M. Energy

Local growth and development, quality of life, and quality of the environment all depend on the availability of clean, affordable energy. Stowe's energy use has changed over time in response to growing demand, new energy sources, and new technologies.

Town residents and businesses historically relied on local wood, water and horsepower to fuel their energy needs. Mills grew up around dam sites, and settlements grew up around mills. With the coming of the first steam powered lumber mill, established by the Burt Company in Stowe Hollow in 1883 and later moved to Stowe Village in 1895, direct access to hydropower was no longer required for production operations.

Wood served as the primary heating and cooking fuel for much of the town's history. Wood fueled cook stoves were first introduced to Stowe in 1820. As the nineteenth century progressed, other imported fuels such as coal, kerosene, and gas came into wider use.

For many years, horses and oxen provided both power for field and domestic work as well as transportation. In 1897 an electric line, the Mt. Mansfield Electric Railroad, was constructed and carried freight, mail, and passengers from Waterbury to Stowe into the next century. Horses, however, were not supplanted as the primary form of local transportation until the advent of the automobile.

Stowe Village was incorporated in 1896 in part to finance the installation of electric power in the village. The Village of Stowe Electric Light & Power System was established in 1911 as a public utility, and electric lighting was installed soon thereafter.

During the twentieth century, the use of electricity grew in importance for power, lighting, and heat as it became recognized as a more convenient, adaptable, and much

cleaner energy source. The twentieth century also heralded the widespread adoption of the internal combustion engine, and with it, local and national dependence on relatively cheap supplies of fossil fuels for power, heat, and transportation.

The availability of alternative energy sources fueled Stowe's transition from an economy heavily dependent on natural resources to one based on tourism, including the development of the town's commercial ski industry, which relies entirely on electric energy to power its operations.

ENERGY USE & DEMAND

Today Stowe continues to rely on three major sources of energy: oil (heating, diesel, kerosene, and gasoline), propane gas, and electricity. Wood and solar power are also used for residential heating, but to a much lesser extent.

Stowe accounts for approximately 1.42% of the state's total electric power consumption. The Town of Stowe Electric Department ("SED") is one of Vermont's fourteen municipal electric utilities, SED is the second largest municipal electric utility in Vermont in terms of annual sales. According to a recent forecast conducted by ITRON, one of the largest energy resource management firms in the United States, SED expects a 1% load growth each year through 2033. This equates to adding 36 new residential and 6 new commercial customers each year.

A portion of Stowe along Route 100 from the Stagecoach Road to the border with Morristown is served by the Morrisville Water & Light Department. This area includes approximately 280 customers. The Vermont Electric Cooperative delivers electricity to approximately 70 residential customers in sections of Sterling Valley. Green Mountain Power also serves some customers along the Route 100 corridor in Stowe.

SED currently serves approximately 4,530 meters: 3,624 meters are for residential customers and 906 meters are for commercial customers. This is an increase of roughly 1,500 customers since 1994. The residential customer base accounts for 35% of sales, and approximately 70% of our residential meters are held by a customer with a primary residence outside of the Town of Stowe. The commercial and industrial sector accounts for 56% of sales, which includes snowmaking at Stowe Mountain Resorts.

Locally, the rate of growth in energy use will depend on three factors:

- The amount of residential, commercial and industrial growth
- The effectiveness of state and local conservation programs
- The local substitution of alternative technologies

Stowe's peak load was 19 megawatts (MW) in 2023 and our minimum load was 9.6MW. Our average monthly load was 13.2MW. SED's system is designed to meet our maximum, minimum, and average loads without negative effects on power quality, reliability, and safety. SED's distribution system is designed to serve their customer's needs and support expected increased growth in electric consumption. SED's system has

also been upgraded to allow for increased distributed generation resources, which will support those customers able to participate in net-metering projects. Peak electric demand in Stowe occurs in winter months, which is primarily the result of increased energy consumption associated with ski area operations, and customer's higher heating and lighting demands. Stowe, like most communities in Vermont, has seen increased energy consumption in the summer months largely due to increased deployment of heat pumps.

ENERGY INFRASTRUCTURE

SED maintains system distribution lines and a 34.5 kV sub-transmission that feed three substations, including two primary metering points: the underground Wilkins Substation and the 3360 Line which provides power to the Houston and Lodge substations. The utility service territory covers an area of 63 square miles. SED serves its customers with around 8.1 miles of transmission, 91 miles of distribution overhead lines, and 83 miles of underground distribution line. There is an average of 30 customers per mile of distribution. The town receives most of its power through VELCO's 115kV transmission line that serves the VELCO and SED substation located at Cady Hill.

Historically, SED received most of its power through the "Northern Loop" - a 44-mile, 34.5 kV sub-transmission system owned by Green Mountain Power. Today, the primary purpose of the loop is to feed other local utilities, including Morrisville Water and Light, Johnson Electric, Hardwick Electric, and Hyde Park Electric. The construction of VELCO's 115kV line makes the Northern Loop a backup source of power for SED should anything happen on the 115kV line.

SED purchases most of its power from wholesalers and utilities under contractual or joint ownership agreements. As SED is a municipal department, the Town of Stowe's Aa2 credit rating enables the utility to negotiate supply contracts at very favorable rates.

Local generating capacity is limited in Stowe due to the area's terrain. However, SED commissioned the Nebraska Valley Solar Farm in August of 2016. This project is a 1MW generation facility and is predicted to generate roughly 1-2% of SED's energy needs for the next 30 years. It is also located "behind the meter," meaning that the energy it generates will offset the cost of energy that SED would otherwise have to purchase. SED secured financing through a federal program that covers roughly 75% of the interest on the borrowing needed to complete the project. The project is sited on a reclaimed gravel pit that has been leased from the Town, which maximized the use of the gravel pit and could provide an opportunity to expand the solar facility in the future.

Vermont's net metering program encourages the development of solar and other small-scale renewables by allowing a customer to sell the excess electricity that their project generates to the electric utility. As Vermont's net metering program includes significant financial incentives, SED and the rest of the Vermont electric utilities have experienced an influx in net metered generation on its system in the past few years. As of July 1, 2024, SED has 2.16MW of solar generation from net-metering installations. The generation from these net metering customers does reduce the amount of power SED would have to purchase from elsewhere. However, when a utility purchases energy from

a net-metering project, the cost of the electricity is the highest source of electricity that a utility can purchase. Net-metering customers who elect to transfer the renewable energy credits generated by their project to SED allows SED to claim the Vermont Class 2 RECs generated by the project, which contributes to SED's Renewable Energy Standard portfolio targets. SED recognizes the benefits that properly sited and installed small scale renewables provide and is committed to integrating more local generation to benefit all of its customers.

Electric vehicles ("EVs") are another emerging technology that has helped to change SED's electric grid in recent years. Today, the utility owns and operates 10 EV stations which are all available to the public 24 hours a day. Stowe Electric began installing its EV stations in 2013. With those first installations, SED became the first distribution utility in Vermont to own EV stations and the first to implement an electric tariff designed specifically for EV charging. The data from those first charging stations showed that most of the usage came from EV drivers visiting Stowe. This realization presented an opportunity to achieve two goals. The first was to leverage Stowe's tourism draw to establish it as a prime destination for EV-driving tourists by installing several dispersed and conveniently placed EV stations. The second, to providing the infrastructure that EV drivers require for longer trips in order to promote the use of EVs to reduce fossil fuel consumption and clean transportation technologies. As the usage of SED's EV station fleet grows, the amount of greenhouse gas emissions from transportation decreases as well as smog and particulate matter.

SED's charging stations can be found at the following locations:

- Green Mountain Inn – 7 kW Level 2
- American Flatbread – 7 kW Level 2
- Stoweflake Mountain Resort and Spa – 7 kW Level 2
- Stowe High School – 7 kW Level 2
- Stowe Living – 7 kW Level 2
- Stowe Rec Path behind the Akeley Building – 7 kW Level 2
- Sun and Ski Inn and Suites – 7 kW Level 2
- Stowe Electric's administrative office – 7 kW Level 2
- Trapps Brewery – 7 kW Level 2
- Thompson Park – Level 3

SED and Burlington Electric Department are the only two municipal electric utilities in Vermont that have fully deployed Advanced Metering Infrastructure ("AMI"). SED began implementation of its AMI program in late 2012. SED's AMI system provides several benefits. It eliminates the need for meter readers to visit customer properties to physically read their electric meter. It provides SED customer service representatives with secure access to more detailed information letting them better assist customers with questions about their bill. The AMI system notifies SED staff when a meter loses power which allows staff to begin locating and addressing the issue even before customers contact the utility.

The AMI allows SED customers to view their account and electric usage through a secure online platform. AMI also allows SED to offer dynamic or "time-of-use" rate structures that reflect the cost of purchase and deliver electricity to the grid varies during certain periods. Due to supply and demand, the electricity SED purchases to serve its customers can cost more in certain circumstances, such as when air conditioning demand picks up during a heat wave, which are referred to as "peak periods." Time-of-use or dynamic rate structures can charge a customer more than the standard rate for usage during peak periods, and charge less for usage during other times, referred to as "off-peak periods." This allows customers that participate in these rate structures and can reduce their electric consumption during peak periods to save money on their utility bill. This could be achieved from using their electric clothes dryer in the morning or evening, or charging their electric vehicle during an off-peak hour.

ENERGY CONSERVATION

In recent years, growing concern over the nation's dependence on , non-renewable sources of energy and impacts from the extraction and consumption of these sources have resulted in new policies and programs designed to emphasize energy efficiency and conservation. Such efforts include traditional utility demand side management ("DSM") programs and the creation of Efficiency Vermont ("EVT"), the statewide Energy Efficiency Utility ("EEU"). Most recently, the Vermont Legislature developed the Renewable Energy Standard ("RES") which includes a mandate that electric distribution utilities implement programs to reduce the fossil fuel consumption attributable to their customers and the related greenhouse gas emissions.

EVT, the first EEU in the country, is organized as an independent, non-profit entity and since 1999 has assumed the responsibility for operating and implementing core statewide energy efficiency programs. These programs are supported through the collection of the Energy Efficiency Charge ("EEC"), a volumetric charge which is collected by regulated Vermont's electric and natural gas utilities. The Vermont Public Utility Commission ("PUC") calculates a new EEC rate every year. For example, customers pay based on the number of kWh used in each month and, for customers served under a demand rate, customers pay based on the number of kW that they are billed for each month. EVT provides a range of services to residential, commercial, industrial, and agricultural users to help reduce their electric and heating fuel consumption through efficiency measures.

Although local utilities no longer have the expense of operating their own efficiency programs, they may still elect to implement demand side management programs that are targeted to avoid specific transmission and distribution system investments.

2024 Efficiency Vermont Energy Efficiency Rates

Customer Class	2024 EEC
Residential	$0.01115 per kWh
Commercial	$0.01008 per kWh
Commercial Demand	$0.00640 per kWh plus $1.34343/kW
Industrial	$0.00771
Industrial Demand	$0.00519 per kWh plus $1.10773/kW

Street Lights	$0.01008 per kWh times the nominal wattage of the light times 360 hours per month

The Legislature developed the RES in 2015. It establishes mandates for electric utilities to source a percentage of their portfolios from specific types of sources. One of the categories, commonly referred to as the Energy Transformation Category or Tier III, includes a mandate that electric distribution utilities implement programs to reduce the fossil fuel consumption attributable to their customers and the related greenhouse gas emissions. The required percentage rises from two percent in 2017 to 12 percent in 2032, except that small municipal utilities, such as SED, will not have to meet this category until 2019. A utility may meet this category through additional distributed renewable generation or "energy transformation projects." Energy transformation projects must deliver energy goods or services other than electric generation and must result in a net reduction in fossil fuel consumption by a utility's customers and the attributable greenhouse gasses. The act states that energy transformation projects may include home weatherization or other thermal energy efficiency measures, air source or geothermal heat pumps, and other measures. Though SED is not required to meet compliance targets until 2019, efforts such as its most recent additions to its EV station fleet will be counted toward the utility's requirements. It also plans on rolling out additional programs prior to its compliance years.

The most recent updates to building efficiency standards are an example of another statewide initiative to increase energy conservation. Spurred by legislative goals outlined in Act 89 passed in 2013, they are designed to help achieve the goals set out in the 2011 Vermont Comprehensive Energy Plan which states that Vermont should establish a "…clear path to achieve a goal of having all new buildings built to net zero design by 2030." The Department of Public Service ("DPS") was tasked with drafting the Residential Building Energy Standards ("RBES") and Commercial Building Energy Standards ("CBES") and updating these standards every three years. The most recent version of the Standards took effect in 2024. They apply to most new construction projects and provide requirements for building design, ventilation systems, the building's thermal envelop, combustion safety, electric vehicle charging, among others. The project builder is tasked with self-evaluation and enforcement of the RBES and CBES.

Act 89 also authorized the DPS to adopt "stretch" codes for residential buildings which is designed to achieve greater energy savings than the baseline RBES and compliant buildings will gain a presumption of compliance with every conservation criterion of Act 250. The DPS is also in the process of adopting a "stretch" code for commercial buildings. Municipalities have the option to adopt either or both stretch codes as part of their bylaws.

Stowe does not have building codes but energy conservation is encouraged under local land use regulations through the application of provisions that protect renewable energy resources and support good site design and layout. These include standards for the

clustering and location of buildings for passive solar benefits, shared infrastructure, and the preservation of existing vegetation.

ENERGY AFFORDABILITY

SED's electric utility rates are competitive with other Vermont utilities and the high cost of energy locally reflects high energy costs throughout the northeast. According to the latest numbers compiled by the Vermont Department of Public Service, SED has the 7th lowest electric rates among the 17 electric utilities in the state. SED, through its partnership with Efficiency Vermont, offers a number of rebates on beneficial electrification technologies that can help Vermonters transition their fuel sources to electricity, which over time has a lower cost than fossil fuels.

Local prices for gasoline, propane, kerosene and heating oil are also typically higher than the national average. The price of heating fuels follows the volatile international market that can double or halve in a single year. Many homes have wood or pellet stoves to supplement winter heating needs as a hedge against high costs of traditional fuels. An increasing number of Vermont households and businesses have begun installing cold climate heat pumps ("CCHPs") to help meet their home heating needs. Recent advancements in air source heat pump ("ASHP") technology have made an established technology suitable for Vermont's cold winters as they can now help heat a space in weather down to 0 degrees Fahrenheit. The Vermont Department of Public Service has reported that these recent advancements in efficiency have made them among the most cost-effective forms of home heating when compared to traditional fuels such as oil, propane, and wood. This has the potential to change home heating costs for many Vermonters as an ASHP that is utilized and installed properly allows for homeowners to transition off of fossil fuels in favor of Vermont's low-carbon electricity mix.

The high cost of winter fuels represents a real danger to residents with low incomes. There are assistance programs available, including the government funded Low Income Home Energy Assistance Program ("LIHEAP") and the Weatherization Program which are both administered by the Vermont Department for Children and Families ("DCF"), and the WARMTH program. DCF also compiles lists of community action agencies, many of whom provide fuel assistance and home weatherization services. Efficiency Vermont also provides residential efficiency services such as energy audits, insulation and air sealing, valuable information on efficient appliances, and rebate opportunities to help homeowners afford these efficiency technologies.

EQUITY AND ENERGY PLANNING

The Town of Stowe Inclusivity Statement says:

The Town of Stowe welcomes all persons, regardless of race, color, religion, national origin, sex, gender identity or expression, family status, age, or ability, and wants everyone to feel safe and welcome in our community. As a town, we formally condemn discrimination in all its forms, commit to fair and equal treatment of everyone in our community, and will strive to ensure all of our

actions, policies, and operating procedures reflect this commitment. The Town of Stowe has and will continue to be a place where individuals can live freely and express their opinion.

This applies to all areas of energy planning, including energy affordability, generation, distribution, and conservation.

Consideration for equity in energy planning can take many forms. Energy equity known as "energy justice" as described in the 2022 Vermont Comprehensive Energy Plan (CEP) "aims to make energy accessible, affordable, cleaner, and democratically managed for all communities." This section will discuss energy as it relates to Stowe and the thermal, transportation, and electric sectors, in the context of distributive, procedural, contextual, and corrective equity. According to the 2022 CEP:

- *Distributive Equity* considers whether Vermonters, regardless of racial and other socioeconomic factors, equitable share both the benefits and the burdens of the energy system.

- *Procedural equity* acknowledges equitable planning and implementation, and the right of communities to participate in decision-making around policies and programs. This considers which stakeholders have a seat at the table, what voices are heard during public engagement processes for siting new generation facilities and infrastructure, and who benefits from those facilities.

- *Contextual equity* recognizes that come communities are more likely to experience adverse impacts of policies and programs due to vulnerabilities, such as being more vulnerable to natural disasters.

- *Corrective Equity* recognizes the need for a clear process to hold decision makers accountable in community for equity commitments. Advisory committees (e.g., the Energy Committee, Planning Commission) or oversight boards should review clean energy projects to ensure impacted communities are being appropriately served.

ENERGY BURDEN IN STOWE

According to the 2023 Efficiency Vermont Energy Burden Report,[1] Vermont households spend around $7,000 annually on thermal, electric, and transportation fuels. Households in Stowe have a total energy burden of 9.7%, with about a 4%

[1] https://www.efficiencyvermont.com/news-blog/whitepapers/vermonts-2023-energy-burden-report

thermal energy burden, 2% electricity burden, and 4% transportation energy burden. This report highlights distributive inequities of total energy burden, where lower income households are experiencing a higher energy burden in terms of heating and cooling homes, fueling modes of transportation, and electricity costs. Future projects that help improve energy efficiency and provide more opportunities for alternative modes of transportation could help reduce energy burdens experienced in Stowe. The Town should also continue to share weatherization, energy efficiency, and other incentives with households.

THERMAL SECTOR

According to the 2020-2024 Vermont Housing Needs Assessment, and American Community Survey 5-Year Estimates, much of Vermont's housing stock is older than the national average. The average home in Vermont was built in 1974, compared to the nationwide average of 1977. Over one quarter of the housing stock in Vermont was built before 1939. Aging housing stock can result in an inequitable distribution of energy burden and living conditions. Older homes often use energy less efficiently and could benefit from weatherization services. There is also often a prevalence of lead paint, asbestos, and plumbing and electrical components that do not meet fire and safety codes, which may also act as a barrier to installing residential, clean and renewable energy sources for heating and cooling.

TRANSPORTATION SECTOR

The Vermont Agency of Transportation provides a framework for transportation equity,[2] and how to equitably plan for access to safe, high-quality, affordable, and convenient transportation options for all Vermonters. The Vermont Health Equity Toolkit also provides policy documents, funding opportunities, and other resources to support equity in transportation.[3] Policies and actions outlined in Stowe's Transportation section of this plan help achieve goals related to equity in transportation.

Transportation energy costs are consistently the largest portion of household energy spending and burden statewide. According to the 2023 EVT Energy Burden Report, transportation energy burden experienced in Stowe matches the statewide transportation energy burden at 4%. Developing accessible transportation projects guided by the needs expressed within the community can help advance equitable transportation networks. For example, increasing access to public transit, health care, and educational facilities can help lower local transportation energy burdens and spending.

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2 Transportation Equity | Agency of Transportation (vermont.gov)

3 Health Equity Planning Toolkit - Lamoille County Planning Commission (lcpcvt.org); https://www.lcpcvt.org/vertical/Sites/%7B3C01460C-7F49-40F5-B243-0CA7924F23AF%7D/uploads/HE_Toolkit_Resources_Table_Revised_Mar.2023.pdf

The Lamoille region relies heavily on automobiles as a primary means of transportation. This reliance is reinforced by the separation of employment areas, commercial services, and housing. Supporting compact, mixed-use development can help create more walkable, bikeable, accessible places. According to the 2022 CEP, Transportation Demand Management (TDM) involves transportation infrastructure that increases the quality and types of transportation choices available. Public transit, ride share, bicycling, and walking are all alternatives to getting around by single-occupancy vehicles. Stowe should continue to enhance mobility by providing transportation alternatives, and provide meaningful transportation choices to children, seniors, residents, visitors, and businesses. Creating more walkable and bikeable communities can help decrease transportation spending, energy burdens, and emissions, facilitate more access to community assets, and increase health equity.

Improved access to electric vehicles (EV), plug-in hybrids, and charging infrastructure can contribute to a cleaner transportation network by reducing fossil fuel usage. Efficiency Vermont's 2023 Energy Burden Report indicates that changing from fossil fuel vehicles to a new or used EV or plug-in hybrid could reduce annual household energy burden between 9 – 12% or $700 - $900 per year. EV use raises an equity issue because at present EV drivers do not pay road taxes, which are part of the purchase price of gasoline; as EVs become a higher percentage of vehicles on the road, this inequity should be addressed.

DISTRIBUTION OF UTILITIES; EQUITY STRATEGIES FOR RENEWABLE ENERGY ACCESS & AFFORDABILITY

Local leaders and SED should continue to look to programs and policies that encourage locally generated and managed, fossil fuel-free energy, while also prioritizing access and affordability for historically underserved and disadvantaged community members. Providing renewable power and services close to where it is used, also known as distributed energy resources (DER), has multiple benefits including the potential to lower costs for consumers, improve the reliability and resilience of the grid, and increase equity among community members. DERs can promote energy savings and can lead to improved health and equity in Stowe. The Town and SED can work with LCPC to review locally proposed energy projects and how they may meet the goals of the Stowe Enhanced Energy Plan. Some examples of DER projects that can promote energy savings and equity are described below.

- *Community-Owned Solar* can provide several meaningful benefits to participants and communities, including:
  - Increased access for low- to moderate-income households,
  - Greater savings on energy costs,
  - Energy resilience,
  - Community ownership,
  - Wealth-building opportunities,

- Equitable workforce development, and
- Pollinator gardens and biodiversity.

Related to the last bullet, "agrivoltaics," or the co-location of agriculture and solar energy, is a land use practice that could benefit both agriculture and renewable energy industries.[4] Pollinator habitat and other crops or livestock production are located under and around panels. Opportunities for this should be explored and supported in Stowe.

SED has planned a community renewable energy project scheduled to come on-line in 2025 that will apply the combined generation capacity from a micro-hydroelectric and solar project to offer low- and moderate-income households an on-bill credit on their electric bills.

- *Microgrids* are interconnected, locally controlled power systems that can function while connected to the larger grid or completely on their own. Microgrids enhance the resilience of the power grid by providing localized power generation and storage. A microgrid can range in size from a single building, to a hospital complex to a neighborhood and even a distribution circuit. They can keep critical community services running during outages caused by extreme weather events or other disruptions. Low-income and disadvantaged communities in Vermont often face more grid reliability issues. These communities spend a higher percentage of their income on energy bills and are more vulnerable to power outages. Microgrids can ensure reliable energy access for these communities during extreme weather events and other instances where the larger power grid is under duress.

SED completed a micro-grid feasibility study through a grant from the American Public Power Association. The study looked at potential locations for microgrids in Stowe and included public safety and critical infrastructure, customers at the end of distribution feeders, and co-located with SED's Nebraska Valley solar array. The study identified that SED's distribution system would benefit more from investing in traditional system hardening measures (i.e., increased vegetation treatments and improved fault-detection equipment), then building small micro-grids. The study also suggested that locating a utility scale battery storage project in SED's territory would provide a greater benefit to the community than several smaller micro-grids.

- *Utility Scale Battery Storage Project*: SED has been investigating the feasibility and benefits to our customers from a utility scale battery storage project. A battery storage project is not in SED's current 5-year annual plan; however, SED anticipates a role for this technology as part of SED's strategy to

[4] https://www.energy.gov/eere/solar/agrivoltaics-solar-and-agriculture-co-location

implement peak-shaving, winter reliability planning, load-shifting, and energy arbitrage (i.e., charging the battery during times of increased PV and hydro generation, and releasing the energy during system peaks). SED identified several locations in Stowe where a battery storage facility can bring resiliency to our system and save our customers' money on their electric bills. The next phase of this study is to develop a budget, timeline to implement the project, and issue a request for information.

- *System Hardening and Resiliency Capital Projects*: Recognizing the financial incentives available to municipal utilities under the Inflation Reduction Act and Infrastructure Investments and Jobs Act, SED has applied for federal grants and a low-interest loan under the USDA Powering Affordable Clean Energy program to fund key system hardening and resiliency projects. SED has a rolling 5-year capital plan that is updated annually to adjust to new funding sources and emerging priorities. SED has received over $7,500,000 in grant funding and low-interest loans (with a 20% loan forgiveness component) to build new renewable energy generation, upgrade distribution lines and equipment, install a distribution loop-feed for resiliency, and upgrade our outage detection and management system. These projects are critical system upgrades to address more frequent and intense storms that cause outages and upgrade our system to prepare for increased distributed energy generation, electrification of home heating and cooling loads, electric vehicles, and updated regulatory standards.

- *SED's Emergency Operations Center*: SED has received funding from a Congressionally Directed Spending earmark to renovate an existing building at our Moscow Mills campus into a combined distribution system monitoring and emergency management operations center. This facility is the first of its kind for SED that will create a unified grid monitoring, dispatching, and operations control center. The building will have solar and battery storage backup and whole building controls for its electric heating, cooling, and lighting systems. The building will allow SED staff to maximize our grid monitoring and control software and unify the dispatching of SED line crews, right of way maintenance crews, and out of area resources dispatched to assist SED with outage restoration.

- *Utility-led Energy Programs* increasingly play a role in providing fossil fuel-free energy infrastructure, storage, and programs to ensure reliable, affordable clean energy for all. All Vermont utilities offer programs for income-eligible Vermonters to help lower the cost of energy at home. SED and Efficiency Vermont have various rebates and incentives available to offset the cost of purchasing equipment, such as E-Bikes, Electric Vehicles, electric yard equipment, and heat pump purchases and installation. Furthermore, SED has also helped organize a weatherization event for households in Stowe and other areas of Lamoille. Low-cost window inserts provided by Window Dressers and constructed by members of the community help weatherize homes to conserve energy and lower household utility costs.

PURCHASE POWER CONTRACTS AND SERVICES

Each year Vermont utilities file an Annual Resource Report with the Vermont Public Utility Commission that explains load projections and how the utility will meet their obligations. SED's energy and capacity requirements are provided through a variety of contract obligations and SED has used longer term power contracts to limit its market exposure from unexpected short-term increases in power costs. SED works with Energy New England, a wholesale power supply contractor, to find least-cost opportunities to address SED's energy needs and the increased renewable and carbon-free requirements in the Vermont Renewable Energy Standard.

Stowe's actual load data from 2017 to 2023 as well as forecasted load through 2028 is shown below in Table 1.

Stowe's Historical Annual Load Requirements

Stowe's Historical Load MWH					
	Snow Making Load	Non-Snow Making Load	Total Stowe Load	Snow % Increase/ (Decrease)	Stowe % Increase/ (Decrease)
2017	8,610	69,541	78,151		
2018	7,801	70,003	77,805	-9.39%	-0.44%
2019	7,422	68,205	75,627	-4.87%	-2.80%
2020	7,648	62,523	70,172	3.05%	-7.21%
2021	9,286	67,936	77,222	21.41%	10.05%
2022	8,839	69,546	78,386	-4.81%	1.51%
2023	8,932	69,614	78,546	1.05%	0.20%

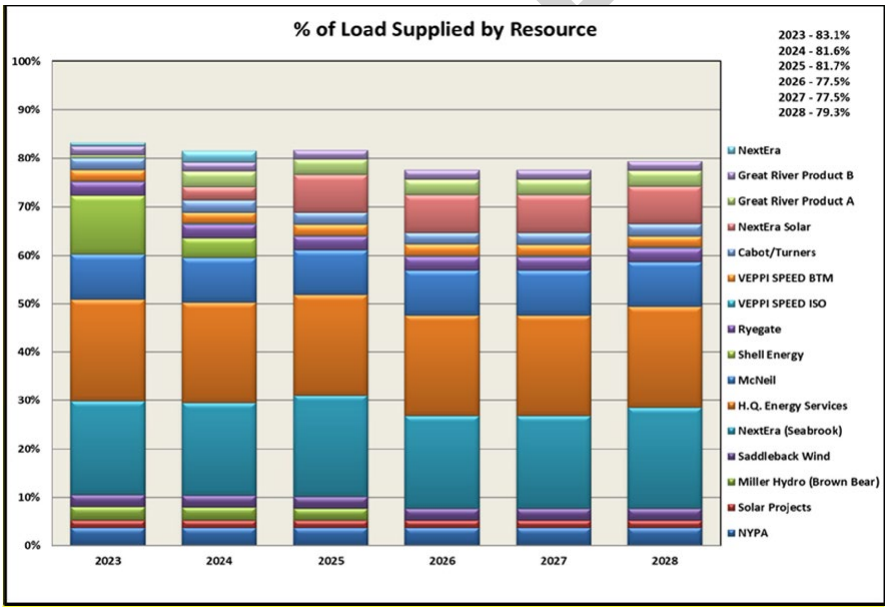
Stowe's Forecast Load MWH					
	Snow Making Load	Non-Snow Making Load	Total Stowe Load	Snow % Increase/ (Decrease)	Stowe % Increase/ (Decrease)
2024	9,019	69,962	78,981		
2025	9,109	70,739	79,848	1.00%	1.10%
2026	9,200	71,860	81,061	1.00%	1.52%
2027	9,292	72,986	82,278	1.00%	1.50%
2028	9,385	74,315	83,701	1.00%	1.73%

Stowe has long-term contracts and entitlements that provide suppliers, fuel sources, and term diversity. A brief description of each resource is listed below

Stowe Long-Term and Existing Power Resources, Calendar Year 2023

2023 Total KWH's by Resource								
Resource		Type	MWH	KWH	% of Load	Fuel	Location	Termination
Niagara		Block	3,169	3,168,815	3.9%	Hydro	Roseton	9/1/2025
St. Lawrence		Block	97	97,425	0.1%	Hydro	Roseton	4/30/2032
HQ Contract		ISO Bilateral	17,462	17,461,600	21.4%	Hydro	HQ Highgate 120	10/31/2038
McNeil	1.550	Wood Unit	5,544	5,543,755	6.8%	Wood	Essex	Life of Unit
Ryegate		Wood Unit	2,444	2,443,765	3.0%	Wood	RYGT	11/1/2032
Stony 1A/1B/1C	4.916	Dispatchable	278	277,883	0.3%	Natural Gas/Oil	Stonybrk 115	Life of Unit
Saddleback Ridge	0.21	Run of River	1,793	1,792,602	2.2%	Hydro	LUDDN_LN	Exp. 2035
NextEra	0.017	ISO Bilateral	546	545,600	0.7%		Mass hub	3/31/2024
Miller Hydro		ISO Bilateral	2,739	2,738,801	3.4%	Hydro	TopSham.Milr	Exp. 2025
Seabrook Offtake		ISO Bilateral	15,281	15,280,521	18.7%	Nuclear	Seabrook 545	Exp. 2034
Shell		ISO Bilateral	9,443	9,442,651	11.6%		Mass hub	4/30/2024
Great River Hydro		Hydro	2,181	2,180,630	2.7%	Hydro	Moore	12/31/2027
Cabot/Turners		ISO Bilateral	2,355	2,354,601	2.9%	Hydro	Mass hub	Exp. 2030
Standard Offer ISO			103	103,198	0.1%	Methane	VT Nodes	Life of Unit
ISO Energy Net Interchange			15,117	15,117,489	18.5%			
Totals			78,549	78,549,335				
Standard Offer BTM		Load Reducer	1,765	1,764,559	2.2%	Solar	Behind meter	Life of Unit
Nebraska Valley Solar Project		Load Reducer	1,220	1,220,103	1.5%	Hydro	Behind meter	Life of Unit
		Reconstituted	81,534	81,533,998	100.0%			

Stowe's Yearly Projected Resource Distribution

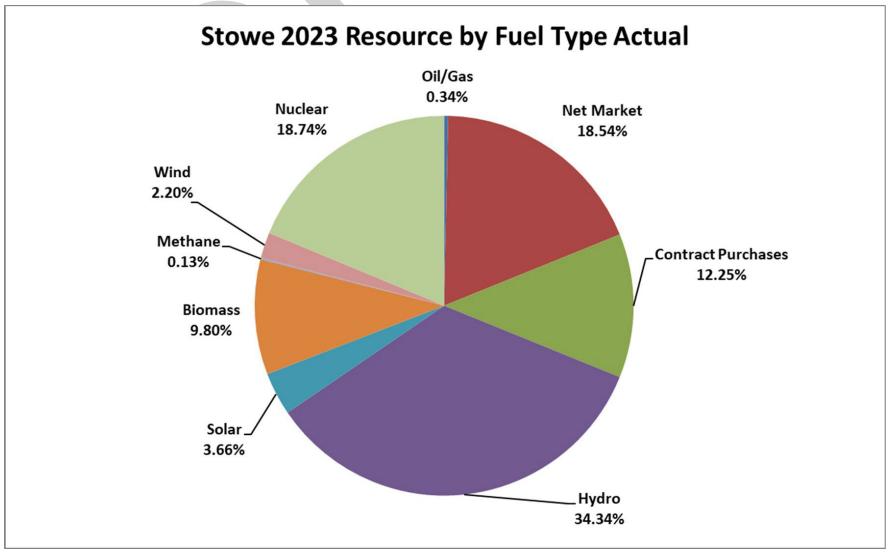


In 2024, the Vermont Legislature passed Act 179 which updates to the RES. The Act increases the amount of total renewable energy electric utilities are required to purchase to 100% on or before January 2035, depending on the type of utility. It also changes the definition of new metering, and creates two new Tiers: Tier 4, and Tier 5.

There are now five tiers to the RES program:

- Tier I : Meet a 100% by 2035 total renewable energy requirement (63% of annual load by 2025 increasing to 100% by 2035)
  - Any class of tradeable renewable attributes that are delivered in New England qualify.
- Tier II: Meet 20% of sales with distributed generation in 2035 (5% by 2025 increasing at least 1.5% each year to 2035))
  - New Vermont based unit that is 5 MWs or less or renewable generation
  - Utilities can petition the Commission to include resources over 5MW to qualify
- Tier III: Meet 10⅔ % of sales with "energy transformation projects" in 2032 (6% of annual load in 2025 increasing ⅔% to 2032)
  - Excess Tier II-qualifying distributed generation or a project that reduces fossil fuel consumed by their customers and the associated greenhouse gases emissions qualifies for compliance (MW conversion will be determined by the Commission)
- Tier IV: Meet 10% of annual load by 2035 from regional renewable energy resources built after January 1, 2010 and can deliver power to ISO-NE. This category encourages increased procurement from renewable generation that supports the reliability of the regional ISO-NE electric system. For municipal utilities the target is 5% of the utility's annual load by 2030 and 10% of their annual load by 2035..
  - Tier V: involves load growth, and retail utility providers meeting load growth above it's 2024 calendar year load with 50% renewable energy beginning January 2025, up to 100% on and after 2028.

Stowe Electric Department's current Energy portfolio contains over 50% renewable generation. See figure below for electric resources by fuel type.



CURRENT ENERGY USE

Estimates of current energy use consist primarily of data available from the American Community Survey, the Vermont Agency of Transportation, the Vermont Department of Labor, Efficiency Vermont and the Vermont Department of Public Service. These estimates were developed by the Lamoille County Planning Commission with guidance from the Department of Public Service. Future generation potential estimates were developed by Lamoille County Planning Commission based on guidance from the Department of Public Service.

Current Energy Use

Residential Heating Energy Use

	Utility Gas	Fuel Oil, Propane, Kerosene	Solar Energy	Wood	Electricity	Other	Total
# of Households	178	1,765	68	215	154	88	2,468
% of Households	7.2%	71.5%	2.75%	8.7%	6.2%	3.56%	100%

Source:2022 American Community Survey

Commercial Heating Energy Use

607 commercial buildings	Total
% of businesses	100%
Total Heat Energy Consumption of Commercial Buildings (Usage in million BTUs)	474,929

2023 VT PSD Municipal Consumption Tool

Annual Transportation Use

# of Fossil Fuel Burning Light Duty Vehicles	3,547
Total Miles Driven (based on 12,500 average annual miles traveled/vehicle)	44,337,500
Usage in Gallons (based on 22mpg average fuel economy)	2,015,340
Usage in million BTUs	239,795

Source: 2021 American Community Survey 5-Year Estimates, 2023 VT PSD Municipal Consumption Tool

Annual Electricity Use

	kWh Usage
Residential	31,761,967

Commercial & Industrial	50,242,529

Source: 2022 Annual Electricity Usage data from Efficiency Vermont

Current Energy Generation		
Generation facility	Number of sites	Generation Capacity (kw) as of 03/2024
Hydro (Currently not Operational)	1	93
Solar	145	3,000
	-	-
Residential Wind	-	-
TOTAL	146	3,093

Source: Vermont Public Service Department, March 2024

ELECTRIC VEHICLE ADOPTION AND HEAT PUMP INSTALLATION

As Stowe and Vermont as a whole shift from gas powered vehicles to electric vehicles, there is an anticipated increase in electric vehicle adoption. However, data provided by the Stowe Electric Department demonstrates a slight downward trend in electric vehicle adoption based on rebates provided since SED started its rebate program in 2019. The table below shows electric vehicle adoption based on SED rebates issued from 2019 to 2024. Total SED has recorded 101 electric vehicle purchases in the Stowe Electric Department service area. In terms of weatherization, the table below demonstrates an upward trend in the installation of heat pumps in Stowe since 2019. This is based on those customers receiving rebates through Stowe Electric Department. Total heat pump installations recorded by SED's rebate program from 2019 to 2024 is 899. Stowe Electric Department covers the majority of the service area for the Town of Stowe. Data from other local utilities that cover small portions of Stowe are not reflected in the table below.

Lifetime Participation Tier III		
Yr	Heat Pumps	EVs
2019	43	3
2020	71	10
2021	158	12
2022	286	36
2023	242	24
2024	99	16
Total	899	101

Source: Stowe Electric Department, 2024

WEATHERIZATION IN STOWE

Aside from fuel switching and installing new heating systems such as heat pumps, weatherization practices such as adding insulation, weather stripping, and installing Energy STAR appliances continue to play an important role in promoting energy

efficiency. In addition to heat pump installations, Efficiency Vermont recorded 77 residential weatherization projects in Stowe from 2020-2022.

Stowe was awarded funding in 2023 through the Vermont Climate Catalysts Innovation Fund for a window inserts project that built and installed over 320 window inserts to provide weatherization improvements to residential customers. 55% of orders were completed for income qualifying households. This is a particularly valuable project that allowed the utility to provide meaningful weatherization solutions to our customers and start a conversation regarding how low- and moderate-income families can improve the habitability and weatherization of their homes, while taking advantage of rebates and other financing measures.

FUTURE ENERGY USE AND GENERATION TARGETS

GENERATION TARGETS

The Vermont Public Service Department (PSD) provides a Generation Scenarios Tool to help set targets for renewable energy generation. The 2024 tool models statewide targets for 10%, 20%, and 25% in-state generation scenarios in the future. Incremental energy generation targets are one output of the tool, as well as capacity targets for different resources and resource availability, with land availability and grid headroom as possible constraints. The Lamoille County Planning Commission used the 25% in-state generation scenario to align with the 2022 Comprehensive Energy Plan. Statewide targets are broken down by region in the tool, and LCPC broke regional targets to the municipal level, based on population and suitable land area. Population data used in the Generation Scenarios Tool is from the 2020 U.S. Census.

Rather than using total land area available in each town, which the tool defaults to, LCPC used “suitable” acreage for generation as the land area value. Suitable acreage was based on the percentage of total land area that includes both prime and secondary acreage for renewable generation, as displayed in the Regional Enhanced Energy Plan maps. This percentage was then distributed evenly across all towns, for ground-mounted solar and wind generation. Land area does not include area needed to support hydro generation sites or rooftop solar (as these do not occur on land). However, the Generation Scenario Tool assumes that 1 acre is needed per MW of power produced for hydro projects.

To contribute to the goal of 90% renewable energy by 2050, the 2024 Generation Scenarios Tool forecasts that Stowe will need to add new renewable facilities capable of producing an additional 15,683.4 MWh of new renewably generated electricity. Stowe could meet this target with a combination of renewable energy technologies. Ground-mounted solar is the most available generation technology and will likely contribute substantially to the future technology mix for Stowe’s renewable energy generation. Rooftop solar may increase in availability as structures are able to support it. While wind

generation potential is limited, there is some land available to support small-scale projects.

Output target for renewable energy generation

Town	2023 Existing Generation (MWh)*	2025 Incremental output projections (MWh)	2035 Incremental output projections (MWh)	2050 Incremental output projections (MWh)
Stowe	3,863	4,014.0	10,034.8	15,683.4

Source: VT Department of Public Service, 2024 Generation Scenarios Tool
*Based on VT Department of Public Service, 2024 Generation Scenarios Tool

Incremental Renewable Energy Capacity Target for 2050

Town	Gound mounted solar: Potential capacity (MW)	Rooftop Solar: Potential capacity (MW)	Wind: Potential capacity (MW)	Hydro: Potential capacity (MW)
Stowe	7.6	1.2	0.8	0.6**

Source: VT Department of Public Service, 2024 Generation Scenarios Tool
**There may not be enough hydro resources available or grid system headroom to meet the 2050 capacity target for hydro power.

In order for the Town of Stowe to meet this incremental output target for renewable electric generation of 15,683.4 MWh, relying primarily on ground-mounted solar, the 2024 Generation Scenarios Tool predicts that about 84 acres of land devoted to solar panels would be needed to meet this target.

SOLAR AND WIND POTENTIAL

The solar and wind potential resource maps at the end of this chapter demonstrate there is sufficient land available to meet this target. While the wind map shows limited potential for wind power resources in Stowe given current technology, there is adequate solar resource potential to meet the Generation Scenario Tool target described above. Using the latest resource potential layers from the Energy Atlas published by the Vermont Public Service Department, in Stowe there are 1,524 acres of prime solar potential and 8,086 acres of secondary solar potential. Prime solar potential areas shown on the map are areas where there are no Known Constraints. Secondary solar areas are locations where there are possible environmental constraints.

However, as discussed in the Electric Grid Limitations section below, land is not the only constraint to meeting the generation targets projected above. Rooftop solar and solar built on parking structures can contribute to this generation target and reduce the amount of land required to meet projected generation targets. Where possible, rooftop solar should

be explored as an option to minimize impacts to Stowe's scenic and natural resources especially Priority Forest Blocks and Habitat Connectors in the Shutesville Hill Wildlife Corridor. Rooftop and ground mounted solar should be explored for municipal properties where feasible and where it is cost effective. In 2020, the Stowe High School was assessed for rooftop solar but the current structure is not compatible with rooftop solar. When the school roof is replaced, building it to meet weight and panel installation requirements should be considered.

HYDRO POWER POTENTIAL

According to existing generation capacity data provided in March of 2024 by the Vermont Public Service Department, Stowe has one (not currently operational) hydroelectric power dam with a generation capacity of 93 kw. The Moscow Mills Dam was formerly operational until the Powerplant was inundated with flood waters in 2011 by Tropical Storm Irene. The Stowe Electric Department is working to restore this hydroelectric facility to an operational status. In 2017, Stowe Electric Department purchased the property and built new administrative buildings in 2019. Once restored the expected generation capacity of this project is 411 MWh (411,000KWh).

THERMAL ENERGY NETWORKS (GEOTHERMAL POTENTIAL)

Thermal Energy Networks are heating and cooling systems that circulate water to capture or reuse thermal energy between buildings . Thermal Energy Networks can capture waste heat from large buildings, refrigeration systems, industrial processes or from moderate temperatures underground. This neighborhood-scale decarbonization approach requires higher density areas such as village centers, other growth centers, or a cluster of housing/ community buildings. This may be a long-term solution as the Town of Stowe recently underwent a sidewalk, paving, and utility upgrade project along Main Street. However, other rights of way may be accessible for Thermal Energy Network development in the near term. The ideal time to install Thermal Energy Networks is with planned utility upgrades, other infrastructure investments or repairs, or when new commercial or residential construction is occurring in an existing neighborhood. Benefits of a thermal energy network system include utilizing heat that already exists and was already paid for and yielding long-term cost savings on heating and cooling buildings. Where Thermal Energy Network shared infrastructure may not be feasible, individual air-source heat pumps are another option. Air Source Heat Pumps pull inherent thermal energy within air or water from outside to heat indoor spaces. This harnessed heat is transferred directly to air or water for circulation in interior spaces, or to provide domestic hot water. All types of heat pumps also provide cooling and dehumidification for buildings by transferring moisture and excess heat to the exterior. Visit vctn.org to learn more about Thermal Energy Networks and other efforts to achieve neighborhood-scale decarbonization.

ELECTRIC GRID LIMITATIONS

The resource potential and environmental attributes of the land are not the only factors in the consideration of whether a site is viable for the deployment of a particular technology. The capacity of the electric grid to transmit the newly generated electricity is

also key and currently poses a serious challenge for meeting the 90x50 energy generation goal for Lamoille County, particularly within the grid in the northern tier of the state known as the Sheffield Highgate Export Interface (SHEI). In Lamoille County, SHEI encompasses the towns of Belvidere, Eden, Johnson, Cambridge and parts of Hyde Park, and Morristown. As of November 2024, SED does not share the grid limitations experienced within the SHEI. Installing a neighbor-hood scale Thermal Energy Network significantly reduces load on the electrical grid and can help reduce potential future limitations (see previous section).

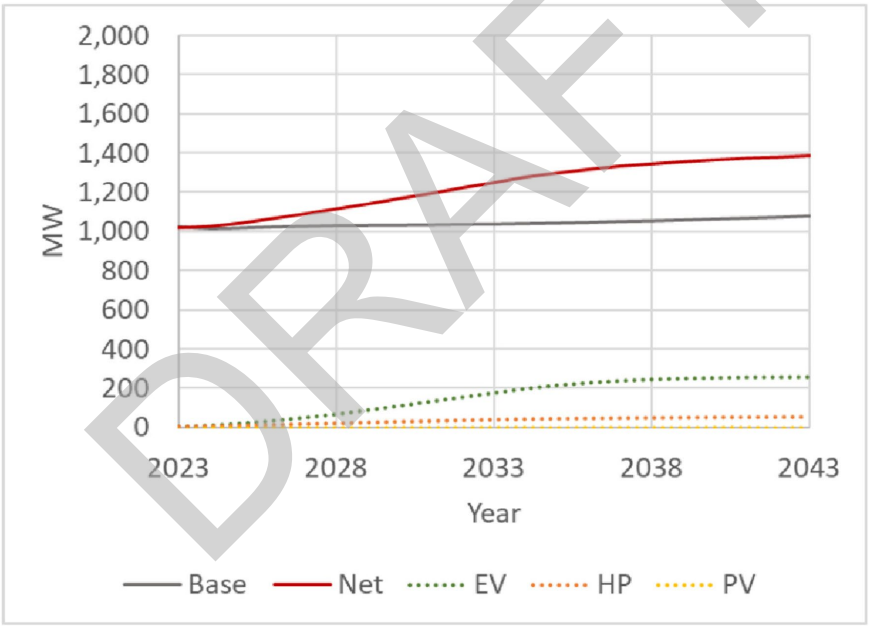
Currently, existing renewable energy generation plants within SHEI, such as Lowell Wind and Sheffield Wind, produce more electricity than can be consumed within the SHEI region. Given the lack of usage within SHEI, a solution would be to export the electricity to areas with greater electric demand. However, current physical limitations of the grid do not allow for adequate export of power, and exporting the power becomes an issue to the point that existing wind turbines are being forced to curtail energy production in order not to overload the grid. Local utilities are already implementing winter curtailment plans to avoid grid system blackouts.

The 2024 Generation Scenarios Tool provided by the Public Service Department added a new category focused on transmission and distribution headroom. Transmission headroom is the amount of extra capacity a device has available for transmitting power over long distances via high voltage power lines, while distribution headroom is the capacity available for short distances via lower voltage lines. These categories allow municipalities to understand limitations to the electric system in the region. According to the 2021 VELCO LRTP, and the 2024 Generations Scenario Tool from the Vermont Public Service Department, the County has 25.5 MW of transmission headroom available. However, the 2024 VELCO LRTP shows there is 0 MW of additional "Optimized Distribution" headroom in Lamoille County, meaning that there is no longer any transmission headroom in Lamoille County for additional generation without causing harm to rate payers or hosting capacity in other regions. There remains room on the grid for additional load. Municipalities like Stowe in the region can still encourage electrification such as installing heat pumps and electric efficiency measures. The 2024 VELCO LRTP highlights system upgrades across Vermont, many of which could benefit Stowe and may provide additional transmission system headroom for generation as well as for load. These potential upgrades are found in section "5 Discussion of Peak Demand Results" in the VELCO Long Rage Transmission Plan which can be viewed at:https://www.velco.com/2024-vermont-long-range-transmission-plan. Limitations to the grid affect all sectors of planning (Transportation, Land Use, Housing, Energy, Economic Development etc..) and the Town's ability to continue to grow.

Local electric utility providers and VELCO (Vermont Electric Power Company) are playing an active role in planning for the projected increase in load on the grid system. The 2024 VELCO Vermont Long-Range Transmission Plan recognizes

grid system load challenges and forecasts scenarios required to meet statewide energy goals and generation capacity targets by 2050. Load forecasting in the Long-Range Transmission Plan projects the need for a 75-Megawatt load reduction by 2043 to mitigate expected growth in the load on the grid system. These projections include assumptions such as a constant level of increase in electric vehicles being adopted and charged on the local grid system, and an increase in heat pumps by 60% by 2043. The Vermont Roadmap Electric Vehicle Forecast in VELCO's plan predicts that electric vehicle demand during summer peak will grow from 9 MW in 2024 to 256 MW by 2043. See table below for increased grid system load forecasting identified in VELCO's 2024 Long-Range Transmission Plan.

FIGURE 6 – PROJECTED VERMONT SUMMER PEAK LOAD AND ITS COMPONENT FORECASTS



Source: VELCO 2024 Long-Range Transmission Plan

The 2024 VELCO Vermont Long-Range Transmission Plan identifies the following actions to meet anticipated grid system growth and the Vermont Comprehensive Energy Plan statewide goals:

- Increase energy storage available during peak demand times such as in the evening
- Grid system upgrades

- Grid system load curtailment
- Coordination between VELCO and local utilities

At the local level, electric utilities utilize similar forecasting strategies to plan for increased demand on the local grid system as identified in their Integrated Resource Plans (IRP). In accordance with 30 V.S.A. section 218c, electric and gas companies are required to update Integrated Resource Plans every 3 years. The IRP established a framework for decision making that utilities utilize to meet the public's need for energy services. It develops methods to evaluate a utility's investment and purchase decisions. Current IRPs for local utilities are filed with the Public Utility Commission and Vermont Department of Public Service as well as housed on a utility company's website. Grid system load forecasting in IRPs is based on a range of economic, technological, and weather data. Load forecasting considers both expected base load and peak load demand such as seasonal winter and summer peaks in energy use. Similar to VELCO's Plan, the IRPs consider growth anticipated due to an increase in electrifying modes of transportation and heating/cooling systems. The Stowe Electric Department (SED) Integrated Resource Plan for example forecasts a steady increase in grid system load demand between 1-2% annually. The table below from Stowe Electric Department's 2024 Resource Report demonstrates load forecasting and the expected increase in demand on the local grid system for SED's service area.

Stowe's Historical Annual Load Requirements

Stowe's Historical Load MWH					
	Snow Making Load	Non-Snow Making Load	Total Stowe Load	Snow % Increase/ (Decrease)	Stowe % Increase/ (Decrease)
2017	8,610	69,541	78,151		
2018	7,801	70,003	77,805	-9.39%	-0.44%
2019	7,422	68,205	75,627	-4.87%	-2.80%
2020	7,648	62,523	70,172	3.05%	-7.21%
2021	9,286	67,936	77,222	21.41%	10.05%
2022	8,839	69,546	78,386	-4.81%	1.51%
2023	8,932	69,614	78,546	1.05%	0.20%

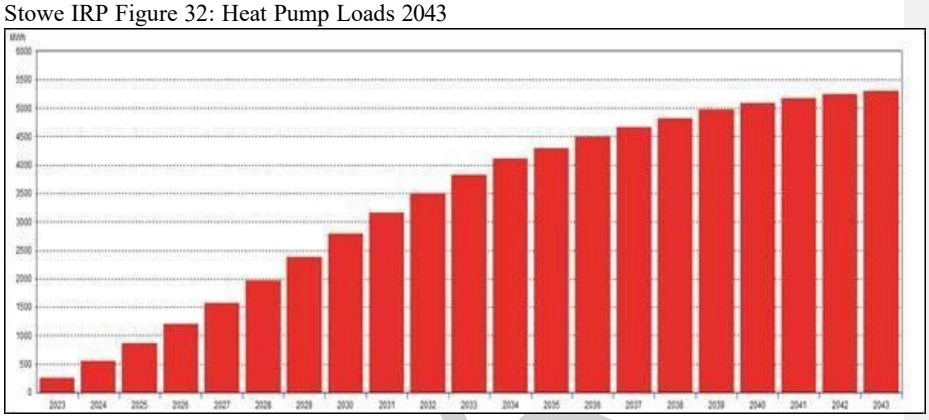
Stowe's Forecast Load MWH					
	Snow Making Load	Non-Snow Making Load	Total Stowe Load	Snow % Increase/ (Decrease)	Stowe % Increase/ (Decrease)
2024	9,019	69,962	78,981		
2025	9,109	70,739	79,848	1.00%	1.10%
2026	9,200	71,860	81,061	1.00%	1.52%
2027	9,292	72,986	82,278	1.00%	1.50%
2028	9,385	74,315	83,701	1.00%	1.73%

Source: Stowe Electric Department, 2024

Local IRPs also identify load forecasting associated with growth in heat pump installations and electric vehicle adoption. For example, the table below from Stowe Electric Department's 2023 IRP shows the heat pump sales forecast. By 2043 heat pump energy requirements reach 5,200 MWh with a maximum peak demand of 3.2 MW.

Electric vehicle load forecasting in Stowe's IRP was developed in conjunction with the 2023 VELCO Long-term Forecast. By 2043 electric vehicles are expected to account for 90% of all registered vehicles in Vermont. See figure 6 above from the 2024 VELCO Long-Range Transmission Plan for expected increase in load demand on the grid due to electric vehicle adoption.

Stowe IRP Figure 32: Heat Pump Loads 2043



Source: Stowe Electric Department, 2024

As local utilities cover a smaller area for electric service, they will not see as significant of a load increase as larger utility providers such as Green Mountain Power. In addition to forecasting grid system load increases, local utility providers are exploring alternatives to ensure grid reliability such as energy storage and micro grid systems. The Stowe Electric Department for example was awarded more than $1.6 million in grant funding for resiliency and infrastructure modernization, including funding for a microgrid feasibility study.

LEAP ENERGY TARGETS

To support the update of the Vermont Comprehensive Energy Plan and Climate Action Plan, and to achieve Green House Gas emission reduction requirements of the Global Warming Solutions Act, the Vermont Department of Public Service developed the Low Emissions Analysis Platform (LEAP Model). The outcome, shown below, projects future energy demand for Lamoille County and represents one possible scenario by which Lamoille County can contribute to achieving state energy goals. The scenario relies on increased efficiency, conservation, and electrification as ways for decreasing the overall amount of energy used. What follows is a simplified explanation of energy usage trends envisioned by the 2023 LEAP Model. The Municipal Consumption Tool developed by the Vermont Public Service Department, was used to develop estimates of current energy use

for each Lamoille County Town. Municipal LEAP targets were proportioned based on total local energy shares estimated by the Municipal Consumption Tool.

The figure on the next page shows the transition in the amount of energy obtained from renewable and non- renewable fuel sources. Among the most notable trends are:

- The model results show that, despite a growing population and economy, energy use will decline by nearly 35 percent because of increased efficiency and conservation.
- Electricity use will increase with the intensified use of heat pumps as primary heating sources and the use of electric vehicles. Because those choices are powered by electricity, and electricity is three to four times more efficient compared to fossil fuels, overall energy use will decrease.
- Over time, the model projects a near complete elimination of our two principal transportation fuels, gasoline and diesel, as well as oil, currently the major fuel used for space heating in many parts of the state.
- The 2023 Climate Action Mitigation Scenario which utilizes the LEAP Model framework, places more emphasis on an increase in electrification for heating and cooling needs. The former LEAP modeling placed more emphasis on an increase in wood heating sources. While Lamoille County residents will likely continue to utilize wood heat in some form whether it be a primary or secondary heating source, the new LEAP targets focus on the expected increase in electrification and electric heating and cooling systems such as heat pumps. From a BTUs standpoint, cold climate heat pumps are one of the most efficient and carbon free sources for heating and cooling buildings, allowing Vermonters to use less energy overall for their HVAC system needs.

LEAP Projections:

To demonstrate the magnitude of changes that would need to take place to align Stowe's energy profile with the state energy goals, LEAP offers very specific targets to serve as a guidepost for the Town of Stowe's transitions in energy use and generation. Policies and actions listed in Section 5 of the Stowe Town Plan show steps that can be completed by the Town to help attain the projected targets. Many other policies and implementation steps could help the Town attain its energy goals, but these strategies cannot be achieved by the Town of Stowe alone and require the action of the state agencies, public utilities, and private individuals. The latest renewable electrical output targets from the 2023 LEAP Model were added below.

The 2023 LEAP Model also projects energy demand for core sectors: residential, commercial, and industrial. The tool accounts for multiple fuel types including, but not limited to, electricity, wood, solar, heat, and other fossil fuels. There are pathways to meet demand using a "business-as-usual" (baseline) scenario under

typical energy planning and programs, and a Climate Action Plan (CAP) mitigation scenario developed to meet GWSA greenhouse gas emissions reduction targets.

LEAP TARGETS

Projected total energy demand: Residential Sector

Year	2025	2030	2035	2040	2050
Baseline Total Electrical Demand (Thousand MMBTUs)	326.374	302.005	288.690	283.766	280.495
CAP Mitigation Total Demand (Thousand MMBTUs)	294.423	247.001	211.831	181.850	165.559

Projected total energy demand: Commercial Sector

Year	2025	2030	2035	2040	2050
Baseline Total Electrical Demand (Thousand MMBTUs)	192.735	189.843	187.582	187.025	187.406
CAP Mitigation Total Demand (Thousand MMBTUs)	189.363	187.087	185.609	187.807	191.891

Projected total energy demand: Industrial Sector

Year	2025	2030	2035	2040	2050
Baseline Total Electrical Demand (Thousand MMBTUs)	66.975	66.570	66.006	66.823	68.957
CAP Mitigation Total Demand (Thousand MMBTUs)	66.975	66.570	66.006	66.823	68.957

Projected total energy demand: Transportation Sector

Year	2025	2030	2035	2040	2050
Baseline Total Electrical Demand (Thousand MMBTUs)	58.213	53.430	50.577	47.891	43.210
CAP Mitigation Total Demand (Thousand MMBTUs)	56.663	47.654	38.690	32.231	27.062

Target: Households heated with wood

Year	2025	2030	2035	2040	2050
# of Households	1,042	936	846	739	571
% of Households	26.8%	23.6%	20.9%	17.9%	13.3%

Target: Residential heat pumps

Year	2025	2030	2035	2040	2050
# of Residential Heat Pumps (Baseline Scenario)	493	936	1,197	1,322	4,461
# of Residential Heat Pumps (CAP Mitigation Scenario)	1,054	1,941	2,835	3,737	4,177

Target: Households weatherized

Year	2025	2030	2035	2040	2050
# of Households (Baseline Scenario)	280	414	541	672	950
# of Households (CAP Mitigation Scenario)	763	1,309	1,649	1,989	2,668

Target: Commercial heat pumps

Year	2025	2030	2035	2040	2050
# of Heat Pumps (Baseline Scenario)	107	204	261	289	303
# of Heat Pumps (CAP Mitigation Scenario)	636	1,264	1,922	2,363	2,458

Target: Passenger electric vehicle use

Year	2025	2030	2035	2040	2050

# of vehicles (Baseline Scenario)	193	397	854	1,747	1,648
# of vehicles (CAP Mitigation Scenario	190	897	2,084	3,191	4,448

SITING OF RENEWABLE ENERGY GENERATION FACILITIES

Areas Preferred for Renewable Energy Development

Areas preferred for renewable energy development are the areas identified as "preferred" in Act 174 unless these areas are identified as unsuitable by municipal plan of the municipality in which the development is proposed. The preferred areas include:

- Parking lots
- Brownfield Sites
- Landfills
- Rooftop installations
- Gravel pits

Areas Not Supported for Renewable Energy Development

This plan identifies some areas where renewable energy development is not supported due to their natural or scenic value, or due to the importance of protecting our citizens from potential natural disasters. On the solar and wind maps, these areas are referred to as "no solar" or "no wind", also known as "Known Constraints."
These areas include:

- Floodways
- Special flood hazard areas shown on FEMA Flood Insurance Rate Maps
- River Corridor Areas
- Class 1 and Class 2 Wetlands
- Vernal Pools
- State-significant Natural Communities and Rare, Threatened, and Endangered Species
- Wilderness Areas
- Highest Priority Forest Blocks
- Solar installations greater than 15kW located within the Stowe Historic Overlay District or Moscow Historic District.
- On historic buildings within the Stowe Historic Overlay District that are clearly visible from public rights-of-way (Note: The historic buildings noted here are not shown

on the energy maps. Renewable energy generation estimates on page X of the plan do factor in the historic buildings data).

Areas That May Be Undesirable for Renewable Energy Development

There are many areas that have the potential for renewable energy generation, but possess environmental constraints that may pose a barrier to the development of renewable energy facilities. In some cases, these constraints may prohibit the development and in others the development may be suitable. The solar and wind resource maps, name these areas as "secondary solar" or "secondary wind". Also known as "Possible Constraints". The areas include:

- Primary agricultural soils
- Protected Lands Act 250 Agricultural Soil Mitigation areas
- Deer Wintering Areas
- Hydric Soils
- Locations within the Ridgeline and Hillside Overlay District that are clearly visible from public rights of way. (Note: Renewable energy generation estimates do not factor in The Ridgeline and Hillside Overlay District Layer); and
- Working farmland within the Rte. 100 corridor when clearly visible from Rte.100. (Note: The working farmland within the Rte. 100 corridor noted here is not shown on the solar and wind maps. Renewable energy generation estimates do not factor in the working farmland.)

5. The Town will continue to support the location of a transfer station in Stowe.

Solid Waste Tasks	Responsibility	Priority
1. In conjunction with the Lamoille Regional Solid Waste Management District (*LRSWMD*), inform and educate the public on solid waste issues.	Selectboard *LRSWMD	Ongoing
2. Maintain active membership on the LRSWMD board of directors.	Selectboard	Ongoing
3. Provide opportunities for recycling at all municipal buildings and parks, as well as in Stowe Village.	Selectboard Public Works Director	Short-term
4. Explore opportunities for the collection and use of food waste in anaerobic digesters for the production of methane to produce electricity.	Conservation Commission Planning Director *LRSWMD	Mid-term
5. Investigate the possibility of deeding the Stowe Transfer Station property to the LRSWMD.	Town Manager Selectboard	Mid-term

Energy

Goal: To prioritize the availability, affordability, and efficient use of energy resources, including the development and use of renewable and clean energy resources in a manner that considers equity in planning and siting, protects public health and safety, reduces carbon emissions and costs, supports community resiliency, and minimizes adverse environmental and aesthetic impacts.

Policies

1. The Town will continue to ensure, to the extent of its abilities, the availability of electric energy at reasonable cost to local customers through active involvement in the state's formulation of electric utility policy, including utility restructuring.

2. Municipal energy expenditures will be reduced to the extent feasible through energy efficiency and conservation and the use of renewable and clean energy resources.

3. Energy efficiency and conservation and the use of renewable and clean energy resources will be prioritized in new municipal construction projects, renovations projects, equipment purchases and operations.

4. The Stowe Energy Committee will be notified of planned municipal capital projects and equipment purchases to allow for comments and recommendations from the Committee.

5. The Town will use life cycle costing in evaluating energy-related capital expenditures, as appropriate and provide that information to the Stowe Energy Committee.

6. The use of available, cost-effective renewable and clean energy resources will be incorporated into new municipal facilities and retrofit of existing facilities.

7. The Town, through the Stowe Electric Department, will promote and prioritize energy efficiency and conservation among its local customer base.

8. Future energy transmission lines should use existing rights-of way, when possible**.**

9. The Town encourages high density, mixed-use development, including in-fill development that reflects the historic scale and pattern and protects the residential character of existing residential neighborhoods (Policy cross-referenced in the Settlement Pattern Policies section of this Plan). This could also help meet energy conservation goals.

10. The Town shall adopt zoning bylaws and subdivision regulations to promote energy-efficient building and site design and to reduce or eliminate greenhouse gas (GHG) emissions and/or fossil fuel infrastructure.

11. Building construction and/or rehabilitation will incorporate energy efficient design and conservation technologies including Net Zero. All new development shall meet applicable state energy efficiency and conservation requirements and should be encouraged to exceed state efficiency requirements. Residential buildings, as defined by 30 V.S.A. 51(a)(2), that are principal building, shall comply with the Stretch Code, as defined by 30 V.S.A. 53(a). Such buildings for which the Residential Building Energy Standard (RBES) Certificate certifying compliance with the Stretch Code is not recorded in the Stowe Land Records shall be deemed land development without a zoning permit in violation of these Regulations. As per Act 89, the Town Planning office will provide RBES and CBES information when a building or zoning permit is applied for.

12. The Town will develop standard deep retrofit specifications and incentives for existing residential building owners to reduce the carbon footprint of the building to zero and deploy an incentive program for electrification for switching building space heating and water heating from fossil fuel-based to electric or other clean energy. The Town will review whether a neighborhood-scale Thermal Energy Network would be feasible with large construction or redevelopment projects. The Town will collaborate with the Stowe Electric Department to create financial incentives to electrify new and existing buildings (e.g, rebates for electric heat pumps, panel upgrades, and electric appliances).

13. The Town will support programs that assist owners with weatherizing and improving the efficiency of existing buildings, and/or promote incentive programs for energy-efficient construction or renovation.

14. The Town will adopt regulations to require all-renewable and clean energy sources for new construction and major remodels/redevelopment by 2030. Options such as RBES/CBES building code updates and Net Zero Ready ordinances should be explored as tools for transitioning new construction to all-renewable and clean energy sources. The Town will implement a "solar ready" building code for new construction.

15. The Town will promote smart-growth development, paying particular attention to incentivizing denser development close to already built environments/public transportation and implement a framework for considering the GHG implications of different types of development. The Town will consider use of neighborhood-scale Thermal Energy Networks. Emphasis should continue to be placed on non obstruction of views, building style conformity in the area, appropriate landscaping and screening and street set backs on major traffic roadways.

16. The Town will plan for and promote non-traditional vehicular transport modes (e.g, bike, e-bikes, scooters and pedestrian) using best practices for traffic engineering, including sidewalks, pathways and bike lanes, park and ride lots, public transit services and/or ridesharing programs that reduce transportation energy costs. It will utilize credits and incentives to help defray such costs where available.

17. The Town shall encourage owners to manage forested land for long-term, sustainable harvesting of wood as a renewable fuel source and where appropriate promote forested land in order to follow best carbon caption policies.

18. The Town will support the work of local energy committees as partners in education and outreach to the community.

19. The Town's Zoning Office, with the assistance of Stowe Electric, will provide energy code and energy efficiency program information when an application is submitted for a zoning permit for the construction of, or alterations to a building.

20. The Town encourages the use of electric heat pump heating and cooling and other clean energy systems in new construction and as a replacement for fossil fuel heating systems in existing buildings where applicable. The Town will also encourage use of solar energy for lighting and appliance usage in new construction, renovations or building upgrades. The Town will support partnership Efficiency Vermont and other incentive providing State and Federal entities/programs.

21. The Town will continue to require Certificates of Occupancy (CO) for new construction, major renovations, and additions for all heated spaces and will ensure that energy code certificates be submitted before a CO is issued. Any building that requires a Certificate of Occupancy must be certified for CBES or RBES compliance before the CO is issued. The Town Planner will make quarterly reports to the Energy Committee of contractor compliance to RBES and CBES.

22. The Stowe Electric Department will actively pursue achieving or exceeding renewable and clean energy and carbon reduction goals established by the State of Vermont.

23. The Town will participate in Public Utility Commission (Section 248) review of new and upgraded generation and transmission facilities as necessary to ensure that adopted community standards are given due consideration in proposed energy facility development.

24. The Town of Stowe supports the generation of small net-metered or off-grid renewable energy facilities, including solar arrays, small wind facilities or combined systems intended primarily to serve local residences or businesses long as they meet the following standards:
    a. The maximum tower height for net-metered, or similar off-grid wind energy facility shall not (a) exceed 120 feet in total height, as measured vertically from the ground to the rotor blade tip at its highest point, or (b) extend in total height more than 30 feet above the existing tree canopy or other obstructions within 300 feet of the tower, whichever is greater.
    b. Power generating facilities and accessory structures must meet the minimum setback requirements for the zoning district(s) in which they are located.
    c. All ground-mounted wind energy facilities must be setback at least 1.5 times the total facility height, as measured vertically from the ground to the rotor blade tip at its highest point, from all property lines, occupied buildings on adjoining properties, overhead utility lines, public and private rights-of-way and established trail corridors, unless easements are secured from adjoining property owners.
    d. Wind energy facilities shall be sited or screened so that shadows cast by rotor blades will not result in shadow flicker on occupied buildings located in the vicinity of the project.
    e. On properties outside the SHOD containing Historic Buildings as defined by the Stowe Zoning Regulations, solar ground installations are preferred to roof-mounted installations on historic buildings.
    f. Ground installations, to the extent functionally-feasible, shall be installed in locations that minimize their visibility, such as a side or rear yard, and be screened from view of public rights-of-way and adjoining properties.
    g. Consideration is given to impacts on disadvantaged communities.

25. The Town of Stowe does not support the installation of large-scale wind installations—defined as one or more turbines, each with a nameplate capacity greater than 100kW, or height of more than 170 feet.

26. The Town of Stowe supports the installation of commercial/utility scale solar power generating facilities in appropriate locations as long as they provide a clear, direct benefit to the local Stowe Community. Power generating facilities and accessory structures must meet the minimum setback requirements for the zoning district(s) in which they are located.

27. The Town discourages the fragmentation of core forest areas when siting renewable energy generation facilities and will evaluate whether the cost of fragmenting forest blocks outweighs the benefits of siting an energy generation facility. Consider carbon sequestration, greenhouse gas emissions, flood resilience, and other values of intact forest blocks.

28. Critical wildlife habitat, including but not limited to, deer wintering areas, rare and/or endangered species habitat, local fisheries, critical bear and bird habitat significant forest habitat blocks and identified travel corridors, as mapped by the VT Department of Fish & Wildlife, shall be protected from inappropriate development and land management activities. (Policy cross-referenced in the Environmental Quality Goals and Policy Section).

29. The Public Utility Commission shall give due consideration to the standards and guidelines of the Ridgeline and Hillside Overlay District when considering applications for any wind or solar facilities proposed for the district.

30. Ground-mounted solar and wind energy facilities shall not be located within the 100-Year Flood Hazard Area, the Fluvial Erosion Hazard Overlay District or within 50 feet from the top of bank of any watercourse.

31. The Town supports the use of electric vehicles and will work with the Stowe Electric Department to facilitate public access to charging stations throughout the town. The Town will consider equity in planning efforts and work to enhance access to electric vehicles in traditionally underserved communities.

32. The Town will implement an "EV Ready" building code that requires new developments to have wiring capacity to charge electric vehicles and establish minimum parking requirements for exclusive EV use, per the RBES/CBES 2024 compliance for Level 2 EVSE electric vehicle charging.

    a. The Town will utilize incentive programs, federal Direct Pay credits and other funding mechanisms to transform the energy sector, in particular, electric vehicles and charging infrastructure.
    b. The Town will reinvest in incentive programs for electric vehicles and charging infrastructure, to include among other things, zoning guidelines for public, workplace and multi-family charging areas.
    c. The Town will develop a plan of preferred locations for EV charging that can focus on traffic and pedestrian patterns, transformer capacity and assist, where appropriate with both tourism and local charging ability.
    d. The Town will demonstrate progress in electrifying transit, school buses and medium to heavy duty vehicles in order to reduce harmful emissions and improve public health.
    e. In the interim, the Town will utilize credits and incentives to upgrade diesel engines on Town owned equipment, where applicable, until time for new equipment purchases.

33. At the point of purchase/replacement, the Town and School should ensure, wherever feasible that: All new fleet vehicles are electric; all new mowers, leaf blowers, and other equipment are electric; and the schools have charging stations installed for staff use.

34. The Town will work with the school district to encourage and support energy efficiency programs, heat pump technology and solar energy installations at all school district facilities and to promote these strategies through curricula and action with students and communications with families.

Energy Tasks	Responsibility	Priority
1. Conduct periodic energy audits of all municipal buildings and implement the recommendations as appropriate.	Public Works Director Electric Department	Ongoing
2. Review and update as needed existing town policies, bylaws and ordinances to promote energy efficiency and conservation; to encourage renewable energy resources and access for their sustainable use.	Public Works Director Planning Commission	Ongoing
3. Develop zoning guidelines for public, workplace, and multi-family charging (signage, parking spaces painted, etc).	Planning Commission Director of Planning Selectboard	Ongoing
4. Develop a map of preferred locations for electric vehicle charging that can focus on traffic and pedestrian patterns, transformer capacity, and serves both tourism and local charging.	Director of Planning Stowe Energy Committee Stowe Electric Department	Short-term
5. Encourage the Town to purchase and install a new charger that the Electric Department can operate and maintain – a second fast charger and/or a charger at Stowe Elementary School/Memorial Park area.	Planning Commission Director of Planning Selectboard	Medium-term
6. Designate the Village of Moscow as a village center – this would unlock funding and technical support that will benefit the village and the electric department.	Planning Commission Director of Planning Selectboard	Short-term
7. Investigate participation with other towns or organizations in bulk-purchasing agreements for municipal fuel supplies.	Public Works Director Selectboard Town Manager	Short-term
8. Continue to pursue sidewalk, recreation path, bicycle lanes, public parking and transit projects in part to reduce local transportation energy use.	Public Works Director Planning Commission Director of Planning Recreation Commission Selectboard	Ongoing
9. Explore possibilities for community-based, renewable energy resources such as wind, solar, anaerobic digesters and small-scale hydroelectric.	Conservation Commission Town Manager Selectboard Stowe Electric Department	Mid-term

10. Support the Smith's Falls hydroelectric/solar project and emergency operation center (the Millwright's Office restoration).	Stowe Electric Department	Long-term?
11. Conduct a Phase I environmental site assessment for the Moscow Highway Garage parcel which could inform future development – solar, battery storage, electric vehicle charging, etc.	Public Works Director Director of Planning	Medium-term
12. Support the partnerships with Efficiency Vermont and DriveElectric to encourage electrification adoption (heat pumps, EVs, etc)	Stowe Electric Department Stowe Energy Committee	Ongoing
13. Review zoning regulations for opportunities to promote energy conservation, the development of renewable energy resources, and require adherence to RBES Stretch Code for residential buildings.	Planning Commission Director of Planning Selectboard	Ongoing
14. Require buildings to meet RBES/CBES compliance before Certificate of Occupancy is issued. The Town Planner will make quarterly reports to the Energy Committee of contractor compliance to RBES/CBES.	Director of Planning Energy Committee	Ongoing
15. Explore opportunities for, and make progress as appropriate towards using alternative fuels, including, but not limited to, biodiesel in town-owned vehicles and consider replacing town vehicles with more energy efficient models as they are scheduled for replacement.	Public Works Director Town Manager Selectboard Highway Superintendent	Ongoing
16. Explore options for conversion to biomass energy and solar systems and other alternative energy sources in public school buildings, using local fuel sources where economically feasible.	Selectboard School Board	Mid-term
17. Work with local energy committees to create benchmarks for achieving increased energy efficiency and reducing the production of greenhouse gasses in town operations to work towards the 2024 LEAP Model targets.	Conservation Commission Public Works Director Planning Director	Mid-term
18. Consider opportunities for "load shedding" including developing an off-peak rate to lower use during peak periods and encouraging the use of private generators to provide energy to Stowe Electric during peak use periods.	Selectboard *Stowe Electric Dept.	Mid-term
19. Explore opportunities to install neighborhood-scale Thermal Energy Networks.	Planning Commission Selectboard	Mid-term
20. Explore opportunities for the collection and use of food waste in anaerobic digesters for the production of methane to produce electricity.	Conservation Commission Planning Director *LRSWMD *Stowe Electric Company	

21. Consider replacing the metal halide ornamental streetlights on Main St. and Depot St. with LED fixtures once the technology has advanced to the point that they are clearly cost effective.	Selectboard Town Manager Planning Director Stowe Electric Dept.	Short-term
22. Work with Stowe Electric to install additional EV charging stations throughout the town and promote their use.	Selectboard Stowe Electric Dept.	Ongoing
23. Consider installing solar arrays on town-owned properties to cover the electricity use of municipal facilities.	Selectboard Stowe Electric Dept.	Ongoing
24. Explore opportunities for pollinated gardens/habitat on Town owned land to reduce fuel/energy spent on mowing municipal properties.	Conservation Commission Planning Director	Ongoing