1.Purpose

It is the overall intent of this chapter to encourage the efficient use of energy and the development of renewable energy resources in accordance with 24 V.S.A. §4302(c)(7). It is also the intent oft his energy chapter to address the requirements of Act 174 of 2016 and to act with due diligence to meet the enhanced energy standards developed by the Vermont Department of Public Service (DPS). This chapter was prepared based upon the *Guidance for Municipal Enhanced Energy Planning Standards* (DPS; March 2, 2017) in order for the Cavendish Town Plan to be given greater weight in the Section 248 process. This chapter describes existing conditions in Cavendish and conveys community policies on energy conservation, renewable energy production, and how land uses can contribute toward energy conservation.

Cavendish recognizes both the significant impact of climate change, and the need to be proactive in reducing our environmental footprint. To that end, while we include the state of Vermont's "Comprehensive Energy Plan" (CEP) as part of the Cavendish Town Plan, we qualify this inclusion as follows:

- Cavendish is a small town, with limited resources, and will adhere as it can to the goals and objectives this Enhanced Energy Plan
- As we believe in environmental responsibility, products should be sourced from companies where working conditions are safe and secure, workers are paid a living wages and the environment in which the workers operate is not being destroyed by mining and extraction.
- In addition to the renewable forms of energy from solar, wind and hydro, we urge the state to seriously consider other alternative energy sources that are clean, safe and reliable as new technologies have advanced to the point where they are practical and cost effective.

The Southern Windsor County Regional Planning Commission (SWCRPC) has developed a 2018 *Regional Energy Plan* to meet these standards in order to receive Section 248 "substantial deference". Cavendish is coordinating the development of this municipal energy plan with the SWCRPC so that:

1. The municipal plan is informed by the ongoing regional energy planning process; and,
2. The municipal plan is compatible with the regional plan.

This energy chapter was developed with assistance from the SWCRPC through funding provided by the Vermont Department of Public Service.

Due Consideration: To give such weight or significance to a particular factor as under the circumstances it seems to merit, and this involves discretion. [*Black's Law Dictionary, 6th ed. 1990*]

Substantial Deference: Means that a land conservation measure or specific policy shall be applied in accordance with its terms unless there is a clear and convincing demonstration that other factors affecting the general good of the State outweigh the application of the measure or policy. [*30 V.S.A. §248*]

1.1 Energy Goals

Through the 2016 Vermont Comprehensive Energy Plan (CEP) and Statute, the State of Vermont has identified a number of goals and strategies to achieve energy conservation throughout the state. The Town of Cavendish embraces the State Energy Goals[1] including but not limited to the following. Through the detailed policies and actions contained in this plan, Cavendish will strive to achieve these goals.

[1] Energy goals as referenced in 24 V.S.A. §4302(7), 10 V.S.A. §578(a), 10 V.S.A. §580, 10 V.S.A. §581, and in the Vermont Comprehensive Energy Plan

Reduce total energy consumption per capita by

15% by 2025

More than one third by 2050

Reduce greenhouse gas (GHG) emissions from 1990 levels

40% reduction by 2030

80% to 95% reduction by 2050

Meet remaining energy need from renewable sources

25% by 2025

40% by 2035

90% by 2050

2.Analysis of Energy Use

2.1.Power Generation and Transmission Facilities

Green Mountain Power (GMP) is the electric utility provider in much of Cavendish and Ludlow Electric provides electricity to most of the Proctorsville section of town. There is one utility-scale power generation facility located in Cavendish; the 1,716 kW hydroelectric generating power plant that is located on the Black River and owned by Green Mountain Power. It has provided power since it opened in 1907. There are 24 known solar renewable energy generation sites in town as of 2020, of which one is a 148 kW commercial-scale, ground-mounted solar facility that was constructed by the town of Cavendish in 2014 on

land alongside the wastewater treatment plant and the transfer station. It is net metered and provides power for municipal uses.[2]

There are two electric substations in Cavendish. The first, owned by GMP, is at the hydropower generating plant along the Black River. The other is owned by VELCO and is located off Quent Phelan Road to service the Vermont Electric Power Company (VELCO) transmission line. There are three transmission lines in Cavendish. The first, a 345 KV line runs north from Chester along the western border of Cavendish with Ludlow and ends at the Quent Phelan Road VELCO substation. The second, a 46 KV line runs east-west from Ludlow to Weathersfield, roughly paralleling Route 131 and the Black River, and services the GMP substation. The third, a 46 KV line runs east-west, somewhat north of the second line and crosses the VELCO substation. See Appendix A for more detail about existing energy generation, and Maps for detail of transmission lines.

2.2.Energy Use

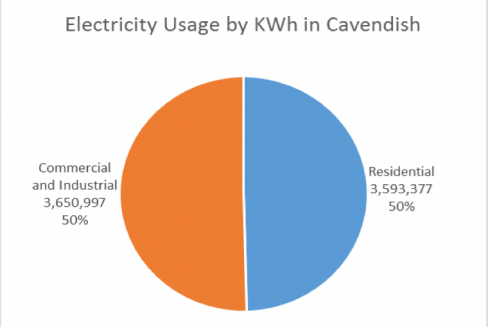
As discussed in the *2016 Vermont Comprehensive Energy Plan* (CEP), "fossil fuels currently play a dominant role in meeting Vermonters' demand for energy services, with gasoline and distillates (namely diesel and heating oil) alone supplying around half of all of Vermont's primary energy consumption." The CEP states that less than 20% of the statewide consumption of primary energy is from renewable energy sources. More than two thirds of that renewable energy comes from the electric power supply, which includes power generated by hydro, biomass, wind, solar, and other facilities. The remaining renewable energy consumption in Vermont is largely comprised of wood for home heating and ethanol blended into gasoline[3]. According to the U.S. Energy Information Agency, as of August 2020 Vermont consumes more than three times as much energy as it produces, but total energy consumption is the smallest of all the states, which contributes to Vermont having the lowest carbon dioxide emissions of any state. Vermont ranks 47th of all states in energy production (50th in electricity production) and it ranks 14th in energy expenditures per capita. Thus, an energy gap exists that should be filled with renewables. [4]

Cavendish bears a relatively high energy burden when compared to other towns in Vermont. According to a 2019 study published by Efficiency Vermont, Cavendish's median household income is $49,375 and residents' cost of electricity, heating, and transportation averages $5,898, producing an energy burden of 12%, placing Cavendish close to the highest burden category in the state.[5]

2.3.Electricity

In 2015 there were 965 Cavendish residences that accounted for 50% of the total annual electricity used. Commercial and industrial uses accounted for the other 50%. The total electricity used equaled 7,244,374 kWh and the average residential use was 3,723 kWh. (See Chart A. Data provided by Efficiency Vermont)

According to the Vermont Department of Labor there were 51 commercial establishments



[2] 2020 Energy Action Network; Community Energy Dashboard
[3] *Vermont Comprehensive Energy Plan* (Department of Public Servic
[4] https://www.eia.gov/state/?sid=VT
[5] *Vermont Energy Burden Report*, *Appendix D*, Sears & Lucci, Octobe

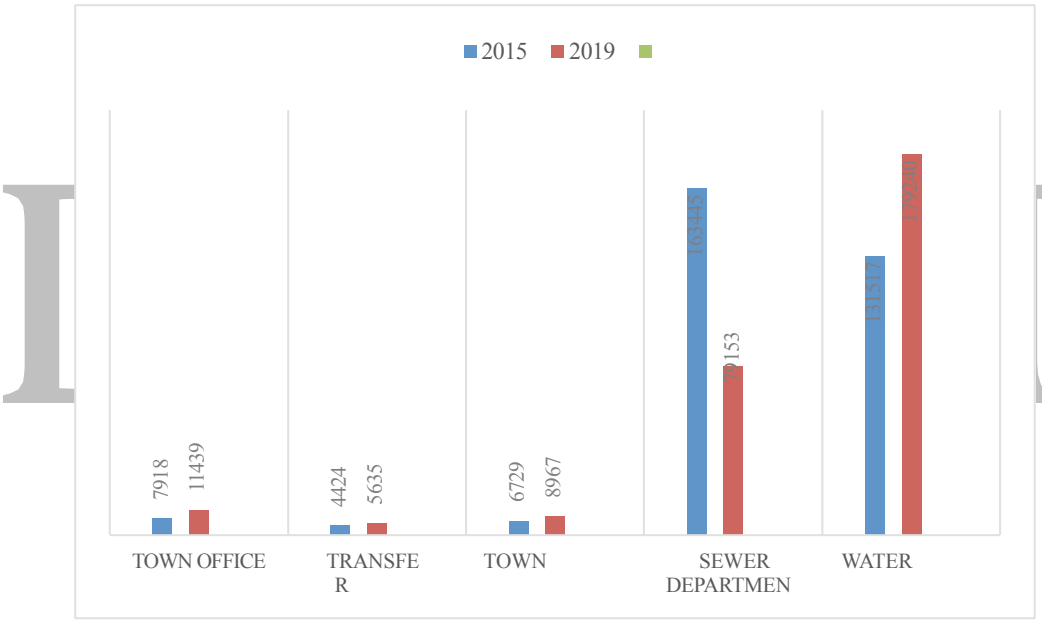
in Cavendish during 2018 employing some 320 people.

Total electricity consumption in Cavendish has dropped in recent years. (There was a 12.6% decrease in total electricity usage in Cavendish between 2014 and 2016, which was accentuated by the 148 kW solar array coming online in December 2014.) See Appendix A and Chart B for more detail.

A comparative energy cost analysis of municipal buildings and facilities for 2015 found that the KWh of electricity used by the Sewer Department was the highest, followed by the

Water Department, and then the Town Office. (see Chart B). Chart A
Analysis of 2019 municipal electric usage shows a pattern

similar to 2015, but new aeration systems in the wastewater plant significantly reduced its usage. An energy audit was performed for the Town Office in 2010 and, as a result of a grant from EECBG a number of recommendations were implemented, including insulating, updating electric lighting, and upgrading the heating system to electric heat pumps. In 2014 the town constructed a net-metered 148 kW solar array and the overall cost of municipal electricity dropped. Audits of other municipal facilities would be helpful to identify further cost-effective energy upgrades.



2015-19 CAVENDISH MUNICIPAL ELECTRICITY USAGE – Chart B
Source: 2015-19 Cavendish Town Records

2.4.Heating

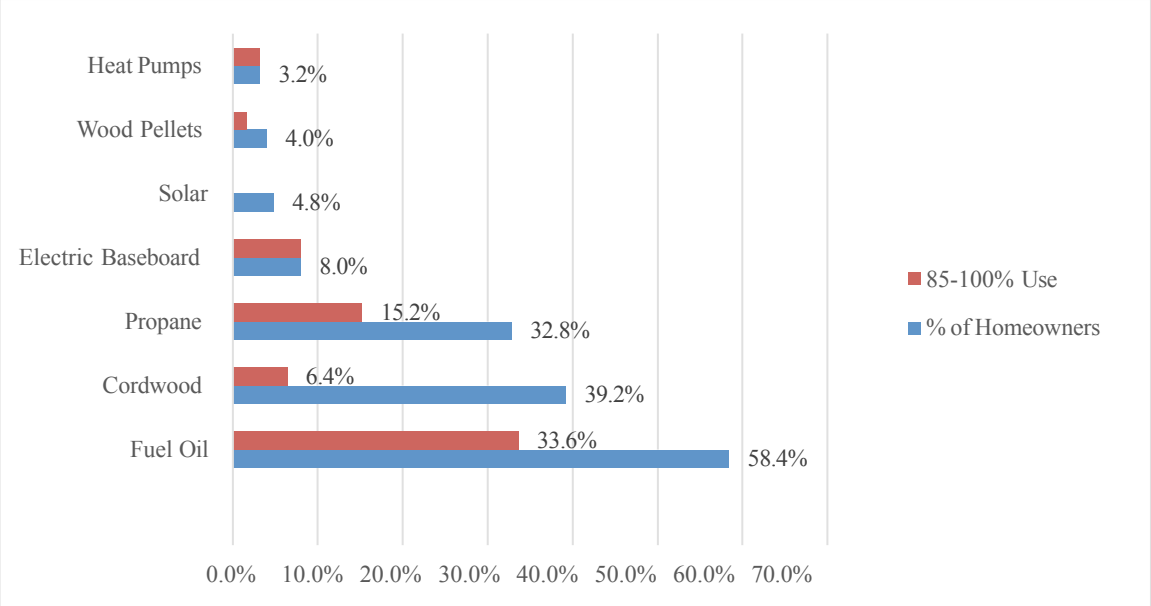
According to the 2010 Census there were 965 household units in Cavendish, eleven percent of which were renter occupied and 31% were second homes. (see Chart D)

Fossil fuels are currently the primary fuel type used for heating structures in Vermont[6]. According to American Community Survey (ACS) data (2011-2015), the predominant ways to heat homes in Cavendish included fuel oil (65%), wood (21%) and propane/LP gas

[6] *Vermont Comprehensive Energy Plan* (Department of Public Service, 2016)

(11%). (The 2018 ACS estimates are roughly the same.) In 2015, the estimated average annual cost to heat a home was $1,572 and about $10,969 to heat a business. See Appendix A for more detail about heating existing buildings.

In 2019 the Cavendish Energy Committee surveyed town residents on their energy usage. Of 715 surveys mailed, 17.5% responded. While most residents reported using two or more sources of energy to heat their homes, the largest group used fuel oil (58%) although only 34% used only or mostly oil. Next was cordwood (39%) although only 6% used cordwood exclusively. See Chart C for a full analysis of fuels used and number of users per this survey.



2019 Analysis of Home Heating in Cavendish – Chart C
Source – 2019 Cavendish Energy Committee Survey

Wood is the only form of these heating fuels that is renewable and locally produced. Sustainable forestry operations are important not only to supply fuel wood for residents, but also to maintain an active working landscape in rural Cavendish and support a local forestry economy.

During 2010 the Town of Cavendish spent $40,286 on fuel, of which 24% was to heat municipal buildings and 76% was to power the municipal vehicle fleet. In 2015 these expenses had increased by 13% but again 24% was to heat buildings and 76% powered the fleet. But in 2019 while spending had increased
12% only 18% was for heat, while 82% was for the fleet. Efficiencies in municipal heating were not matched by efficiencies in vehicles. [7]

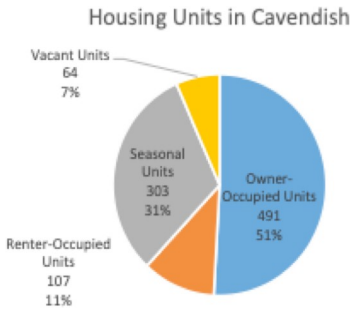


Chart D

2.5.Transportation

Cavendish is a rural area and the personal automobile dominates transportation options for residents (see the Transportation Chapter of this plan for more information about other modes of travel). The negative environmental impact of single-occupant vehicle driving is

[7] Source: 2010, 2015 and 2019 Cavendish Annual Town Reports.

well documented. Costs associated with using an automobile for most travel needs can be significant (see the Housing Chapter of this plan for more information on household transportation costs). About 90% of the local work force travel to jobs located in another town. Common work destinations are Chester, Springfield, Ludlow, Quechee, Claremont, and Rutland. Approximately 76% of employed Cavendish residents drive alone to work, while about 11% carpool. The average commute time is about 26 minutes. See Appendix A.

According to 2015 ACS data, there were about 1.8 vehicles per occupied household in Cavendish. The average miles per vehicle traveled in a year was estimated at nearly 15,220, which accounts for approximately 0.97 million gallons of total fuel used and an estimated total fuel cost of more than $2.2 million.

According to the 2019 Cavendish Energy Committee Survey, the number of cars per occupied household grew to 3.07, although that survey did not include rental units, which could reduce that number. Fuel costs are volatile. Gasoline costs of around $4 a gallon in 2008 and $3.70 in 2014 were challenging for many household budgets. During 2015, average motor vehicle fuel costs in Vermont dropped to about $2.45 per gallon, which cost declined further to $2.14 in 2020.[8]

But transportation patterns are changing as electric vehicles (EV) come on the market. According to Consumer Reports in a 2020 study, the average EV driver will spend 60% less to power their vehicle than the owner of a gas-powered vehicle; EV owners are spending half as much to repair and maintain their vehicle as owners of gas-powered vehicles, with much of that savings benefiting used car buyers; and owners of EVs with a range of 250 miles or greater will be able to do 92% of their charging at home.[9]

To help incentivize EV ownership in Cavendish, in 2020 the Town has installed a Level 2 EV charging station in Proctorsville next to the Svec Memorial Green. It is centrally located near restaurants and shops as a free amenity to the public, and can serve two vehicles at a time.

Cavendish's Town Plan includes recommendations to improve the walking and bicycling facilities in the villages, and recommends concentrating more housing resources in the villages. In the 2019 Cavendish Energy Survey residents were asked to prioritize town projects. The largest response of 34% favored weatherization, but 32% favored more bike paths and 26% want better sidewalks.

3.Energy Targets

The standards that the Department of Public Service has established for energy targets must be metif this Plan is to receive substantial deference in Section 248 energy siting proceedings.

The purpose of this plan is to receive substantial deference in section 248 energy siting proceedings. The Town of Cavendish in due diligence will strive to meet the standards and energy targets set forth by the department of public service.

Cavendish is using targets (or scenarios) developed using the Long-Range Energy Alternatives Planning (LEAP) Model and provided to Cavendish by the SWCRPC. The background for the targets is described in more detail in the *2018 Southern Windsor County Regional Energy Plan*. The purpose of the targets, when combined with the analysis presented in the previous section, are intended to provide an overview of existing energy use and projections for the pace of change that is needed over the next three-plus decades.

[8] Source: Vermont Fuel Price Report, December 2015, November 2020.

[9] *Electric Vehicle Ownership Costs: Today's Electric Vehicles Offer Big Savings for Consumers*, Harto, Consumer Reports, October 2020.

Energy targets for Cavendish are presented in Appendix A.

4.Implementation Actions (Pathways)

In order to meet our stated energy goals and targets, the Town of Cavendish identifies the following implementation actions, also referred to as "Pathways". These implementation action categories are intended to be consistent with those used in the *Guidance for Municipal Enhanced Energy Planning Standards* (DPS; March 2, 2017).

4.1.Conservation and Efficient Use of Energy

The Town of Cavendish encourages the conservation and efficient use of energy. Efforts to improve energy efficiency and conservation are Cavendish's initial focus. Cavendish has identified the following implementation actions to achieve this policy.

In order to assist in implementing these actions, the Town has established an Energy Committee under 24 V.S.A. §§4433, 4464. The Town will also consider including priority municipal energy efficiency projects into the Capital Budget and Program. The Town may also consider establishing a fund to support appropriate municipal energy projects (e.g. capital projects, outreach efforts, incentives).

4.1.1.Encourage Conservation by Individuals and Organizations

Cavendish cannot control the use of energy by individuals and organizations. However, the Town can lead by example, serve as a resource, and encourage individuals and organizations to conserve and use energy efficiently. To do so, Cavendish identifies and promotes the following resources to provide guidance to individuals and organizations:

a) Inform residents about energy efficiency programs through Efficiency Vermont and the Weatherization Assistance Program for low-income households through Southeastern Vermont Community Action (SEVCA) and encourage residents to participate.
b) Work with partner organizations and Efficiency Vermont to offer workshops and educational opportunities to businesses on efficiency in new construction, retrofits, and conservation practices.
c) Publicize local energy conservation projects to encourage future private and public activities.
d) Use various methods to disseminate educational information, such as through Okemo Valley TV, brochures, website materials, public events and digital media.
e) Conduct outreach to service clubs.
f) Identify large energy usage customers (including large businesses, manufacturing facilities, and schools) as a target audience and encourage participation in commercial and industrial efficiency programs through Efficiency Vermont.
g) Encourage local business start-ups to conduct energy audits.

4.1.2.Promote Efficient Buildings

Net-Zero: A construction method for buildings that generate as much energy as they consume. Also known as a zero-energy building.

Net-Zero Ready: A building constructed in a manner that, with subsequent on-site renewables installed, can make as much energy as it uses.

Stretch Code: A building energy code that achieves greater energy savings than the base Residential Building Energy Standards (RBES). The Stretch Code is required for Act 250 projects and may be adopted by municipalities.

Table 1: Thermal Efficiency Targets

	2025	**2035**	**2050**
Weatherize Homes (percentage, number)	17%	31%	63%
	102	186	377
Weatherize Commercial Establishments	4%	7%	15%
	2	4	7

Building heating accounts for about 30% of all energy consumed in Vermont. Creating more efficient buildings can be achieved through weatherization and high-performance construction methods. Cavendish identifies the following to encourage efficient buildings:

a) Promote the use of Vermont's residential building energy label/score.
b) Promote the use of the Residential Building Energy Standards and Commercial Building Energy Standards. To do so, the Town Office will distribute State energy code information to all applicants seeking a building permit for a structure that is heated or cooled. (The Town does not currently issue Certificates of Occupancy.)
c) Promote benchmarking (using the free EPA Portfolio Manager tool and/or with assistance from Efficiency Vermont) for commercial buildings.
d) Require that all residential Act 250 projects follow the residential stretch energy code.
e) Require that all commercial Act 250 projects follow commercial stretch energy guidelines.
f) Encourage new buildings to incorporate net-zero ready construction methods.
g) Consider providing incentives (e.g. density bonuses) to developments that exceed the state's stretch energy code, or net-zero ready or net-zero demonstrated requirements, and that are located in an area identified elsewhere in this plan as appropriate for growth.
h) Promote building placement and location with passive solar and active solar in mind, and promote the use of landscaping for energy efficiency.

4.1.3.Promote Decreased Use of Fossil Fuels for Heating

Table 2: Use of Renewables for Space Heating			
Thermal renewable energy use	**2025**	**2035**	**2050**
	48%	63%	93%

Table 3: Thermal Fuel Switching Targets (by Number of Heating Units)			
New efficient wood heating systems	**2025**	**2035**	**2050**
	2	6	45
New heat pumps	98	266	512

Building heating is the second largest contributor to greenhouse gas emissions. Home heating is heavily reliant on fossil fuels at this time. Solutions to address this situation involve high-efficiency heating system upgrades and fuel switching. Cavendish identifies the following to encourage using less fossil fuel to heat buildings:

a) Promote the use of cold climate heat pumps with education/presentations in coordination with the Efficiency Vermont/electric utilities.
b) Promote the use of ground-source heat pump heating and cooling systems for new construction.
c) Identify municipal buildings that would be good candidates for cold climate heat pumps, and develop a plan and schedule to add the heat pumps to those buildings.
d) Encourage, promote, and incentivize advanced wood heating in certain situations by:
    1) Supporting the conversion of existing fossil fuel heating systems to wood;
    2) Encouraging local manufacturing of advanced wood heat technology with low-particulate emissions;
    3) Supporting development of wood fuel delivery infrastructure;
    4) Supporting development of sustainable forestry and procurement services;
    5) Expanding wood fuel processing facilities, encouraging bulk wood pellet delivery systems; and,
    6) Providing training and education on the benefits of heating with efficient, clean wood energy systems that have low-particulate emissions.
e) Promote wood stove change-out programs that take older non-EPA certified stoves out of service and replace them with more efficient and lower emitting cord or pellet stoves.
f) Identify municipal buildings that would be good candidates for wood pellet or chip heating and develop a plan and schedule to convert those buildings to wood heat.
g) Explore opportunities for anaerobic digesters as appropriate.

4.1.4.Demonstrate the Municipality's Leadership by Example with Respect to the Efficiency of Municipal Buildings

Cavendish wishes to lead by example and demonstrate to individuals and organizations the benefits of building efficiency through the following efforts:

a) Seek support and guidance from Efficiency Vermont for efforts to improve the efficiency of municipal buildings.
b) Develop an inventory and conduct energy audits on municipal facilities, and develop a strategic plan to make energy efficiency and conservation upgrades.
c) Assess the life cycle costs of potential energy improvements during design and construction planning. For example, investment in a new, efficient heating system may be more expensive up front, but more economical to operate over time.
d) Incorporate weatherization/energy efficiency projects into the municipal Capital Budget and Program.
e) Implement low-impact development, green stormwater infrastructure practices, and/or strategic landscaping to shade buildings and reduce temperatures, thereby increasing overall efficiency.
f) Develop policies so that if investing in new municipal buildings, municipalities strongly consider locations that will give people the option to get to those buildings without driving – for example, by putting a new town hall near the post office or school or other village location instead of distant from the town center.
g) Replace older municipal fossil-fired heating systems with high-efficiency, cold- climate heat pumps, geothermal heat, or advanced wood heating systems with low- particulate emissions (including wood-fired district heat), or considering switching over to biofuels.

4.2.Transportation

a) The Town of Cavendish encourages the reduction of transportation energy demand and single-occupant vehicle use.
b) The Town of Cavendish promotes the use of renewable or lower-emission energy sources for transportation (e.g. electric vehicles or hybrid vehicles).

Cavendish has identified the following implementation actions to help achieve these policies.

4.2.1.Encourage Increased Use of Public Transit

There is a public transit operator that has routes that serve Cavendish (i.e. Southeast Vermont Transit, a.k.a. "The Current"). Maximizing public transit ridership is a priority. Cavendish will implement the following actions to encourage public transit:

a) Improve awareness of existing public transit services to residents and visitors.
b) Plan and advocate for access to public transit, especially for Act 250 proceedings for larger developments.

4.2.2.Promote a Shift Away from Single-Occupancy Vehicle Trips

Public transit can meet some mobility needs, but additional efforts are required to reach the energy goals for reducing transportation energy use. Cavendish will work to encourage the following actions to encourage a reduction in single-occupant vehicle trips:

a) Encourage people to re-think their trip before leaving home.
b) Given the very fast internet speeds in urban Vermont at this time, telecommuting is enabled. Evaluate if these internet speeds are available in any part of Cavendish. Work with state officials and internet service providers to enhance speeds.
c) Explore opportunities for shared work space that better enable residents to telecommute – encourage creation of commercial shared work spaces.

d) Promote the Go Vermont webpage, which provides ride share, vanpool, public transit and park-and-ride options.
e) Support employer programs to encourage telecommuting, carpooling, van pooling, walking and bicycling for employees' commute trips. Encourage employers to offer such programs and provide information on tax benefits that may be available for doing so.

4.2.3.Promote a Shift from Gas/Diesel Vehicles to Electric or Other Non-Fossil Fuel Transportation Options

To meet State energy goals, municipalities will need to contribute toward efforts to reduce the number of vehicle-miles traveled, and switch to renewable, non-fossil fuel transportation options. Cavendish has identified the following pathways to shift toward electric vehicles and other non-fossil fuel travel:

a) Promote general awareness of, the benefits of, and access to electric vehicles and alternative-fuel vehicles.
b) Promote and seek additional grants to fund the strategic installation of Level 2 and DC fast-charging Electric Vehicle charging infrastructure in each village.
c) Identify park-and-ride possibilities at strategic town and village locations and seek grants to install Electric Vehicle charging stations at each.
d) Plan, advocate for, and consider requiring the installation of Electric Vehicle charging infrastructure as part of new development or redevelopment, especially for developments subject to Act 250.
e) Encourage the establishment of a local biofuel supplier.
f) Support the development of additional refueling stations for alternative fuels for both private and public transportation fleets by sharing station development costs between public and private interests.

4.2.4.Facilitate the Development of Walking and Biking Infrastructure

Active transportation such as walking and bicycling offers significant health benefits and requires no outside energy resources. Cavendish encourages completing short trips by walking or bicycling instead of driving, by planning for safe and convenient infrastructure that support "Complete Streets Principles". In order to do this, Cavendish has identified the following pathways:

a) Update municipal road standards (for maintenance and new construction) to reflect complete streets principles. *where appropriate and feasible*
b) Seek to implement bike and pedestrian improvement recommendations identified elsewhere in the Cavendish Town Plan.
c) Create a committee to create more opportunities to walk and bicycle around town.

4.2.5.Demonstrate the Municipality's Leadership by Example with Respect to the Efficiency of Municipal Transportation

In order to meet the State energy goals, municipalities should lead by example and demonstrate to individuals and organizations the benefits of energy efficiency in transportation. Cavendish wishes to do so through the following ways:

a) Establish policies that allow employees to telecommute.
b) Install electric vehicle charging infrastructure on municipal properties.
c) Purchasing plug-in hybrid or plug-in all-electric municipal and fleet vehicles when possible, and choosing the most fuel-efficient models if EVs are not practicable.

d) Establishing minimum fuel efficiency standards for the purchase of new vehicles.
e) Consider incentives for employees who commute using methods alternative to single occupancy vehicles, e.g. walking, biking, public-transit, and carpooling.
f) When purchasing diesel fuel, the Town should use the highest biodiesel blend available without compromising the manufacturer's engine warranty. All manufacturers fully warranty their engines with the use of B5, a blend of 5% biodiesel and 95% diesel.

4.3.Land Use Patterns and Densities

a) The Town of Cavendish encourages maintaining the historic settlement pattern of compact downtowns and village centers surrounded by rural countryside in accordance with 24 V.S.A. §4302 and as described elsewhere in this Cavendish Town Plan.
b) The Town of Cavendish recognizes that compact development has a number of benefits, including furthering both State planning goals and State energy goals.
c) The Future Land Use Map and corresponding descriptions in the Land Use Chapter of the Cavendish Town Plan encourages the types of land use patterns and densities that are likely to result in the conservation of energy.
d) Cavendish Village and Proctorsville Village have been designated by the State Downtown Board under 24 V.S.A. Chapter 76A.

According to their Guidance, the DPS anticipates that if municipalities are actively participating in the above statutory frameworks for community planning, they will likely meet Pathways Standard 8.

Cavendish's Town Plan and various implementation methods, both regulatory and non- regulatory, combine to demonstrate a commitment to the above statutory planning framework. This plan documents what the municipality is doing in this area as it relates to encouraging the conservation of energy through land use development patterns and densities.

4.3.1.The Plan Includes Land Use Policies (and Descriptions of Current and Future Land Use Categories) that Demonstrate a Commitment to Reducing Sprawl and Minimizing Low-Density Development

According to the enhanced energy planning guidance, the reduction of sprawl and low- density development not only reduces energy consumption, but also can improve the local and regional economy.

a) The Future Land Use Map and corresponding descriptions in the Land Use Chapter of the Town Plan generally calls for growth to occur in the Village areas. (See the Future Land Use Map and the corresponding language in the Land Use Chapter.)
b) Cavendish's Future Land Use Map and Town Plan language also calls for maintaining the rural countryside in the areas surrounding the growth areas described in "a" above. (See the Future Land Use Map and the corresponding language in the Land Use Chapter.)
c) Statements for access management and other provisions intended to control strip development along major roadways are included in both the Land Use Chapter and Transportation Chapter.

4.3.2.Strongly Prioritize Development in Compact Mixed-Use Centers

As indicated in the enhanced energy planning guidance, households within a compact, mixed-use center typically use less energy than those located in outlying areas. The energy savings are realized through reduced vehicle-miles-traveled and generally smaller homes, which require less energy to heat and cool. Locating services such as shopping or daycare within walking or biking distances to the places where people work and live can further reduce transportation energy use. This enables people to either choose an alternative to driving a single-occupancy vehicle or to significantly reduce the length of their drive.
Cavendish chooses to encourage this by:

a) Maintaining Village Center Designation, and improving the awareness of property owners about the tax credit opportunities to help pay for improvements to eligible buildings within Cavendish's Village Centers.
b) Coordinating with Southeast Vermont Transit (The Current) and the Go Vermont program to discuss options to promote car-sharing and public transit services.
c) Continuing to actively work on making sidewalk improvements based on the recent Village Center Master Plan.

4.4.Statement of Policy on the Development and Siting of Renewable Energy Resources

The heating, transportation and conservation targets and pathways combined are not sufficient to meet the 90% by 2050 energy planning goal. The Long Range Energy Alternatives Planning (LEAP) model also assumes the purchase of additional out-of-state renewable energy will help to reach this goal; however, that is also not sufficient to meet the energy goals. New local renewable energy generation is also needed in order to achieve the ambitious "90 by 50" energy goal. The following sections discuss how the municipality wishes renewable energy generation to take place in Cavendish.

4.4.1.Evaluate Existing Renewable Energy Generation

According to existing data, there are 22 known renewable energy generation facilities in Cavendish as of November 2017[10], as summarized in Table 4. Existing facilities nearly amount to 1.7 MW of installed capacity. In order to more easily compare existing facilities with the targets for new renewable energy needs, generation output was estimated in MWh based upon the conversion factors found in the Guidance for regional enhanced energy plans.

Table 4: Existing Renewable Generation in Cavendish

Type	**Number of Sites**	**Installed Capacity (MW)**	**Est. Output (MWh)**
Solar	20	0.261	320.4
Wind	1	0.002	6.1
Hydro	1	1.44	3,832

[10] Vermont Energy Dashboard (February 2017)

4.4.2.Analyze Generation Potential from Preferred Sites and/or Potentially Suitable Areas

An analysis of renewable energy generation potential was conducted for Cavendish by the SWCRPC. This consisted primarily of an analysis of existing and available GIS mapping data based upon the guidelines established by the DPS for enhanced energy planning. Table 5 below summarizes the findings of this analysis.

Table 5: Potential Renewable Energy Generation[11]

Type	Capacity (MW)	Generation Output (MWh)
Roof-top Solar	1.5	1,815
Ground-mounted solar	300.3	368,288
Wind	632.9	1,940,471
Hydro	0.01	49.1
Total	**934.71**	**2,310,623**

Based upon this analysis, there is significant potential to generate power from renewable sources in Cavendish, primarily through ground-mounted solar and wind. There is limited potential to generate hydropower other than from the existing dam site at this time. The potential for rooftop solar projects is limited. Without ground-mounted solar and/or some forms of wind, there is inadequate generation potential from hydro and rooftop solar to meet the "90 by 50 goal" alone.

4.4.3.Identify Sufficient Land for Renewable Energy Development to Reasonably Reach the 2050 Targets

Table 6 summarizes Cavendish's targets for renewable energy generation[12]. There is more than adequate land area in Cavendish that has solar potential to meet our 2050 renewable energy target of 13,558 MWh, which is the equivalent of approximately 11 MW of ground- mounted solar at the installed capacity. The guidance assumes 8 acres of land is generally needed to support 1 MW of solar. This would amount to about 88 acres of land to meet this target. This represents about 4.2 % of the total land area in Cavendish that is estimated to have potential to generate solar power.

Table 6: Renewable Energy Generation Targets

Renewable Energy Generation	2025	2035	2050
Cavendish Targets (in MWh)	3,390	6,779	13,558

[11] Derived from GIS mapping analysis (SWCRPC, 2017)

[12] SWCRPC, derived from Regional Shares of In-State Generation Target (DPS, 2017)

4.4.4.Ensure that Local Constraints do not Prohibit or Have the Effect of Prohibiting the Provision of Sufficient Renewable Energy to Meet State, Regional or Local Targets

These constraints have been analyzed, and the Town does not believe that these constraints prohibit or have the effect of prohibiting sufficient renewable projects needed to meet the state, regional or local energy goals.

The following resources are not appropriate locations for renewable energy projects and are hereby excluded from the potential wind and solar sites as depicted on the map. The following are consistent with the "known constraints" as described in the DPS mapping guidance.

a) Vernal pools with a surrounding 50-foot buffer;
b) Department of Environmental Conservation (DEC) river corridors;
c) Federal Emergency Management Agency (FEMA) floodways;
d) State significant natural communities and rare, threatened and endangered species;
e) National wilderness areas; and,
f) Class 1 and Class 2 wetlands.

The following represent constraints that will likely require mitigation and which may prove a site unsuitable after a site-specific study has been conducted based upon state, regional or local policies that are adopted and currently in effect. Points a) through g) below are consistent with the "possible constraints" as described in the DPS mapping guidance.

a) Agricultural soils (NRCS-mapped prime agricultural soils, soils of statewide importance or soils of local importance);
b) Act 250 agricultural soil mitigation areas;
c) FEMA special flood hazard areas (floodplain);
d) Protected lands (state fee lands and private conservation lands);
e) Deer wintering areas;
f) ANR conservation design highest priority forest blocks; and,
g) Hydric soils.

4.4.5.Statements of Policy to Accompany Maps

Cavendish hereby promotes the development of renewable energy generation in order to achieve the energy goals and targets as established in this plan. The following statements of policy apply to renewable energy projects:

a) All new development should be sited to accommodate solar.
b) Cavendish encourages rooftop solar projects.
c) Cavendish encourages residential-scale wind turbines.
d) Renewable energy projects, including ground-mounted solar projects of 15 kW and bigger, must not be located in the following areas:
    1. Vernal pools with a surrounding 50 foot buffer;
    2. Commercial scale projects in the river corridors as most recently mapped by the Vermont Department of Environmental Conservation (DEC);

Undue Adverse Effect (Impact)

An adverse impact that meets any one of the following criteria:

(1) Violates a clear, written community standard intended to preserve the aesthetics or scenic, natural beauty of the area;

(2) Offends the sensibilities of the average person (i.e. it is offensive or shocking because it is out of character with its surroundings or significantly diminishes the scenic qualities of the area); or,

(3) Fails to take generally available mitigating steps that a reasonable person would take to improve the harmony of the proposed project with its surroundings.

This definition is based upon Vermont

3. FEMA floodways;
4. State significant natural communities and rare, threatened and endangered species;
5. National wilderness areas;
6. Class 1 and Class 2 wetlands; and,
7. Within 50 feet of all streams and Class 1 and 2 wetlands.

e) All ground-mounted solar projects must meet or exceed the setback standards in 30 V.S.A. §248(s).

f) Any new biomass facility and all ground-mounted solar projects of 150 kW or greater shall be sited and screened so that the visual impact of these facilities will be minimized and screened from class 1,2 and 3 town highways as well as scenic view points and adjacent properties. These facilities include but are not limited to solar panels, transformers, utility poles and fencing. The proposed project must provide plantings that blends the project with its surroundings. This shall consist of naturalistic plantings using a mix of native plants, berms or a combination thereof to achieve the objective of screening the site and avoid introducing invasive species.

Wind Turbine Categories

Residential-scale – wind turbines that are up to 30 meters (or 98 feet) tall, measured at the hub, or the center of the wind turbine blades.

Community-scale (sometimes referred to as commercial-scale) – wind turbines that are up to 50 meters (or 164 feet) tall, measured at the hub.

Utility-scale – wind turbines that are usually 70 meters (or 230 feet) tall or greater, measured at the hub.

a. Screening shall provide a year-round visual screen and shall occur on property owned or controlled by the owner and or operator of the facility. A diversity of tree and shrub species shall be used to create a diverse, naturalized screen rather than a large expanse of uninterrupted, uniform planting.

b. The Owner/Operator must file a planting plan with the Town which details planting and or berm locations, plant species, quantities, sizes and planting specifications which conform to ANSI 300 (American National Standards Institute). The owner must replace any dead or diseased vegetation within 6 months serving as part of the landscape mitigation measures throughout the life of the project or until the project ceases commercial operation

g) Proposed renewable energy facilities must not have undue adverse impact on significant wetlands, significant wildlife habitat, wildlife travel corridors/habitat connectivity, storm water, water quality, flood resiliency, important recreational facilities or uses, scenic resources identified in this plan, or inventoried historic or cultural resources.

h) Proposed renewable energy facilities must not result in forest fragmentation or perpetuate invasive species.

i) For all utility-scale wind (i.e. hub height of 70 meters/230 feet) and commercial-scale wind projects (i.e. hub height of 50 meters/ 164 feet hub height), the owner must

Shadow Flicker

A flickering effect caused when rotating wind turbine blades periodically cast shadows, such as through the windows of adjacent homes. Shadow flicker is considered by some individuals as a nuisance and may cause headaches. No more than 30 hours per year is commonly used as a limit to reduce nuisance complaints.

demonstrate that the proposal was evaluated and that reasonable mitigation was considered with respect to the following criteria:

1. Operational noise, to be measured at the property line, will result in noise levels consistent with state standards.
2. Avoid or minimize "shadow flicker" through careful project siting, planting trees or other methods.
3. Avoid or minimize adverse impacts to significant wildlife habitat and wildlife travel corridors, including applicable terrestrial, aquatic and aerial species (e.g. migratory, resident and breeding bird and bat populations).
4. Avoid or mitigate safety hazards in the vicinity of the project area (i.e. ice shedding or ice throw hazards, blade throw hazard, and tower fall zones).

4.4.6.Maximize the Potential for Renewable Generation on Preferred Locations

Preferred locations include specific areas or parcels that are specifically identified to indicate preferred locations for siting a generator or a specific size of type of generator. Identifying preferred sites informs the community where renewable generation is desired. The identification of such sites can help to streamline the permitting process.

Preferred sites for Cavendish include:

a) Rooftops;
b) Parking lots;
c) Brownfield sites; and,
d) Disturbed portions of extraction sites (i.e. gravel pit, quarry).

4.4.7.Demonstrate the Municipality's Leadership by Example

Cavendish will lead by example by working with partner organizations to identify opportunities for local renewable energy generation that benefits the community and furthers the goals and policies of this plan.