

5. ENERGY

Goals

- To encourage the conservation of energy by individuals and organizations
- To promote efficient and climate resilient buildings
- To demonstrate the Town’s leadership by example with respect to the efficiency of municipal buildings, municipal transportation, and renewable energy generation

Policies

1. Support and encourage school participation in Vermont Energy Education Program (VEEP) activities to foster an educational foundation geared toward energy savings.
2. Support the efforts of Efficiency Vermont to promote the selection and installation of devices, appliances, and equipment that will perform work using less energy (e.g., ENERGY STAR).
3. Consider and prioritize efficiency along with cost when replacing current systems in municipal buildings.
4. Consider and prioritize efficiency along with cost when replacing or adding municipal vehicles.
5. Consider municipal renewable energy generation options including community solar, wastewater methane collection, or other potential municipally owned projects.

The intent of this energy section is to meet the municipal determination standards for enhanced energy planning enabled in 24 V.S.A. 4352. The purpose of enhanced energy planning is to further regional and state energy goals, including the goal of having 90% of energy used in Vermont come from renewable sources by 2050 (90 x 50 goal), and the following:

- A. *Vermont's greenhouse gas reduction goals under 10 V.S.A. § 578(a);*
- B. *Vermont's 25 by 25 goal for renewable energy under 10 V.S.A. § 580;*
- C. *Vermont's building efficiency goals under 10 V.S.A. § 581;*
- D. *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*
- E. *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 and 8005.*

A positive determination of compliance with the requirements of enhanced energy planning, as provided by the Regional Planning Commission, will enable Bakersfield to achieve “substantial deference” instead of “due consideration” in Section 248 applications for energy generation facilities (ex.

wind facilities, solar facilities, hydro facilities, etc.) under Criteria (b)(1)-Orderly Development. In short, this means that Bakersfield will have a greater “say” in Certificate of Public Good proceedings before the Vermont Public Service Board about where these facilities should or should not be located in the community. To receive a positive determination of energy compliance, an enhanced energy plan must be duly adopted, regionally approved, and must contain the following information:

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

Municipal Energy Consumption & Targets

The following section reviews current data and future targets for thermal/space heating, transportation, electrical energy use and energy generation. These targets are based on the overall goals of the Vermont Comprehensive Energy Plan. As required under Vermont state statute targets are set for 2025, 2035 and 2050.

Data and Modeling

While the data used in this plan offers insights into current needs and progress, it is also imperfect in multiple respects. Because of the relatively small population of Bakersfield and the region, there is a high margin of error on data from the American Community Survey. Many other available data sources are not regularly updated or incomplete in their scope. Regardless, the data provided in this plan is the best available and still provides valuable insight.

Energy targets were created by the Department of Public Service using the LEAP (Long-range Energy Alternatives Planning) software to create a model of the demand for and supply of total energy usage in Vermont and the region. LEAP software is a system that allows users to create complex models of future energy use. The LEAP model does not identify specific costs that would be incurred in the future. Instead, it compares 2050 costs among various scenarios, in order to achieve the least-cost alternative to meet legislative goals. The LEAP model also includes impacts that do not result in out-of-pocket costs, such as impacts of pollution. Because of the model’s complexity, it is difficult to explain comprehensively. The following scenarios provide some background on the methodology and the inputs used to create both statewide and regional models in LEAP. Appendix 1B presents the full model results for the region and the state as well as a more thorough explanation of the model assumptions and methodology. Targets for generation were developed by the Northwest Regional Planning Commission in partnership with the Department of Public Service.

Thermal Energy/Space Heating

Thermal energy use means energy used to heat homes, commercial and industrial buildings.

Residential Space Heating

Current Use

The most common fuels used for heating in Bakersfield are fuel oil, wood, and bottled, tank or LP gas. Overall, residential heating in the Town is 54 BBTUs (billion British Thermal Units), accounting for 36.3% of total residential energy use.

Three households have installed cold climate heat pumps through Efficiency Vermont’s programs. Cold climate electric heat pumps use less energy to provide the same amount of heat as fossil fuel heating systems.

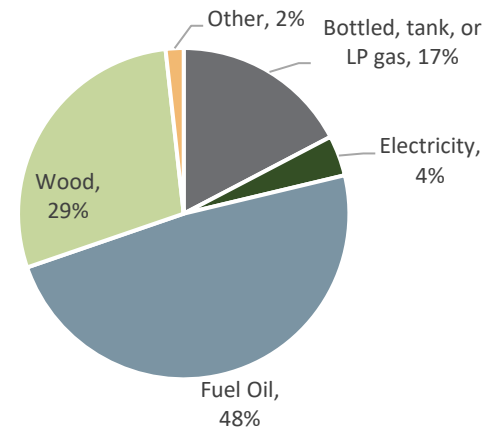
Target

The 2050 target is to significantly reduce residential thermal energy use by transitioning to more efficient electric heat pumps. Additionally, the target assumes that current homes will be weatherized to better retain heat, and new homes will be energy efficient.

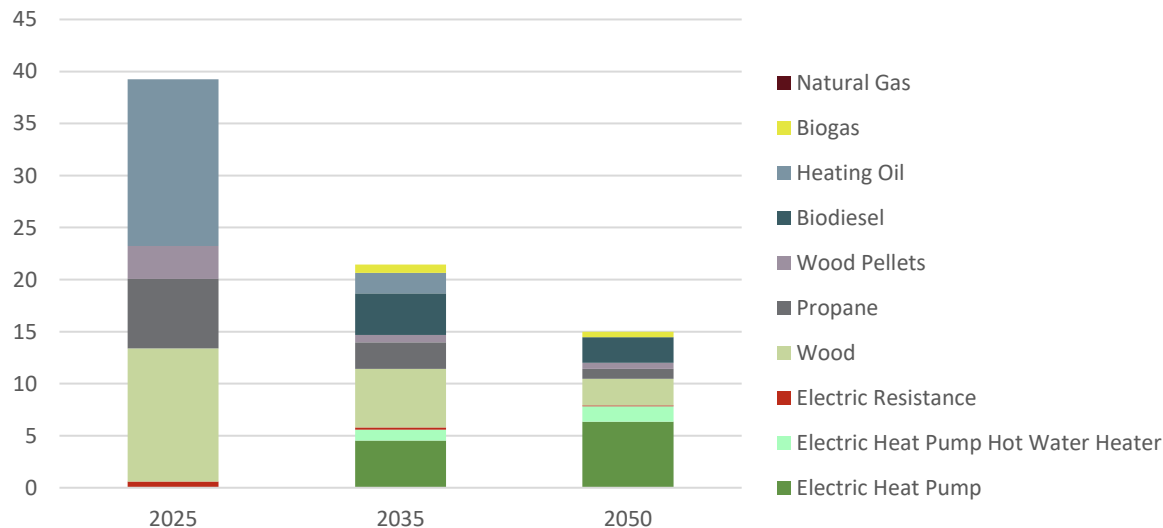
Residential Thermal Goals

- ↓ Significantly decrease the use of fossil fuels including fuel oil, natural gas and propane.
- ↑ Significantly increase the number of residential cold climate heat pumps and heat pump hot water heaters
- ↑ Increase the number of weatherized homes.

Current Residential Thermal Energy Use by Type of Energy



Residential Thermal Energy Use Target



Target Number of Residential Heat Pumps

Year	#
2025	71
2035	171
2050	199

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Commercial Space Heating

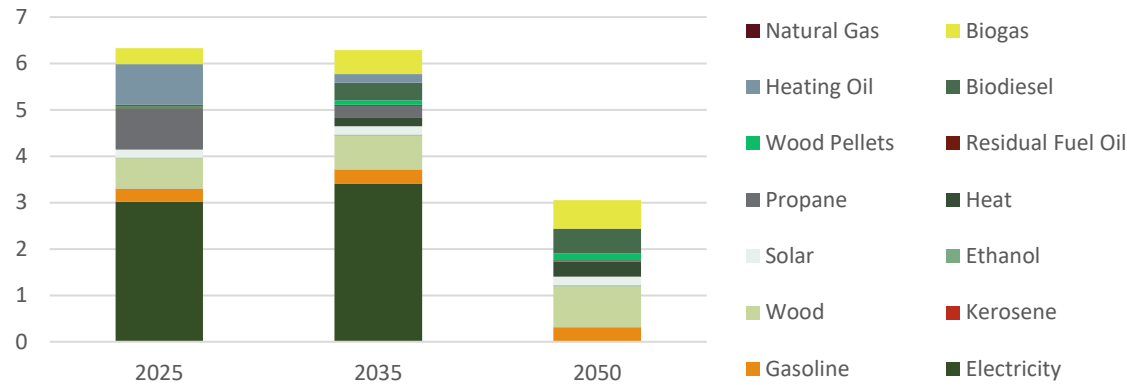
Current Use

There is no survey data on commercial and industrial heating energy use, or the types of fuel used. Based on statewide trends and the businesses located in Bakersfield, commercial and industrial heating use is estimated to be around 7.1 BBTUs per year. 0 businesses in Bakersfield have installed cold climate heat pumps through Efficiency Vermont's programs.

Target

Similar to residential heat use, the 2050 target for commercial and industrial heat use is to reduce thermal energy use by significantly decreasing the use of fossil fuels and increasing the use of efficient heat pumps.

Commercial Thermal Energy Use Target



Commercial Thermal Goals

- ↓ Significantly decrease the use of fossil fuels
- ↑ Significantly increase the number of commercial cold climate heat pumps and heat pump hot water heaters

Target Number of Commercial Heat Pumps	
Year	#
2025	3
2035	8
2050	9

Transportation

Transportation energy use includes gas, diesel and electric vehicles. It accounts for the largest percentage of energy use in Vermont.

Land Use, Transit & Complete Streets

A key strategy to reducing the energy spent on transportation is to reduce the number of total miles driven.

Transportation Goals

- ↓ Decrease the total amount of miles travelled in personal vehicles.
- ↓ Significantly decrease use of fossil fuels including gasoline and diesel.
- ↑ Significantly increase the adoption of electric vehicles.

Carpooling reduces the number of vehicles on the road and the total energy used. Bakersfield encourages carpooling as noted in the Transportation chapter.

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The Town can also support a reduction in personal vehicle trips by encouraging compact land use patterns and complete streets that promote walking and cycling. It is one of the fundamental building blocks of a more efficient, resilient, and greener community. More information on these goals and policies can be found in the Land Use chapter.

Passenger Vehicles and Light-Duty Trucks

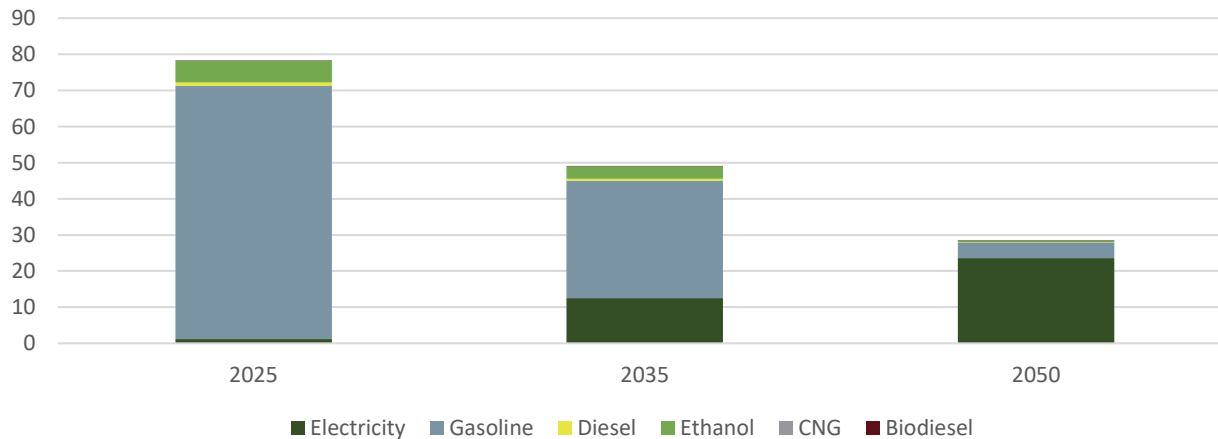
Current Use

The vast majority of personal vehicles and trucks in Bakersfield use fossil fuels such as gasoline. Personal vehicle use represents roughly 55% of all residential energy use in Bakersfield.

Target

The 2050 target for passenger vehicles and light duty trucks requires almost all vehicles to be fully electric by 2050. Electric vehicles are more efficient than gasoline and diesel vehicles, with typical fuel economy equivalent to more than 100 MPG. Therefore, the switch to electric vehicles will reduce total transportation energy consumption. The 2050 target also assumes that the number of vehicle miles travelled will decrease 10% due to increases in carpooling, public transit, walking and cycling.

Passenger and Light Truck Energy Use Target



Year	Plug-In Hybrid	Electric
2025	2	6
2035	5	29
2050	21	123

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Medium and Heavy-Duty Trucks

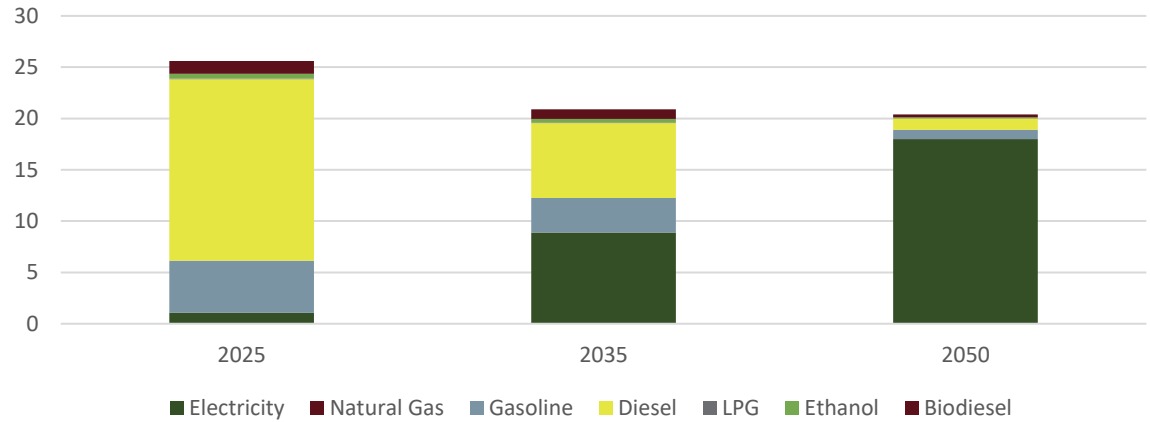
Current Use

There is no available on current energy use of medium or heavy-duty trucks. Diesel is the most common form of fuel for heavy-duty vehicles in Vermont (VTrans 2021, Vermont Transportation Energy Profile).

Target

Similar to passenger vehicles and light trucks, the target for medium and heavy-duty trucks is that the majority will be electric vehicles by 2050. Advancements in electric vehicle technology will be required to meet this goal.

Medium and Heavy Duty Truck Energy Use Target



Electricity

Residential Electricity

Current Use

Electrical energy use in Town is equivalent to 15.5 BBTUs. 87% is residential and 13% is commercial.

Target

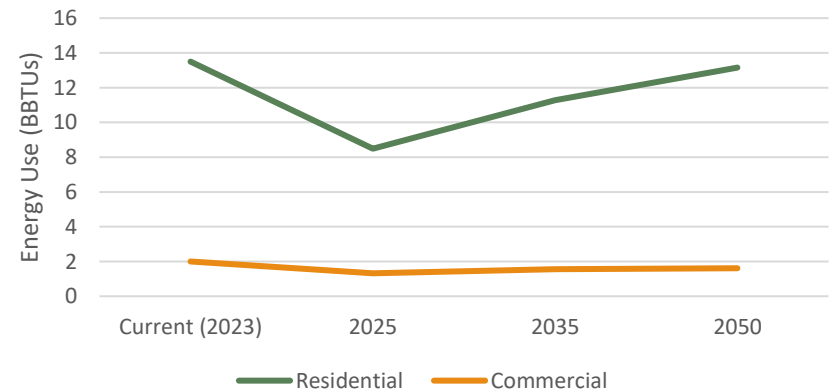
Data on electrical energy use is difficult to interpret. Increased energy efficiency of household appliances, lightbulbs and devices should bring electrical energy use down over time. However increased use of electricity for heating via heat pumps and for transportation via electric vehicles will increase electrical demand significantly. Therefore, the total amount of electrical energy use is expected to increase by 2050, even as total energy use declines.

Electrical Goals



Electrical use will increase due to increasing use of electricity for heating and vehicles.

Electrical Energy Use Targets



Energy Generation

As the amount of electricity needed for heating and transportation increases, some of that energy will need to be generated locally. This plan assumes about half of all electricity generation will occur locally. The overall renewable target is for 3.8 MW of new energy to be produced in Bakersfield, equivalent to the power needed for 646 homes.

Since availability of some renewable energy sources such as wind and hydro can vary widely based on the environment, the municipal target assumes all renewable energy will come from solar power.

Energy Generation Targets

Solar

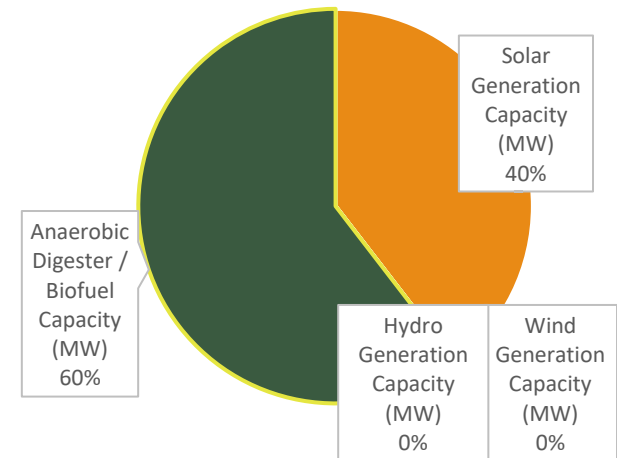
Bakersfield currently has 0.26 MW of solar power generation. An additional 3.5 MW will be required to meet the 2050 goal. The goal assumes that 0.8 MW of this will be generated by rooftop solar systems. This is equivalent to roughly ¼ of homes and businesses having rooftop solar. The remaining 2.7 MW will be generated by ground-mounted solar, which is roughly 21 acres of solar fields.

Wind

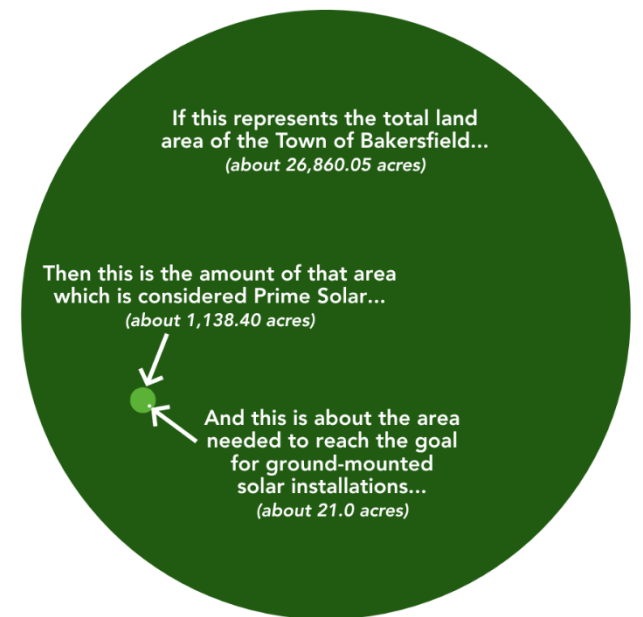
Bakersfield currently has no wind generation facilities, and no wind generation is proposed to meet the 2050 goal.

Bakersfield does not support the construction of “industrial” or “commercial” wind generation facilities within the Town. For the purposes of this plan, Bakersfield considers any wind facility with a tower height (excluding blades) in excess of 100 feet tall to be considered an “industrial” or “commercial” wind facility. Small, net-metering scale wind generation may be possible. More information is needed regarding the viability and affordability of these systems, but generally Bakersfield views these types of facilities

Existing Renewable Energy Generation in Bakersfield



BAKERSFIELD SOLAR POTENTIAL DIAGRAM



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favorably provided that impacts to known constraints are avoided, impacts to possible constraints are mitigated, and site-specific concerns are addressed.

Hydro

The Town does not currently have any dams that produce hydroelectric power. There are no major rivers in Bakersfield which makes the development of hydro power unlikely, although some small-scale “run-of-the-river” generation may be possible.

Biodigesters

Biodigesters are facilities which convert food scraps or manure into renewable natural gas (RNG). RNG may be used directly in place of fossil fuel natural gas or burned in a generator to convert the energy to electricity. On-farm biodigesters generally require a minimum of 500 cattle. There is currently one biodigester in Bakersfield at the Gervais Family Farm that produces 0.78 MW. There may be additional potential for more biodigesters in Bakersfield. Thermal generation from a “district heating facility”—a central facility that would provide heat to several structures -- is another potential use for biodigesters.

Energy Storage

One potential issue with increasing renewable energy production is that some renewables can only produce energy under the right environmental conditions. For instance, solar panels can only generate power when the sun is out. To address this, there will be a need for additional energy storage systems such as batteries. There is no specific target for energy storage.

New Technologies

New technologies continue to develop, including the emergence of geothermal heat as an electricity source. Investigating which technologies are suitable for our region and its residents will be an ongoing process. It is hard to know exactly what the future makeup of Vermont’s electricity generation will be, but it is important to support a diverse, distributed, and robust set of generation facilities in the region. This will ensure resiliency, equity, and adaptability for the future.

Energy Generation Maps

Energy generation maps showing the potential areas available for solar, wind, and hydro power are available in Appendix 1A of the Town Plan.

Equity, Feasibility, and Challenges

Equity

It is the policy of Bakersfield that no segment of the population should, because of its racial, cultural, or economic makeup, bear a disproportionate share of environmental burdens or be denied an equitable share of environmental benefits. It is further the policy of the Bakersfield to provide the opportunity for the meaningful participation of all individuals, with particular attention to environmental justice focus populations, in the development, implementation, or enforcement of any law, regulation, or policy.

Bakersfield has and will continue to broaden its consideration of equity in its planning and implementation work. This includes working to:

- Improve the ability to respond effectively and respectfully to complex social, economic, and political issues that impact the community.
- Improve the decision-making processes to ensure that decisions are fair and balanced.
- Create and support the development of a more inclusive workspace and external community culture.

Defining equity is important for this plan and Bakersfield's continued work.

1. Distributive equity recognizes disparities in the allocation of resources, health outcomes, the inequities in living conditions and lack of political power place frontline / impacted communities.
2. Procedural equity includes equitable planning and implementation that requires communities have a meaningful opportunity to participate.
3. Contextual equity ensures that mitigation and adaptation strategies consider that low-income communities, black communities, indigenous communities and people of color, and people with disabilities, historically marginalized people, are often more vulnerable to climate change.
4. Corrective equity ensures that mitigation and adaptation strategies provide communities with clear processes to hold the state accountable to its commitments to pursue equity.

Bakersfield has officially adopted a Declaration of Inclusion. These themes and ideas have been incorporated into this plan and will be considered further in the implementation of this plan. The Bakersfield will continue to identify ways to implement the statement of inclusion and identify how to consider equity and inclusion within their work. Bakersfield will continue to partner with local and regional organizations to ensure projects and programs support improved access to opportunity for all people in Bakersfield.

Generation Siting

Bakersfield finds it to be essential that all decisions regarding new renewable energy generation facilities take into consideration concerns about health and safety. The noise, vibration, glare, or other impacts from generation facilities shall be mitigated by developers to ensure that such impacts do not have an undue adverse impact upon neighboring properties.

It is hard to know exactly what the future makeup of Vermont's electricity generation will be, but it is important to support a diverse, distributed, and robust set of generation facilities in the region. This will ensure resiliency, equity, and adaptability for the future.

Split-Incentives

95% of households are owner-occupied and 5% are renter households. In many rental housing options, the landlord is responsible for building maintenance while the tenant is responsible for utility bills. As a result, the landlord may not have a strong financial incentive to invest into home improvements such as weatherization or heat pumps and renters may face high utility costs with few options to address them. This is a particular problem given that in the Northwest Region the median renter household has half the income of the median owner-occupied household. Finding new ways to incentivize both landlords and tenants as well as provide targeted outreach and education on this topic could help to alleviate this issue.

Feasibility and Challenges

Bakersfield faces several challenges in achieving the targets laid out in this plan which will require the cooperation and coordination of the federal government, state government, NRPC, and private sector.

High Upfront Costs- While efficient technologies such as heat pumps and electric cars are more affordable to operate, they also tend to have higher up-front costs. Incentives have been created to help Vermonters, especially low-income Vermonters, access these technologies. Unfortunately, many residents still find a gap between the subsidized cost and the amount they can afford. Increased incentives, especially for middle income households, as well as the quickly improving technology, could help to alleviate this barrier for Bakersfield's residents. There is also a need to substantially increase the capacity of existing programs for low-income residents, such as the low-income weatherization programs to reduce wait times.

Grid Limitations- The Vermont electrical grid was developed to have a one-way flow of electricity and distributed renewable generation can impact the function of the electrical grid. As with the rest of the United States, Vermont has historically depended on a small number of centralized power plants—the vast majority of which are located outside of the state.

Impact on Local Energy Companies- The changing energy landscape may have negative impacts on local energy companies, such as heating fuel and gas stations, that cannot evolve their business model. In the short term, this may hinder residents from accessing new, innovative heating and transportation technologies locally. In the long term, it may lead some local energy companies to disband, with lost jobs as a consequence. There are several programs in the state and region to help retrain workers who currently work in the fossil fuel industry. Certain sectors, including weatherization and green technology installation, will require additional labor and can provide careers for those transitioning out of fossil fuel industries.

Despite the challenges involved in implementation, it is important to remember the key issues this plan hopes to address: energy security, environmental protection, economic need/opportunities, and equity. Without making significant changes to how Bakersfield generates and uses energy, our energy future will be less secure, our environment less healthy, and our economic situation potentially dire. Bakersfield finds that any and all progress toward the goals of this plan is important. A lack of action at the state, regional, and local levels may have serious consequences.

10. IMPLEMENTATION

As required by statute, a municipal plan must have a plan for implementation. This chapter identifies available tools, strategies, and opportunities that will assist the Town in building our vision for the future. Short-term actions are intended to be completed by 2034. Long-term actions have longer timeframes but may still have steps that can be taken to advance progress in the short-term. It is important to periodically review the plan to prioritize implementation steps and to ensure that all recommendations are being considered.

Action	Timeframe	Responsible Party
Historic and Archaeological Resources		
Seek opportunities for structural remediation and renovation of the town-owned Carriage Barn.	Short	Conservation Commission, Historical Society, Selectboard
Community Services and Spaces		
Coordinate with interested landowners, tower companies and cell providers to build infrastructure that brings reliable cell service to Bakersfield.	Short	Planning Commission, Selectboard
Coordinate with NWSWD, local scrap businesses and residents to organize the collection of junk vehicles and bulk waste from private residences.	Short	Planning Commission, Selectboard
Upgrade the Town Garage. (details?)	Short	Selectboard
Consider opportunities to expand access to the public water system in order to address issues with private wells.	Long	Planning Commission, Selectboard, Fire District #1
Consider purchasing or conserving property in the Village for a future community wastewater leach field.	Long	Planning Commission, Selectboard

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Transportation		
Seek opportunities to reduce vehicle speeds through the Village, including installing speed indicator signs.	Short	Selectboard
Coordinate with VTrans to reduce the impact of state snow plowing on Village sidewalks.	Short	Selectboard
Coordinate with the Town of Waterville with to ensure that Waterville Mountain Road is clearly marked on both sides as closed and unpassable in the winter.	Short	Selectboard
Seek opportunities to extend the Village sidewalk network further north and south along Main Street as originally proposed in the 2004 Feasibility Study. South Main Street is the highest priority area for sidewalk expansion.	Long	Planning Commission, Selectboard
Energy		
Consider energy efficiency when upgrading municipal vehicles and buildings.	Ongoing	Selectboard
Support the efforts of Efficiency Vermont to promote the installation of energy-efficient devices, appliances, and equipment in residences and businesses.	Ongoing	All departments
Consider municipal renewable energy generation options including community solar, wastewater methane collection, or other potential municipally owned projects.	Long	Planning Commission, Selectboard

Land Use, Environment and Resilience, Housing		
<p>Update the town’s zoning bylaws. Update should include the following:</p> <ul style="list-style-type: none"> • Reflect the new district boundaries in the Land Use chapter • Explore alternatives to the fixed area allocation system for regulating density in rural areas • Comply with the HOME Act and ensure a variety of housing options are supported 	Short	Planning Commission
Maintain a current Local Hazard Mitigation Plan and adopt a Local Emergency Operations Plan each year.	Ongoing	Selectboard, Emergency Management Coordinator
Economic Development		
Continue to play an active role in the Brigham Academy redevelopment to ensure that it supports the goals of the Town Plan and brings as much benefit as possible to the community.	Ongoing	Selectboard, Planning Commission
Investigate opportunities to open a cooperative general store in the Village that sells items from local businesses and meets the day-to-day shopping needs of residents.	Long	Selectboard, Planning Commission

APPENDIX 1: ENERGY PLAN APPENDIXES

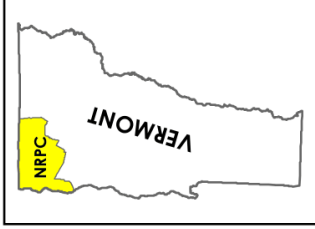
A. Energy Generation Maps

Energy generation maps show the potential areas available for solar, wind, and hydro power, as well as existing biomass which could be used for wood heating. These maps exclude high priority resources which are known constraints. Energy generation facilities shall not be located in areas where known constraints exist.

The maps also consider lower priority resources as Possible Constraints. These resources often impact the siting process for generation facilities. New generation facilities shall not have an undue adverse impact upon possible constraints. Often, site-specific mitigation solutions are possible when possible constraints exist on a parcel. Therefore, possible constraints have been included in the area designated as “base” on the regional energy generation maps (solar, wind, biomass, hydro).

Utility Service Areas

Bakersfield, Vermont Act 174 The Energy Development Improvement Act



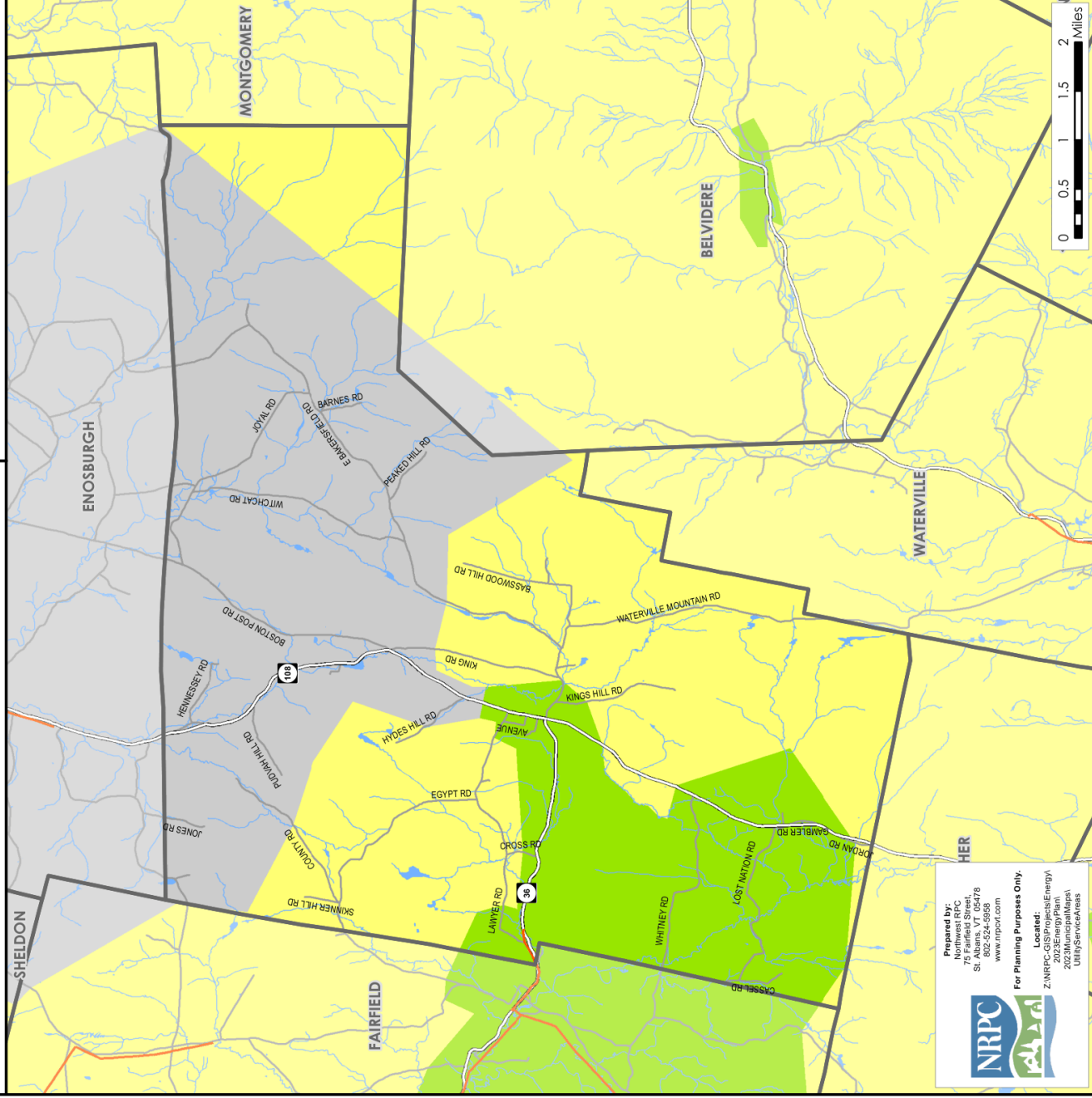
This map and the corresponding data is intended to be used to inform energy planning efforts by municipalities and regions. This may also be used for conceptual planning or initial site identification by those interested in developing renewable energy infrastructure. The information is for informational purposes only. No specific investigation for a proposed facility and cannot be used as 'siting maps.'

Legend

Utility Service Area Features

- Green Mountain Power
- Swanton Village Electric
- Vermont Electric Co-op
- Enosburg Falls Electric
- Substation
- 3 Phase Power Line
- Transmission Line

Sources: VCGI
Disclaimer: The accuracy of information presented is determined by its sources. Errors and omissions may exist. The Northwest RPC is not responsible for these. Questions or on-the-ground location can be resolved with the respective utility or a registered surveyor. This map is not a substitute for a professional engineering or surveying study. The presence of features, and may indicate relationships between features, but is not a replacement for surveyed information or engineering studies.



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 UtilityServiceAreas



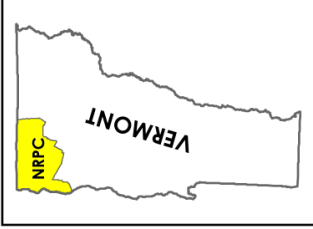
Transmission & 3 Phase Power Infrastructure

Bakersfield, Vermont





Act 174

The Energy Development Improvement Act

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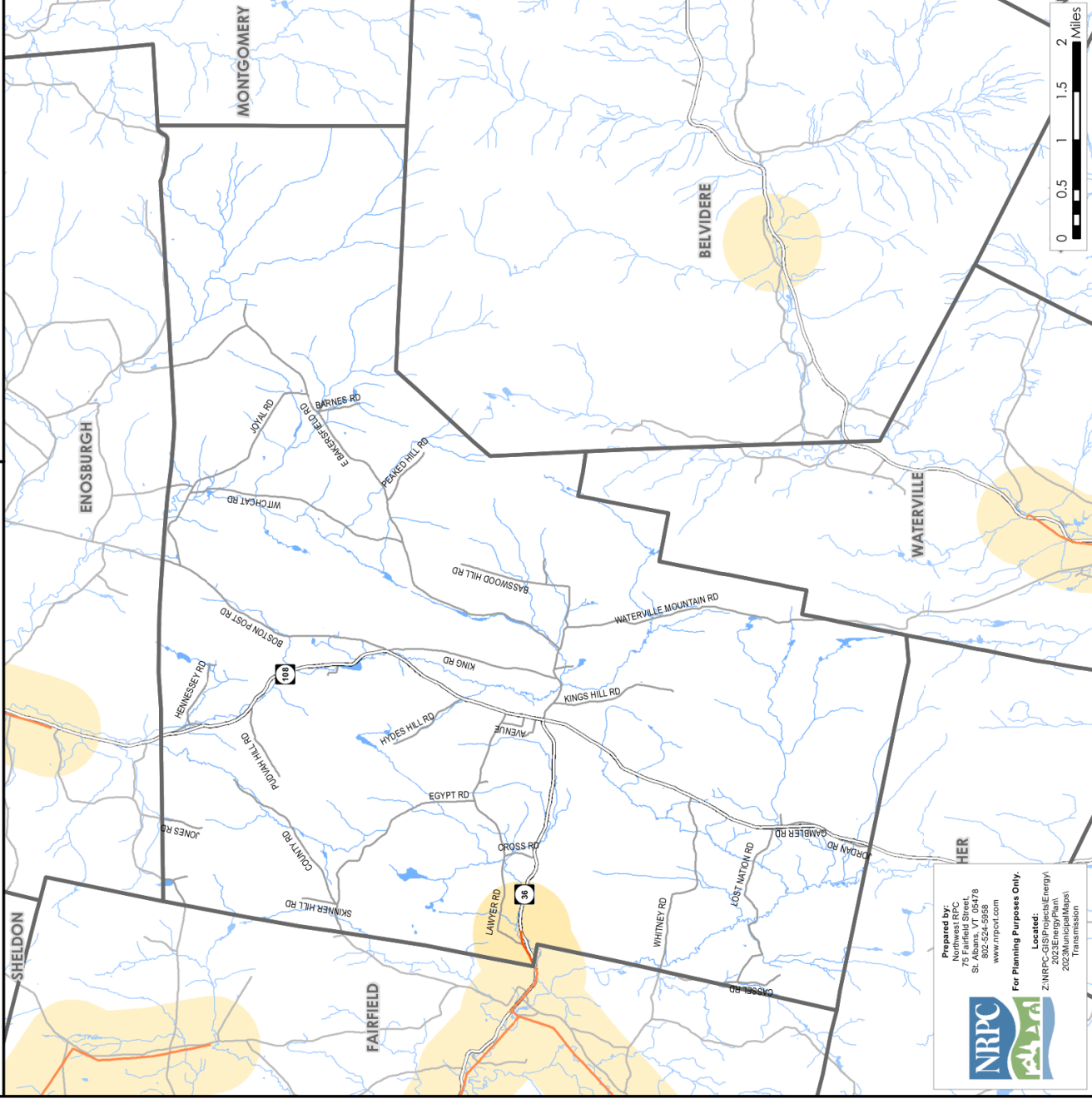



Legend

-  Substation
 -  3 Phase Power Line
 -  Transmission Line
 -  1/2 Mile Buffer* (3 Phase Power Line & Transmission Line)
- *The half mile buffer shows where generation facilities can be located without significant loss of power in transit to transmission lines.

Sources: VCGI

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For Planning Purposes Only.

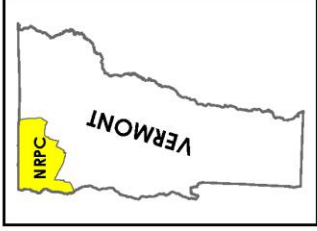
Located:
21NRPC - Vermont (Energy)
2023E - Municipal Maps
2023Municipal Maps
Transmission

Solar

Bakersfield, Vermont Act 174

The Energy Development Improvement Act

This map and the corresponding data is intended to be used to inform energy planning efforts by municipalities and regions. This may also be used for conceptual planning or initial identification by those interested in site selection. The maps do NOT take the place of site-specific investigation for a proposed facility and cannot be used as siting maps."

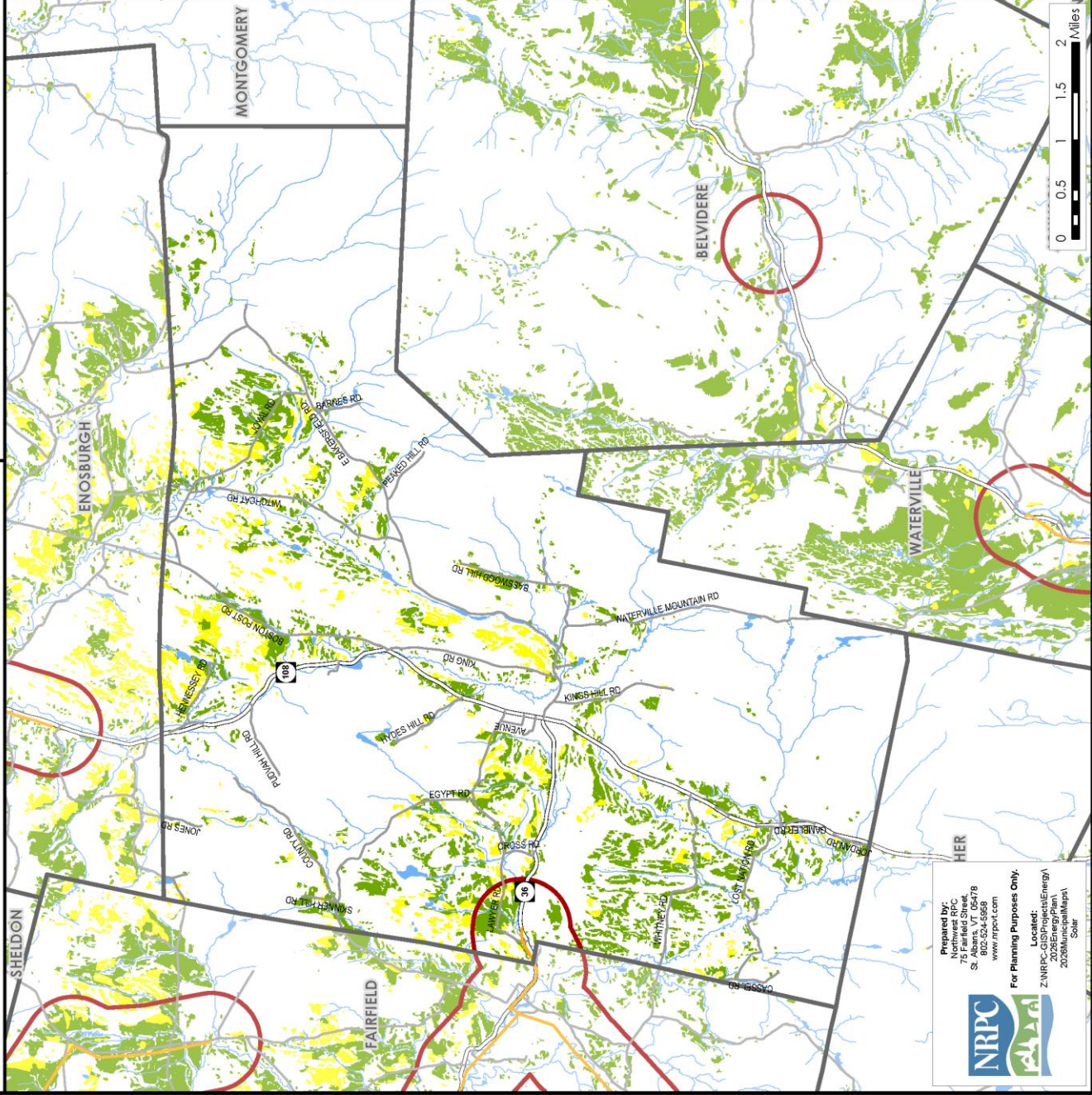


Legend

- Substation
- 3 Phase Power Line
- Transmission Line
- 1/2 Mile Buffer* (3 Phase Power Line & Transmission Line)
- Prime Solar/No Known Constraints
- Base Solar/Possible Constraints

*The half mile buffer shows where generation facilities can be sited without the acquisition of power in transit to transmission lines.

Sources: VCGI
Disclaimer: The accuracy of information presented is determined by its sources. Errors and omissions may exist. The Northwest RPC is not responsible for these. Questions or on-line-ground location can be resolved through the Vermont Agency of Natural Resources. This map identifies the presence of features, and may indicate relationships between features, but is not a replacement for surveyed information or engineering studies.

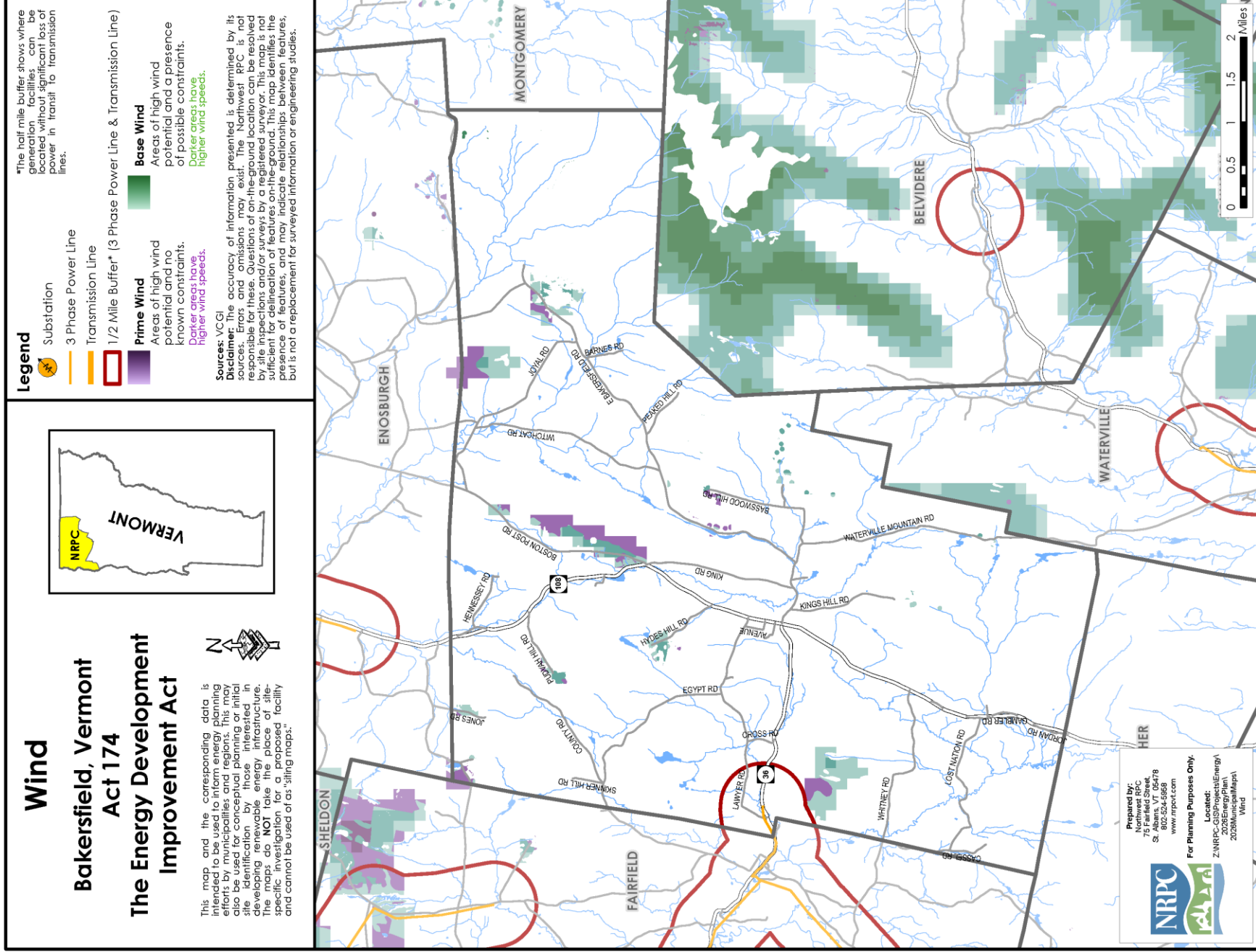


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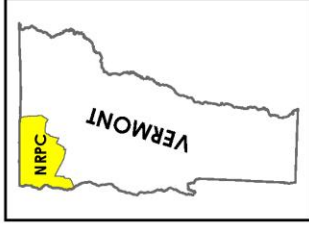
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Woody Biomass Bakersfield, Vermont Act 174 The Energy Development Improvement Act

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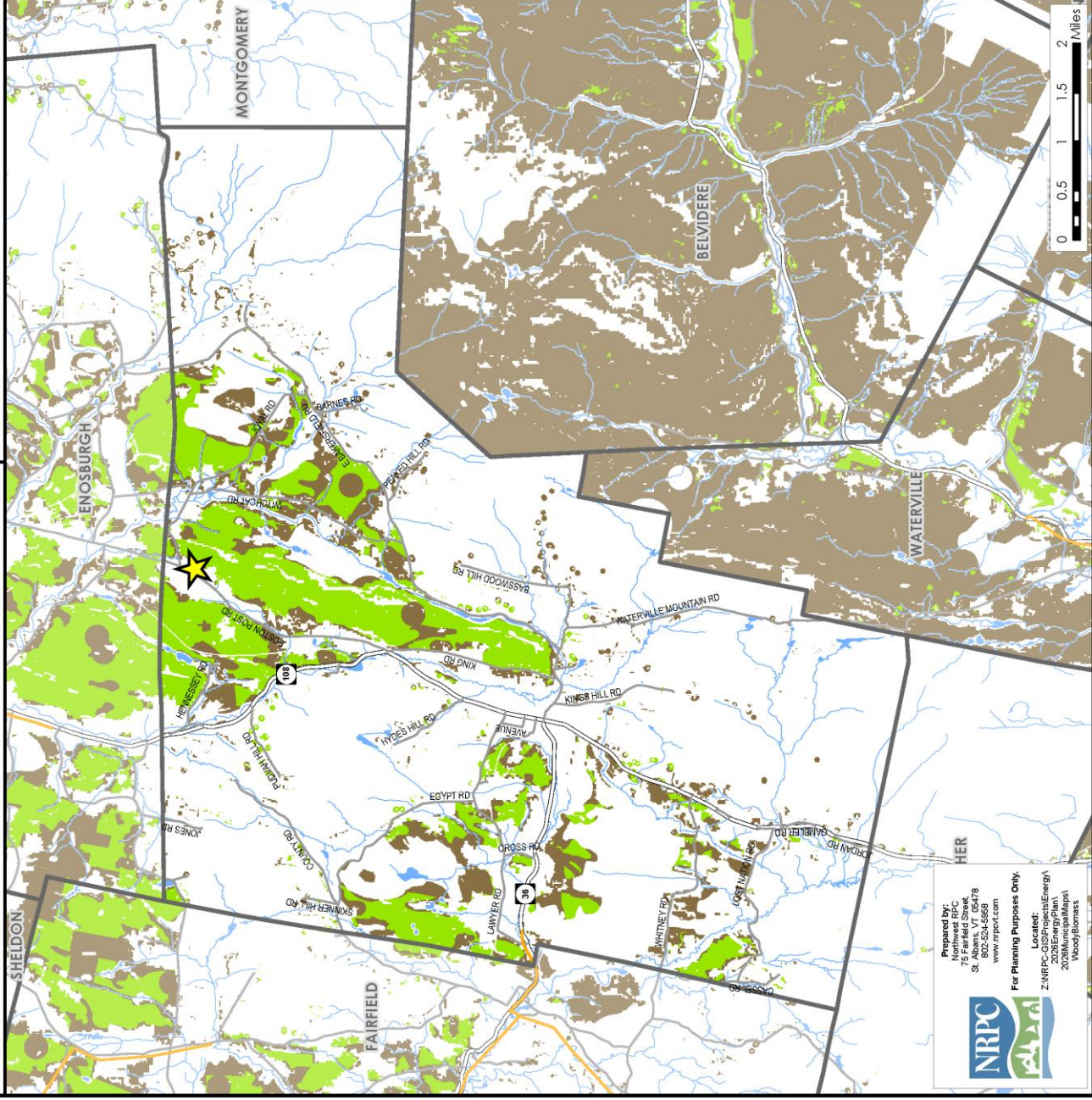
Legend

- Biomass System
- Methane Digester
- Substation
- 3 Phase Power Line
- Transmission Line
- Prime Woody Biomass/No Known Constraints
- Base Woody Biomass/Possible Constraints

Note: The prime and base biomass shows where biomass, specifically cordwood, could be harvested. The location of biomass generation facilities, including methane digesters, is more site specific and therefore does not have prime or base areas.

Sources: VCGI

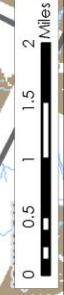
Disclaimer: The accuracy of information presented is determined by its sources. Errors and omissions may exist. The Northwest RPC is not responsible for these. Questions of on-the-ground location can be resolved by site inspections and/or surveys by a registered surveyor. This map is not sufficient for delineation of features on-the-ground. This map identifies the presence of features, and may indicate relationships between features, but is not a replacement for surveyed information or engineering studies.

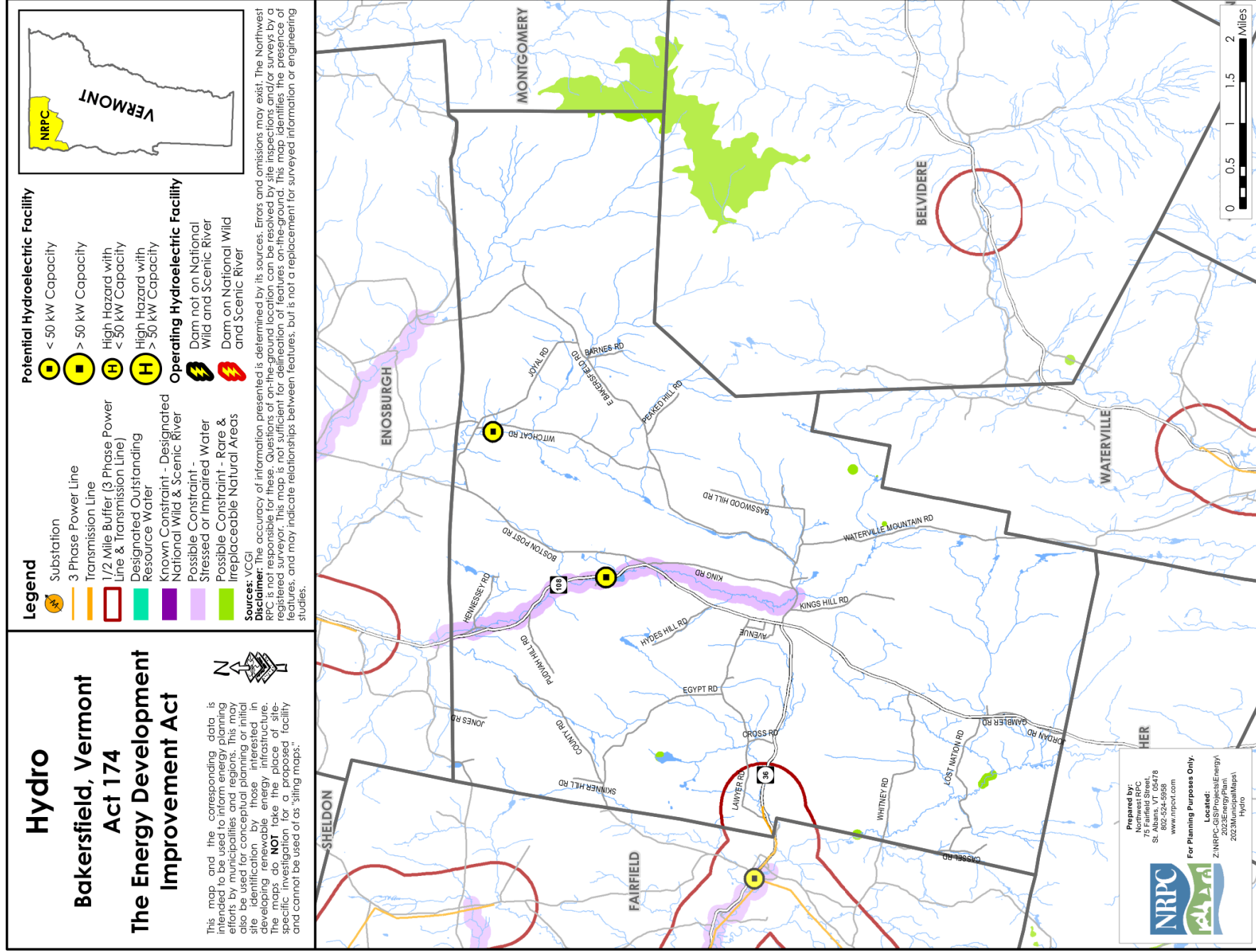


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2020EnergyMap.mxd
Woody Biomass





Hydro

Bakersfield, Vermont

Act 174

The Energy Development

Improvement Act



This map and the corresponding data is intended to be used to inform energy planning efforts by municipalities and regions. This map is not intended to be used in place of site identification or to make planning decisions. The maps do NOT take the place of site-specific investigation for a proposed facility and cannot be used as "siting maps."

Legend

- Substation
- 3 Phase Power Line
- Transmission Line
- 1/2 Mile Buffer (3 Phase Power Line & Transmission Line)
- Designated Outstanding Resource Water
- Known Constraint - Designated National Wild & Scenic River
- Possible Constraint - Stressed or Impaired Water
- Possible Constraint - Rare & Irreplaceable Natural Areas
- VCGI
- Potential Hydroelectric Facility < 50 kW Capacity
- Potential Hydroelectric Facility > 50 kW Capacity
- High Hazard with < 50 kW Capacity
- High Hazard with > 50 kW Capacity
- Operating Hydroelectric Facility
- Dam not on National Wild and Scenic River
- Dam on National Wild and Scenic River

Sources: VCGI
Disclaimer: The accuracy of information presented is determined by its sources. Errors and omissions may exist. The Northwest RPC is not responsible for these. Questions of on-the-ground location can be resolved by site inspections, and/or surveys by a registered surveyor. This map is not sufficient for delineation of features on-the-ground. This map identifies the presence of features, and may indicate relationships between features, but is not a replacement for surveyed information or engineering studies.

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 2023\Mapa
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B. Energy Plan Data and LEAP Modeling

Under 24 V.S.A § 4348a(a)(3) municipal enhanced energy plans must include data on current energy use by sector and municipal targets for 2025, 2035 and 2050 which comply with the Vermont Comprehensive Energy Plan. This appendix describes how current use and municipal targets were developed.

Current Use

Data on current energy use was developed using the Department of Public Service municipal consumption tool. The following details the data sources for each sector of energy use. The best available data sources were used.

There are several limitations on the data. With the exception of metered electricity and natural gas, there is no direct measures of energy usage. Therefore, the current use data relies heavily on state estimates of energy use per house or business. Additionally, at the town level, there is a high margin of error for U.S. Census American Community Survey data which impacts accuracy.

Thermal Energy Use

Residential thermal energy use was estimated based on the number of housing units in the municipality and the average state heating use per household. Commercial thermal energy use was estimated using data from the Vermont Department of Labor on the number and type of businesses and a statewide estimate of the typical heating energy use of those types of businesses.

Transportation Energy Use

Transportation energy use was estimated based on the total Vermont DMV registrations for internal combustion and electric vehicles and statewide estimates of average vehicle mile travelled and fuel economy. Vermont registrations are based on address, differences between zip code address and municipal boundaries exist in some communities which make this data less accurate.

Electrical Energy Use

Metered electrical energy use is reported by the distribution utilities to Efficiency Vermont for residential and commercial uses. Farm operations may choose to select the residential or commercial energy rate.

2025, 2035 and 2050 Consumption Targets

The 2025, 2035 and 2050 municipal targets are based on a proportion of the regional targets found in the Northwest Regional Energy Plan. Regional targets were developed by the Department of Public Service based on the 2022 Vermont Comprehensive Energy Plan.

The 2022 Vermont Comprehensive Energy Plan included a Low Emissions Analysis Platform (LEAP) analysis of one pathway towards reaching the state's statutory 2050 energy goals. This scenario is known as the CAP mitigation scenario. Information on the state's LEAP modeling process can be found at <https://publicservice.vermont.gov/document/2022-cep-analysis-greenhouse-gas-emission-reduction-pathways-vermont>.

The statewide LEAP model targets were then divided among the Regional Planning Commissions by the Vermont Department of Public Service. NRPC has divided each consumption target by municipality based on the percentage of current energy use in the municipality. For thermal energy use, the natural gas portion of the target was allocated only to communities with existing natural gas lines, as large-scale expansions of the existing natural gas pipelines are not expected.

2025, 2035 and 2050 Generation Targets

NRPC developed the regional energy generation targets using the Vermont Department of Service's generation scenarios tool. NRPC assumed that 50% of the regional energy supply would be produced by renewable sources within the region. More information on the regional target can be found in the Northwest Regional Energy Plan.

The regional target was then divided by municipality based on total population, under the assumption that municipalities with higher population will have higher energy demand. These targets were divided between ground-mount and rooftop solar under the assumption that one-quarter of the total available rooftop solar potential will be developed.

Finally, the targets were adjusted to remove the ground-mount solar target for St. Albans City, as under regional policy the entire community is within a growth area where ground-mount solar is not appropriate. This adjustment had the impact of adding roughly 800 kW of ground-mount solar to all other municipal targets. All other municipalities have sufficient land area outside of growth areas for ground-mount solar.

C. Energy Resource Mapping Constraints

Solar, Wind and Biomass Maps

Known Constraints

- **Confirmed Vernal Pools:** There is a 600-foot buffer around confirmed vernal pools. (Source: ANR)
- **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. (Source: VCGI)
- **River Corridors:** Only mapped River Corridors were mapped. Does not include 50 foot buffer for streams with a drainage area less than 2 square miles. (Source: VCGI)
- **National Wilderness Areas:** (Source: VCGI)
- **FEMA Floodways:** (Source: VCGI)
- **Class 1 and Class 2 Wetlands:** (Source: VCGI)
- **Downtowns, Planned Growth Areas, Village Centers, Village Areas and Transitional Areas:** These areas are the current or planned areas of dense development in the region. Larger solar generation facilities are land-intensive and interrupt the desired pattern of smart growth development. This constraint does not apply to ground-mounted solar of 500 kW or less in all areas other than downtowns, roof-mounted solar, or parking lot canopy solar within such designated areas. The inclusion of this resource as a regional constraint is consistent with goals and policies of the Northwest Regional Plan. (Source: NRPC) (Source: NRPC)
- **FEMA Flood Insurance Rate Map (FIRM) Special Flood Hazard Areas:** Special flood hazard areas as digitized by the NRPC were used—just 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. (Source: NRPC)
- **Ground and Surface Waters Drinking Protection Areas:** Buffered Source Protection Areas (SPAs) are designated by the Vermont Department of Environmental Conservation (DEC). SPA boundaries are approximate but are conservative enough to capture the areas most susceptible to contamination. The inclusion of this resource as a regional constraint is consistent with goals and policies of the Northwest Regional Plan. (Source: Vermont Agency of Natural Resources [ANR])
- **Vermont Conservation Design 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 inconsistent with goals and policies of the Northwest Regional Plan. (Source: ANR)

- **Public Water Sources:** A 200-foot buffer is used around public drinking water wellheads. The inclusion of this resource as a regional constraint is consistent with goals and policies of the Northwest Regional Plan. (Source: ANR)
- **National Natural Landmark – Chazy Fossil Reef:** The Chazy Fossil Reef in Isle La Motte has been designated a National Natural Landmark by the US Department of Interior. (Source: NRPC)
- **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 known constraint.

Possible Constraints

- **Potential and Probable Vernal Pools:** There is a 600-foot buffer around unconfirmed vernal pools. (Source: ANR)
- **Protected Lands:** This constraint includes public lands held by agencies with conservation or natural resource oriented missions, municipal natural resource holdings (ex. 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, and private parcels with conservation easements held by nonprofit organizations. (Source: VCGI)
- **Features from ANR's Vermont Conservation Design:** Highest Priority Interior Forest Blocks, Highest Priority Connectivity Blocks, Highest Priority Physical Landscape Blocks and Highest Priority Surface Water and Riparian Areas.
- **Deer Wintering Areas:** Deer wintering habitat as identified by the Vermont Agency of Natural Resources. (Source: VCGI)
- **Hydric Soils:** Hydric soils as identified by the US Department of Agriculture. (Source: VCGI)
- **Agricultural Soils:** Local, statewide, and prime agricultural soils are considered. (Source: VCGI)
- **Act 250 Agricultural Soil Mitigation Areas:** Sites conserved as a condition of an Act 250 permit. (Source: VCGI)
- **Class 3 Wetlands:** Class 3 wetlands in the region have been identified have been included as a Regional Possible Constraint. The inclusion of this resource as a regional constraint is consistent with goals and policies of the Northwest Regional Plan (Source: ANR)
- **Municipal Conservation Land Use Areas:** Conservation Land Use Districts, as designated in municipal plans, that include strict language that deters, but does not prohibit development.

Hydro Maps

Known Constraints

- **National Scenic and Recreational Rivers:** Known constraint; Missisquoi and Trout Rivers. This constraint will only be incorporated into the Hydroelectric Resource Map. Dams occurring within an impacted area will be displayed as such on maps. (*Source: Digitized by the BCRC from Upper Missisquoi and Trout Rivers, Wild and Scenic Study Management Plan*)

Possible Constraints

- **“303d” List of Stressed Waters:** Possible constraint. This constraint will only be incorporated into the Hydroelectric Resource Map. Dams occurring within an impacted area will be displayed as such on maps. (*Source: ANR*)
- **Impaired Water:** Possible constraint. This constraint will only be incorporated into the Hydroelectric Resource Map. Dams occurring within an impacted area will be displayed as such on maps. (*Source: ANR*)
- **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. (*Source: VCGI*)