SECTION 9: ENERGY AND UTILITY PLANS

9.1 INTRODUCTION

Dorset Energy Goals and Policies:

- Reduce dependence on non-renewable and imported energy sources;
- Promote energy conservation and efficiency in residential, commercial, and industrial structures and operations;
- Reduce energy consumption in all taxpayer funded buildings and operations; and
- Develop sustainable, local renewable energy resources.

The town of Dorset recognizes it is necessary to work toward a sustainable energy future in a manner that minimizes environmental impacts and supports the local economy. The purpose of this energy chapter is to further those goals and recommend actions by increasing public awareness of energy issues, assessing local energy use and conservation opportunities, and evaluating the potential for utilization of various renewable energy resources to meet the town's energy goals. Given new opportunities presented through Act 174, the town has determined that developing an enhanced energy element represents a sound step in advancing these policies.

Act 174 and Enhanced Energy Planning

In 2016, the Vermont legislature approved Act 174 to enhance regional- and town-level energy planning and to establish a way for municipalities to have more input on the siting of electric generation facilities through local land use planning. The Act established standards that –if met by a regional or municipal plan—give their contents 'substantial deference' in Section 248 proceedings of the Public Utility Commission regarding the siting of electric generation facilities. The standards require that plans address specific requirements organized into three broad categories:

1. Analysis and Targets: assessment of current energy use and targets for future consumption;
2. Pathways: identification of implementation actions and strategies to achieve future targets;
3. Mapping: renewable energy resource maps and siting guidelines for renewable electric generation facilities.

VT Energy Goals and Policies (VT CEP 2016):

- Obtain 90% of energy for all uses from renewable sources by 2050;
- Reduce statewide energy consumption by 30% by 2050;
- Reduce greenhouse gas emissions to 50% below 1990 levels by 2028 and 75% by 2050;
- Rely on in-state renewable energy sources to supply 25% of energy use by 2025;
- Improve the energy efficiency of 25% of homes by 2025;
- Meet the Vermont Renewable Energy Standard through renewable generation and energy transformation.

This energy chapter is outlined in accordance with the Act 174 standards. Requirements for regional and local plans are based on statewide policies and goals outlined in the Vermont Comprehensive Energy Plan (CEP), updated in 2016. Central goals of the CEP are summarized to the right. A Regional Energy Plan was adopted in 2017 by the Bennington County Regional Commission (BCRC). The Dorset enhanced energy plan element has been developed with support from the BCRC.

Energy Use in Vermont and the Bennington Region

The State of Vermont established markers through the CEP to help guide communities to such a sustainable future. A central goal of the plan is to attain **90% Renewable Energy by 2050**. To achieve this goal, however, development of new renewable energy sources is insufficient on its own. Since renewable sources yield less energy per unit than their fossil fuel-based counterparts, a drastic reduction in overall energy consumption is critical to meeting this target.

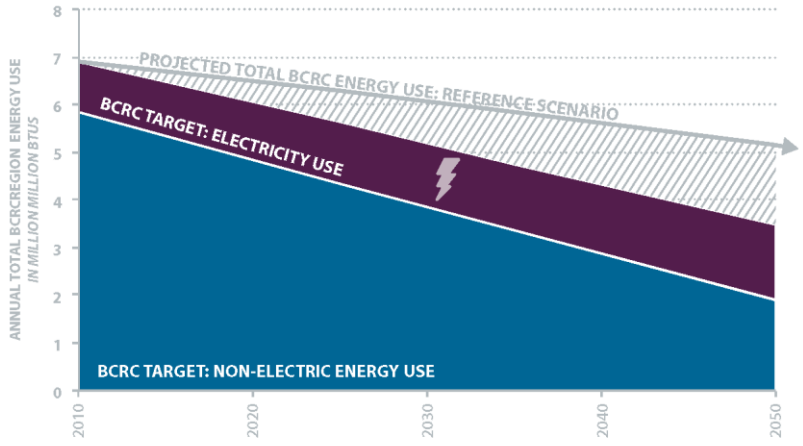


Figure 9.1: BCRC Region Energy Cost Estimates, 2014

According to LEAP estimates (see below for more details), to achieve the 90X50 energy goal, the BCRC region will need to dramatically reduce energy use by increasing efficiency and relying on electricity for many more purposes. The 'Reference Scenario' above represents a business-as-usual scenario.

In the Bennington region, **Total Energy Consumption will be Cut by More than Half of 2010 levels by 2050**. Energy conservation efforts combined with improved energy efficiency through technology upgrades and building weatherization will enable Vermont towns to reduce energy consumption to sustainable levels into the future.

A key aspect of improved efficiency will be a greater reliance on electricity to power everyday needs. Since electricity can be generated from renewable resources, and electric-powered technologies such as heat pumps and electric vehicles are highly efficient, switching to electricity will help lower overall energy consumption even as lifestyles remain much the same as today. **By 2050, nearly Half of All Energy will be supplied through Electricity** (CEP projections).

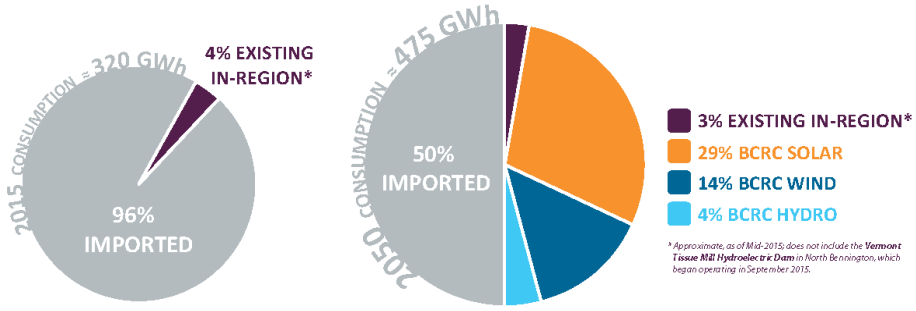


Figure 9.2: Sources of Bennington Region Electricity, 2015 v. 2050

Electricity use will increase significantly by 2050, with in-region renewable generation equivalent to about half the expanded 2050 electricity supply.

Though this major shift in energy use is considerable, there are opportunities to lower costs and bolster the local economy through a **Transformation of the Energy Sector**, which costs the Bennington Region over **$150 Million a Year** (2014 estimates). Nearly all this money currently flows out the region and the state through the purchase of foreign fuels and distribution services, so redirection of these funds to local energy businesses and jobs will better retain wealth in local communities.

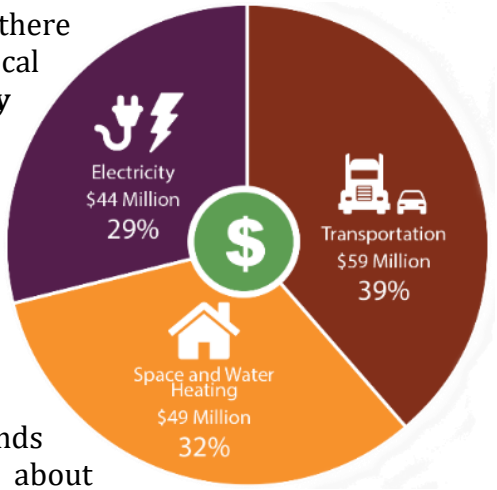


Figure 9.3: BCRC Region Energy Cost Estimates, 2014

Generated by BCRC staff based on data from Census Bureau, VT Dept. of Motor Vehicles, and US Energy Information Administration.

Dorset's future energy use will reflect the regional trends shown here in brief. For more in-depth information about regional energy planning, see the Bennington County Regional Energy Plan (adopted March 2017). The remainder of this energy chapter will focus on energy use and policies in the Town of Dorset.

9.2 ANALYSIS AND TARGETS

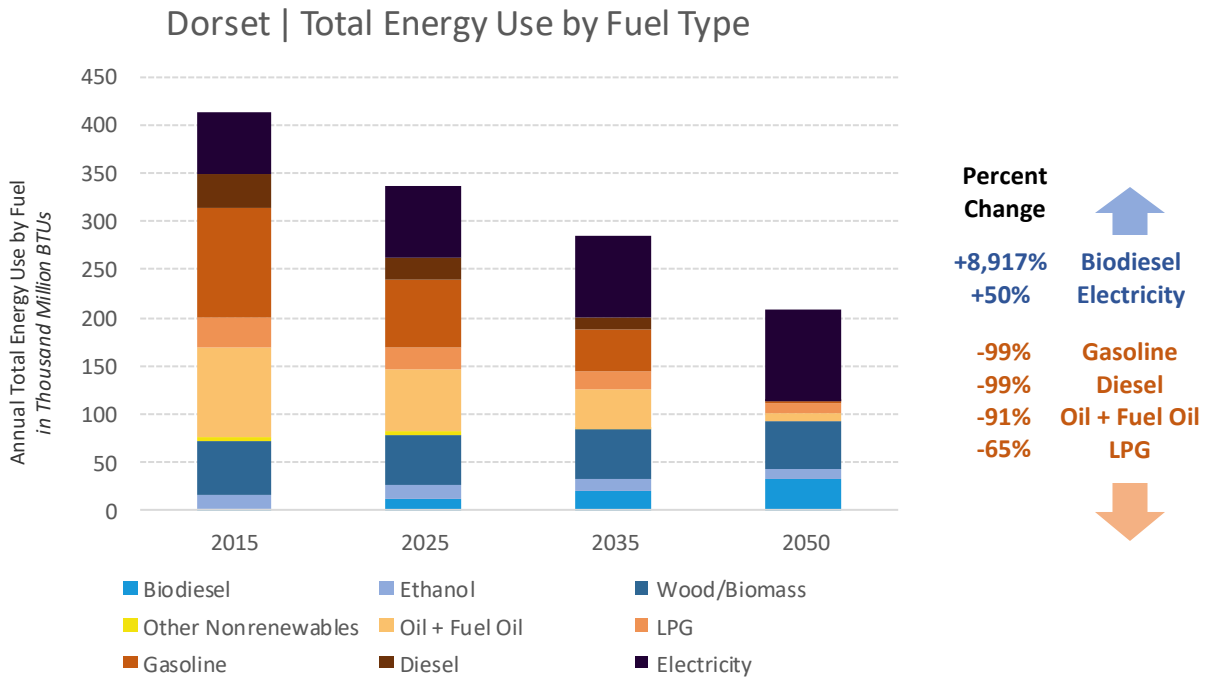
This section of the Act 174 standards calls for analysis of energy resources, needs, scarcities, costs, and problems within the municipality across the three energy sectors: electric, thermal, and transportation. Overall current energy use in Dorset is broken down by fuel source below, and future targets for reduced energy consumption are illustrated across transportation, residential heating, industrial uses, and commercial uses. Specific targets for efficiency and conservation improvements are identified for electric vehicles (EVs), cold climate heat pumps, and full residential weatherization projects.

Current and Future Energy Use

Dorset consists of two dense village centers surrounded by extensive rural settlement and open space. The town's 2,031 residents live mostly in detached, single family homes (more than 9 in every 10 homes according to the 2010 Census). This type of development pattern is linked with considerable energy use to meet transportation, space heating, and daily electricity needs. According to LEAP model projections (see BCRC Regional Energy Plan 2017, page 39, for more details), Dorset uses over **400 thousand million BTUs** (British Thermal Units) per year in total energy. **Dorset will Need to Reduce Energy Consumption by Half to about 200 thousand million BTUs by 2050** to achieve 90% renewable energy by that target year.

The chart below illustrates one path the town may pursue to achieve this goal through **Gradual Adaptation and Fuel Switching** over the next several decades. With the year 2015 as a baseline, Dorset has identified energy use targets by fuel/energy carrier for years 2025, 2035, and 2050:

Figure 9.4: Dorset Total Energy Use by Fuel Type, 2015—2050. Based on LEAP projections.



According to LEAP projections, Dorset will phase out fossil fuels through electrification of the transportation and heating sectors, with biodiesel replacing some conventional diesel and oil fuels, and with widespread use of woody biomass for space heating. Over time, **Electricity** will go from meeting **Just 15% of Total Energy Needs in 2015 to 46% of Energy Needs in 2050.** More details on how specific technologies and strategies can achieve this energy reduction and fuel conversion are broken down by energy sector below.

Residential Energy Use

Energy use can be grouped into 3 major sectors: transportation, thermal (heating and cooling), and electricity. Dorset's more than 2,000 residents living in about 1,005 households consume large amounts of energy for transportation, to heat space and water, and to power lights and appliances with electricity. See Table 9.1 for an estimate on how much Dorset households spend on energy by sector each year. By identifying technologies and practices capable of catalyzing the transformation of each energy sector, Dorset aims to provide its residents the tools necessary to lower their energy use and costs and to realize state energy goals.

Table 11: Dorset Residential Heating and Electric Use and Costs. ACS 2015 Estimates, Efficiency Vermont data.
The vast majority of Dorset's 1,005 occupied housing units are single family homes, which together consume close to $4 million a year in heat and electric energy use. As shown below, dense, multi-unit dwellings are more efficient than single family homes due to lower average square footage and efficiencies arising from passively shared heat. Residents spend the most money on heating oil and non-heat electricity.

	Occupied Residential Units	Total Oil Use (gallons)	Total LP Gas Use (gallons)	Total Wood Use (pellet bags)	Electric Use for Heat (kWh)	Non-heat Electric (kWh)	Total Cost by HH Type	Cost /Unit
Single Family	935	516,742	174,210	63,795	490,518	9,350,000	$3,788,580	**$4,052**
Two-Family	26	10,777	3,633	1,330	10,230	234,000	$84,747	**$3,259**
Multi-Family	24	6,632	2,236	819	6,295	192,000	$59,216	**$2,467**
Mobile Homes	20	8,290	2,795	1,023	7,869	160,000	$62,249	**$3,112**
Cost Factor		$2.75/gal	$3.45/gal	$5.00/bag	$0.15/kWH	$0.15/kWH		
Total Cost		**$1.49 mill**	**$630,915**	**$334,840**	**$75,744**	**$1.46 mill**		

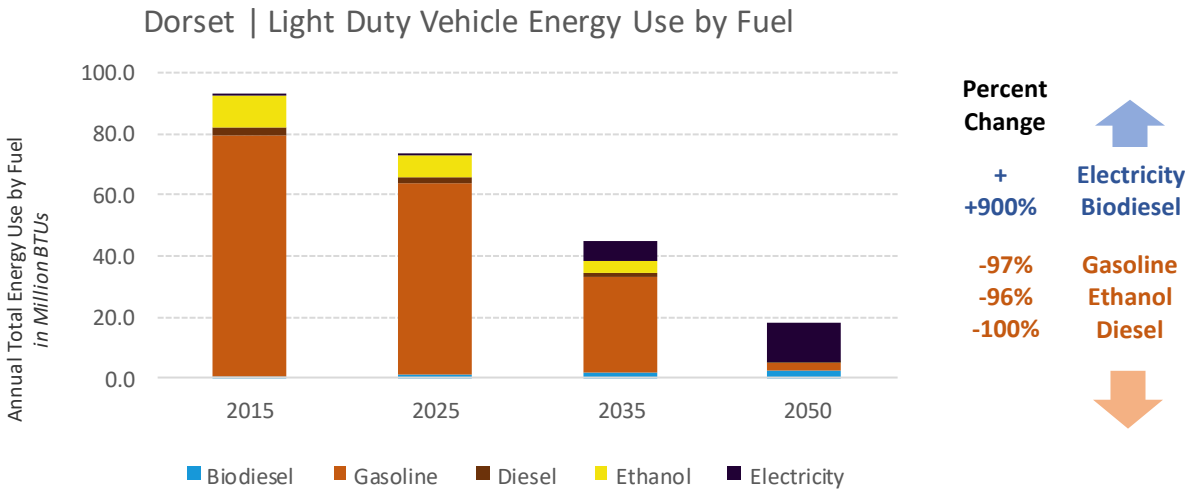
Methodology: Assumed heating efficiency of 60,000 BTU/sq.ft. and the following square footage assumptions: 2,000 sf; 1,500 tf; 1,000 mf; and 1,500 mobile homes (higher sq.ft. due to generally lower efficiency). Units in housing structure and heating source shares from Census.

Transportation

In Dorset, and across all Vermont, **Transportation Consumes the Most Energy of Any One Sector**. Due to Dorset's expansive settlement pattern along the main transportation corridors of Routes 30 and 7, people and goods often travel considerable distances to reach places in and around the community. The light duty vehicle has made this independent mobility and the convenience that comes with it possible, yet most vehicles rely on vast amounts of non-renewable fuel inputs to function. Given the dependence most households have developed on fossil fuel vehicles to move among sprawling destinations, transportation represents one of the greatest challenges to reducing overall energy use.
Fortunately, electric vehicle (EV) technologies have advanced significantly in recent years and these systems are projected to dominate the car industry in coming decades. By electrifying the light duty vehicle fleet, Dorset residents have the opportunity to improve transportation efficiency and divert money currently spent on fossil fuels to support local electricity production. Targets for gradually reducing energy consumption and converting to EV technologies are shown in the following chart:

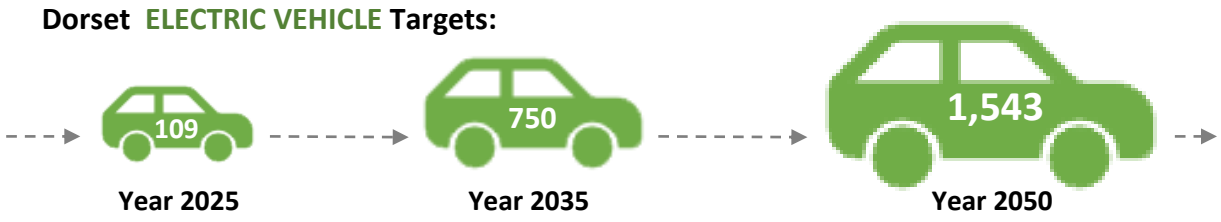
According to LEAP scenarios, Dorset's total energy for transportation will fall gradually to **Just 20%, or One Fifth, of Current Levels by 2050**. Electrification of the light duty vehicle fleet will account for much of this reduction in energy use through improved efficiency. **In 2050, Electric Vehicles Will Comprise More than 70% of Light Duty Vehicles** in the town. A combination of biodiesel and gasoline fuels will power the remaining portion of light duty vehicles.

Figure 9.5: Dorset Light Duty Vehicle Energy Use by Fuel, 2015—2050. Based on LEAP projections.



There are three main kinds of EVs: all-electric vehicles, plug-in hybrid electric vehicles, and hybrid electric vehicles (in the latter the battery recharges from the combustion motor and from braking so there is no plug-in component). Today's EVs have a fuel efficiency many times greater than that of combustion engine vehicles (about 100 mpge [mile per gallon equivalent] compared to about 30 mpg), and the range and efficiency of EVs are projected to improve further (U.S. Dept. of Energy). Several Dorset residents already own EVs, but use will have to increase steadily to be on track to meet the 90X50 energy goal. The following targets are intended to guide adoption rates over time:

Figure 9.6: Dorset Electric Vehicle Count Targets, 2025, 2035, 2050. Based on LEAP projections and ACS estimates.

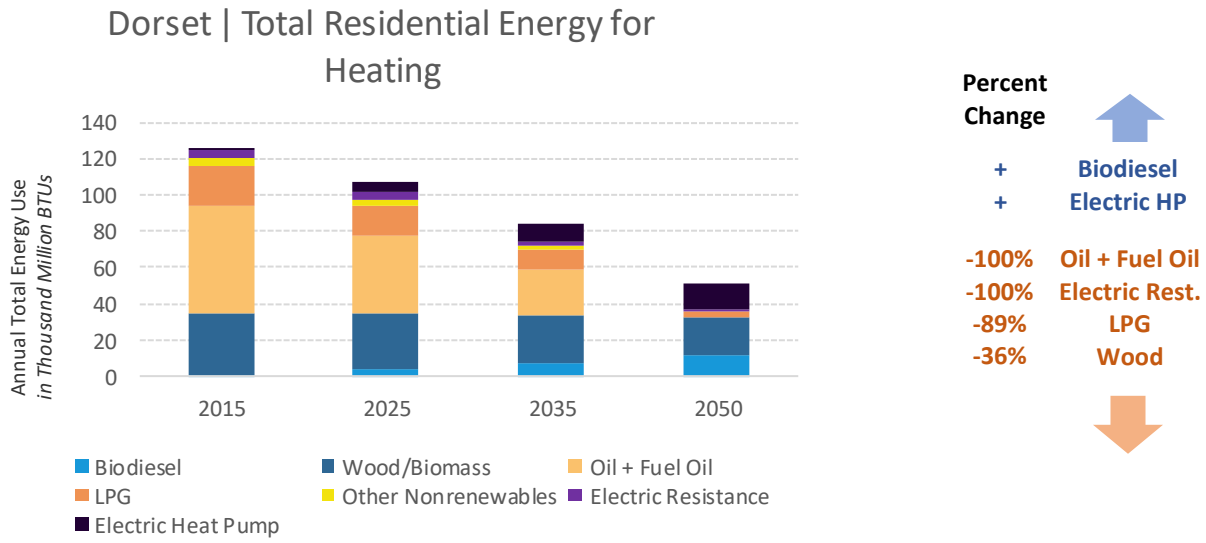


While EVs will play a major role in reducing energy use while allowing Dorset residents to continue to rely on some personal vehicle travel, efficiency gains from EVs alone will not account for all the energy reduction needed to meet future transportation energy targets. **Conservation through Behavior Changes such as Carpooling, Transit Use, and Increased Reliance on Walking and Biking will be Critical** to reaching 2050 energy targets. Policies that encourage denser land use development and implementation of Complete Streets road design are necessary to shift the predominant transportation model from being vehicle-centric to multimodal and efficient-by-design.

Thermal

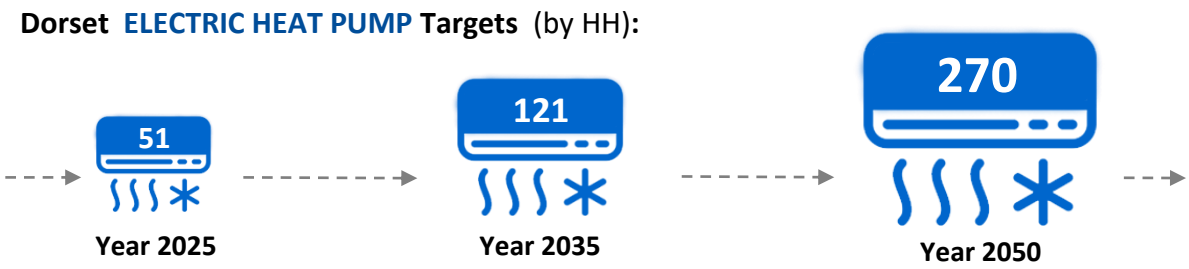
Close to half of Dorset homes are heated throughout the 7-month heating season by oil. Though this fuel source has been inexpensive and widely accessible in the past, projected future shortages of fossil fuels suggest that the town should mitigate reliance on this fuel source by switching to more efficient systems that can be powered by local resources. Woody biomass is one abundant local resource already use for space heating. Wood and pellet stoves currently heat 27% of Dorset residences, and this proportion is projected to increase to about 40% of Dorset homes by 2050. Though the number of homes heated by woody biomass will increase, the total energy consumed by these systems will lower from about 14 thousand million BTUs to 9 thousand million BTUs as aging stoves are replaced by newer, more efficient ones.

Figure 9.7: Dorset Total Residential Energy Use for Heating, 2015—2050. Based on LEAP projections.



In total, **Dorset's Energy Use for Residential Heating will Decline to Just 40% of Current Use, or 21 thousand million BTUs**, by 2050. Cold-climate electric heat pumps are another highly efficient technology that will play a major role in lowering overall energy consumption through electrification. By 2050, **1 in 4 Homes will Use an Electric Heat Pump as its Primary Heating Source**.

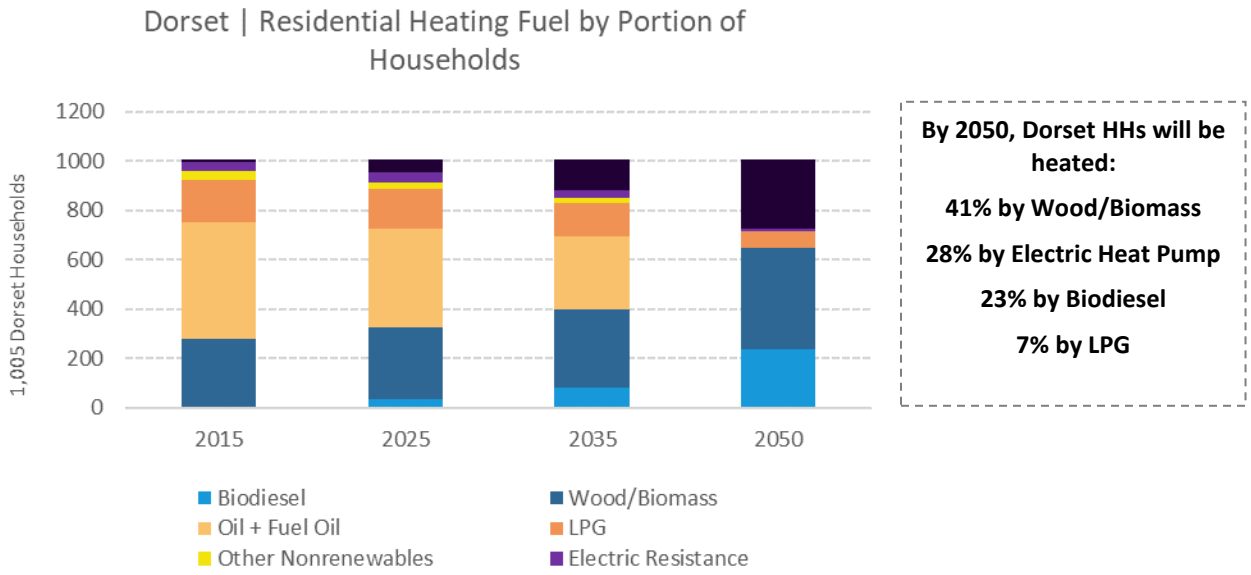
Figure 9.8: Dorset Electric Heat Pump Count Targets, 2025, 2035, 2050. Based on LEAP projections.



Cold-climate heat pump technology, based on the mechanism that cools refrigerators by extracting cold air from ambient space, has improved greatly in recent years. In addition to being more energy efficient than other technologies for heating, **Heat Pumps Also Cool Homes during the Warmer Months**.

The overall shift in residential thermal energy use can also be shown by portion of households:

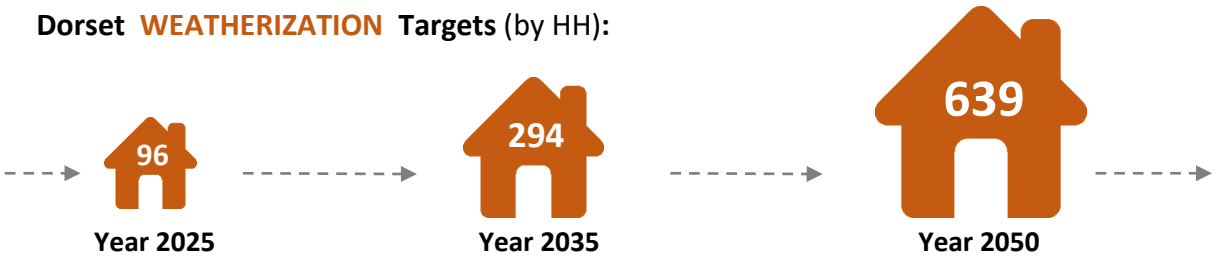
Figure 9.9: Dorset Total Residential Energy Use for Heating by HH, 2015—2050. Based on LEAP projections.



According to LEAP estimates, of Dorset's about 1,005 households, roughly 411 homes will rely for heating on woody biomass through high efficiency pellet and wood stoves, about 278 homes will use electric heat pumps, and almost 236 homes will use biodiesel-based systems. Some homes will continue to use liquid propane gas (LPG), but at a fraction of today's usage (about 67 homes in 2050).

Gradually switching thermal systems to more efficient electric options will do much to improve energy efficiency, but thermal conservation gains will rely on extensive weatherization of existing homes and **Local Enforcement of Building Codes for New Construction and Renovations**. See targets for weatherizing existing homes:

Figure 9.10: Residential Weatherization Count Targets, 2025, 2035, 2050. Based on LEAP and ACS estimates.



By better sealing and insulating homes, total energy use will decrease drastically since it requires less energy to heat and cool a weatherized home. **NeighborWorks of Western Vermont** is a regional organization that offers technical assistance and financing options to make weatherization programs accessible. Efficiency Vermont data shows that at least **106 Thermal Shell Improvement Projects have been Undertaken by Dorset Residents since 2014**, indicating that residents already value this approach to efficiency. Given that individual shell improvement projects—such as air sealing and insulation—are not typically comprehensive weatherization projects, these numbers do not likely represent the full weatherization of homes prescribed in the targets on the previous page. They do represent important progress, however, and place Dorset well on its way to fully weatherizing 96 homes by year 2025.

Electricity

As mentioned previously, electricity use will expand greatly in the future since it is a reliable way to make local renewable energy sources available for use. Electricity is a conductor of energy, not a source, but electricity is often mentioned as if it were an energy source since widespread adoption of appliances, vehicles, and thermal technologies powered by electricity are critical to achieving Vermont's energy goals through efficiency improvements. Current trends show that overall electricity use in Dorset is declining slowly despite rising use in commercial and industrial establishments:

Table 12: Dorset Electricity Usage by Year and Sector (in kWh). Source: Efficiency Vermont.

Sector	2014	2015	2016
Residential	13,301,482	12,940,386	12,564,616
Commercial & Industrial	4,009,442	4,091,125	4,270,428
Total	**17,310,924**	**17,031,511**	**16,835,045**
Count of Residential Premises	**1,401**	**1,397**	**1,395**
Average Residential Usage	**9,494**	**9,263**	**9,007**

Note on Residential Premises versus Household Counts: The Residential Premises count shown above (1,395) represents all residential units currently connected to electric utility services. The estimated residential household count (1,005: sourced from the US Census Bureau's American Community Survey 2011-2015 Estimates) shown elsewhere in this chapter represents estimated year-round residences, which is smaller than total residential premises count due to high incidence of seasonal homes in the town.

Efficiency Vermont reports that electricity use has declined in residences in part due to efficiency enhancement programs and initiatives. For example, Efficiency Vermont estimates that **Dorset Homes have Saved at least $111,868 since 2014** by switching to high efficiency appliances and weatherizing their homes. While these trends show electricity consumption on the decline, total electricity use will eventually begin to increase as Dorset residents switch to electric transportation and thermal systems. As part of this process, total **Electricity use is Expected to Increase to 94.9 thousand million BTUs by 2050**. This increase may seem contrary to energy use reduction goals, but since electricity is much more efficient than the fuels it will replace, total energy consumption will decline even as electricity use rises. More is said about local generation of electricity in the section: *Local Renewable Energy Potential*.

Commercial and Industrial Energy Use

Home to about 78 commercial establishments, Dorset consumes almost 50 thousand million BTUs of energy per year for commercial services. Energy reduction in this sector is not projected to be as drastic as in the residential heating or transportation sectors. The vitality that these businesses contribute to local communities is substantial, and so state energy policies have placed a lighter energy reduction burden on these sectors relative to the residential sector. See charts on the following page.

Figure 9.11: Dorset Total Commercial Energy Use by Fuel, 2015—2050. Based on LEAP projections.

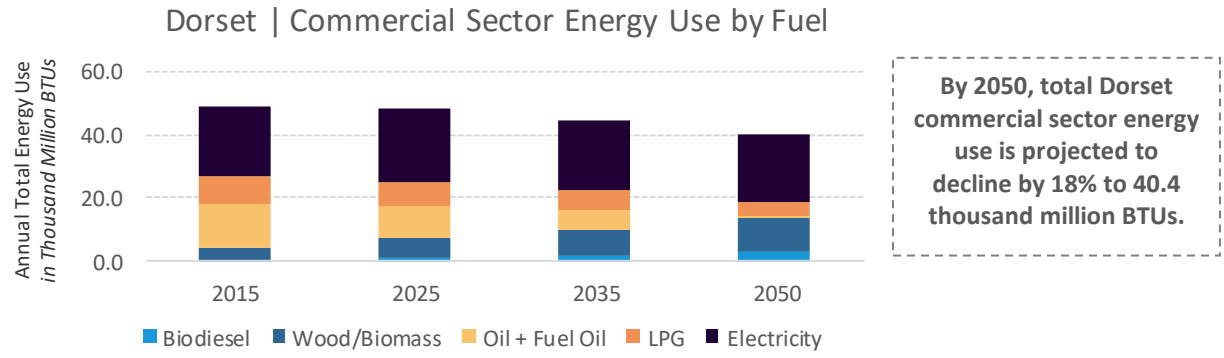
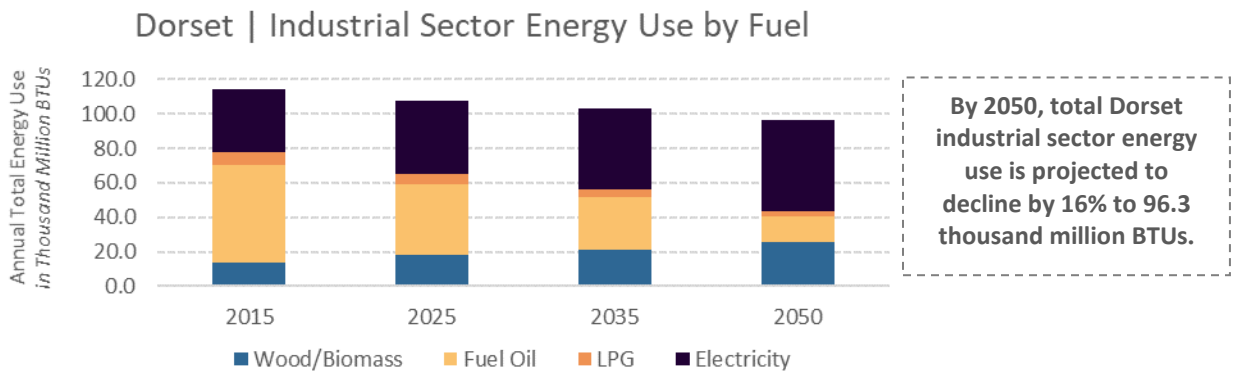


Figure 9.12: Dorset Total Industrial Energy Use by Fuel, 2015—2050. Based on LEAP projections.



Fuel oil use is projected to decrease to minimal levels in the commercial sector and 74% in the industrial sector by 2050. Businesses will need to plan for electrification, woody biomass combustion systems, and biodiesel use to replace this fuel over this time period. Most businesses can reduce energy consumption through straightforward conservation practices such as upgrading lightbulbs and appliances, powering down appliances and machinery when not in use (such as by using programmable timers), and adjusting thermal settings. Comprehensive energy audits are an excellent first step to identifying strategies that make the greatest impact on energy reduction and cost savings. Additionally, since many commercial and industrial operations involve sizeable building footprints, some sites may be well suited to accommodate rooftop solar arrays.

Municipal Energy Use

Local government and schools are significant consumers of energy, and the costs associated with energy use by those entities have a direct bearing on taxes. Energy conservation and use of alternative energy systems in this sector have the potential to produce significant savings for the community and to set a visible example of responsible energy use. Over the past decade, **Dorset Has Become a Leader** among Vermont's municipalities for the town's proactive approach to reducing energy use through efficiency and conservation strategies.

Municipal Energy Improvements:

2007 Town Office Energy Audit:

- Serviced the boiler
- Improved ventilation
- Installed programmable thermostats
- Upgraded to efficient lighting and office equipment
- Air-sealed the building
- Installed cellulose insulation in the knee wall and attic
- Improved the water heater
- Sprayed foam insulation in the basement and box sills

Other Initiatives:

- Replaced all streetlights with efficient LED fixtures
- Purchased 2 bike racks and encouraging businesses to do the same
- Restoring marble sidewalks throughout town to encourage walking

Historical Society:

- Interior lighting upgraded to LED and timed light controls
- 2006 Building Renovations: double-pane window installation and rigid foam, fiberglass and blown-in cellulose insulation in walls, attic, and cellar

Dorset Library:

- Energy audit completed, heat pumps & new windows

Dorset and East Dorset Fire Houses:

- Energy audits completed, grant-funded weatherization work at both sites and a new boiler at East Dorset Fire House

For example, the Town has taken major strides to reduce energy consumption at the town office building by pursuing recommendations from a 2007 energy audit (see list of improvements to the right). The Town also worked with the electric utility company to replace all streetlights in the town with highly efficient LED fixtures. The new LED units consume significantly less electricity and have reduced the town's annual expenditure in this area (previously $12,000) by about one-third. The light from the LED units also is much more natural and is distributed evenly, with little wasted light or areas of overlapping illumination between adjacent lights. Estimates of current energy use by town government are below:

Table 13: Estimated Annual Fuel Consumption and Cost for Town Government: Dorset, VT.
Estimates from Town, 2017.

Energy Source	Quantity Used	Cost Factor	Total Cost
Heating Fuel	2,000 gallons	$2.75/gallon	$5,500
Diesel Fuel	12,000 gallons	$2.75/gallon	$33,000
Gasoline	1,800 gallons	$2.50/gallon	$4,500
Electricity	12,000 kWh	$0.15/kWh	$1,765
Total Cost			**$44,765**

Another round of efficiency and conservation improvements to the town offices should take place. The Town is currently considering a renovation of the building that would

incorporate an open floor plan and greater reliance on electric heat pumps for year-round climate control.

As demonstrated in the table above, the town's highway department, with its trucks and heavy equipment relying on great amounts of diesel fuel, is the largest expenditure for energy in local government. Maintenance of the town's highway infrastructure is a critical public service; as petroleum prices will increase and with experts predicting fuel supply disruptions within the next 20 years, we must explore alternative fuel technologies. Several cities and towns have used biodiesel blends for trucks and equipment. Biodiesel use is difficult at present because of high cost and limited supply, although there is one small producer in Bennington County.

Churches are significant energy users in the community. The United Church of Dorset and East Rupert (the Dorset Church), located next to the Dorset Green, has undergone a number of efficiency and conservation improvements such as modern insulation and weather sealing and upgrading to T-8 fluorescent fixtures and LED lighting indoors and out. The church plans to replace current oil heaters to a hot water heat pump and 3 cold climate heat pumps. The East Dorset Congregational Church, located adjacent to the East Dorset Green, has upgraded its chapel building with T-8 fluorescent lighting fixtures and replaced older windows with double pane windows. The church currently adjusts building use seasonally due to the high cost of oil heating in the winter. Insulating and weatherizing the church and chapel buildings would yield major energy savings for the congregation.

The Dorset School is overseen by the local school district, which has focused considerable effort on energy improvements in recent years. An energy assessment of the building was completed in 2009 and most of the recommended actions implemented (see right). Since that time additional major steps have been taken. This included a total rework of lighting throughout the school under the ReLight program – which again significantly reduced electricity usage, while providing what lighting experts consider to be better lighting for our students and teachers. The school roof work continued, with almost the entire roof having been replaced and upgraded. The school also shifted to producing electricity to meet almost of its needs through the installation of solar panels on the roof in 2014.

Dorset School Energy Improvements:

- Buses: added timers to block heaters, maintain tire pressure, reduced idling;
- Computers: replaced CRTs with LCD monitors, use of power management systems;
- Gym: weatherstripped doors, installed programmable thermostats and automatic exhaust fans;
- Kitchen: repaired vent, replaced refrigerators and freezer with Energy Star-rated units, replaced vending machine;
- Boiler Room: replaced one boiler with highly efficient unit that handles most of school's heating needs;
- Lighting: Replaced all interior and exterior lights with T-8 fluorescent and LED fixtures;
- Roof: replaced several sections and added proper insulation
- Solar Panels: installed non-net-metered panels that provide electricity to utility and a discounted rate to the school for their electricity consumption.
- Wind Power: the school assessed their land for future wind generation capacity

The school has seen considerable savings in both electricity and fuel oil use since implementing these improvements – in fact, it is estimated that **The School's Total Energy Use was Reduced by 35%.** An active "Farm to School" program also has been established at the Dorset School (www.dorsetfarmtoschool.org). Students learn about farming and healthy food while maintaining a garden and helping to implement a composting program. The school works with local farmers to integrate agriculture into educational programs while using locally sourced food whenever possible.

The Long Trail School is a private secondary school occupying a large building off Kirby Hollow Road. The school has replaced some lighting with efficient LED fixtures and has contacted Efficiency Vermont about possible future weatherization improvements. The Dorset Energy Committee will reach out to the school to offer assistance in identifying and implementing improvement projects.

9.3 PATHWAYS

This section of the Act 174 standards involves the identification of implementation actions and concrete recommendations that demonstrate a commitment to achieving the future energy targets outlined in the previous section. Though several means for reaching 90X50 have been discussed already, this section calls out specific strategies for quick reference and prioritization. Identified pathways are categorized under the standards into conservation and efficiency actions, land use planning strategies, and renewable energy resource development.

Conservation and Efficiency Actions

According to a survey administered at Dorset's 2017 Town Meeting, the most common conservation and efficiency strategies used by town residents are
(1) turning lights off when not in use,
(2) turning down the thermostat in winter,
(3) making sure to close and secure windows,
(4) reducing car use by combining errands,
(5) weatherstripping doors and windows,
(6) eliminating unnecessary lights, and
(7) changing interior lights to LEDs. These behaviors certainly contribute to lowering overall energy use, and Dorset residents should continue to promote these easy, inexpensive strategies. However, to realize the energy targets set forth in the previous section, town residents must couple these actions with considerable investments in

NeighborWorks of Western Vermont (NWWVT), through its HEAT Squad program, provides low-cost ($150) comprehensive residential energy audits, low- and zero-interest energy loans, and access to $2,500 in financial incentives available from Efficiency Vermont. The energy audits identify the most impactful efficiency improvements that can be made to a home, and representatives connect clients with certified contractors and financing options to pursue the projects they are interested in. On average, clients save 32% on annual heating costs after improvements.

high-efficiency electric technologies and community-wide initiatives capable of transforming Dorset's energy sector.

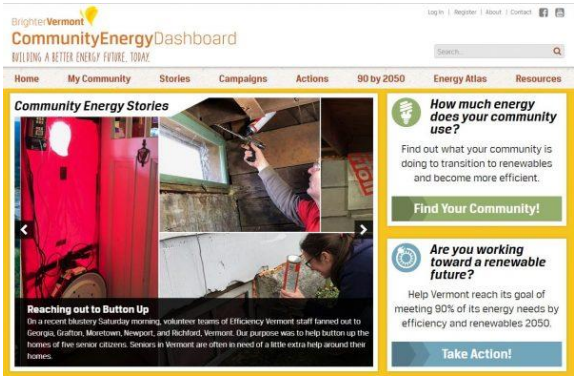
Listed in Table 9.4 are the top three strategies Dorset should pursue across the thermal, transportation, and electricity sectors to catalyze a major reduction in local energy consumption.

To disseminate information about needed behavior changes and technology upgrades, the Town must leverage two key distribution points: the town offices and local schools. The Town should display its comprehensive energy audit, data on the street light initiative, and information about rebates and improvements pursued in a prominent place at the town offices and on the town website to inspire residents to pursue their own audits. The offices may also host workshops about available incentives and financing for improvements. Workshops and information packets shared with school children may also be an effective way to encourage families to improve their energy practices.

Given that financial constraints are often a limiting factor restricting low-income home owners, renters, and others from pursuing weatherization or technology upgrades, considerable attention should be paid to expanding access to weatherization and financing programs available through NWWVT, BROC, and the Vermont State Employees Credit Union (VSECU).

Other conservation concerns important to Dorset residents include reducing waste through recycling/composting and obtaining more food from local and sustainable sources. Targeting local institutions such as schools and businesses with technical assistance to integrate robust recycling/composting programs and to source local food products will be a reliable strategy for change.

Sharing success stories as projects are implemented can also create positive social momentum around energy improvements. One platform for sharing stories and creating local campaigns is the **Vermont Community Energy Dashboard**. In addition to providing access to renewable resource mapping tools and data showing how Dorset is on track to meet its 2050 targets, the Dashboard provides **Actions Checklists** for **businesses**, **farms**, **institutions**, **municipalities**, and **homes** to reduce their energy use.



Vermont Community Energy Dashboard provides information on current energy use by town, future energy targets consistent with Act 174, and steps communities, businesses, and homeowners can take to lower their energy use and/or invest in renewable energy.

Table 14: Town of Dorset: Top 3 Conservation and Efficiency Strategies by Energy Sector.

	What	How	Goal
Thermal			
1.	Comprehensive energy audits for all homes and businesses	▪ Promote the NWWVT *HEAT Squad*'s low-cost energy audits for homes and businesses ▪ Promote BROC's *SAVES* energy audit service ▪ Encourage all fuel dealers to sell efficiency services such as audits, weatherization services, etc. ▪ Encourage all businesses and industries to consult with Efficiency Vermont to identify energy-saving improvements to their operations	All local institutions complete energy audits and pursue basic efficiency upgrades
2.	Weatherization of homes and businesses	▪ Increase awareness of rebates and incentive programs available from Efficiency Vermont; of NWWVT *HEAT Squad*'s low-interest energy loans for homes and businesses; and BROC's weatherization assistance program ▪ Small businesses may be eligible for *Building Performance* rebates from Efficiency Vermont ▪ Enforce state-mandated Residential and Commercial Building Energy Standards	96 homes by 2025
3.	Adoption of electric heat pumps	▪ Help coordinate installations by certified contractors eligible for Efficiency Vermont rebates ▪ Share information on becoming certified installer with all local fuel dealers	51 heat pumps by 2025
Transportation			
1.	Switch to EVs (electric vehicles) and improve efficiency of existing vehicles	▪ Encourage upgrading personal vehicles, public transit, and town and school vehicles to EVs ▪ Host electric car show and install charging stations; ▪ Trial biodiesel use in town vehicles	109 EVs by 2025
2.	Enhance multi-modal and public transportation	▪ Work with Marble Valley Regional Transit ('The Bus') and Green Mountain Community Network to identify opportunities for service improvement or expansion ▪ Promote 'Vermont Shires Connector' bus service to Albany airport and the train station to NYC ▪ Administer resident transportation survey (ex: Weybridge survey) ▪ Promote bike and E-bike use	
3.	Carpool and Ride Share	▪ Promote use of school buses, work place carpooling, Manchester Park & Ride lot, and recognize businesses that allow ride-share parking (ex: E. Dorset store)	
Electric			
1.	Upgrade lighting fixtures	▪ Replace interior and exterior light bulbs to CFLs and LEDs at homes, businesses and industries, streets and parking lots, and farm operations ▪ Install occupancy sensors with timers ▪ Share information on Efficiency Vermont rebates	
2.	Upgrade to ENERGY STAR appliances	▪ Share information on rebate programs and savings ▪ Eliminate unnecessary or underutilized appliances	
3.	Localize electricity sources (since long-distance transmission is inefficient)	▪ Provide information to home and business owners about installing renewables systems, and with all residents about participating in community solar	

Land Use Planning Strategies

The organization of towns into hubs of activity interconnected by transportation routes shapes how we use energy in our daily lives to move, produce, and consume. Dorset's existing land use regulations generally encourage dense development along established transportation corridors and historic centers and discourage it outside of these areas, but improvements to the town plan and bylaws will allow for more mixed use and infill development in and around the town's villages. Such improvements will advance the ability of residents to live closer to where they shop, gather and work, thereby reducing transportation costs, increasing the efficiency of densely-built, multi-unit buildings, and enhancing the vitality of Dorset's village centers.

Areas for Land Use Regulation Improvement:

- Building Size and Density Limits: increasing allowed building size and densities could make future proposals more viable;
- Reduction of Lot Sizes: lowering required lot sizes would make lots more affordable and encourage multi-story development;
- Mixed-Use: regulations should be reviewed to make sure they encourage mixed-use development;
- Home Business Regulations: regulations should be reviewed to make sure they reasonably accommodate home-based businesses;
- Slopes Restrictions: existing slope restrictions prohibit development where it may otherwise be advantageous;
- Form-Based Code: FBC may encourage diverse development in appropriate areas while assuring a high aesthetic standard is maintained in the town.

The Town needs to revise its land use bylaws to address several factors currently limiting infill development (see left). There is a desire on the part of many residents to allow for more mixed-use, walkable development in and around Dorset and East Dorset Villages, though there has been resistance to this land use strategy in favor of preserving development patterns featuring large lots with single family homes and considerable setbacks. Demonstrating ways in which a high-density strategy would better allow for current residents to 'age-in-place' and for residents to afford housing in town could make this pathway more appealing.

Of course, there must be adequate infrastructure to support denser development in the town, such as enhanced wastewater treatment facilities and varied transportation options in and around village centers. This infrastructure is currently lacking, exacerbating the challenge of attracting denser downtown development to the villages. While a conventional sewage treatment system may prove impractical for Dorset due to limited space for facility construction and discharge areas, smaller-scale alternative or innovative systems may be feasible. For example, the Town of Arlington successfully expanded their school facilities recently by installing a packaged wastewater treatment plant with the ability to process sufficient volumes of wastewater with minimal impact to surrounding areas.

Improved land use regulations and wastewater infrastructure will establish a supportive environment for infill development in Dorset and East Dorset villages, but in order for diverse uses to be viable in these areas, residents should have regular, preferably pedestrian access to them. Increasing the number of affordable, walkable residential units in the immediate vicinity of the villages would create demand for services, produce employment opportunities, and introduce vitality to village sidewalks, stores, and parks. Improvements to street design and landscaping that incorporate pedestrian-friendly features such as trees, human-scale lighting, and benches and bike racks also promote this activity. Provision of adequate telecommunications services throughout the town facilitates working-from-home and telecommuting, thereby reducing travel costs and retaining economic activity in the village centers.

What is Mixed-Use Development?

Mixed-use development is a type of development that encourages economic and pedestrian activity by grouping residential, commercial, institutional, or cultural uses densely in an area. Multi-story buildings with residential units above commercial spaces are a common element of mixed-use and historic development patterns. Examples above are from downtown Dorset and Manchester.

Many residents have expressed interest in purchasing more of their food locally to reduce trips to grocery stores in neighboring Manchester and to support local businesses. The weekly Dorset Farmers Market is a year-round hub where local producers sell their products direct to consumers. Beyond this successful market, though, expanding the grocery staples and carry-away offerings at existing general stores in Dorset and East Dorset villages may be another way to achieve this goal. Of course, attracting a food market or new restaurants to the villages could be a popular development, but in order for this to occur Dorset's land use regulations should be amended to allow for more infill and mixed development.

Table 15: Town of Dorset: Top 3 Land Use Strategies.

	Land Use Strategy	Goal
1.	Explore possibilities for serving the village centers with innovative wastewater treatment facilities (see example of Arlington school's packaged wastewater treatment plant)	Enhance wastewater management to support denser development while protecting the environment
2.	Review and revise bylaws to better encourage denser infill development in and around the village centers	Increase number of affordable, walkable housing and commercial units in villages
3.	Pursue transportation improvements indicated by a resident transportation survey, such as the strategic placement of park and ride sites; Use the Site Plan and Subdivision Review processes to make sure that new construction accommodates multiple transportation modes; All road improvement projects must incorporate Complete Streets design principles	Increase public transit use, ride-sharing, and biking and walking in the town; Enhance the safety of biking and walking; Increase total ridership on school buses

In the fall of 2017, the State recognized Dorset and East Dorset villages as designated village centers through the Agency of Commerce and Community Development's designation program. This program grants access to tax incentives and preferred status for funding opportunities that encourage historic building improvements and dense, mixed-use investments in these areas. The benefits of this program can be leveraged to pursue land use goals that will reduce energy consumption.

Renewable Resource Development

Immense financial and energy savings are realized when fuels and electricity are generated close to their points of use. Since renewable energy sources yield less energy per unit than their fossil-fuel and nuclear-based counterparts, energy efficiency must be improved in acquisition, processing, and transport stages. Available resources that can provide for some of the area's energy needs include: biomass (wood and field crops), water (hydroelectric), wind, and direct solar radiation. In addition to supporting local businesses and keeping energy dollars circulating in the local economy, utilization of these renewable resources would provide significant environmental benefits by reducing the amount of pollutants emitted by fossil fuel combustion and supporting good management of natural resources. Developing those resources now also will help provide energy security for the community, assuring availability of the energy needed to sustain economic prosperity well into the future.

Vermont Renewable Fuels is a renewable fuels dealer specializing in wood pellet sales and biomass boilers and stoves based in Dorset.

Energy from renewable sources has many applications. It can help address space and water heating needs, provide fuel for transportation, and generate electricity (that can, in turn, be used for heating, transportation, and many other functions). Space and water heating can be accomplished using solar energy, wood (cordwood, pellets, or chips), biodiesel, and geothermal sources. Certain biofuels, especially ethanol, methanol, and biodiesel, can be used to provide energy for various types of vehicles. Electricity will become increasingly important as a way to deliver energy for a wide range of uses, and can be produced from renewable sources including biomass, wind, solar, and water.

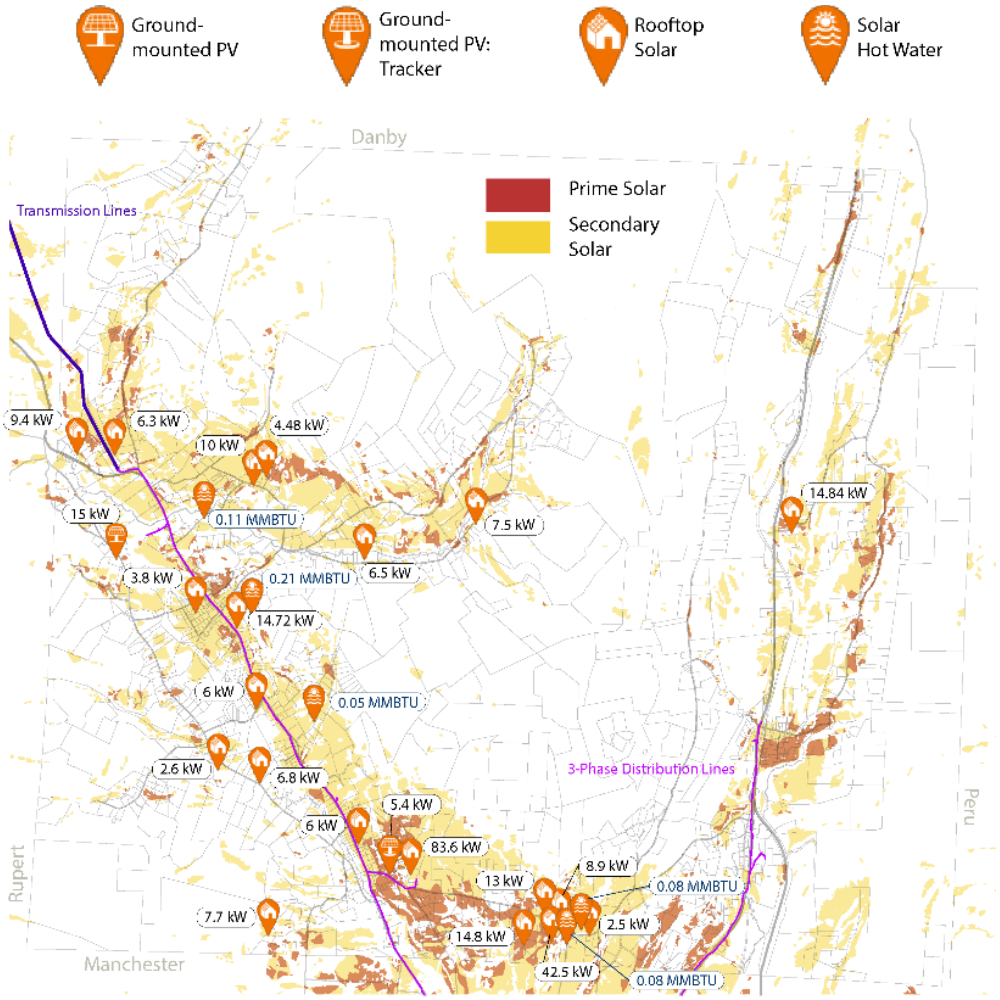
Table 16: Town of Dorset: Top 3 Renewable Resource Strategies.

	Renewable Resource Strategy	How	Goal
1.	Develop appropriate scales of solar and wind facilities	Prioritize municipally- and state-owned areas for solar renewable development; Identify preferred sites to incentivize commercial solar in suitable locations; Support community solar projects to expand access to renewable energy generation	5.2 MW of new solar capacity by 2050
2.	Expand use of biomass for heating and liquid biofuels	Support cost-effective development of biomass energy resources, and promote the use of combined heat and power biomass projects in town and	Reduce carbon pollution

		biomass heating in residences; Trial biodiesel in town vehicles (example: Manchester pilot program); Support production and use of liquid biofuels at farms	emissions
3.	Promote potential renewable energy generation during the approval process for new construction and property improvement applications	Use the Site Plan and Subdivision Review processes to promote use of solar energy or other renewables use in new construction; Provide resources on solar, wind, biomass, and geothermal systems to developers and home owners as applicable to work being pursued on their properties	Increase local renewable generation

9.4 RESOURCE MAPPING

This section of the Act 174 standards requires the identification (through map analysis) of potential areas for the development and siting of renewable energy resources as well as any areas that are unsuitable for siting those resources. This section contains maps of existing renewables generation, future wind generation potential, and future solar generation potential with preferred sites for development, and statements of policy regarding the siting of renewable energy facilities.



Map 9: Dorset Existing Renewable Energy Generation Sites. *Based on VT Energy Dashboard data, accessed 10/10/17. GIS data from VCGI. Not a complete inventory of all renewable energy sites in town.*

Local Renewable Energy Generation and Potential

Nearly all energy consumed in Dorset is imported in the form of gasoline, oil, propane, and electricity. Some imported electricity is powered from renewable sources, primarily the electricity purchased from hydroelectric generating facilities in Quebec and Labrador, Canada. Today some energy production occurs in Dorset in the form of at least twenty rooftop solar arrays (installed capacity of over 271.9 kW generating 285,863 kWhs annually), at least two ground-mounted panels (total installed capacity of 20.4 kW generating 16,422 kWhs annually), and five residential solar hot water heaters. Two businesses and a local institution have sizeable rooftop solar arrays: the Aerie Motel (14.84 kW), GSK Climate Control (42.5 kW), and the Dorset Elementary School (83.6 kW). See Map 9 above.

Act 174 - Environmental Constraints

Known Constraints:

Vernal pools
River corridors
Floodways
State significant natural communities
Rare, threatened, and endangered species
Natural wilderness areas
Class 1 and 2 wetlands

Possible Environmental Constraints:

VT agriculturally important soils
Special flood hazard areas
Protected and conserved lands
Deer wintering areas
Conservation design highest priority forest blocks
Hydric soils

There are many more areas in the municipality where specific scales of solar and non-utility wind development are appropriate. The following map analyses, which comply with **Act 174** standards for renewable resource mapping (for more details, see Bennington County Regional Energy Plan, pages 80-83), provide information about renewable resource availability in the town. Maps were generated using GIS (geographic information systems) data layers developed by VCGI (the VT Center for Geographic Information). Renewable resource layers were mapped, and '**Known Constraints**' were removed entirely from available resource areas. '**Possible Constraints**' were overlapped with renewable resources to highlight where there are potential complications for developing generation facilities. Remaining resource areas that do not overlap with any environmental constraints are considered '**Prime'** resource areas, and resource areas that overlap with Possible Constraints are called '**Secondary'** resource areas.

Dorset Local Constraints:

- Historic Landmarks
  - Dorset Quarry
  - Freedley Quarry
  - Funicular Sites
  - Benedict Road Kiln
- Public Parks / Recreation Areas
  - Cutler Memorial Park
  - Pinnacle Forest
  - Owls Head Town Forest
  - Lane Road Fields
- Design Control Area
  - Design District
- Protected Natural Areas
  - Forest I Land Use District
  - Groundwater Source Protection Areas (SPAs)
- Species Habitat Protection
  - Aeolus Hibernaculum (unmapped – entire municipality)

Local constraints are applied differently by type and scale of renewable energy facility. Policies on how local constraints are applied are outlined below in Figures 4.4, 4.5, 4.6, and 4.7.

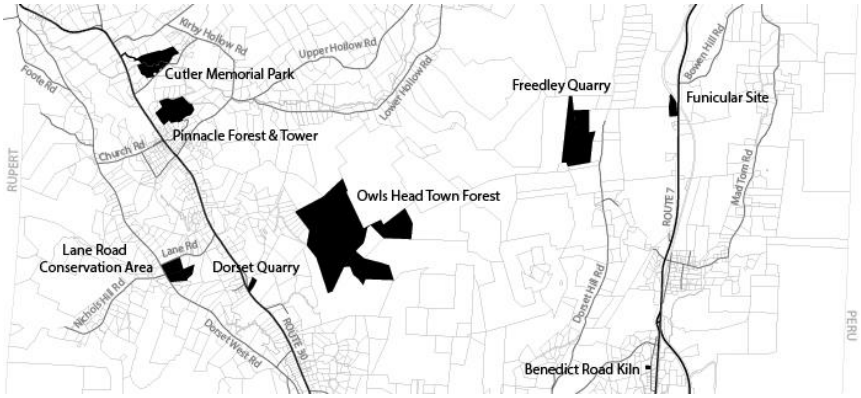
Locally-Identified Constraints

Act 174 authorizes municipalities to identify local resource areas where renewable energy development is inappropriate and/or development is already restricted. In accordance with this guidance, Dorset has identified several local

constraints with the goals of preserving treasured historic landmarks, respecting public recreation sites, and protecting environmentally sensitive areas.

Identified historic landmarks and public recreation sites to be excluded from most renewable energy development are listed above and mapped in Map 10 below. Also excluded is the Forest I land use District, where permanent development is prohibited to protect high-altitude, high-slope natural areas. An unmapped but critical local resource to be considered in reviewing future development proposals is the **Aeolus Hibernaculum** located in the highlands of Dorset. The caves provide hibernation habitat to bat species including the Indiana Bat, which is considered an endangered species with its populations depleted by white nose syndrome and habitat loss. The VT Agency of Natural Resources (ANR) considers the entire town of Dorset to be a sensitive area for the bats, and for this and other reasons large-scale (utility) wind development is not permitted in the town. Potential impacts to the hibernaculum must be considered when reviewing renewable development proposals. Projects that would degrade the hibernaculum or impair the bats' access to it are not permitted in the town.

Map 10: Dorset Historic Landmarks and Public Parks – Local Constraints. Data from Town.



** Historic funicular infrastructure extends west from the mapped Funicular Site to the Freedley Quarry. Areas where funicular infrastructure exists are considered historic landmarks and shall not be developed.*

Solar

There is abundant solar resource throughout low-lying areas of the town, and much of this resource is unrestricted by state-identified environmental constraints. The Town of Dorset establishes the following policies to guide solar energy development in the town. For policy purposes of this plan, solar energy facilities are grouped into three categories: **Small-Scale Solar**, here defined as solar electricity and transmission facilities up to and including 15 kW (AC) capacity; **Mid-Scale Solar**, here defined as solar electricity generation and transmission facilities greater than 15 kW (AC) capacity and less than or equal to 150 kW (AC) capacity or up to two acres of developed area including fencing, whichever is greater; and **Large-Scale Solar** (also known as 'utility-scale'), here defined as a solar electricity generation and transmission facility 150 kW (AC) or greater in capacity or more than 2 acres of developed site area, whichever is greater.

The town strongly supports the development of small- and mid-scale solar facilities where sufficient solar resource is present and environmental and local constraints permit (see Map 12, solar energy resource potential map, for possible locations). Homes, businesses, schools, and other institutions are encouraged to develop onsite solar facilities. **Community Solar Projects** (see next page) are a great way to expand access to renewable energy. Roof-mounted small-scale solar installations, as preferred areas under the state's Standard Offer and net-metering programs, shall not be restricted anywhere in the town.

Solar Scale Examples

4.7 kW residential tracker

150 kW farm installation

1 MW screened by forest

The town supports large-scale solar facilities on identified preferred sites as defined in state statute and as displayed in Map 13, Dorset preferred solar sites map. Large-scale projects are also suitable in **Preferred Areas**, which are listed below and shall be considered eligible for preferred status benefits under PUC net-metering rules. Large-scale solar developments shall be sited in areas with good solar radiation and where minimal or no known environmental constraints exist. All projects greater than 150 kW in capacity must comply with Dorset's solar screening ordinance (to be developed in 2020-2021) and the following **Siting Criteria**, which reflect the town's goal to preserve scenic, environmental, and historic resources of Dorset:

- New solar facilities shall be restricted to areas that do not adversely impact the community's existing and planned patterns of growth of compact downtowns and village centers surrounded by a rural countryside, working farms, and/or forest land.
- Solar facilities shall only be sited in locations where screening will suffice to mitigate the visual impact of the facility on the following scenic attributes: views wherein fields form an important foreground; prominent ridgelines or hillsides that can be seen from many public vantage points and thus form a natural backdrop for many landscapes; historic buildings and gateways to village areas; and scenes that include important contrasting elements such as water.
- The impact on prime and statewide agricultural soils, particularly those currently in production, shall be minimized during the project design process.

Preferred Areas for Solar Development

- Roof-mounted systems;
- Parking lot canopies;
- Systems located adjacent to existing large-scale commercial or industrial buildings;
- Tracts of impervious surface not originally developed for energy purposes and lawfully in existence prior to July 1st of the year preceding the year a CPG is filed;
- Reuse of former brownfields;
- Disturbed areas such as gravel pits and closed landfills;
- Community solar projects;
- Preferred sites identified in Figure 4.5

Unsuitable (prohibited) areas for solar development include the following locations:

- Act 174 Known Environmental Constraints (see list on page 88)
- A location that would significantly diminish the economic viability or potential economic viability of the town's working landscape, including productive forest land and primary agricultural soils (as defined in Act 250 and as mapped by the U.S. Natural Resource Conservation Service);
- A location that would fragment or significantly compromise the ecological functions of highest priority forest blocks and habitat corridors as mapped by VT ANR and resilient landscapes as mapped by The Nature Conservancy;
- Steep slopes (>25%);
- Surface waters and riparian buffer areas (except for stream crossings);
- Ridgelines or other landscape features where the facility would be prominently visible against the skyline from public vantage points such as roads;
- A site that causes adverse impacts to historical or cultural resources.

Solar Generation Target: The Town of Dorset aims to develop an **Additional 5.2 MW of Solar Capacity by 2050** to help meet regional and state renewable energy targets. Solar resource areas identified as preferred solar sites in Map 13 total roughly 410 acres and are more than sufficient to meet this target. Solar energy policies should consider the evolving nature of energy technologies. As capacity and diversity of solar energy systems increase over time, policies shall be reviewed to reflect relevant updates in the technology.

Community Solar Projects are of particular interest to the town since they offer an opportunity to people who otherwise lack access to the benefits of solar energy production, such as renters or homeowners with financial or logistical barriers to installing a privately-owned system, to participate in a clean energy project. Dorset here defines community solar projects as group net-metered solar energy installations ranging in size from 15 kW to 150 kW of capacity. Net-metering is a system in which a renewable energy generator is connected to a public-utility power grid and surplus power is supplied to the grid, allowing customers to offset the cost of power drawn from the utility. In a community solar project, shares in a facility are sold to the property owner, neighbors, community members, and local organizations in proportion to their annual energy usage. The utility splits output from the solar farm among the members according to their share size, crediting their utility accounts.

Image from butlerrural.ccop

How Community Solar Works

Step 1 – Solar installation generates energy and feeds it into the utility grid.

Step 2 – Members purchase shares in the installation as a way to add solar power to their energy mix.

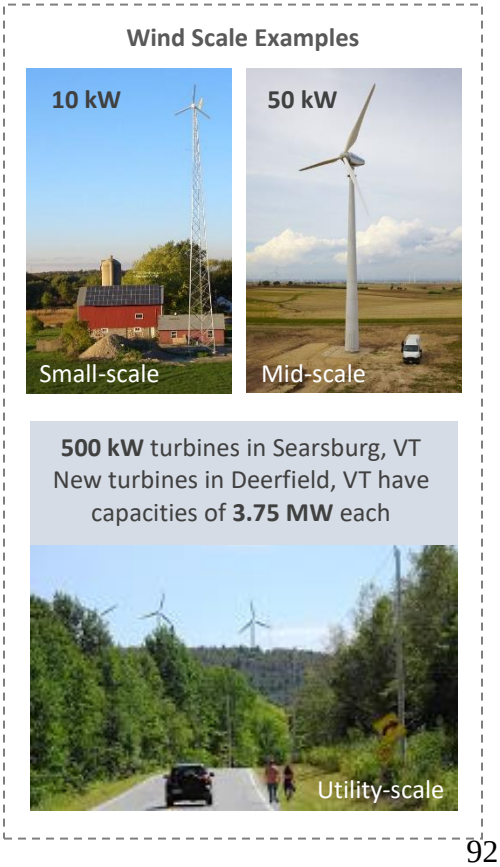
Step 3 – Each member's bill will receive a credit based on the amount of energy produced by the solar panels.

Wind

The Town of Dorset has no wind generation facilities currently connected to the utility grid, but is home to **Star Wind Turbines, LLC**., an innovative manufacturer of small- and mid-scale wind turbines. The company designs ultra-low noise, automated hydraulic lifting, low-wind-speed turbines (5 kW – 45 kW capacity) that minimize visual and physical impacts to the environment. Star Wind was recently awarded funding by the Department of Energy to test its turbines against national performance and safety standards. Dorset is proud to be home to this growing business and unique source for locally-produced wind power.

The Town of Dorset establishes the following policies to guide wind energy development in the town. For policy purposes of this plan, wind energy facilities are grouped into three categories: **Small-Scale Wind**, here defined as systems with generating capacities up to and including 10kW (AC); **Mid-Scale Wind**, here defined as systems with generating capacities greater than 10kW (AC) and less than 1MW (AC); and **Utility-Scale Wind**, here defined as systems with a generating capacity per turbine of 1 MW or greater.

The Town of Dorset has determined that large, **'Utility-scale' Wind Generation Facilities are Not Currently Feasible Anywhere in the Town of Dorset**. Nearly all high wind resource areas are concentrated in Dorset's Forest I District, where the Dorset Town Plan prohibits permanent development and access to 3-phase power connection is currently limited. Additionally, the presence of the Indiana Bat Hibernaculum raises concerns about the impact of utility-scale wind infrastructure to that species' free movement in the area. Furthermore, the Bennington County Regional Energy Plan establishes a regional constraint of 1KM residential buffer for utility-scale wind development. These constraints, along with protected groundwater source protection sites, envelop the town so extensively that the entire municipality is excluded from consideration for utility-scale wind projects (see Map 14 below). At the next revision of this plan, the Town of Dorset shall review this policy to see if future improvements in wind power technologies better mitigate impacts to the environment.



Dorset has determined that **Only Small-Scale and Mid-Scale Wind Power Generation is Appropriate in the Town**. In contrast to utility-scale turbines that produce electricity primarily for sale to the electric grid, lower-capacity turbines primarily support on-site electricity use, though they may provide surplus

energy to the electric grid through net-metering. Small-scale systems are appropriate at homes, businesses, schools, and other institutions. Mid-scale wind turbines are only appropriate for placement at institutions such as schools and businesses for the purpose of supplementing onsite energy consumption.

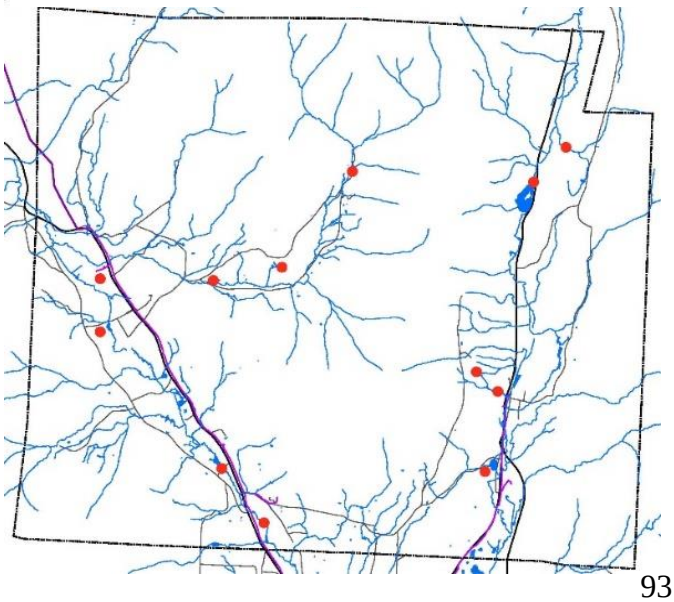
This policy shall not preclude development of small- or mid-scale wind projects that serve and are supported by the local community. For example, **Community-Serving Wind Development** that offsets the electrical demand for businesses, offices, or a neighborhood may be appropriate. All wind development must comply with the State's noise and environmental standards. See Map 15 below to view areas where small- and mid-scale wind facilities will be most effective.

Biomass

The town supports efforts to develop appropriate, cost-effective biomass energy resources. With 14,000 acres of forest, Dorset has abundant woody biomass resource to be used for local heat generation – the most efficient use of biomass for energy. High-efficiency cord wood and pellet stove heating systems are suitable for residential and commercial buildings. Large-scale wood pellet and chip heating systems are a good choice for buildings such as apartments, schools, and other institutions. For example, Flood Brook Elementary School in Londonderry is preparing to install a 500,000 BTU /hour pellet boiler system to replace its existing oil boiler heat system. There is a pellet production facility not far from Dorset (Vermont Wood Pellet Co) and one business in Dorset that distributes pellets and sells pellet furnaces and oil-to-pellet conversion systems (Vermont Renewable Fuels).

When it comes to using biomass for electricity generation, the town sees combined heat and power biomass projects as preferable to enterprises dedicated solely to electricity generation. Biomass electricity facilities may be appropriate in Dorset, though only projects operating at a capacity of 5 MW or less shall be permitted in the town. Other plant-derived renewable fuels such as biodiesel can be produced from oil seed crops to support farm operations and to supply businesses in the area. The town should consider trialing use of blended biofuel in diesel-powered municipal trucks and equipment. The town should support farmers or other businesses that propose cost-effective methane production systems, though possibilities are limited by a lack of local feedstock source for methane production.

Map 11: Historic Hydro Sites. Data from Town.



Hydro

There are no active hydroelectric sites in the Town of Dorset, but historically hydropower did exist at various locations. The Historical Society has

identified 12 previous hydro sites in Dorset dating back to the 19th century (mapped in Map 11). It is not likely that new dams or hydro sites will be permitted in the town due to high standards of environmental regulation at this time, but in some cases existing dams can be restored to produce power. For example, 'micro-hydro' generators may be possible at numerous locations in Dorset. The town supports efforts to develop environmentally responsible and economically viable hydro facilities, particularly at existing dams such as one located just off Route 30 near the border with Manchester.

Recent hydroelectric development in Bennington County has included the rehabilitation of two facilities at existing dams – one on the Walloomsac River in Bennington and one on the Hoosic River in Pownal. These restoration projects are complex due to the need for environmental assessments and remediation of sediments behind dams, and environmental regulations intended to protect downstream aquatic ecosystems. Once completed, however, the facilities have added about **1MW** of reliable renewable energy to the region's energy portfolio.

Several smaller existing dams have potential for redevelopment, all at capacities of less than 100 kW each. Dorset has a few such dams. The Town could sponsor an environmental and hydro potential study to assess the costs and benefits of pursuing development of small generating facilities at these sites.

Geothermal

The soils in low-lying, developed areas of Dorset have high resource potential for geothermal well heating systems. This technology is encouraged in new residential and commercial construction.

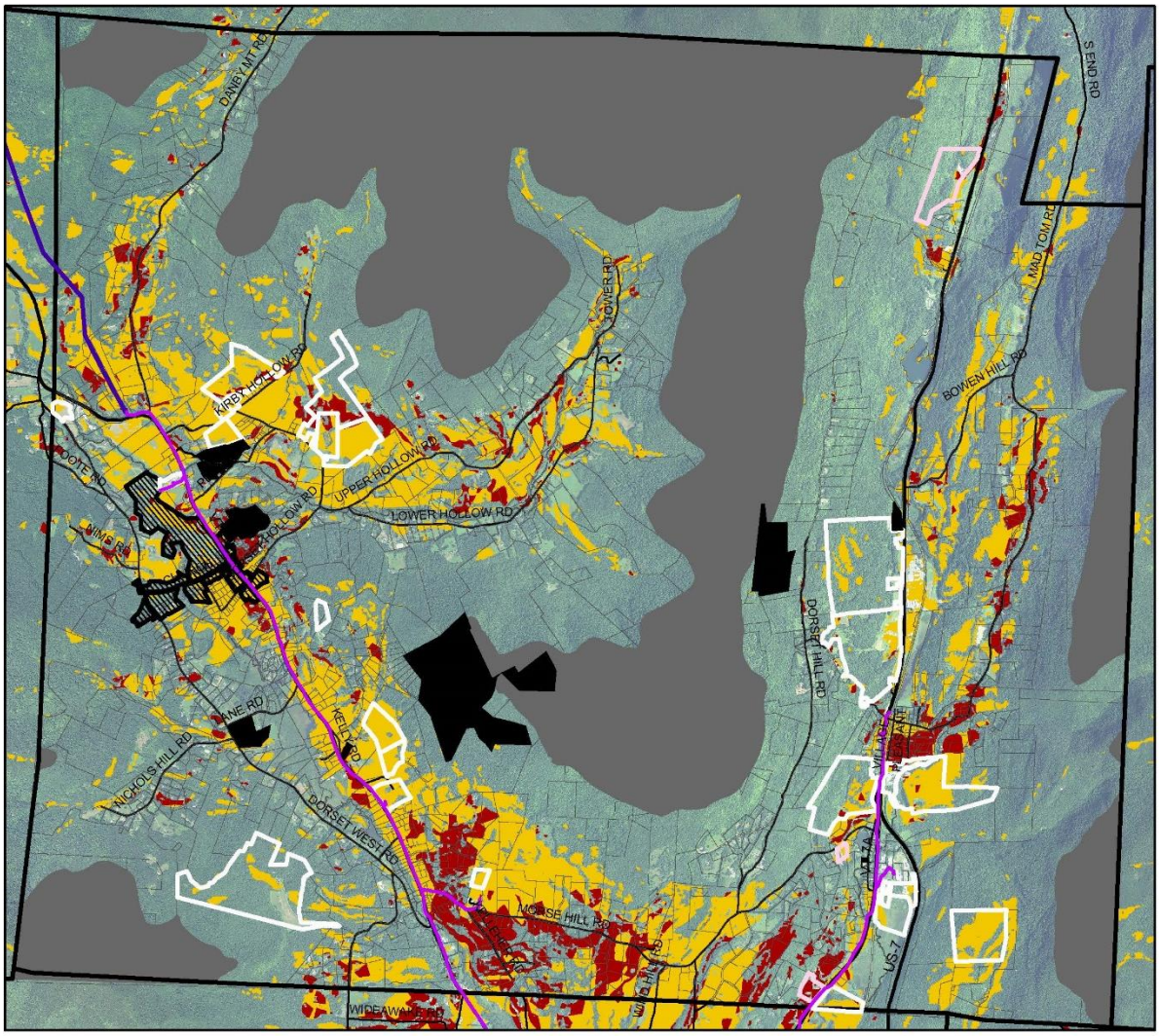
Local Food Production

An often-overlooked renewable energy source that can be supported and developed locally is food. The town commits to participating in efforts to develop a more robust local food and agricultural system, including supporting the siting and operations of composting programs in the town. Municipal boards and committees should support agricultural operations in the town and help facilitate dialogue between local/regional food producers and local/regional institutions such as schools, hospitals, and meal delivery or provision programs.

Renewable Energy Terms Glossary

Act 174 – 2016 Vermont legislation establishing energy planning standards that grant participating regions and municipalities 'substantial deference' in Section 248 proceedings of the Public Utility Commission.
Community-Serving Wind Development – development of small- or mid-scale wind projects that serve and are supported by the local community and that offset electrical demand for businesses, offices, or a neighborhood.
Community Solar Projects – group solar energy installations ranging in size from 15 kW to 150 kW capacity that are net-metered so that energy sold to the electric grid is discounted on project members' electric bills.
Known Constraints – Act 174-identified environmental constraints that are likely to preclude renewable energy development. Listed on page 82.
Possible Constraints – Act 174-identified environmental constraints that may preclude or impact the development of renewable energy facilities, but do not necessarily prevent development. Listed on page 82.
Preferred Sites / Areas – Act 174 term for locations or types of locations that are advantageous for renewable resource development. Areas identified as 'preferred' receive financial incentives when developed for renewable energy production.
Prime Resource Areas – Act 174 term for areas with high levels of renewable resource and where no Known or Possible Constraints are present.
Secondary Resource Areas – Act 174 term for areas with high levels of renewable resource and where no Known Constraints exist, but at least one Possible Constraint is present.
Solar Facility Scales – Dorset has policies for three scales of solar development. See page 84 for details.
Wind Facility Scales – Dorset has policies for three scales of wind development. See page 86 for details.

Map 12: Dorset Solar Energy Resource Potential Map. Large-scale solar energy facilities (greater than 150 kW capacity or 2 acres, whichever is greater) shall be restricted to building rooftops, preferred sites, and other locations specifically identified in this chapter as preferred areas for solar energy development; other sites are considered unsuitable for large-scale solar facilities. Siting of large-scale solar facilities is subject to the Siting Criteria set forth in this section of the plan. *GIS Data from VCGI and preferred sites from Town.*



Preferred Sites

- Preferred Sites
- Preferred - Gravel Pit

- 3-Phase Distribution Lines
- Transmission Lines
- Parcels

- Prime Solar Resource - No Identified Environmental Constraints
- Secondary Solar Resource - No Known Constraints, but at least one Possible Constraint

Local Constraints

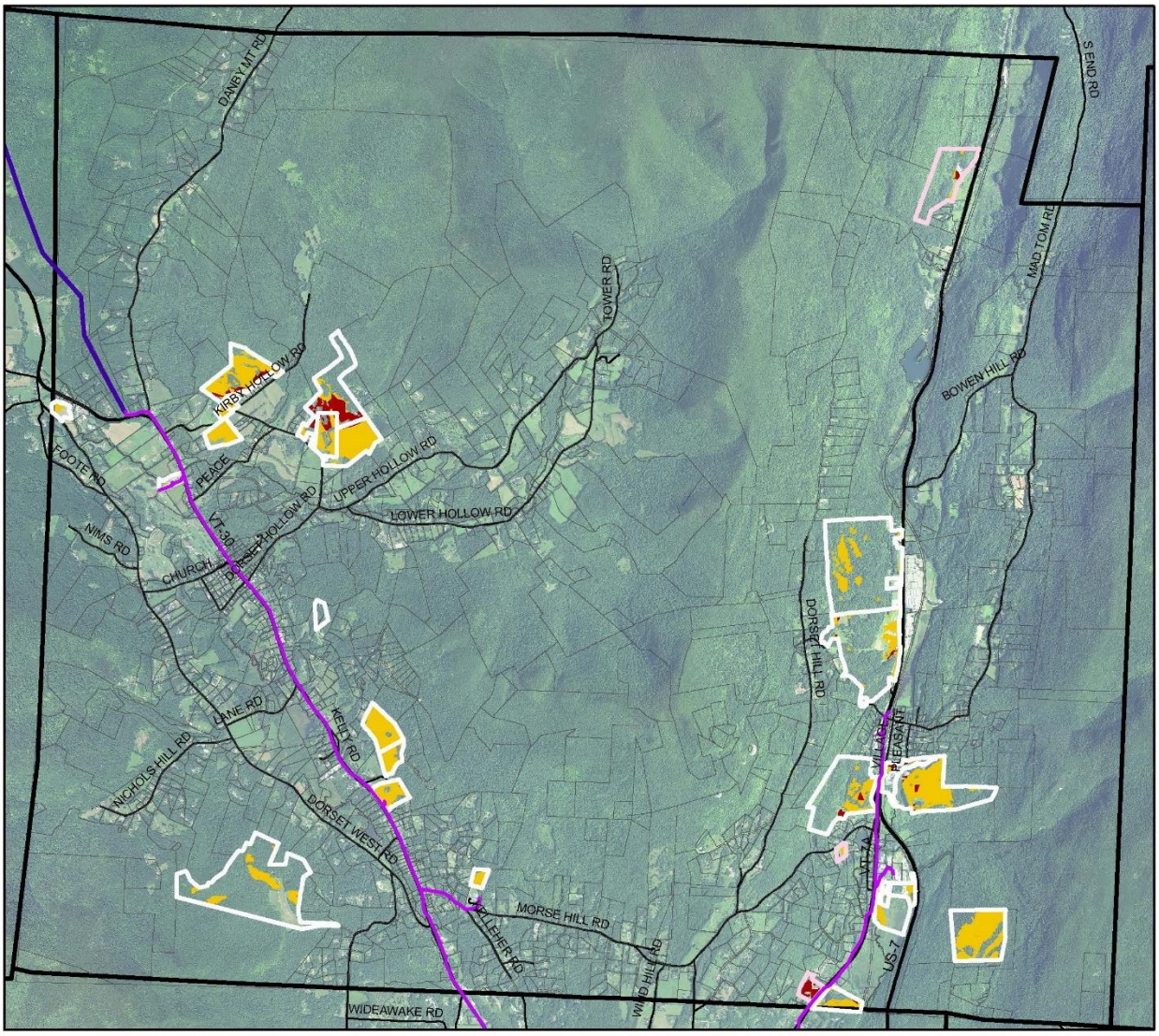
Design District	ground-mounted solar arrays are not permitted
Historic Landmarks and Public Parks Forest I District	solar energy facilities are not permitted, excepting installations of small-scale solar that further the recreational purposes of these areas.

0 0.5 1 2 Miles

N

Map intended for planning purposes only

Map 13: <u>Preferred Sites</u> - Dorset Solar Energy Resource Potential Map. Preferred sites are suitable for development of all scales of solar energy development, including facilities greater than 150 kW capacity. *GIS Data from VCGI and preferred sites from Town.*



Preferred Sites

- Preferred Sites
- Preferred - Gravel Pit
- 3-Phase Distribution Lines
- Transmission Lines
- Parcels

- Prime Solar Resource - No Identified Environmental Constraints
- Secondary Solar Resource - No Known Constraints, but at least one Possible Constraint

0 0.5 1 2 Miles

N

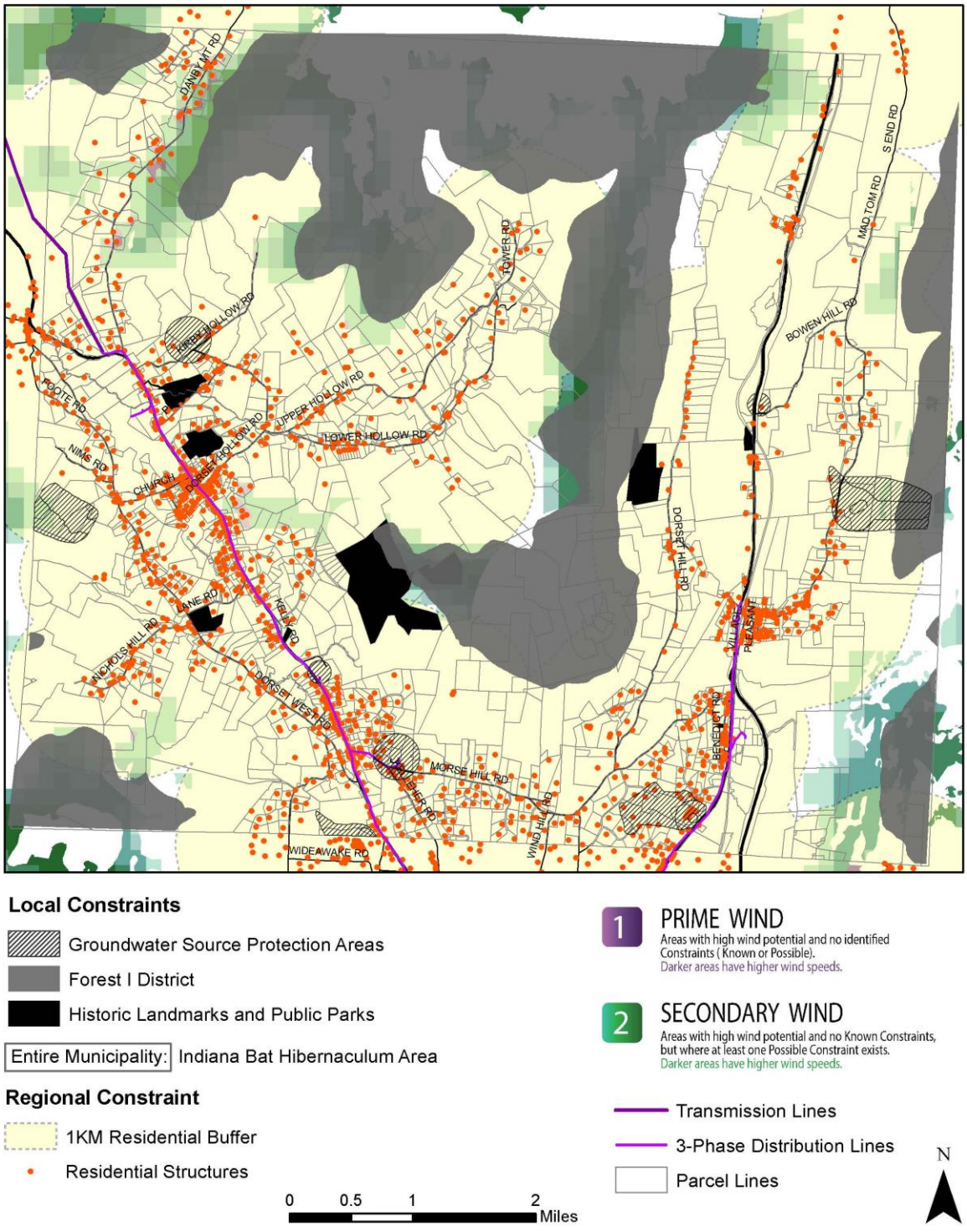
Preferred sites contain about 410 total acres of prime and secondary solar resource

Preferred Sites Methodology

To identify preferred sites for solar development, the Town used a solar resource mapping analysis. The town contacted owners of potential properties by letter requesting those uninterested in being assigned preferred status make their wishes known to the Town in a timely manner. The preferred sites shown above passed through this vetting process.

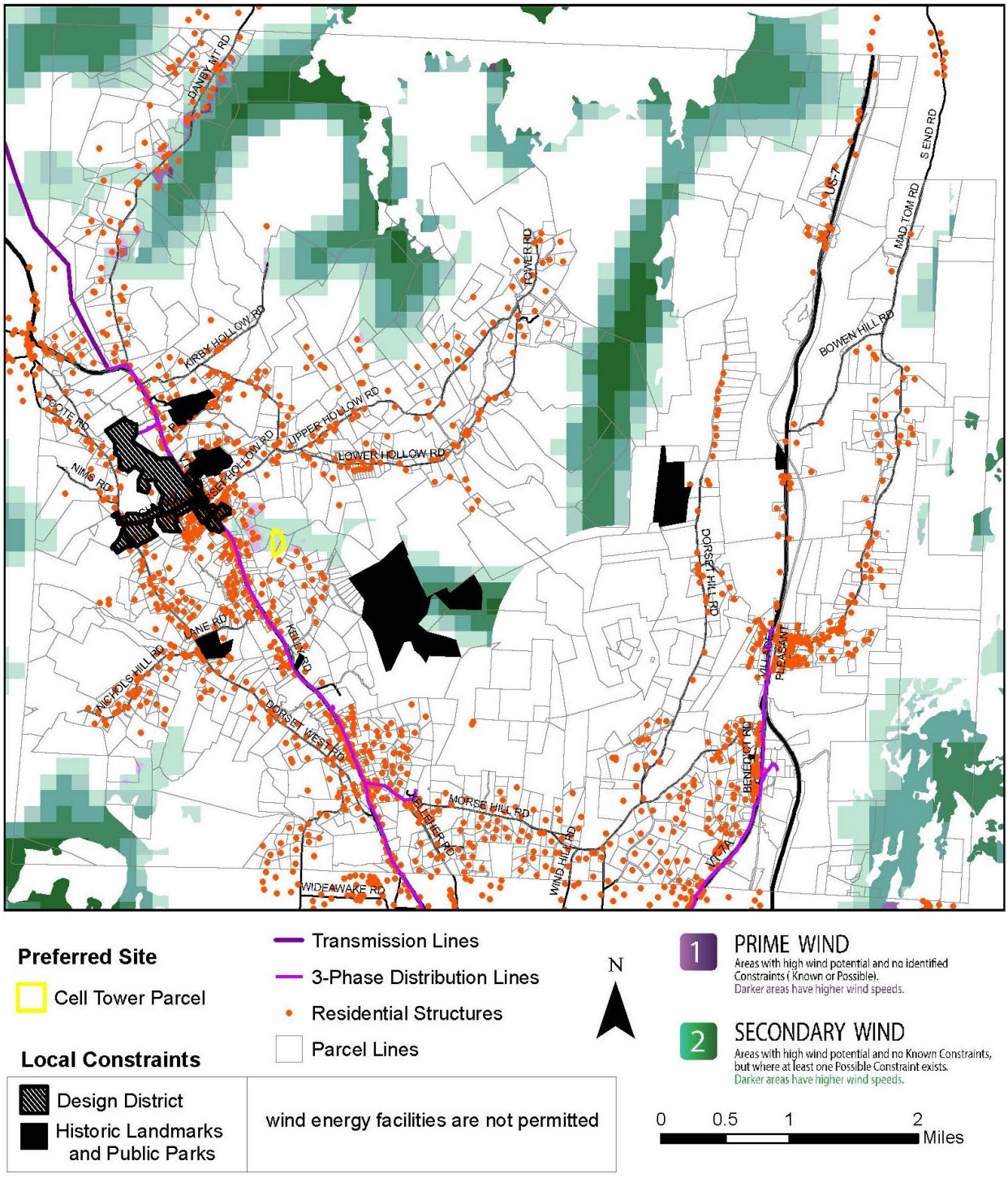
Map intended for planning purposes only

Map 14: Dorset Wind Resource Map Showing <u>No Availability</u> for Utility-Scale Wind. Historic landmarks, public parks, and the Forest I land use district are applied as known local constraints prohibiting development of utility-scale wind facilities in those areas. Groundwater source protection areas, Indiana Bat hibernaculum, and 1KM buffer are applied as possible constraints that currently place prohibitive limitations on large-scale wind development in the town. *GIS Data from VCGI.*



Map intended for planning purposes only

Map 15: Dorset Wind Resource Map for Small- and Mid-Scale Turbines. Historic landmarks and public parks are applied as known local constraints prohibiting development of any wind facilities in those areas, consistent with existing town policies. *GIS Data from VCGI.*



Map intended for planning purposes only