subsequently identified on the maps. Known constraints are conservation resources that shall be protected from all future development of renewable generation facilities. Possible constraints are conservation resources that shall be protected, to some extent, from the development of renewable generation facilities. The presence of possible constraints on land does not necessarily impede the siting of renewable generation facilities on a site. Siting in these locations could occur if impacts to the affected possible constraints are mitigated, preferably on-site.

The known constraints and possible constraints used to create the maps include constraints that are required per the State Determination Standards from the Department of Public Service and constraints that were identified by ACRPC. A full list of known and possible constraints included on the maps is located in Tables 9A and 9B.

Table 9A. Known Mapping Constraints for Solar, Wind and Biomass		
Constraint	**Description**	**Source**
Confirmed and unconfirmed vernal pools	There is a 600-foot buffer around confirmed or unconfirmed vernal pools.	Vermont Agency of Natural Resources (VT ANR)
DEC River corridors	River Corridors were mapped. Includes 50 foot buffer for streams with a drainage area less than 2 square miles.	Vermont Center for Geographic Information (VCGI)/ACRPC
FEMA Floodways		VCGI
State Significant Natural Communities and Rare, Threatened, and Endangered Species	Rankings S1 through S3 were used as constraints. These include all of the rare and uncommon rankings within the file. For more information on the specific rankings, explore the methodology for the shapefile.	VCGI
National wilderness areas		VCGI
Class I and Class II Wetlands		VCGI
Municipal Conservation Land Use Areas	Conservation Land Use Districts, as designated in municipal plans, that include strict language that strongly deters or prohibits development have been included as a regional known constraint. The inclusion of this resource as a regional constraint is consistent with the goals and policies of the Addison County Regional Plan.	Bristol Town Plan
Designated Downtowns, Designated Growth Centers, and Designated Village Centers	These areas are the center of dense, traditional development in the region. This constraint does not apply to roof-mounted solar within such designated areas. The inclusion of this resource as a regional constraint is consistent with goals and policies of the Addison County Regional Plan.	Bristol Town Plan

Highest Priority Forest Blocks	The lands and waters identified here are the areas of the state that are of highest priority for maintaining ecological integrity. Together, these lands comprise a connected landscape of large and intact forested habitat, healthy aquatic and riparian systems, and a full range of physical features (bedrock, soils, elevation, slope, and aspect) on which plant and animal natural communities depend. The inclusion of this resource as a regional constraint is consistent with goals and policies of the Addison County Regional Plan. (Source: ANR)	VT ANR Vermont Conservation Design
Protected lands	This includes public lands held by agencies with conservation or natural resource oriented missions (e.g. USFS), municipal natural resource holdings (e.g. Town forests), public boating and fishing access areas, public and private educational institution holdings with natural resource uses and protections, publicly owned rights on private lands, parcels owned in fee by non-profit organizations dedicated to conserving land or resources (e.g. The Watershed Center), and private parcels with conservation easements held by non-profit organizations.	VCGI

Table 9B. Possible Mapping Constraints for Solar, Wind and Biomass		
Constraint	**Description**	**Source**
Agricultural soils	Local, statewide, and prime agricultural soils are considered.	VCGI
FEMA Flood Insurance Rate Map (FIRM) special flood hazard areas	Special flood hazard areas as digitized by the NRPC were used (just the 100-year flood plain -500-year floodplain not mapped). The inclusion of this resource as a regional constraint is consistent with goals and policies of the Northwest Regional Plan.	Federal Emergency Management Agency (FEMA), ACRPC
Act 250 Agricultural Soil Mitigation Areas	Sites conserved as a condition of an Act 250 permit.	VCGI
Deer wintering areas	Deer wintering habitat as identified by the Vermont Agency of Natural Resources.	VT ANR
Hydric soils	Hydric soils as identified by the US Department of Agriculture.	VCGI

At the end of the mapping evaluation, ACRPC calculated the amount of renewable resource generation possible in Bristol based upon the maps and some assumed values for the amount of land it took to produce specified amounts of solar and wind energy. The results of this analysis are depicted in Table 10, Renewable Generation Potential. As the table demonstrates, the amount of renewable generation potential is substantial, especially when compared to the numbers of actual generation that currently exists in Bristol, contained in Table 8.

Table 10. Renewable Generation Potential	**MW**	**MWh**
Rooftop Solar	10	12,350
Ground-mounted Solar	638	782,443
Wind	3,950	12,109,167
Hydro	0	0
Biomass and Methane	0	0
Other	0	0
Total Renewable Generation Potential	4,598	12,903,961

Renewable Generation Targets

As part of the same evaluation, DPS also provided Renewable generation targets that all municipalities would need to meet in the context of the State meeting its target of producing half of its energy within the State. Those targets for Bristol, shown in Table 11 below, are based upon a combination of Bristol's population and to the amount of potential resources available in Bristol.

When one compares the targets in Table 11 with the potential in Table 10, it is readily clear, that at least theoretically, Bristol's resource potential dwarfs its generation targets.

Table 11. Renewable Generation Targets	2025	2035	2050
Additional Renewable Generation Target (MWh)	4,463.14	8,926.28	13,524.66
Total Renewable Generation Target (MWh)	7,665.36	12,128.49	16,726.88

Therefore, Bristol has chosen to apply the community land use standards in the following section to help guide energy projects to locate in areas the town deems acceptable and to prohibit energy projects in other areas.

Land Use, Renewable Generation and Transmission Pathways to Implementation

Given the generation targets, noted above, for Bristol to meet statewide targets, the town has identified the following statements of policy and implementation actions:

Statements of Policy

Land use

1. Encourage settlement patterns that reduce travel requirements for work, services, and recreation.
2. Encourage development of compact neighborhoods.
3. Concentrate development within our residential-agricultural-commercial districts which results in the conservation of natural resources, land, energy used and infrastructure demands.
4. Promote commercial businesses within designated areas.
5. Allow infilling of existing large-lot development if higher density development is desirable and appropriate.
6. Provide opportunities for appropriate home occupation businesses consistent with zoning regulations.
7. Conserve forest land as a renewable energy resource, tempered by the sustainable use of wood for biomass energy production, with practices to recapture carbon through regenerative growth.
8. Support local farms and local food system which decrease energy demands of trucking and shipping and gives value and purpose to our open agricultural lands.

Generation

1. Support the development and siting of renewable energy resources in the Town that are in conformance with the goals, strategies, and mapping outlined in this energy plan.
2. Favor the development of generation utilities in identified preferred locations over the development of other sites.
3. Support production of energy from farm byproduct methane as a desirable agricultural practice
4. Support the use of wind energy only with due regard to aesthetic and environmental considerations, especially in high and medium density residential areas.

Implementation Actions

1. The Bristol Energy Committee will work closely with the Bristol Planning Commission, DRB and Zoning Administrator on any proposed energy development projects within Bristol.
2. Investigate the installation of municipal solar and/or wind net-metering facilities to offset municipal electric use to identify where installation is economically feasible.
3. Investigate installation of community-owner renewable energy project(s) to allow Bristol’s citizens to participate in the economic benefits of local energy production.

Locally Preferred Areas for Energy Production Siting

Bristol has identified the following specific areas as preferred locations for siting energy generation (Map 9): An area of approximately 3,910 acres within the Rural/Agricultural Land Use Planning Area on the western half of the town. This excludes the areas with Known Constraints as identified in Table 10, which are primarily river and stream corridors as well as State Significant Natural Communities and Rare, Threatened, and Endangered Species locations. Additionally, the preferred area excludes those areas identified as Highest Priority Forest Blocks, as well as existing protected lands. This preferred location is the largest contiguous piece of unconstrained land in Bristol and is in close proximity to existing transmission line and 3-phase power infrastructure.

Using existing solar facility footprints as a model, this area has the potential solar energy capacity of more than 230 MW or production of 281,000 MWh each year, well in excess of Bristol's 2050 generation targets (Table 11).

Community Standards for Siting and Decommissioning Energy Projects

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 in Bristol must evaluate and address the proposed site's aesthetic impact on the surrounding landscape and significant viewsheds. The historical working landscape that defines Bristol is dominated by open fields, rural residential development, and forests against the backdrop of the Green Mountains. Rural structures like barns fit into the landscape because their scale and mass generally do not impact large tracts of otherwise open land. Large scale generation projects, however, may need to be limited in height and mass, and/or have their height and mass broken by screening to fit in with this landscape.

Following are Bristol's standards for siting new energy generation. Bristol shall not apply the siting standards so strictly so as to eliminate the opportunity to meet its electrical generation targets.

SOLAR:

Residential scale solar projects, defined as grid-connected/ net-metered projects less than 15kW, whether rooftop or ground mounted, are **supported and encouraged** in all areas of the Town of Bristol. Owners are encouraged to use the siting standards noted below when siting their array on their property.

Net metered commercial solar projects, defined as any project subject to Public Utility Commission (PUC) Rule 5.100 governing net-meter solar arrays and ranging in size from 15kW – 500kW are **supported and encouraged** in Bristol, subject to the siting criteria below, within the preferred areas as designated by this Plan depicted on Map 9, Preferred Energy Area.

Commercial solar projects, are of a size greater than that permitted by the net-metering rules (>500kW) are **discouraged** in the Town of Bristol, but allowed within the preferred areas as designated by this Plan depicted on Map 9, Preferred Energy Area, subject to the siting criteria below.

1. Siting:

Good sites have one or more of the following characteristics:

- Roof-mounted systems;
- Systems located in close proximity to existing larger scale, commercial, industrial or agricultural buildings;
- Proximity to existing hedgerows or other topographical features that naturally screen the proposed array from view from at least two sides;
- Systems fit the scale and context of their location.
- Reuse of former brownfields or otherwise impacted property.
- Glare and noise are minimized to the extent possible.
- "Preferred" areas as defined by the Public Utilities Commission Rule 5.100 governing net metered sites;
- Sites designated as "preferred" areas by this Plan.

Poor Sites have one or more of the following characteristics:

- Sites obscure views of historic buildings and scenic views from common vantage points like roads and neighborhoods.
- Topography that causes the arrays to dominate the skyline from common vantage points like roads or neighborhoods (recognizing that this is more difficult for wind towers);
- Locations in floodways or mapped river corridors;
- A location in proximity to and interfering with significant viewsheds of the Green Mountains, Deer Leap, and Hogback Mountain;
- The removal of productive agricultural land from agriculture use (except in identified "Preferred Areas");
- Sites that require public investment in transmission and distribution infrastructure in order to function properly;
- Areas of forestland that need to be clear cut for the installation of solar arrays.

2. Mitigation methods

- Locate the structures on the site to keep them from being "skylined" above the horizon from public and private vantage points;
- Shorter panels may be more appropriate in certain spaces than taller panels to keep the project lower on the landscape;
- 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 Municipal Zoning Regulations within the Zoning District in which it lies;
- Use the existing topography, development or vegetation on the site to screen and/or break the mass of the array;
- In the absence of existing natural vegetation, the commercial development must be screened by plantings 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; Plantings shall be made in accordance with a screening plan, included with application for and made a condition of the project's Certificate of Public Good.
    a) Such screening plan shall include at a minimum:
        (i) A schematic showing the location of both existing and planned planting material, earthwork and structures.

        (ii) A plant material list including all plants to be made as part of the screening, listed by both common and botanical name, the size at installation, expected size at maturity, and expected number of years to maturity.

        (iii) Pre-construction photographic images of the site to document the site's condition prior to planting or project construction. These images shall set the basis for decommissioning.

b) The screening requirements of this Section apply year-round during the entire period of existence of a project, whether or not a solar project is still in service. Screening must remain in place and be maintained until a project has been fully decommissioned or deconstructed and the site restored.

All planting must be completed within four weeks of the date on which the solar project first feeds electricity onto the electric grid (the "in service date"), or in the case of new commercial development the completion of principal construction. A solar project with an in-service date falling during frozen ground conditions must complete all plantings by May 31 of the same year.

c) Where new screening materials must be installed or planted, natural, living, screening materials, such as trees and shrubs, shall be used in lieu of artificial screening materials such as walls, fences, and other structures; provided, however, that limited use of artificial screening materials is permissible to the extent that

(i) the use of living screening in that area is not feasible, and

(ii) the artificial screening is of size, scale and materials that are consistent with the character of the surrounding neighborhood and landscape.

d) Maintenance of landscaping and screening shall be the joint responsibility of the developer and property owner on which the project is constructed, maintained and operated. Screening maintenance shall include at a minimum prompt replacement of any diseased, damaged or dead plant material, and limit the impacts of invasive species identified by the State of Vermont Agency of Natural Resources, and in the case of any project such obligations shall be a condition of and enforced through any Certificate of Public Good granted by the PUC, or any successor administrative agency having jurisdiction over such a project.

- The siting of solar equipment shall minimize view blockage for surrounding properties. 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 solar equipment in a manner designed to reduce impacts on neighbors or public viewsheds constitutes reasonable mitigation;
- Use fencing that allows small wildlife passage.

WIND:

Residential (on property) Scale Wind, consisting of a single tower less than 120 feet high generating less than 15kW of energy, are **supported** under the following siting and mitigation guidelines.

Community (Commercial) Scale Wind, consisting of one or more towers all less than 200 feet high (so as not to require night lighting) and producing less than 1 MW of electricity, are **supported** under the following siting and mitigation guidelines.

Industrial Scale Wind, consisting of wind projects with a total capacity of greater than 1MW or with a tower or towers taller than 200 feet or requiring night lighting for any reason, are **prohibited** in the Town of Bristol, due to low energy potential and significant aesthetic impacts.

1. **Siting**:

Good Sites have one or more of the following characteristics:

- Systems located in close proximity to existing larger scale, commercial, industrial or agricultural buildings;
- Proximity to existing transmission system to minimize the new infrastructure required to serve the project;
- Reuse of former impacted property or brownfields that have qualified for and are listed in the State of Vermont Brownfield program.
- Significant isolation distances from existing residential uses to allow the noise from the turbine to dissipate to a level of at least the State decibel standard before it reaches the property line.
- Sites designated as "preferred" areas by this plan.

Poor Sites have one or more of the following characteristics:

- A location in proximity to and interfering with a significant viewshed, especially of the Green Mountains, Deer Leap, and Hogback Mountain;
- Sites that require public investment in transmission and distribution infrastructure in order to function properly.
- Sites impacting significant natural resources.

2. Mitigation methods:

- At a minimum, all wind turbines must observe setback restrictions such that if a tower falls, the entire structure will land on property owned or controlled by the tower's owner. Commercial Developers must increase setbacks to mitigate noise to State decibel standard and mitigate shadowing impacts.
- Wind turbines are likely to be most appropriate within agricultural, commercial or industrial contexts and should be sited, where practical, near other structures.
- In landscapes valued for natural or scenic features, particularly the views from downtown and towards Bristol Pond, Deer Leap, and Hogback Mountain, siting will be evaluated for potential visual impacts on scenic views and the experience of a natural landscape.
- Steps should be taken to reduce impacts on wildlife including the flight and migration patterns of birds.
- No wind towers requiring night lighting (wind turbines with a total height greater than 200 ft.) shall be allowed within the Town of Bristol.

TRANSMISSION LINES (necessary to connect the installation to the Public Utility)
These are in addition to the considerations for new energy installations mentioned above.

1. Siting:

Good Sites have the following characteristic:

- Shared or neighboring ROW with other transmission or transportation infrastructure.

Poor Sites have one or more of the following characteristics:

- The removal of productive agricultural land from agricultural use (except in identified "Preferred Areas");
- The clearcutting of forested land.

2. Mitigation methods:

- Consider burying the transmission infrastructure in sensitive areas;
- Use the existing topography, development or vegetation to screen and/or break the mass of the transmission line.

Other Transmission Infrastructure (necessary to connect the installation to the Public Utility, e.g. batteries, converters, storage facilities, etc.)

These are in addition to the considerations for new energy installations mentioned above.

1. Siting:

Good Sites have one or more of the following characteristics:

- Systems located in close proximity to the generating facility.

Poor Sites have one or more of the following characteristics:

- Topography that causes the infrastructure to be visible against the skyline from common vantage points like roads or neighborhoods;
- A location in proximity to and interfering with a significant viewshed, especially of the Green Mountains, Deer Leap, and Hogback Mountain;
- The removal of productive agricultural land from agricultural use (except in identified "Preferred Areas").

2. Mitigation methods:

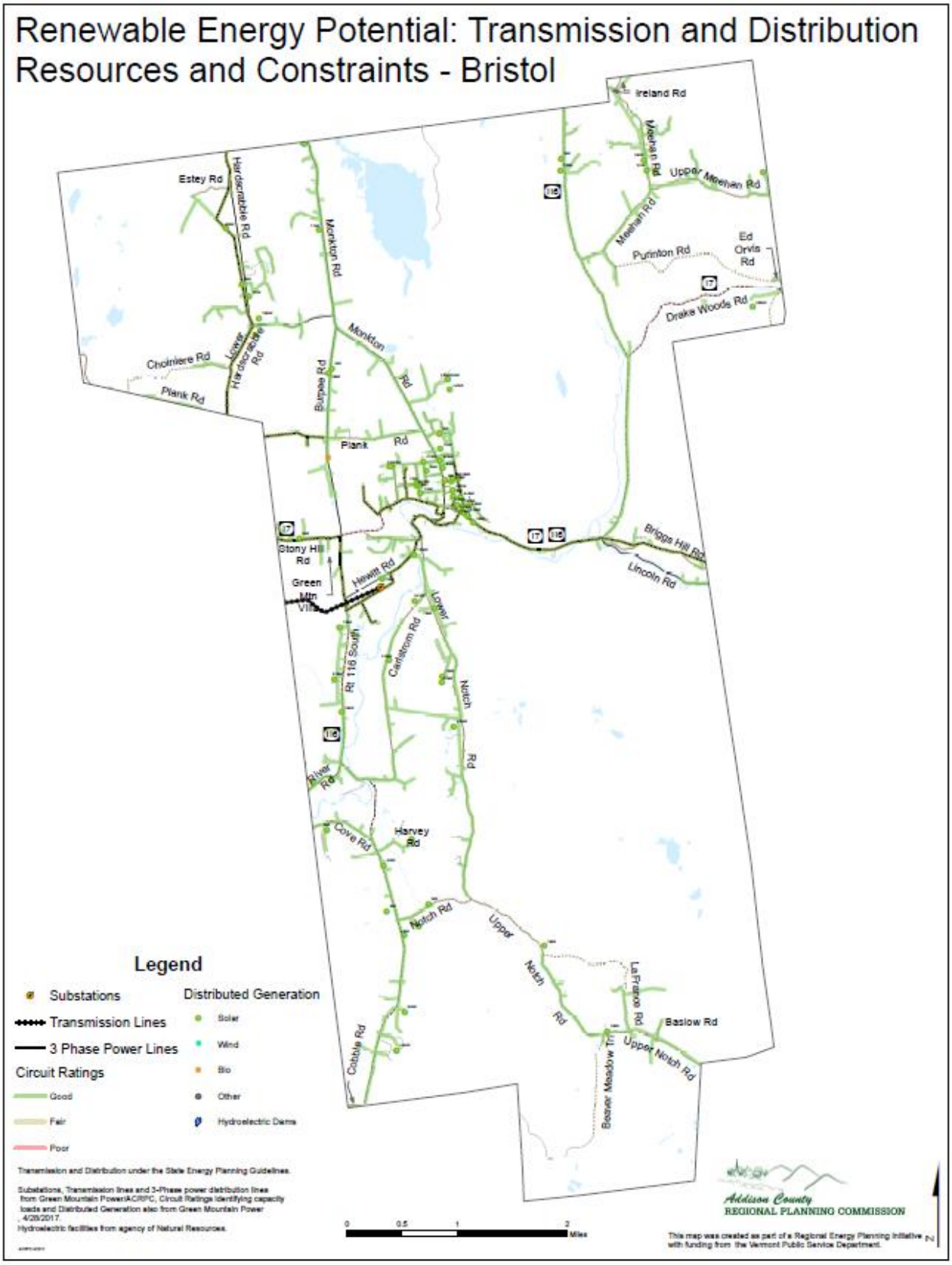
- Locate the structures on the site to keep them from being "skylined" above the horizon from public and private vantage points;
- Shorter structures may be more appropriate in certain spaces than taller structures to keep the project lower on the landscape;
- Developers shall meet setbacks equal to those listed in the Municipal Zoning Regulations within the Zoning District in which it lies;
- Use the existing topography, development or vegetation on the site to screen and/or break the mass of the substation.

DECOMMISSIONING AND RESTORATION

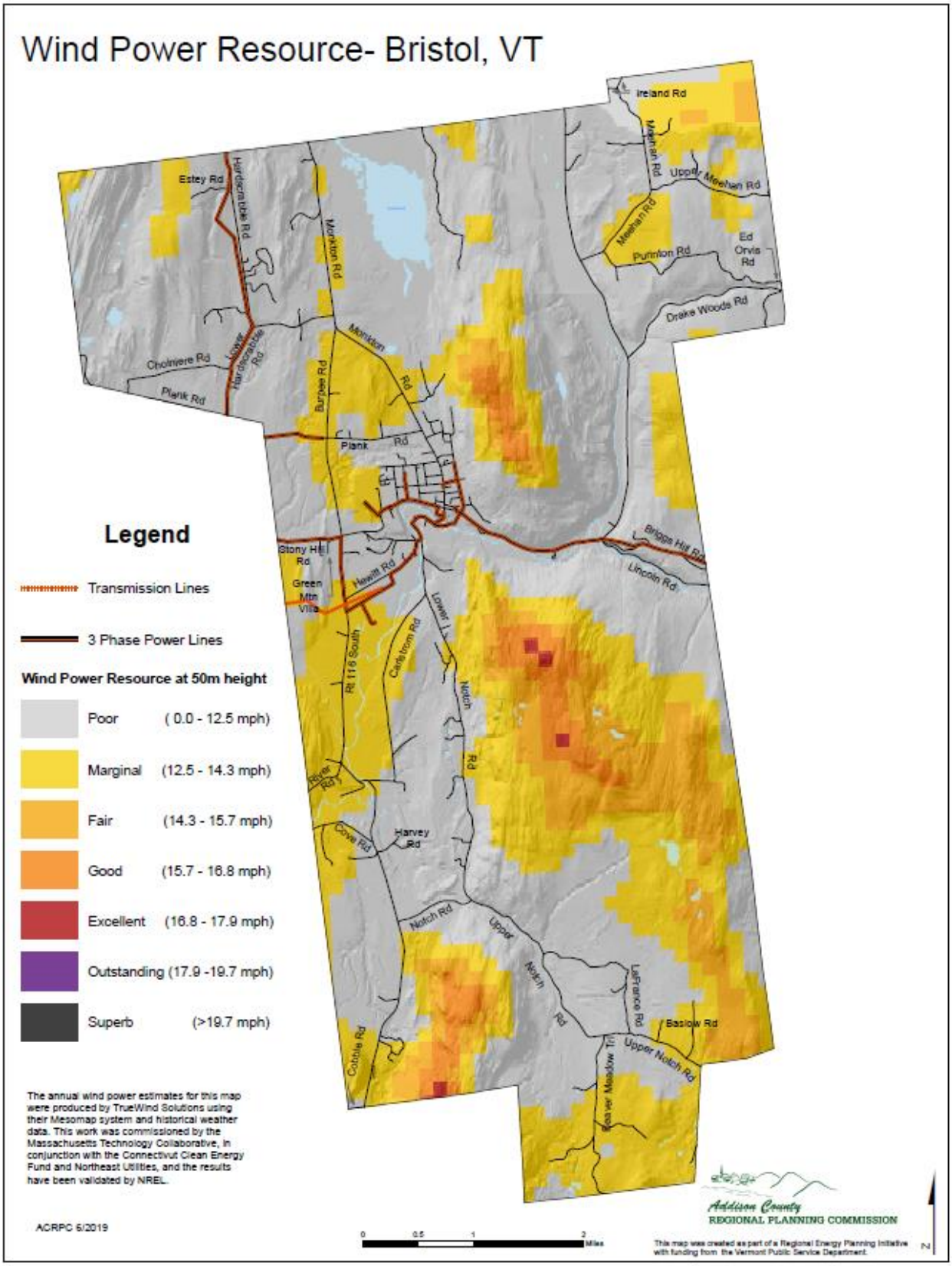
All projects shall be decommissioned at the end of their useful life. This means equipment shall be removed, landscaping preserved and disturbed areas restored. Developers of all non-residential (commercial and industrial) projects shall provide the municipality with appropriate assurances to guarantee funding exists to decommission the project. In Bristol the requirements of PUC Rule 5.904 (A) shall apply to commercial scale solar installations greater than 100 kW.

Bristol Enhanced Energy Plan Maps

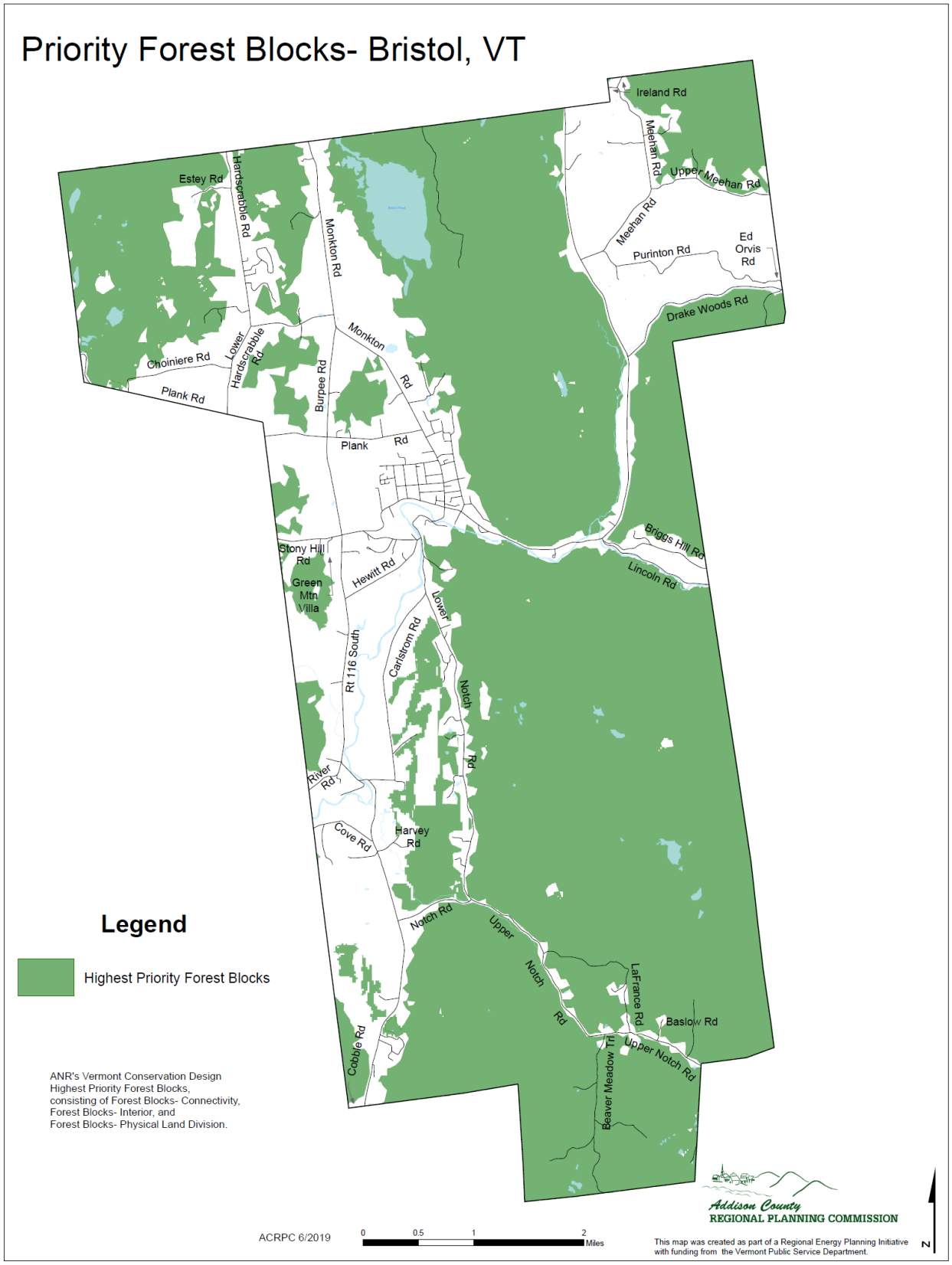
Map 1. Transmission and Distribution Resources



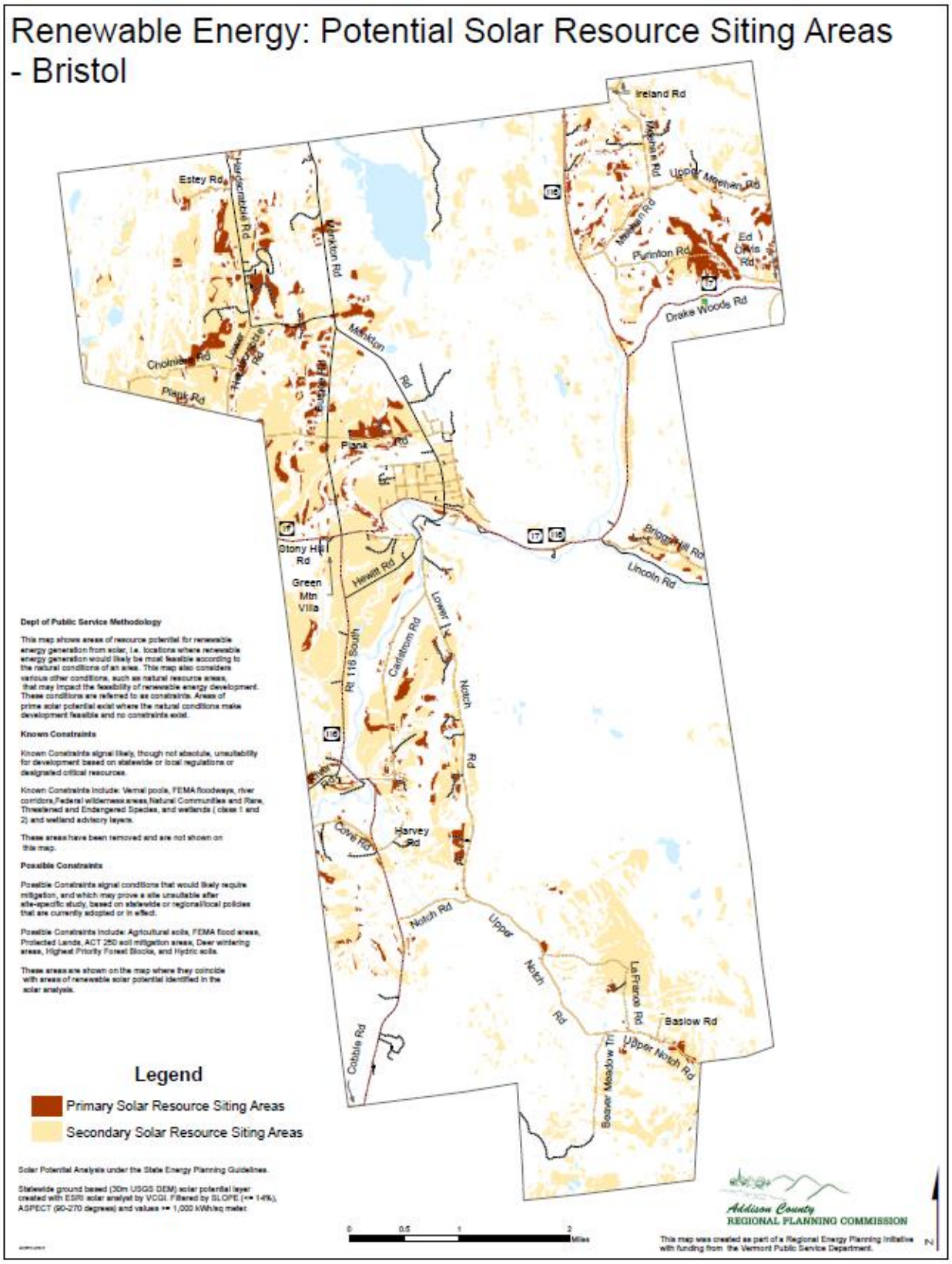
Map 2. Wind Power Resource



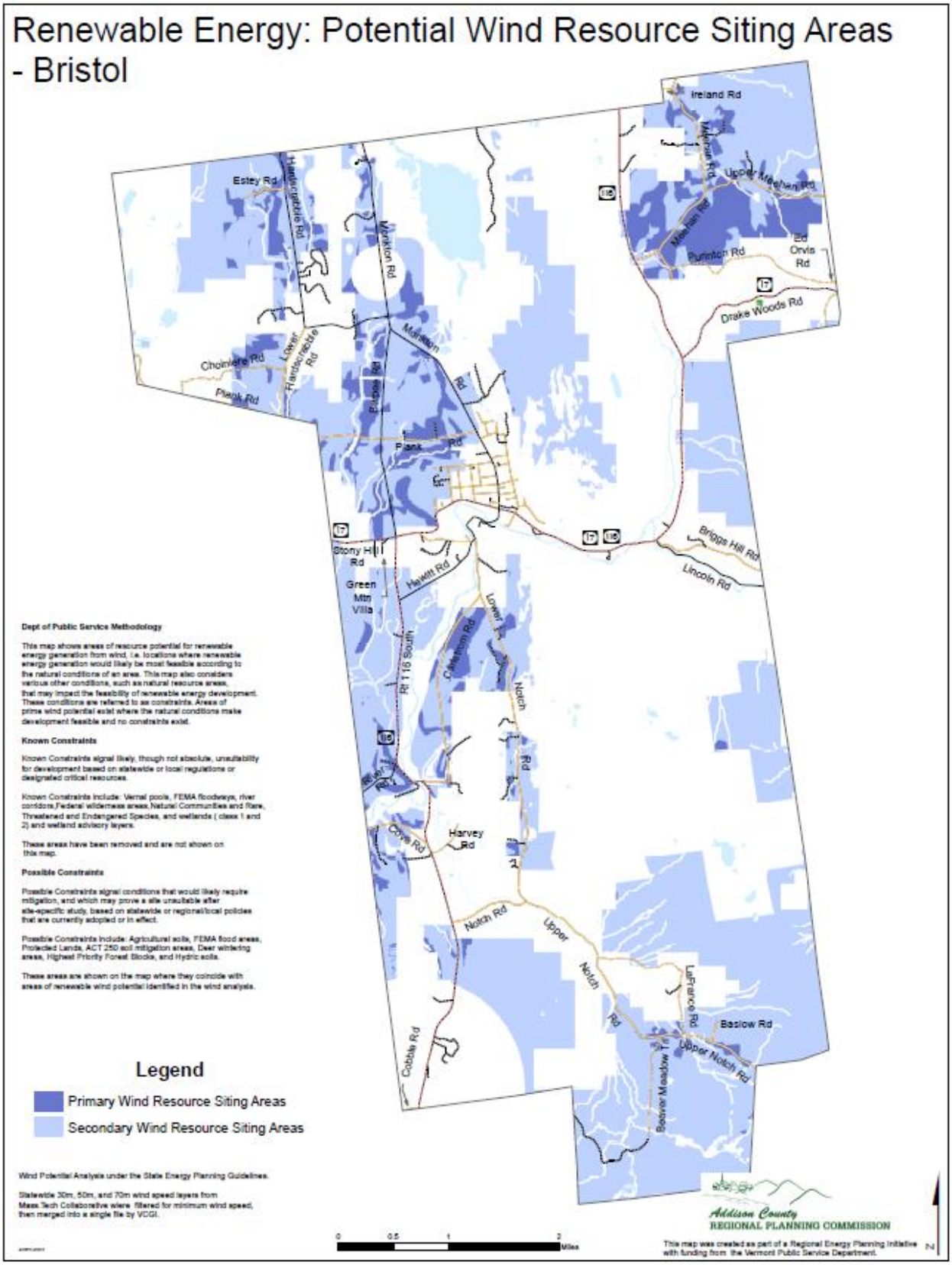
Map 3. Highest Priority Forest Blocks



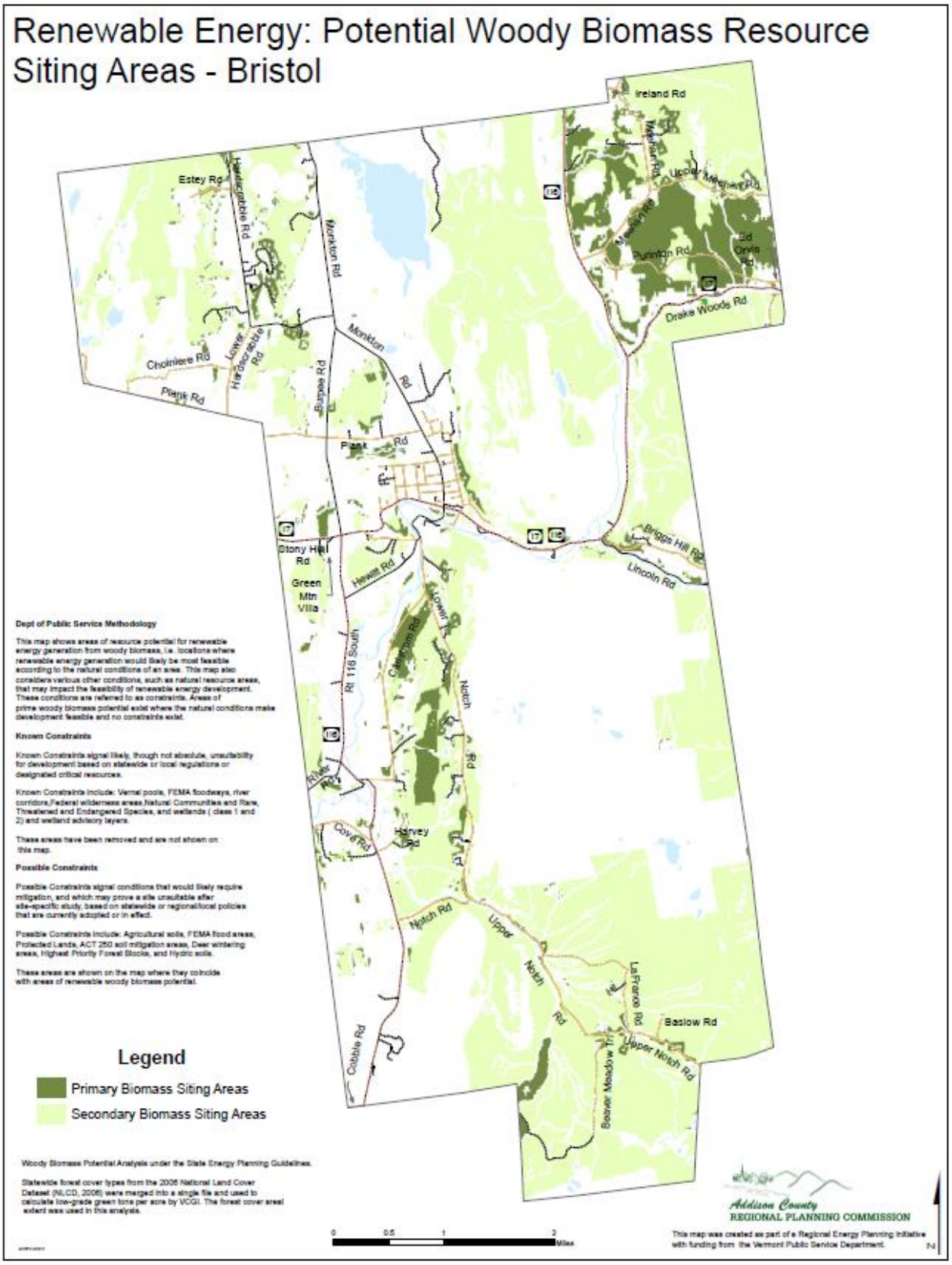
Map 4. Potential Solar Resource Siting Areas



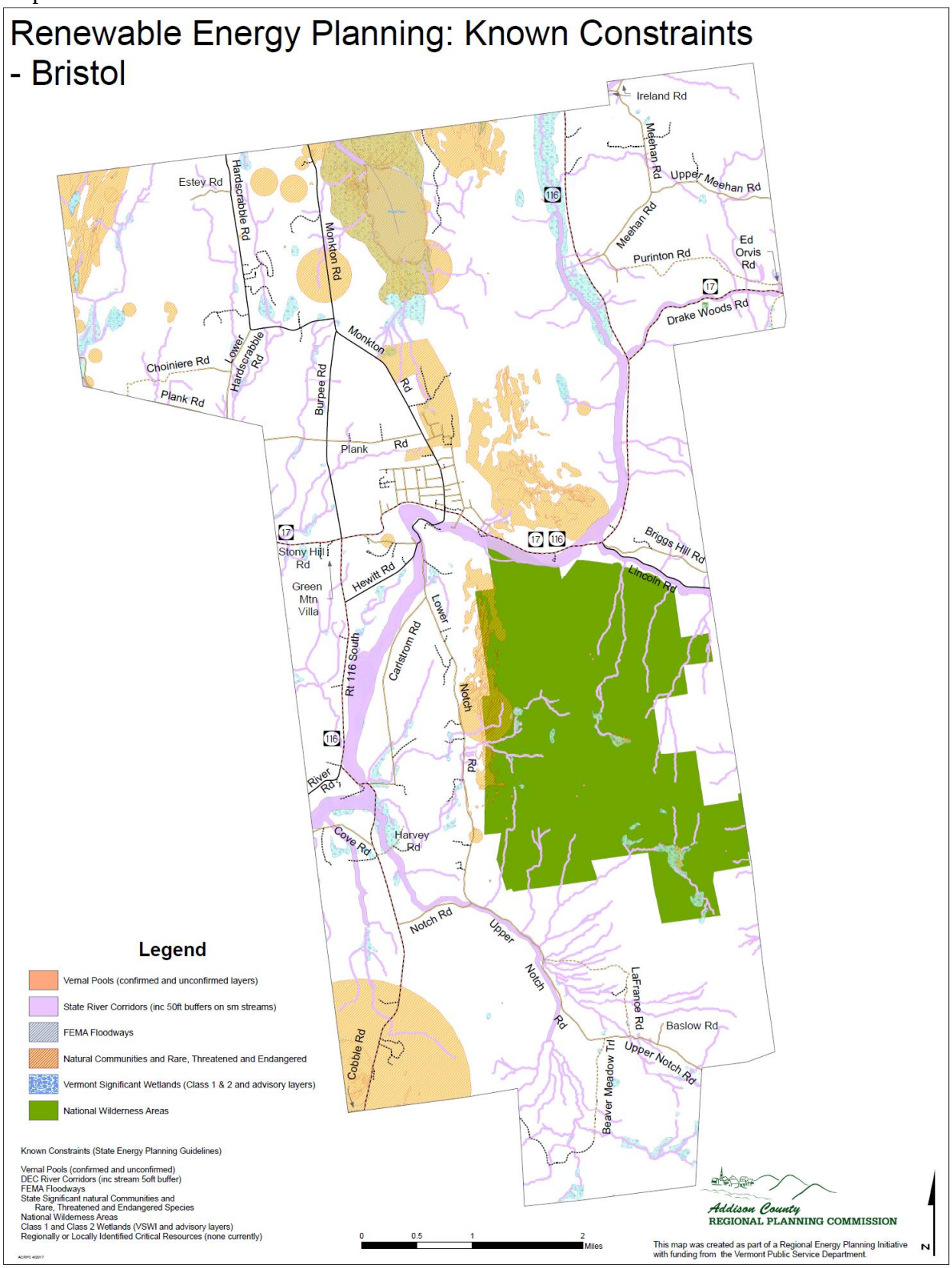
Map 5. Potential Wind Resource Siting Areas



Map 6. Potential Biomass Resource Siting Areas



Map 7. State and Local Known Constraints



Map 8. State and Local Possible Constraints

Map 9. Preferred Energy Area