St. Johnsbury, Vermont, Enhanced Energy Plan
Executive Summary

The St Johnsbury Town Energy Committee has developed an enhanced energy plan as a separate but linked chapter to the 2017 municipal plan. Its purpose is two-fold:
1. to meet the standards of Act 174, which established municipal and regional energy planning standards and, 2. to guide the actions of the town and the town energy committee in meeting the goals set out in the 2016 VT Comprehensive Energy Plan.

Section I: Analysis of Energy–Use, Generation and Distribution

At the beginning of this section there are definitions that are a reference in describing energy calculations and transformations. Energy comes in different forms and is useful for us as we power our homes, offices, vehicles and bodies. It is always conserved neither gained nor lost, but transformed from one kind to another and eventually turned to heat and released to the environment around us. When we transfer one type of energy to another, the transformation is less than 100% efficient and some is wasted as lost heat. It is important to remember that all forms of energy production and use have some negative consequences that we must balance with our needs and the protection of the environment that we and other forms of life depend on for survival. We are now seeing the climate changes as a result of the release of carbon dioxide and other greenhouse gases of the last 200 years since the beginning of the industrial revolution.

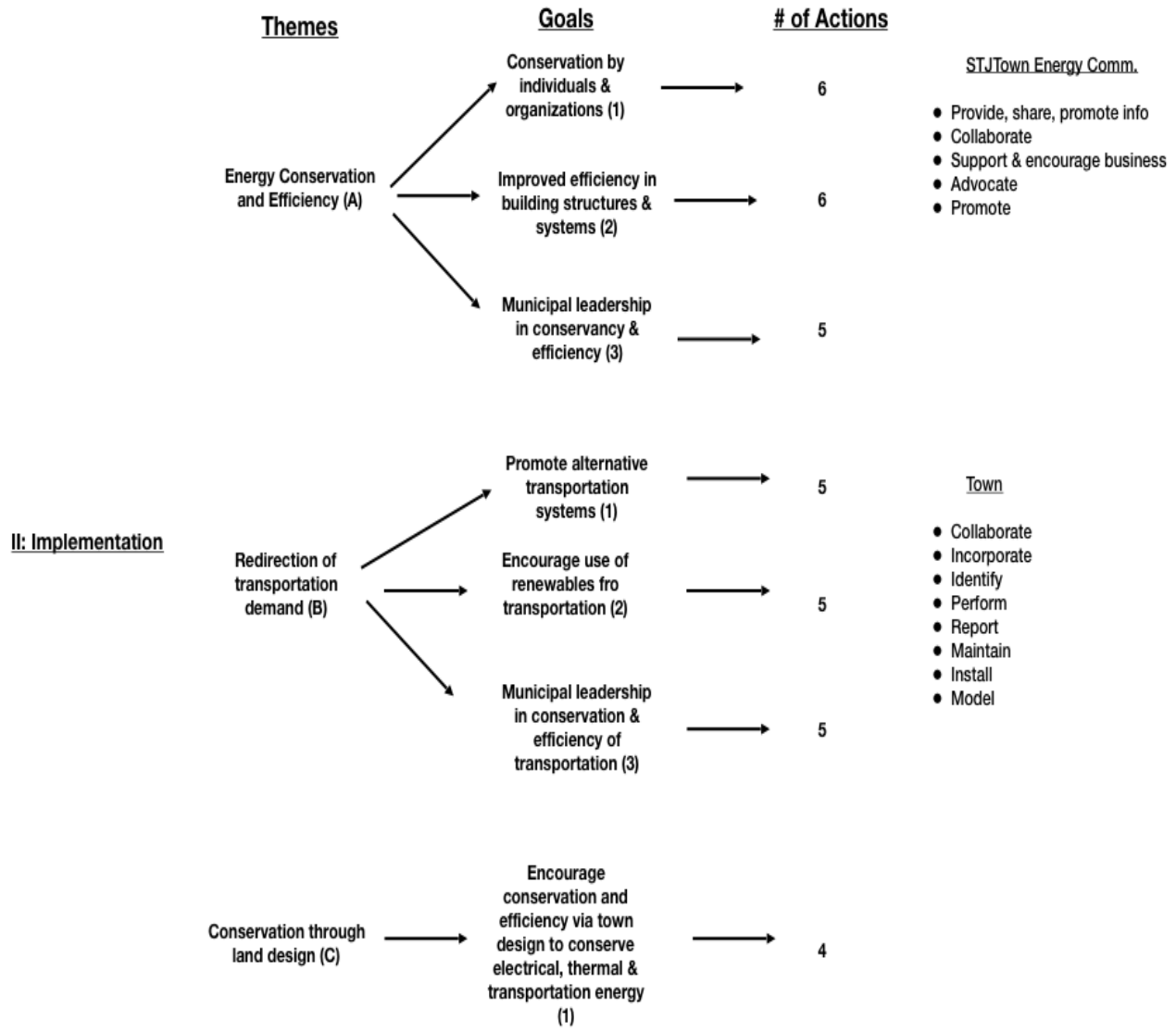
A. **Electricity**: Green Mountain Power, the main source of electricity to St. Johnsbury, produces power that is about 94% carbon free and is 63% renewable. A small portion of town receives electricity from Lyndonville Electric which is not as carbon free for emissions but still has a significant renewable percentage for its energy generation.
B. **Thermal**: In our climate this energy use is mostly for heating our homes and businesses. This accounts for almost half of our energy use. We have many old structures which makes retrofitting difficult for reducing energy consumption. There are very large differences in the amount of energy needed to heat older structures versus newer well insulated and properly constructed newer buildings.
C. **Transportation**: This is the second largest use of energy in St. Johnsbury. We live in a rural environment and transportation is necessary for us to get around for jobs, health care, visits with friends and family, shopping, etc. Many of these activities have been curtailed due to the pandemic and this has resulted in less carbon emissions nationwide. The Energy Plan illustrates that Electric vehicles (plug in hybrids and total electric vehicles) are much more efficient than internal combustion engines but at the present time the problems that exist are the lack of infrastructure to recharge electric vehicles and the poor affordability and availability of electric cars and trucks. There will need to be adaptations to the electrical grid as we transition to more electric vehicles.
D. **Current Renewable Generation**: There are currently about 10,000 MWh(34,000 MMBTU) of renewable energy generated yearly within the town which is only about 3.4% of the total of more than 1 million MMBTU of yearly energy use. Therefore there is considerable work ahead for us to: 1. Conserve our energy usage through weatherization and other strategies, 2. Reduce the use of carbon dioxide generating fuels and release of other greenhouse gases, 3. Generate more electricity in a carbon free way, and 4. Reach the goals of the state

to be 90% carbon free for energy use by 2050 and meet the other Vermont State targets by 2025 and 2035.

Section II: Implementation of Energy Efficiency Measures—Goals and Objective

II: Implementation of Energy Efficiency Measures: Goals and Objectives (Actions)

The chart below is a summary of the themes, goals and actions proposed by the Town Energy Plan to meet the 2016 Comprehensive Energy Plan goals using the statewide 90x50 approach (90% renewables by 2050). Reducing energy use through conservation and converting from fossil fuels to renewable energy sources are the overarching actions.



Section III: The siting of renewable energy generation

Targets have been developed by the State for each region in Vermont for the provision of renewable electrical energy generation, to work towards the State goal of meeting 90% of its energy needs through renewables by the year 2050. St. Johnsbury's share of the state renewable energy generation goal is 2,169 MWh.

This plan will consider renewable generation technologies that do not have an adverse impact on the Town of St. Johnsbury, the Northeast Kingdom region of Vermont, or the policies that guide the Planning Commission and not be limited exclusively to the generation techniques and technologies noted herein.

The conclusion is that St. Johnsbury is well positioned to meet its energy generation goal of 2,169 MWh. The town is not well suited for further development of industrial-scale wind turbines. It is recommended that the Town meet the renewable energy generation goal primarily through solar and methane energy generation, with some biomass energy generation as long as responsible stewardship of the region's forestry resources and sustainable harvesting measures are practiced.

St. Johnsbury, Vermont, Enhanced Energy Plan

Introduction:

This Enhanced Energy Plan stands as a separate but linked chapter to the St. Johnsbury Municipal Plan. This plan has two functions, first to meet the standards of Act 174 which are explained in more detail below and second, to guide the actions of the town and town energy committee in meeting the goals set out in the 2016 Vermont Comprehensive Energy Plan (also known as 90 x 2050 strategy).

The 2016 Vermont Comprehensive Energy Plan (90 x 2050), aiming for 90% renewable energy by 2050, specifies the following energy goals for Vermont:

- Reduce total energy consumption per capita by 15% by 2025, and by more than one third by 2050
- Meet 25% of the remaining energy need from renewable sources by 2025, 40% by 2035, and 90% by 2050
- Meet the 25 by 25 goal for renewable energy (25% in-state energy supply for all energy uses by 2025)

In 2016, the Energy Development Improvement Act (a.k.a. Act 174) was passed to address the siting and development of commercial energy generation facilities, specifically solar and wind projects under 30 V.S.A Chapter 5, Section 248. Such projects are under jurisdiction of the State, not of municipalities. Project developers must obtain a Certificate of Public Good (CPG) from the Public Utility Commission (PUC). Therefore, the local municipality (i.e., St. Johnsbury) would not have control over the location of these facilities. The only involvement available to a municipality is through public hearings in the CPG process.

If a municipality meets the standards of Act 174, it will receive a “determination of energy compliance” from the regional planning commission and thereafter the municipality’s energy plan shall be afforded “substantial deference” in CPG hearings before the PUC. Energy project “siting criteria”, included in the Town Plan, provide St. Johnsbury with more influence over where and what kind of such projects are located.

While all municipal plans are required to contain an energy element, Act 174 created additional voluntary standards. The effect of the inclusion of these additional standards affords a municipal plan “substantial deference” rather than simply the “due consideration” that is afforded to municipal plans that meet the basic requirements of 24 VSA Section 4382.

The basic requirements for an energy plan are:

- *an analysis of energy resources, needs, scarcities, costs and problems within the municipality,*
- *a statement of policy on the conservation of energy, including programs, such as thermal integrity standards for buildings, to implement that policy,*
- *a statement of policy on the development of renewable energy resources, and*
- *a statement of policy on patterns and densities of land use likely to result in conservation of energy*.

The additional standards specified by Act 174 are voluntary, and are outlined in a document created by the VT Department of Public Service. These standards are divided into three parts: Analysis & Targets, Pathways, and Mapping. The analysis of existing energy use must be broken out by electric, thermal and transportation energy, and the "pathways" must include actions that can be taken to achieve the targets. The enhanced standards also include a mapping component that should demonstrate that there is sufficient opportunity for achieving the energy generation targets. A description of areas that are suitable and unsuitable for the siting of renewable energy facilities should be included, and identification of preferred sites in the municipality is encouraged.

This new Energy Plan for the town of St. Johnsbury has been developed to address the enhanced Energy Planning Standards established by the Vermont Department of Public Service, pursuant to Act 174. The document will lead you through the following sections:

I: Analysis of Energy: Use, Generation, and Distribution
II: Implementation of Energy Efficiency Measures: Goals and Objectives
A) Energy conservation & more efficient energy use
B) Reducing transportation demand and single occupancy vehicles trips, and encouraging the use of renewable sources for transportation
C) Patterns and densities of land use likely to result in conservation of energy
III: The siting of renewable energy generation
IV: MAPS

I: Analysis of Energy- Use, Generation, and Distribution:

In order to effectively evaluate where the Town of St. Johnsbury needs to go in terms of their energy future, the community needs to understand how it is currently using and generating energy. This section outlines the estimates of current energy use for the community in the areas of electricity, thermal, and transportation. This information is based on best available data and may change over time as new information is provided.

Here are a few definitions that may help in reading this document:

- BTU(British Thermal Units) and Watts (and watt hours) are both measurements of energy production and consumption. Customarily BTU is used to measure the heat output of various fuels such as fossil fuels (gasoline, heating oil, propane, natural gas), and wood (and its products). Watt Hours are commonly used as a measure of electrical production and consumption. Calculations can be done to get an approximation of how much energy we need to heat (and cool) our homes and offices, power the electrical devices we use, and to drive our vehicles.

- 1 BTU is the amount of heat needed to raise 1 pound of water by 1 degree Fahrenheit., A kWh(Kilowatt hour) is the amount of electrical energy used to power an electrical appliance(s) using 1000 watts for one hour. Conversion of these can be done with the following: 1 kWh= 3400 BTU. 1000 kWh=1 MWh(megawatt hours=million watt hours), 1 MMBTU(million BTU)=1000 MBTU(thousand BTU)=1,000,000 BTU. (For clarification the

capital “M” in metric means one million, whereas the capital “M” in imperial units means one thousand).
For example, here are the approximate energy contents and the carbon dioxide release of various fuels during combustion:

Wood (dry)	One cord = 20 million BTU (20MMBTU) (*)	230 lbs CO2/MMBTU (**)
Wood (dry)	One pound= 8000 BTU (8 MBTU)	1.8 lbs CO2/ lb wood (**)
Coal	1 ton= 28 MMBTU	200 lbs CO2/MMBTU
Coal	1 lb= 14,000 BTU (14 MBTU)	2-2.5 lbs CO2/lb of coal
Fuel oil	1 gallon= 139 MBTU	160 lbs CO2/MMBTU
Gasoline	1 gallon= 124 MBTU	157 lbs CO2/MMBTU
Propane	1 gallon = 91 MBTU	139 lbs CO2/MMBTU

*: The heat output of wood is approximately the same when measured by weight but the dry cord heat output varies from pine at 16-18 MMBTU/cord to beech and oak at 24-29 MMBTU/cord.
**: Without considering any reforestation efforts to sequester carbon that is released from combustion.

- MWh- Megawatt Hour- this measurement is used to measure the expected output of renewable energy generation, i.e. how much you can expect to generate over one hour. For example if you have a fixed solar installation with a capacity of 4 megawatts (MW), it would be reasonable to expect to get a little over 4,900 MWh a year. You would calculate that by multiplying the capacity factor (which is different for each energy source) by the number of hours a year. The capacity factor for solar in this example, is approximately 14% to account for the fact that the sun isn't always shining. A typical Vermont home uses about 7 MWh (600 KWh/month) a year as estimated by Efficiency Vermont based upon data from a number of years.
- REC: Renewable Energy Credit: each REC represents the environmental benefits of 1MWh of renewable energy. Power generators can sell the green attributes of the energy they produce as RECs and whoever buys the RECs can then claim the environmental value of that energy as their own – even though they did not generate that clean power.

A: ELECTRICITY

Electricity is provided to the town of St. Johnsbury by Green Mountain Power (GMP) and the Village of Lyndonville Electric Department. From GMP’s website they state “Our energy supply is 94% carbon free and more than 63% renewable. Most of our supply is hydro power, both from small local hydro facilities in Vermont and large facilities in Quebec. GMP is committed to being 100% carbon free by 2025 and 100% renewable by 2030” (Greenmountainpower.com). The breakout of power sources that GMP utilized in 2018 are depicted in Image 1.

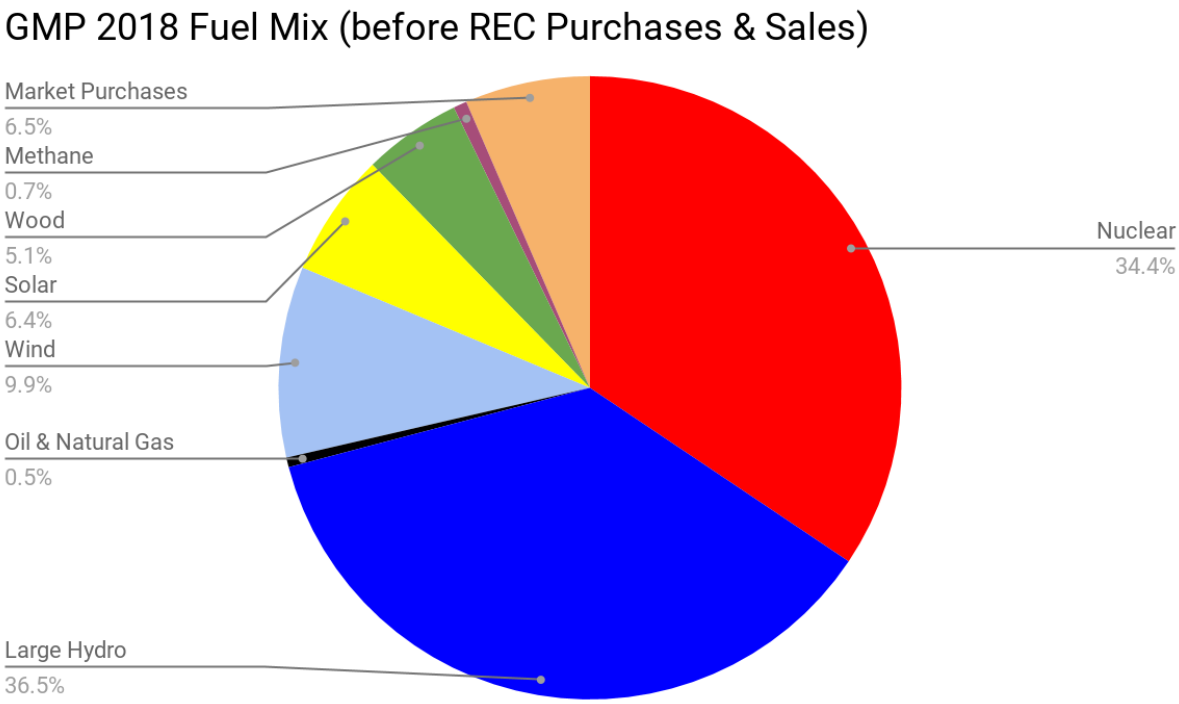


Image 1: GMP 2018 Fuel Mix *before* sale of Renewable Energy Credits

36.5% of electrical energy is produced from large hydro such as Hydro Quebec, and smaller hydro stations in Vermont. 34.4% is nuclear energy from Seabrook until 2034. 6.5% is market purchases, much of it generated from fossil fuels and 22.5% are renewables such as wind, wood, solar, and methane. Currently 0.5% of energy generation is through non-renewable oil and natural gas.

A small portion of the Town of St. Johnsbury receives its electricity from the Village of Lyndonville Electric Department. Similar to GMP, a significant portion of the energy produced by Lyndonville Electric is renewable. Image 2 shows the breakdown of their fuel mix for 2017. "Residual mix" is purchased power through a combination of market purchases and contracts that is used to meet demand. Source is dependent on price and availability.

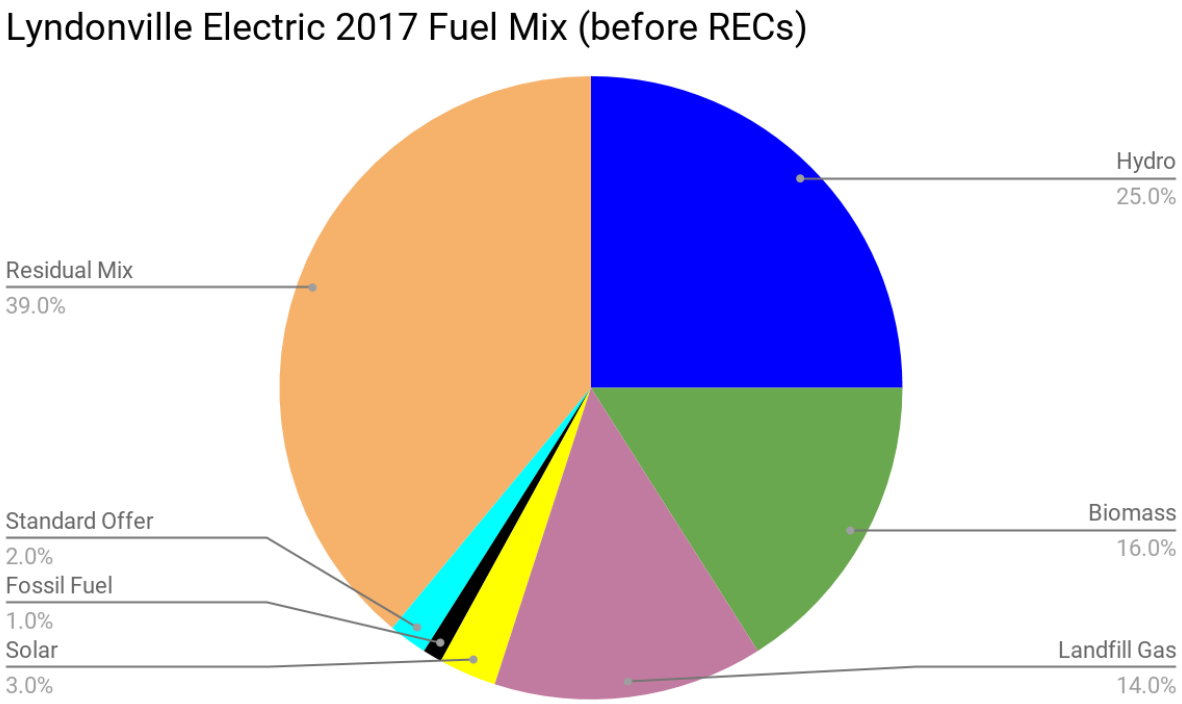


Image 2: Lyndonville Resource Report 2017 Available at: https://vppsa.com/wp-content/uploads/2018/12/Lyndonville-Resource-Report-2017.pdf

Electricity usage in St. Johnsbury (from both power companies) for the years 2016-2019 by sector in MWh is shown in Table 1. Total consumption for 2019 for both commercial/industrial and residential was **256,942 MMBTU.**

Electricity Usage in St. Johnsbury in MWh per year				
	2016 (MWh)	2017 (MWh)	2018 (MWh)	2019 (MWh)
Residential	17,684.017	19,551.928	19,960.126	19,285.391
Commercial & Industrial	55,182.001	55,534.286	57,803.941	56,016.930
TOTAL:	72,866.018	76,086.214	77,764.067	75,302.320

Table 1. Efficiency Vermont Calculations of MWh per year

B: THERMAL

The estimated number of commercial buildings in St. Johnsbury, according to the Vermont Department of Labor, is 298. The estimated total heat energy consumption of these 298 buildings is 209,842 MMBTU. The American Community Survey from 2018 estimates 3,112 households. Many houses in St. Johnsbury were built before 1940 and often require more energy to heat. The estimates provided in the chart below account for the age of the housing

stock, since pre-1940 housing structures are likely to be “leaky” and poorly insulated. The total energy used for heating all occupied homes is 361,459 MMBTU.

Combined MMBTU for all buildings in St. Johnsbury is currently **571,301 MMBTU.**

Table 2 shows the breakdown of households primary fuel type and the annual average use per fuel type. Currently, fuel oil makes up 67% of the heat source for all households, and only 13.7% use renewable wood and 2% use electricity. The category “other” includes all fuels not specified elsewhere. (Many households use more than one heating fuel.)

Occupied Residential heating by fuel source:

Fuel Type: Space Heating	Households	Total avg. Use (Annual)		% Use: (All HHs)	Percent of Use: Owner	Percent of Use: Renter	% of Cost (All HHs)
Tank/LP/etc. Gas	471	421,219	gallons	14.8%	9.4%	23.2%	21.0%
Electricity	63	1,124,686	KwH	2.0%	0.3%	4.6%	3.3%
Fuel Oil	2128	1,465,034	gallons	67.0%	65.0%	70.2%	64.1%
Wood	434	2,597	cords	13.7%	21.3%	2.0%	11.6%
Coal/Coke	0	-	tons	0.0%	0.0%	0.0%	0.0%
Other	78	-		2.5%	4.1%	0.0%	0.0%

Table 2:ACS 5 year estimates on heating by fuel source

C: TRANSPORTATION

Transportation is the second largest consumer of energy in St. Johnsbury. Transportation typically consists of passenger vehicles, light duty trucks, and heavy duty trucks. Transportation accounts for **356,685 MMBTU annually**. The breakdown of gallons used and vehicle miles traveled to calculate total annual MMBTU is shown in Table 3. The average Vehicle Miles Traveled (VMT) is estimated by NVDA data which accounts for longer commutes and incidental trips in the rural region. Registered Electric vehicles (EV) numbers are determined by the Vermont Energy Investment Corporation and use the Department of Public Service’s average of 7,000 VMT’s per EV annually. The VMT for EV’s is lower than for traditional combustion engine vehicles for a few reasons; they tend to be used in more densely settled areas, they are often a second car and do not get as heavily used, and it may be that users of EV’s opt for transportation alternatives when possible, such as bicycles and walking for short trips and mass transit for short and long trips. Internal combustion engines are approximately 17-21% efficient in converting the energy in the fuel to power and move the vehicle compared with an Electric vehicle which is approximately 60% efficient in using the energy in the battery to power the vehicle. The energy that is not used to operate the vehicle is lost as heat to the environment.

According to the 2018 ACS 5-year estimates, there are approximately 4748 vehicles in the municipality. As of January 2018, 31 vehicles were registered as EV’s; two are All Electric Vehicles (AEV) and 29 are Plug-In Hybrid Electric (PHEV). EV’s are almost **5 times** as energy efficient than internal combustion engine vehicles. In comparing the MMBTU between EV’s and combustion engine vehicles(ICE), one EV typically uses 7.96 MMBTU annually while a single

combustion engine vehicle consumes 74.68 MMBTU annually. PHEV energy usage varies widely depending on the length of the trips and will lie somewhere between the EV and ICE, but closer to the EV because of aerodynamics and the hybrid engine.

Transportation Energy Usage			
Total Vehicles: 4748	Average Annual Vehicle Miles Traveled: (VMTs) per vehicle: 14,000	Fossil Fuel: 3,197,091 gallons 333,403 MMBTU Ethanol: 287,738 gal 23,035 MMBTUTotal: **356,438 MMBTU**	**5300 BTU/mile (1.55 KWh/mile)** **186 Miles** travelled per MMBTU
Total Registered EV's: 31 AEV: 2 PHEV: 29	Average Annual Vehicle Miles Traveled: 7,000	Total: **247 MMBTU**	**1100 BTU/mile (.32 KWh/mile)** **878 Miles** travelled per MMBTU

Table 3: 2018 ACS 5-year Estimates on Total # of Vehicles, gallons consumed, and MMBTU
** Registered EV's as of January 2018*

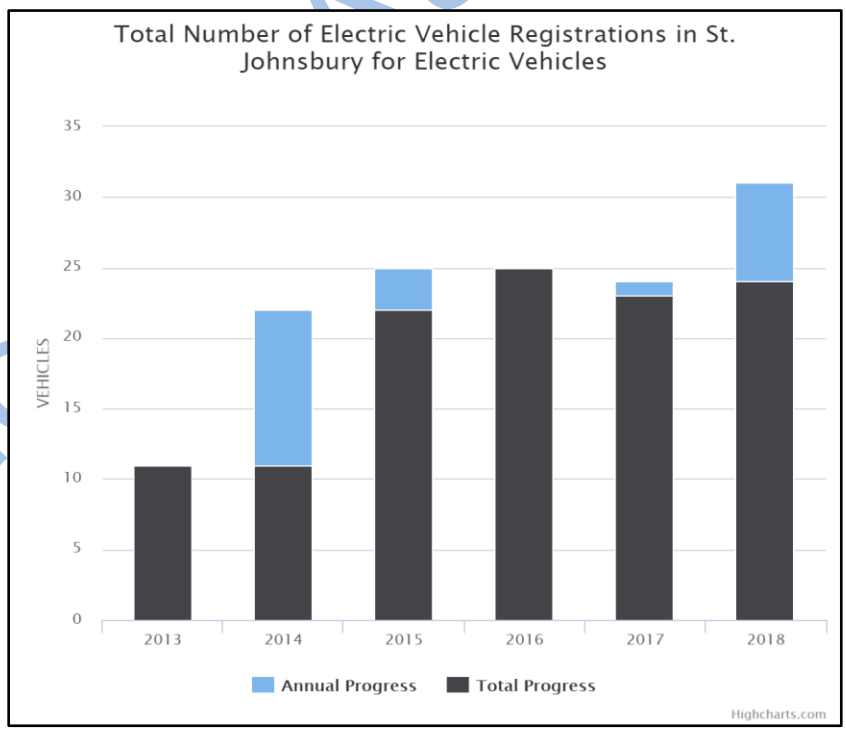


Table 4: Registered EV's in St. Johnsbury up to 2018.
* Data from Brighter Vermont Community Energy Dashboard

To summarize, the amount of energy currently consumed by electricity, thermal, and transportation is summarized in Image 4.

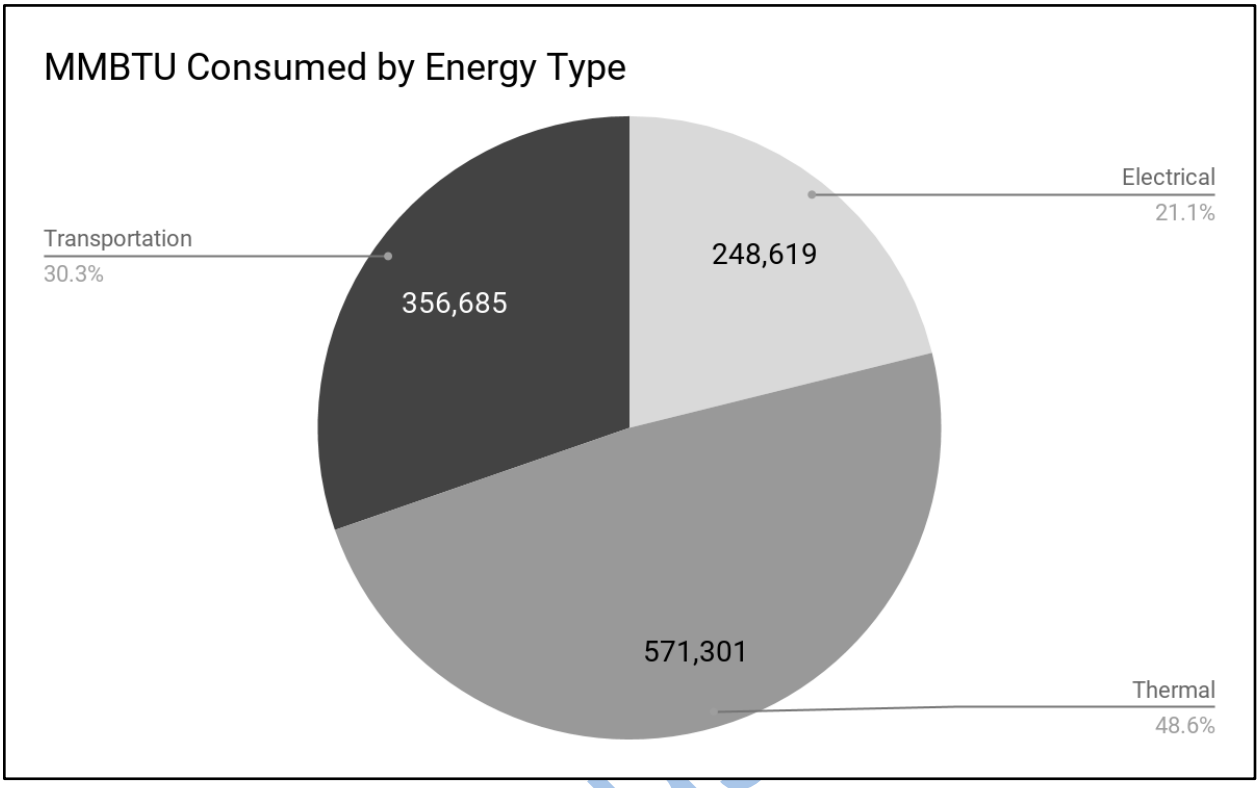


Image 4: MMBTU Consumed for **All Uses** by Energy Type for Town of St. Johnsbury*
*from most recent ACS-2018 projections and Efficiency Vermont data

D) Current Renewable Generation

St. Johnsbury currently generates **10,236 MWh (34,900 MMBTU)** of renewable energy. Hydroelectricity accounts for **6,710 MWh(22,800 MMBTU)** Hydroelectric generating sites are located at Pierce Mills, Arnold Falls, and Gage on the Passumpsic River. The Emerson Falls hydroelectric site is on Sleepers River.

Current solar energy generation accounts for **3,526 MWh(12,000 MMBTU)**. There are currently 75 solar sites in the Town of St. Johnsbury according to Brighter Vermont's Community Energy Dashboard (see Energy Dashboard website for complete listing of all solar sites). 19 of these sites are ground mounted solar displays. The Norwich Solar Technologies site behind the Green Mountain Mall comprises 2,160 solar panels, generating 500KW, and sits on a former sand pit- a great example of putting non-productive land back into use and maintaining a visually pleasing landscape around the site. The St. Johnsbury School and the Town of St. Johnsbury entered into a 25-year agreement to purchase the Net Metering Credits that the Norwich Solar Technologies PV project produces at a discounted rate. Those Net Metering Credits are applied to the Town's various Green Mountain Power accounts saving the Town approximately $325,000 over the term of the agreement.

No energy is being generated by wind, biomass, or other sources within the town of St. Johnsbury at this time. A biomass combustion site for thermal energy at St. Johnsbury School passed bond approval in March 2020 and will be operational soon.

II: Implementation of Energy Efficiency Measures: Goals and Objectives

Fulfilling the goals of the 2016 Comprehensive Energy Plan (The 90 x 2050 approach) requires two overarching actions:

- reducing energy use through energy conservation and
- replacing fossil fuel sources with renewable fuel sources

Targets for future energy use and generation were developed by Vermont Energy Investment Corporation using a regional **Long-Range Energy Alternatives Planning (LEAP)** analysis. **The LEAP analysis identifies pathways that St. Johnsbury can take in order to meet the statewide 90x2050 goal.** It is very important to note that LEAP projections exist to show the massive scale of change that needs to happen, but they remain a hypothetical.

Targets for Future Energy Use:

The 2025, 2035, and 2050 targets for thermal and electric efficiency improvements, and use of renewable energy for transportation, heating, and electricity for St. Johnsbury are broken down into the following 3 themes:

A) Energy conservation & more efficient energy use
B) Reduction of transportation demand and single occupancy vehicles trips, and utilizing renewable sources for transportation
C) Patterns and densities of land use that are likely to result in conservation of energy

A) Energy conservation & more efficient energy use

Consuming less energy is the most effective way to reduce energy needs. More efficient electrical equipment, high efficiency heating systems and improved insulation and weatherization of new and existing structures, using less energy in homes, and less fossil fuels for transportation are key parts of meeting the 90 X 2050 goal. These methods are supported and encouraged by the town. For the purposes of this section, thermal and electrical efficiency will be defined as overall improvements or reductions in the amount of energy used to run mechanical systems or provide climate control for structures.

GOAL 1: Promote conservation of energy by individuals and organizations.

A large part of encouraging conservation of energy and more efficient energy use is providing information to people about conservation and supporting environmental and sustainability efforts. Understanding energy use includes electrical, thermal and transportation energy, plus all the systems embedded in those veins; food production and distribution, waste management, housing, economics, and business. Increasing the town's awareness of energy issues and ways to make positive changes, are a vital part of achieving this goal.

ACTIONS:

- Provide information to residents and visitors about energy conservation, energy efficiency, sustainability, and climate change hazard mitigation
- Leverage existing neighborhood networks to share out information about energy conservation and promote conservation practices
- Encourage environmental education curricula in elementary school, high school, and community college
- Promote local farming, local food production, and the adoption of regenerative agriculture
- Encourage participation in recycling, composting, and reducing single use containers
- Collaborate with local businesses on initiatives that conserve energy

GOAL 2: Encourage more efficient use of energy in building structures and systems, including upgrades to electrical equipment, improved weatherization to reduce heating energy demand, and thermal heat switching to a renewable fuel source

Upgrades to electrical equipment, such as motors and controls, will reduce the amount of energy used to run mechanical systems, and appliances, in residential and commercial buildings and increase energy efficiency. Electrical efficiency is defined as overall improvements or reductions in the amount of energy used to run mechanical systems. This can include replacing older appliances with more energy efficient models, switching traditional lawn tools to high efficiency electrical lawn tools, and upgrading to more efficient lighting, such as LED.

Increasing the number of buildings that are adequately weatherized, defined as buildings that achieve an average of 20- 25% reduction in MMBTU, will reduce heat energy demand. Reduction in heat energy demand through weatherization is an **absolutely essential** component of meeting 90x50 goals. Increased fuel switching (from non-renewables to renewables) will not compensate for lower weatherization targets. On the other hand, more aggressive weatherization strategies will reduce fuel switching targets.

Thermal heat switching is focused on shifting from nonrenewable sources such as propane and oil, to renewable sources such as wood, solar, and electric heat pump technology. Reducing a home's heat demand comes first, weatherization can not be substituted by thermal heat switching. However, a more sustainable and efficient renewable heating system in tandem with improved weatherization can greatly conserve energy and provide more efficient energy use.

Tables 5, 6, and 7 depict the LEAP projections for meeting the 90 X 2050 goals for electrical and thermal efficiency improvements.

TARGETS:

Electricity Efficiency Improvements

	2025	2035	2050
Estimated number of residential customers	5,047	5,349	5,670
% of residential customers to upgrade electrical equipment	25%	37%	51%
# of residential customers to upgrade electrical equipment	1,264	1,987	2,913

Table 5: Electricity Efficiency Improvement LEAP Targets

Residential and Commercial Thermal Efficiency Improvements

	2025	2035	2050
Estimated number of households	3,364	3,566	3,780
% of households to be weatherized	22%	37%	37%
# of households to be weatherized	756	1,316	1,407
Estimated number of commercial establishments	316	335	355
% of commercial establishments to be weatherized	6%	10%	17%
# of commercial establishments to be weatherized	19	32	61

Table 6: Residential and Commercial Thermal Efficiency Improvement LEAP Targets

Thermal Fuel Switching Targets for Residential and Commercial

	2025	2035	2050
New Efficient Wood Heat Systems in Residences	1,952	1,609	1,166
% of households with Wood Heat Systems	58%	45%	31%
New Efficient Wood Heat Systems in Commercial Establishments	57	72	100
% commercial establishments with wood heat systems	18%	22%	28%
New Heat Pumps in Residential Units	579	1,228	1,558
% of households with Heat Pumps	17%	34%	41%
Estimated commercial establishments with Heat Pumps	22	40	60
% of commercial establishments with Heat Pumps	7%	12%	17%

*Table 7: Thermal Fuel Switching LEAP Targets for Residential and Commercial Buildings**

**Targets depict the number of new units going in during each time bracket, not total units. For example, the LEAP projection aims for 1,952 new wood heat units by 2025, and an additional 1,609 wood heat units by 2035. The overall percentage of households with wood heat systems is decreasing because the percentage of households using heat pumps increases more rapidly and accounts for a greater percentage of all heat source types.*

ACTIONS:

- Encourage energy efficiency and conservation when conducting residential and economic planning
- Share Efficiency Vermont, Green Mountain Power, Lyndonville Electric, and HEAT Squad incentives that promote electrical and thermal efficiency and thermal heat switching on multiple media outlets
- Provide information sessions for town residents and property owners about energy efficiency upgrades, weatherization, thermal heat switching and economic benefits of efficiency improvements
- Promote municipal led objectives, such as energy efficiency standards when considering applications for tax stabilization and other incentives, encouraging net zero construction of new buildings in the town
- Identify resources and maintain a database of funding programs and partners that can assist with conversion of electrical systems, weatherization, and thermal heat switching for homes, properties, and businesses
- Leverage creative financing options for residents and property owners to make upgrades in electrical systems, weatherization, and thermal heat switching

GOAL 3: Demonstrate municipal leadership in energy conservation and efficiency

The municipality of St. Johnsbury can lead the way on energy conservation and energy efficiency by modeling energy efficient practices. Successful modeling of energy efficiency can encourage town residents and property owners to make energy efficiency changes to their own homes and properties as well.

ACTIONS:

- Investigate funding sources to perform energy audits on municipal buildings and include energy efficiency measures when retrofitting or upgrading Town facilities
- Continue to make available current energy efficiency standards for commercial and residential buildings to require new and maintenance of existing buildings to meet high energy efficiency standards when applying for a building permit
- Promote municipal buildings' and properties' (e.g. Three Rivers Trail Head) use of renewable energy sources such as rooftop solar or heat pump technology
- Encourage the placement of any new municipal building in existing compact village areas, as appropriate
- Report annually the energy use of Town buildings as improvements are made

B) Reducing transportation demand and single occupancy vehicles trips, and encouraging the use of renewable sources for transportation

According to the 2016 Vermont Comprehensive Energy Plan, transportation accounts for approximately one third of the overall energy use in Vermont, at 33.7%. Nationally, transportation represents 28.6% of overall energy use. This difference is a result of Vermont's higher dependence on automobile transportation due to the state's rural character, more dispersed population, as well as a relatively small industrial base.

In order to meet the 90% renewable energy use by 2050 two actions need to happen:

- fewer vehicle miles need to be traveled and
- those miles travelled need to be far less energy consuming.

Targets for fuel switching as a method for making miles traveled less energy consuming are in Table 8 below. Please keep in mind that the LEAP projections exist to show the massive scale of change that needs to happen.

As the Municipal Plan and this Energy Plan progress and targets are met, the Town of St. Johnsbury should evaluate additional actions that will promote a shift away from vehicle use rather than rely on the conversion of vehicles to renewable fuels.

GOAL 1: Promote alternative systems and structures that reduce transportation demand and single occupancy vehicle trips.

The average resident from the NEK travels approximately 14,000 vehicle miles a year. That is 2,000 more miles than the national average of 12,000 VMT. Reducing vehicle miles traveled is a

critical component of reducing energy consumption. There are many ways to encourage drivers to spend fewer miles on the roads.

As seen in electrical and thermal energy sectors, reducing overall demand for transportation is the most effective way to reduce transportation energy consumption. Conserving energy can happen through opting to walk or bicycle to destinations, and by telecommuting or holding virtual meetings. Either by not moving or by moving your own body as transportation, the number of vehicle miles travelled is reduced.

Even if people are using cars less, cars will continue to be necessary for some travel. We will continue to need to move from place to place over large areas. Carpooling and car sharing options can further reduce the amount of energy used for transportation. Having one car driving with three people in it is much more energy efficient than driving three cars with one person each. Car sharing can help reduce miles travelled as well, by placing a “pause” into the “choosing to drive cycle”. When a vehicle is not available all the time, there is a greater likelihood the individual will think about the necessity of the trip. Small trips are often reworked into larger trips (aka. “trip chaining”) when vehicles are a shared tool, reducing VMT.

ACTIONS:

- Provide information sessions to town residents and property owners about energy conservation in transportation
- Support broadband internet upgrades that provide remote working capability
- Encourage businesses to provide remote working options, when possible.
- Promote active transportation such as walking and bicycling and e-bicycling by mapping and marking bicycle lanes on existing roadways to facilitate access to businesses and services, and including bike/ped lanes or paths in construction or reconstruction of roadways, including installation of bicycle racks
- Support entrepreneurial efforts to implement an EV car share program

GOAL 2: Encourage the use of renewable energy sources for transportation

Fuel switching from a single nonrenewable fuel source vehicle to a more efficient renewable fuel sourced vehicle, such as EV, greatly reduces the number of MMBTU consumed per vehicle. A typical combustion engine vehicle uses approximately 65-75 MMBTU of energy annually. An electric vehicle accounts for far less, 7.96 MMBTU annually. This accounts for an 88-90% reduction in energy consumption. Using the 2050 projected number of vehicles, shown in Table 8, the amount of energy conserved through fuel switching would account for 499,308 fewer MMBTU annually. When enough people switch to EV transportation, carbon emissions are cut drastically.

TARGETS:

Fuel Switching Targets for Transportation

	2025	2035	2050
Projected number of light-duty vehicles in the area, by year	5,711	6,424	7,227
Number of vehicles powered by electricity	739	2,359	5,076
% of vehicles powered by electricity	13%	37%	70%
Number of vehicles using bio-fuel blends	0%	0%	1%
% of vehicles using bio-fuel blends	0%	0%	0%

Table 8: Fuel Switching LEAP Targets for Transportation developed by Vermont Energy Investment Corporation

ACTIONS:

- Provide information sessions for town residents on renewable fuel vehicles and energy conservation in transportation
- Share Efficiency Vermont and Drive Electric Vermont incentives, tax credits, and rebate information to potential car buyers
- Maintain and enhance existing EV charging stations by keeping charging stations in working order, and upgrading and repairing as needed
    - Current sites of EV charging stations in the town of St Johnsbury:
        Level 1: Park and Ride, Western Ave
        Level 1 & 2: 410 Pearl St Municipal Parking
        Level 1 & 2: Twin State Ford, 8 Memorial Dr
        Level 1 & 2: NVRH, 1315 Hospital Drive

- Install additional EV charging stations to provide a greater network especially as demand for EV charging increases, and coordinate with the Vermont Department of Transportation's Level 3 network build-out plans to locate a Level 3 EV charging station in the downtown area as soon as possible
- Advocate at selectboard and school board meetings for: a) increased fleet efficiency (potentially EV) for high mileage vehicles, b) encouraging walking and biking to school and work programs, and c) future fuel switching for heavy utility vehicles as technology develops

GOAL 3: Demonstrate municipal leadership in transportation energy conservation and energy efficiency

The municipality of St. Johnsbury can lead the way on energy conservation and energy efficiency in transportation by modeling energy efficient practices. Successful modeling of energy efficiency can encourage town residents and property owners to make energy efficiency changes in their own transportation patterns and choices as well.

- Encourage, to the extent possible, the use of energy efficient municipal vehicles, with a priority for high mileage vehicles
- Promote the energy conservation benefits of active transportation, carpooling, and remote working to municipal employers and employees
- Model conservation of transportation energy and commitment to sustainable practices
- Provide training and instructional opportunities to municipal leaders and municipal employees about transportation energy efficiency alternatives
- Install EV charging stations when developing or redeveloping municipally owned property, such as schools and town buildings
- Include EVs in consideration of new police cruisers and other vehicles in the normal replacement cycle, and opt for EVs as soon as possible.

C) Patterns and densities of land use likely to result in conservation of energy

The Energy committee is committed to supporting efforts made by the Downtown Association to encourage individuals to live in downtown districts and village centers where goods and services are close by and require less vehicle miles traveled. The Energy Committee supports the Downtown Association in promoting a mixed-use downtown, a livable place where essential goods and services such as grocery stores and pharmacies are in close proximity to where houses are. The Energy Committee supports efforts made by the Downtown Association to encourage "in-fill" development that concentrates new construction and reconstruction to the existing downtown district and village centers. Clustering homes in downtown districts and village centers requires shorter networks of streets and utilities, which require less energy to build and maintain, and require less vehicle miles traveled. There is also less line loss with shorter electrical lines. Any additional efforts to make St. Johnsbury a more centralized community and requiring fewer VMT to get to essential goods and services, are encouraged by the Energy Committee.

GOAL 1: Encourage patterns and densities of land use that conserve electrical, thermal, and transportation energy, and a Town that is more energy efficient in design and form

Compact settlement patterns, mixed-use development and redevelopment, and a walkable and cyclable community will conserve energy. Tied in with ample spaces and places to recharge an EV vehicle, St. Johnsbury can be a leader in land use design and form that promotes energy conservation and energy efficiency.

Actions:

- Encourage mixed-use development and livable downtown design when creating local zoning regulation
- Promote housing development in existing downtown and village centers that meets the demands of the population
- Promote walking and bicycling as transportation and support the development of walking and bicycling infrastructure
- Encourage the future needs of transportation when redeveloping parking lots and/or

sidewalks to save costs and energy in construction (ie. plan for conduits under parking lots for future EV charging station wiring, accommodate additional sites or spaces for Park and Ride users, or plan for the future needs of an EV car share fleet)

- Coordinate with the State of Vermont to relocate its offices back to a downtown location

III: The siting of renewable energy generation

Targets have been developed by the State for each region in Vermont for the provision of renewable electrical energy generation, to work towards the State goal of meeting 90% of its energy needs through renewables by the year 2050. **St. Johnsbury's share of the state renewable energy generation goal is 2,169 MWh.**

An analysis of existing land and renewable resource potential has helped to determine the amount of local renewable energy that could be developed within the Town of St. Johnsbury. This analysis uses maps produced by NVDA and evaluates only prime areas (no known constraints). Rooftop solar is calculated at 10% of structures (including seasonal residences) and assumes 4kw capacity for residential, 20kW for small commercial, and 200 kW for large commercial. NVDA is not planning for additional utility scale wind, so wind is calculated assuming an average output of 9.5 kW (residential), based on average capacity of existing installations in the region. This estimate assumes no locally designated restraints, which may reduce generation capacity. Table 9, identifies the amount of renewable energy generation (in megawatt hours) that The Town of St. Johnsbury could generate; a total of 153,813 MWh, well over the town's target of 2,169 MWh.

Megawatt Capacity for Preferred and Potentially Suitable areas for Renewable Energy Generation		
Renewable Type	Capacity in MegaWatts (MW)	Capacity in MegaWatt Hours (MWh)
Residential Rooftop Solar	1.42	1,738.5
Small commercial rooftop solar (<40,000 sq. ft.)	0.6	735.8
Large commercial rooftop solar (>40,000 sq. ft)	1.8	2,207.5
Ground-mounted Solar	35.88	44,004.7
Wind	.004	6.7
Hydro	0.0	0.0
Biomass and Methane	20	105,120
Total Potential Generation Capacity	**59.704**	**153,813.2**

Table 9: NVDA analysis of only Prime Areas for Renewable Energy Generation Potential

From Table 9, biomass and methane can potentially produce 105,120 MWh energy. While biomass facilities are great generators of energy, they use a renewable fuel that grows at a specific rate (trees), so overharvesting of the regional woodshed is a concern. If biomass energy generation is sought by the Town, **a commitment to responsible stewardship** of the region's forestry resources, accomplished through the use of forestry overlays that minimize fragmentation (regulatory), or enrollment in Vermont's Current Use Program and conservation easements (non-regulatory) **is a must.** The Vermont Climate Action Commission noted in their 2018 Final Report that "the potential loss of carbon from the loss of forestland is real and substantial. Every acre of forest lost to development has the potential to release a hundred metric tons of carbon dioxide equivalent into the atmosphere – like adding 25 cars for a year." (VCAC Final Report, 2018, p.54) and recommended that a carbon sequestration* component (leaving lands forested to soak up carbon from the atmosphere) be added to the Vermont Comprehensive Energy Plan.

St. Johnsbury Wastewater Treatment facility currently generates approximately 15,000 cubic feet of methane and uses on average 10,000 cubic feet of methane to heat the digester. In 2018 there was discussion about updating the system to capture more methane for heating. Updates have been made but not enough to completely offset the facility's energy needs. At this time the facility does not make enough to heat the digester in the winter and uses oil to heat the digester when there is not enough methane generated.

Different fuel sources generate different amounts of energy. Table 10 shows how each renewable source compares in its potential energy output. Capacity factor is the percent of time an identified resource is actively producing electricity. For example, a single methane power generating site can greatly outproduce solar power generation, mostly because methane is a constant fuel, while the sun is not. Carefully looking at capacity factors will allow the municipality to utilize whatever renewable resource is most appropriate for the specific circumstances.

Renewable Generation Outputs and Capacity Factors		
Resource Type	Capacity Factor (%)	Annual MWh output per installed MW
Solar	14% -16 %	1,300
Small Wind	20% -25%	2,000
Utility Scale Wind	25%-35%	2,600
Methane	60%-90%	6,600
Biomass	60%-80%	6,100
Small Hydroelectric	40%- 60%	4,400

Table 10: Vermont Public Service Information regarding Renewable Generation Outputs and Capacity Factors

The sources of renewable energy generation that are identified in this plan include current technologies that are known and supported in Vermont. Advances in the development of renewable energy technologies may result in generation measures or techniques that are not currently considered in this plan but may be more efficient or effective. As such, this plan will consider renewable generation technologies that do not have an adverse impact on the Town of St. Johnsbury, the Northeast Kingdom region of Vermont, or the policies that guide the Planning Commission and not be limited exclusively to the generation techniques and technologies noted herein.

In addition to the recommendations regarding renewable generation, the impact of advancements in energy storage that improve the economic performance of intermittent energy resources must be considered. Battery technology offers sufficient flexibility to provide material benefits from grid scale through small onsite generators. Such storage technology is rapidly maturing, with the price falling to a level that now competes with fossil fueled peak generation assets while further offsetting costly distribution system improvements that are ultimately financed by consumers.
With net metering available and with the advent of bi-directional EV charging capability that permits consumer sales back to the grid, a re-design of the national electric system to a more efficient network model is underway. This development also represents a fundamental challenge to the commercial relationship between the host utility and customers that install onsite solar generation and/or battery storage, with the prospect of altering the current economic assumptions underlying development of renewable generation. It is notable that Green Mountain Power is a pioneer in the storage field, offering a residential backup battery product that also performs as a virtual power plant by controlling economic dispatch of aggregated units during peak pricing events for profit. For planning purposes--given the brisk rate of development of storage technology—an effort to identify and record installations of energy storage assets will be considered to establish a knowledge base in support of future decisions.

This information will better position the Town of St. Johnsbury to evaluate the renewable energy generation options that are available to meet the 90x 2050 energy generation goals. It is important to remember that energy generation targets are ***only one*** of several energy goals in this plan. While the analysis shows St. Johnsbury to be in a good position to meet the energy generation targets, there is much work to be done to meet the goals set out for energy conservation, reducing energy demand, and fuel switching.

Siting Potential:

The regulations mentioned earlier require that a mapping analysis be conducted to identify potential sites for renewable energy development. The NVDA prepared a set of maps (hydroelectric, solar, wind, and biomass) for St. Johnsbury. The purpose of the maps is to determine whether there is sufficient land to meet the St. Johnsbury renewable energy target of 2,169 MWh. The following maps are an indicator of siting potential, but NOT a definitive siting tool.

Statewide preferred locations include :

- rooftops (and other structures)
- parking lots
- previously developed sites
- brownfields
- gravel pits
- Quarries
- Superfund sites

Statewide Known Constraints not likely to be developed for renewable energy because they contain one or more of the following:

- Vernal pools
- River corridors
- FEMA floodways
- Significant natural communities
- Rare, threatened and endangered species
- National wilderness areas
- Class 1 and 2 wetlands
- Regionally or locally identified critical resources

Statewide Possible Constraints that would likely require mitigation because they contain one or more of the following:

- Agricultural soils
- Special flood hazard areas (outside of the floodway)
- Protected (conserved) lands
- Deer wintering areas
- Act 250 mitigated agricultural soils
- Hydric soils
- Highest priority forest blocks

Regional Known Constraints:

NVDA's regional plan has long held that rural areas should receive very little commercial or industrial development unless it occurs in an established industrial park, or in an area specifically designated in the local bylaw or plan as being well suited to such uses. Additionally, renewable energy generation or storage sites should not exceed an elevation of 2,000 feet to protect the fragile environment of high elevations.

Preferred Siting Criteria:

SOLAR:

- Preferred Siting Locations include:
    - Rooftops of structures, residential and commercial
    - Brownfield sites not located in a designated downtown or village center
    - Earth extraction sites (e.g. gravel pits, quarries), active or abandoned
    - Parking lot canopies and surface parking lots
    - Farms, where more than 50% of the power generated is used by the farm

    - Industrial parks, where more than 50% of the power generated is used by the tenants of the industrial park
    - Undersized lots and otherwise undevelopable land in existing industrial parks
    - Minimally invasive sites
        - use gentle and south facing slopes that do not have shading features such as tall trees or large structures
        - locate close to existing transmission or distribution electric lines and have access for the tie-line from the project to the grid
        - locate on suitable soils for installing piles for foundations
- Ensure that alternative and renewable energy generator fields (i.e.: solar) are placed so as to maintain and preserve the historic character of the compact village and views of rural countryside and preserve any site of scenic value to the community
- Maintain Rural Lands on hillsides and along roadsides outside the compact villages while developing business within the Designated Downtown, Industrial Park, and proposed village centers of East St. Johnsbury and St. Johnsbury Center.

WIND:

- **It is the position of NVDA that no further development of industrial-scale (sic16) wind turbines should take place in the Northeast Kingdom**.
- Small scale (non-utility) wind, defined as “turbines under 200 feet in height, including the length of the blades” (NVDA Regional Plan 2018), could be installed on privately held lands. Sites appropriate for small scale wind are very low density areas and on farmland. Small scale wind sites should be located away from residential areas because of the known disturbances small wind turbines can produce.

METHANE:

- Preferred Siting Locations include:
    - Working farms, where more than 50% of the power generated will be used by the farm
    - Enhanced systems for methane capture at Wastewater treatment facility, St. Johnsbury

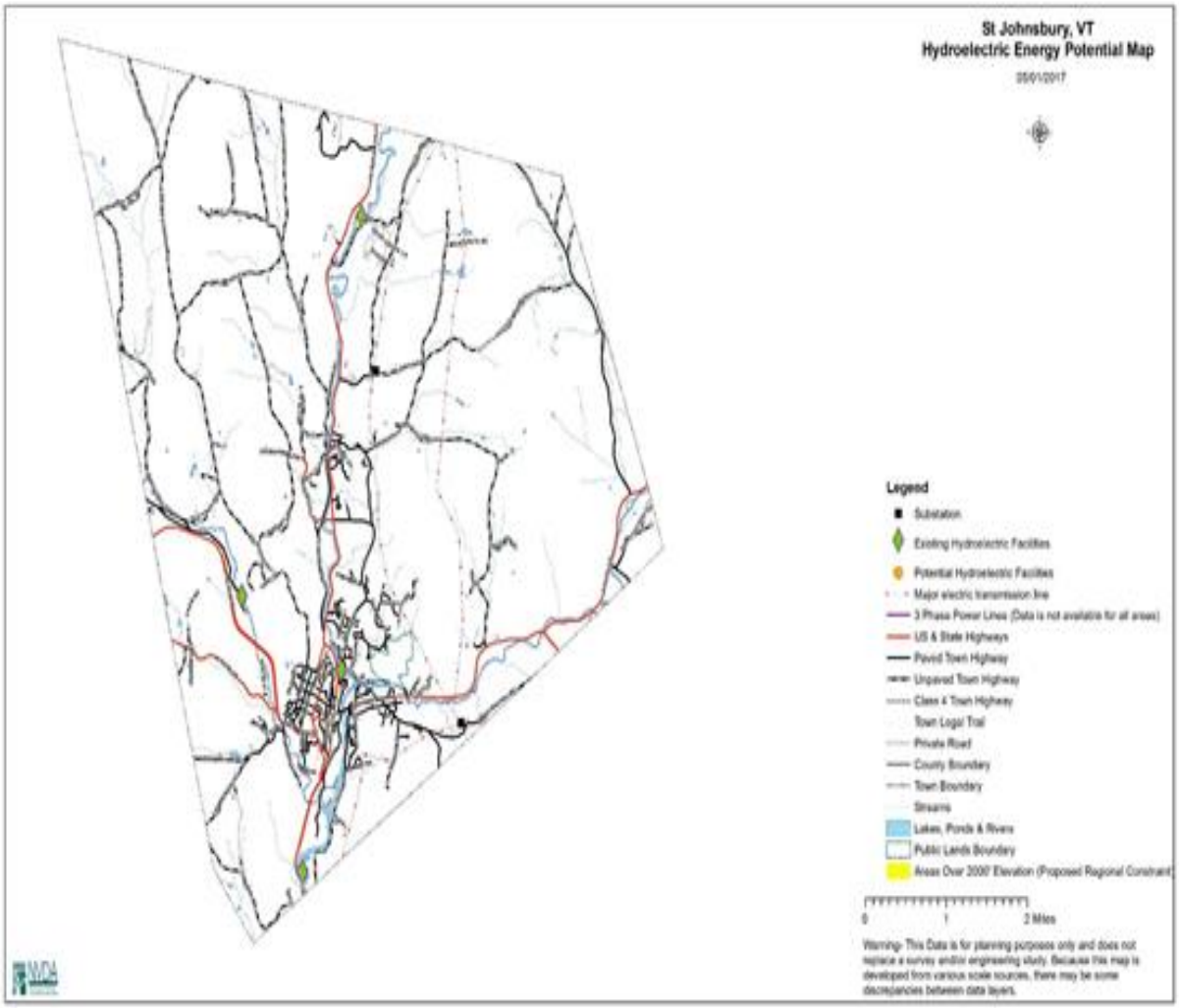
BIOMASS:

- Sourcing woody biomass for large scale energy generation can be detrimental to the forests and woodlands that surround St. Johnsbury IF not sustainably harvested. Unsustainable harvesting can cause increased forest fragmentation, reduced volume of “low grade” trees that provide air and water filtering, diminished soil maintenance, harm to wildlife habitats, and reduced carbon storing capabilities of forests.
- Siting large scale wood-generation and cogeneration facilities can also be fraught with challenges. There are limited amounts of zoned spaces for industrial facilities. There are infrastructure limitations related to transportation of wood chips and pellets, typing into public systems such as water and sewage, and the transmission of heat and power to the locations that would make use of it. Noise, emissions, truck traffic, and unsightly smoke stacks are concerns when citing facilities near residential neighborhoods.
- Locating biomass generation facilities in existing Industrial Parks is recommended and should undergo evaluation to ensure proper infrastructure needs are met.

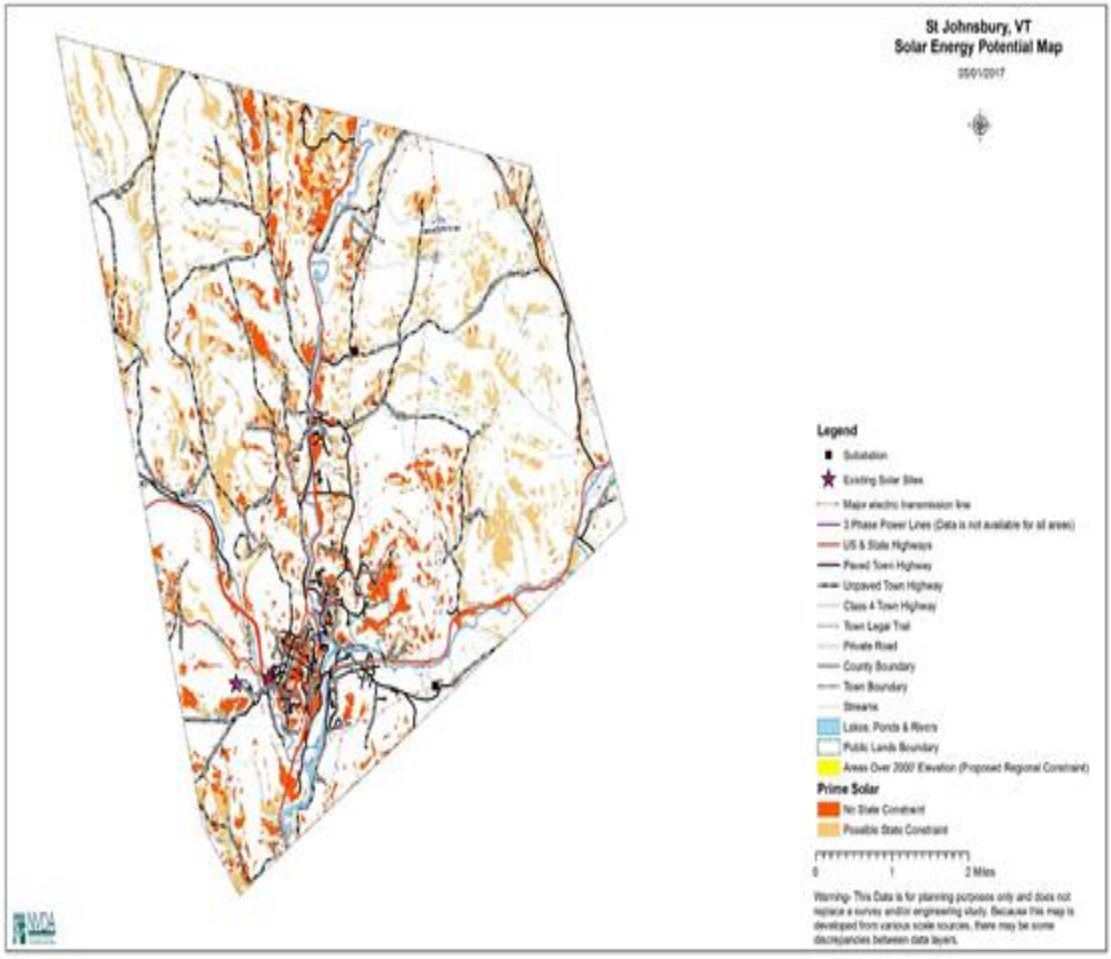
Siting Conclusion:
St. Johnsbury is well positioned to meet its energy generation goal of 2,189 MWh. Given the contentions around biomass energy generation and wind energy generation, it is recommended that the Town meet the renewable energy generation goal primarily through solar and methane energy generation, with some biomass energy generation as long as responsible stewardship of the region's forestry resources and sustainable harvesting measures are practiced.

IV: MAPS

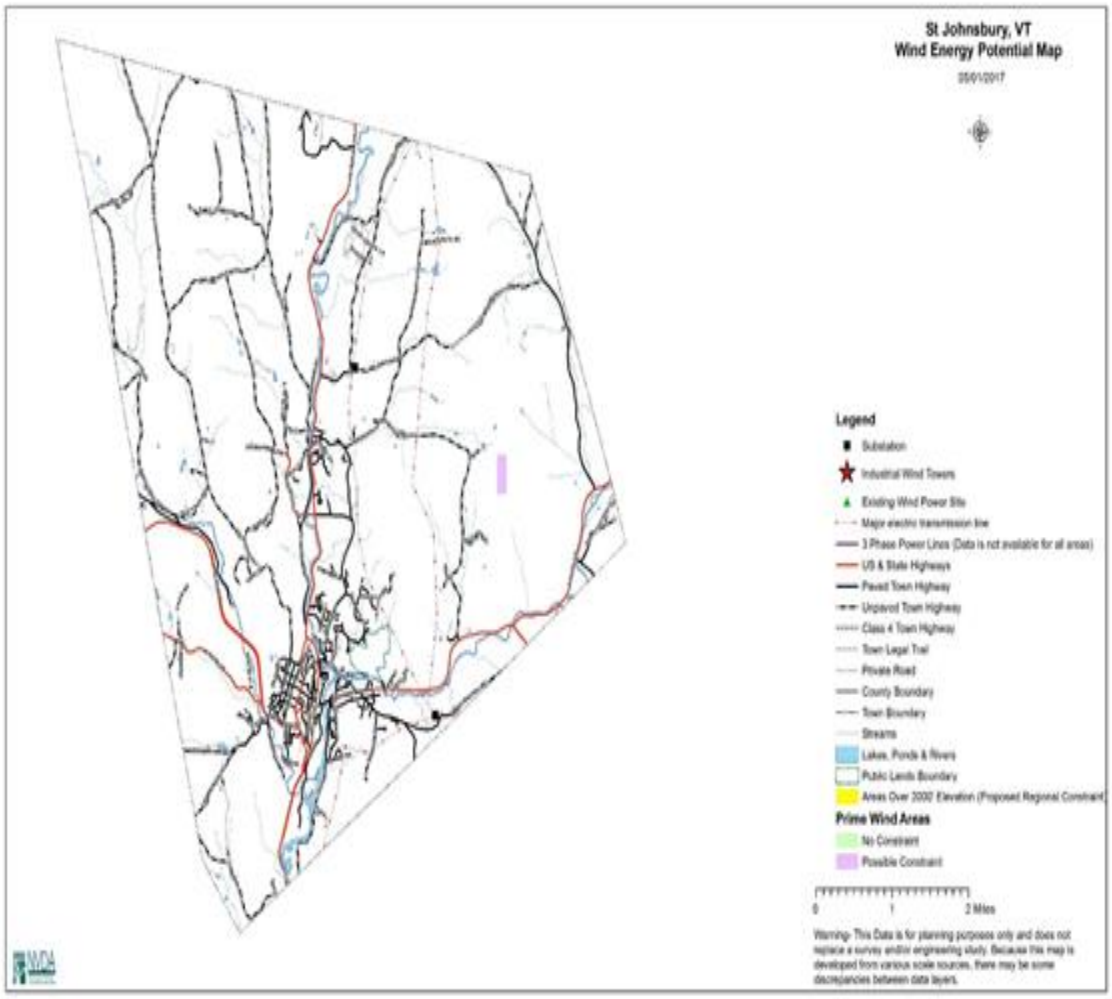
Map 1 shows the potential for hydroelectric energy development in St. Johnsbury. Four existing hydroelectric facilities are present in the town. No new hydroelectric facilities are potentially sited in the mapping exercise.



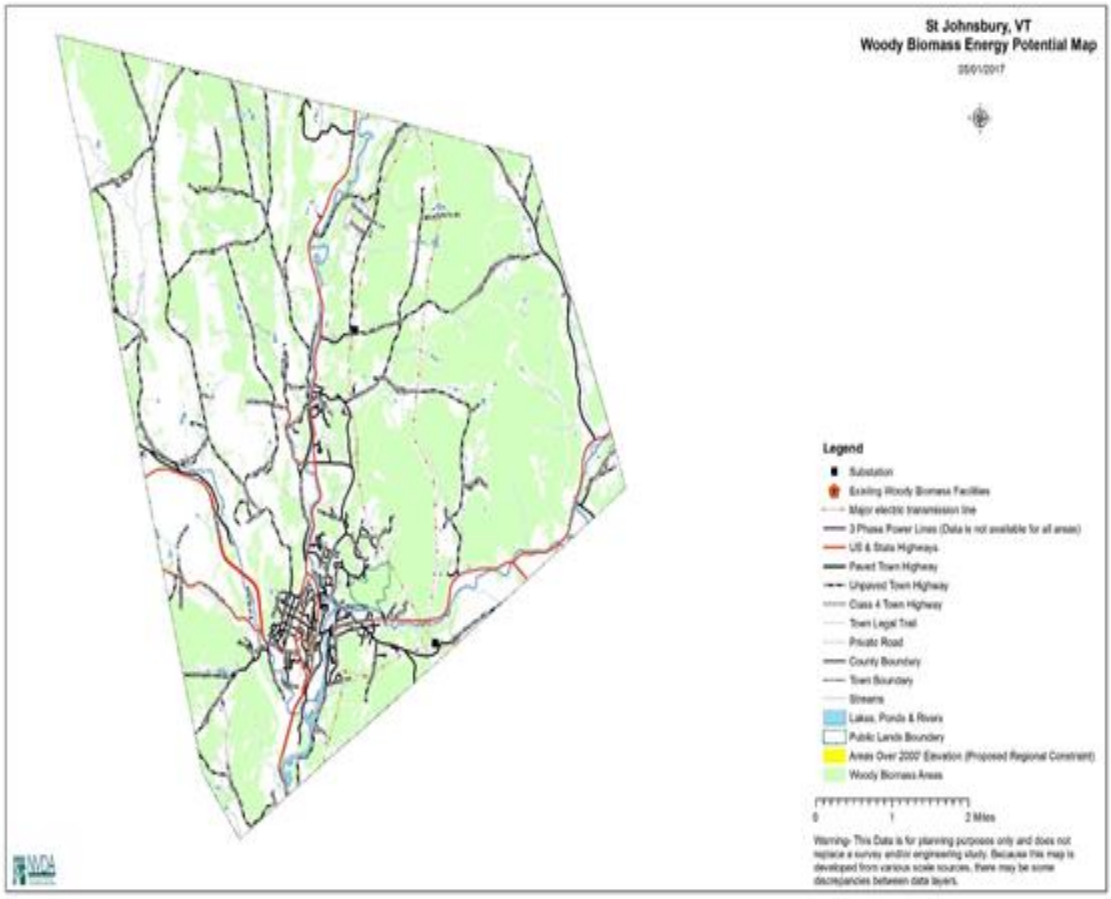
Map 2 shows the potential for solar energy development in St. Johnsbury. All areas in red are prime solar sites with no state constraint. Ground-mounted solar accounts for potentially 44,004.7 MWh of energy, well over the municipality's target of 2,169 MWh.



Map 3 shows the potential for wind energy development in St. Johnsbury which is minimal. The small estimated production from Table 9 accounts for small scale wind development by individual property owners.



Map 4 shows the potential for woody biomass energy development in St. Johnsbury. All areas in green are potential woody biomass areas. The total capacity of biomass for the area amounts to 105,120 MWh, well over the municipality's target of 2,169 MWh.



St. Johnsbury Enhanced Energy Plan Goals and Actions Summary:

The following pages outline the goals and objectives set in the St. Johnsbury Enhanced Energy Plan. The goals and actions are specific, measurable and identify the responsible parties. The priority scale distinguishes three increments; high priority- to be accomplished in 1 to 2 years, medium priority- 3 to 5 years, and low priority, 6 to 8 years.

Theme A: Energy conservation & more efficient energy use

GOAL 1: Promote conservation of energy by individuals and organizations.

	Action:	Responsibility	Priority/ Timeline	Measure of Success
a	Provide information to residents and visitors about energy conservation, energy efficiency, sustainability, and climate change hazard mitigation	Energy Committee, and/or Community Resilience Organization,	High	Hold in-person and virtual opportunities to learn more about conservation, energy efficiency, and climate change hazard mitigation Information posted on appropriate town websites
b	Leverage existing neighborhood networks to share out information about energy conservation and promote conservation practices	Neighborhood Groups, Energy Committee	High	Neighborhood Groups share information to residents through their communication channels and engage in conservation practices
c	Incorporate climate education curricula in elementary school, high school, and community college	Energy Committee, St. Johnsbury School District, St. Johnsbury Academy, CCV	High	Curricula at all grade levels covers climate change content and mitigation strategies
d	Promote local farming, local food production, and the adoption of regenerative agriculture	Energy Committee, Food Alliance Network	Medium	Information about CSA options, Farmer's Markets, and sustainable agriculture is provided to community members on multiple media outlets
e	Promote participation in recycling, composting, and reducing single use containers	Energy Committee, Town of St. Johnsbury Selectboard, St. J Transfer	Medium	Information about composting, recycling, and reusable options instead of disposable is provided to community members on multiple media outlets

		Station, Trash Haulers		
f	Collaborate with local businesses and institutions on initiatives that conserve energy	Energy Committee, Chamber of Commerce	High	Co-host events with local businesses and institutions that share information about energy conservation benefits; town report reflects actions

GOAL 2: Encourage more efficient use of energy in building structures and systems, including upgrades to electrical equipment, improved weatherization to reduce heating energy demand, and thermal heat switching to a renewable fuel source

	Action:	Responsibility	Priority/ Timeline	Measure of Success
a	Encourage energy efficiency and conservation when conducting residential and economic planning, and encourage contractors to abide by energy efficient building codes	St. Johnsbury Planning Commission	High	New energy efficient building codes regulations will be met when building new construction or renovating existing structures. Increased compliance with existing energy codes (see publicservice.vermont.gov/energy_efficiency/cbes)
b	Publicize Efficiency Vermont, Green Mountain Power and Lyndonville Electric, and HEAT Squad incentives that promote electrical and thermal efficiency and thermal heat switching on multiple media outlets	Energy Committee, Efficiency Vermont, GMP, Lyndonville Electric, HEAT Squad	High	Information is shared with the public through multiple media outlets
c	Provide information sessions for town residents and property owners about energy efficiency upgrades, weatherization, thermal heat switching, and the economic benefits of efficiency improvements.	Energy Committee Efficiency Vermont, Landlord Information Exchange group	High	In person and virtual opportunities to learn more about energy efficient electrical upgrades and weatherization improvements Maintain status as a Button Up community
d	Promote municipal led objectives, such as energy	Energy Committee,	High	Tax stabilization projects achieve energy efficiency

	efficiency standards, when considering applications for tax stabilization and other incentives, encouraging net zero construction of new buildings in the town.	Selectboard, tax stabilization committee		standards (see publicservice.vermont.gov/energy_efficiency/cbes)
e	Identify resources and maintain a database of funding programs and partners that can assist with conversion of electrical systems, weatherization and thermal heat switching for homes, properties, and businesses	Energy Committee, Website Manager,	Medium	Online link to resources page from the municipal website
f	Leverage creative financing programs for residents and property owners to make upgrades in electrical systems, weatherization, and thermal heat switching	Energy committee, Efficiency Vermont, St. Johnsbury Housing Committee,VSE CU, local banks	High	A financial program is in place to support residents and property owners to make upgrades and changes in building and systems energy efficiency

GOAL 3: Demonstrate municipal leadership in energy conservation and efficiency.

	Action:	Responsibility:	Priority/ Timeline:	Measure of Success:
a	Investigate funding sources to perform energy audits on municipal buildings and include energy efficiency measures when retrofitting or upgrading Town facilities.	Energy committee	High	Audits are performed on all municipal buildings.
b	Continue to make available current energy efficiency standards that require new and maintenance of existing commercial and residential buildings meet high energy efficiency standards.	Municipality	High	New policies are adopted by the municipality to ensure that all municipal buildings meet current energy efficiency standards and newly-constructed buildings are compliant with current standards (see publicservice.vermont.gov/energy_efficiency/cbes)

c	Promote municipal buildings' and properties' (e.g. Three Rivers Trail Head) use of renewable energy sources such as rooftop solar or heat pump technology	Energy Committee, Municipality	Low	Municipal buildings and properties use renewable energy sources, as appropriate for thermal and electrical energy needs
d	Encourage the placement of any new municipal building in existing compact village areas, as appropriate.	Municipality St. Johnsbury Planning Commission	High	New municipal buildings are placed in existing compact village areas, as appropriate
e	Report annually the energy use of town buildings.	School board, Town Garage, Municipal Offices,	High	Information available annually on town's website, share data and graphs charting energy efficiency and fuel switching (rate of change, energy savings, and financial savings)

Theme B) Reducing transportation demand and single occupancy vehicles trips, and encouraging the use of renewable sources for transportation

GOAL 1: Promote alternative systems and structures that reduce transportation demand and single occupancy vehicle trips.

	Action:	Responsibility:	Priority/ Timeline:	Measure of Success:
a	Provide information sessions to town residents and property owners about energy conservation in transportation	Energy Committee	High	Information is shared with the public through multiple media outlets
b	Support broadband internet upgrades that provide remote working capability	NEK Broadband, Telecommunication Providers	High	All residents will have access to high quality, high speed internet at their homes
c	Encourage businesses to provide remote working options, when possible.	Chamber of Commerce, local businesses	High	Creation of Remote Working Business recognition program for businesses that conduct at least 15% of the week remotely
d	Promote active transportation such as walking, bicycling, and e-bicycling	Energy Committee, St. J Walk Bike Advisory Committee, Local Motion,	High	-Infrastructure is added to provide safety and ease of use for walkers and bicyclists

		Planning Commission, Drive Electric Vermont, VBike		-Co-host events that promote walking and bicycling to school & work, and share information about the energy savings of active transportation including e-bicycles -map and mark bicycle lanes on existing roadways to facilitate access to businesses and services, and including bike/ped lanes or paths in construction or reconstruction of roadways, and install bicycle racks where needed
e	Support entrepreneurial efforts to implement an EV car share program	Drive Electric Vermont	Medium	EV car share program exists and is utilized by residents as needed

GOAL 2 : Encourage the use of renewable energy sources for transportation

	Action:	Responsibility:	Priority/ Timeline:	Measure of Success:
a	Provide information sessions for town residents on renewable fuel vehicles and energy conservation in transportation	Energy Committee, Efficiency Vermont, Drive Electric Vermont	High	In person and virtual opportunities to learn more about transportation conservation, alternative transportation options, and renewable fuel vehicles “Electric Vehicle Demo Day” is offered annually
b	Share Efficiency Vermont and Drive Electric Vermont incentives, tax credits, and rebate information to potential car buyers	Energy Committee, Car Dealers	High	Information is shared with the public through multiple media outlets, at energy committee events, at at local car dealerships
c	Maintain and enhance existing EV charging stations by keeping charging stations in working order, and	EV Charging Station Managing Companies,	Medium	EV stations remain in good working condition and are updated as technology advances.

	upgrading and repairing as needed			
d	Install additional EV charging stations to provide a greater network especially as demand for EV charging increases	Local Businesses, Selectboard, Neighboring towns	Medium	Additional charging stations are added throughout the town and in neighboring towns
e	Advocate at selectboard and school board meetings for: a) increased fleet efficiency for high mileage vehicles, b) enhanced walking and biking to school and work programs, and c) future fuel switching for heavy utility vehicles as technology develops	Energy Committee, in collaboration with: Selectboard School boards	Medium to Low	All high mileage municipal vehicles, such as police cars, are replaced with EV when the vehicle is retired. All new school busses use renewable fuels

GOAL 3: Demonstrate municipal leadership in transportation energy conservation and energy efficiency

	Action:	Responsibility:	Priority/ Timeline:	Measure of Success:
a	Encourage, to the extent possible, the use of energy efficient municipal vehicles with a priority for high mileage vehicles	Municipality	Medium	A majority of high-mileage municipal vehicles are replaced with EV when the vehicle is retired.
b	Promote the energy conservation benefits of active transportation, carpooling, and remote working to municipal employers and employees	Municipality, Go Vermont, Drive Electric Vermont,	High	Vehicle miles travelled by municipal workers is diminished as other modes of transportation are adopted.
c	Model conservation of transportation energy and commitment to sustainable practices	Municipality	High	Reduced mowing of roadways. Replacement of equipment with higher-efficiency models
d	Provide training and instructional opportunities to municipal leaders and municipal employees about transportation energy efficiency alternatives	Municipality, Training Leaders, Energy Committee	High	Trainings and instructional opportunities around transportation energy efficiency are provided to leaders and employees

e	Install EV charging stations when developing or redeveloping municipally owned property, such as schools and town buildings	Municipality, School District	Medium	EV charging stations are installed at schools, academies, and at municipal sites such as libraries, town offices, and town garage

Theme C) Patterns and densities of land use likely to result in conservation of energy
GOAL 1: Encourage patterns and densities of land use that conserve electrical, thermal, and transportation energy, and are more energy efficient in design and form

	Action:	Responsibility	Priority/ Timeline:	Measure of Success:
a	Encourage mixed-use development and livable downtown design when creating local zoning regulation	St. Johnsbury Housing Committee, Developers, St. Johnsbury Planning Commission	High	Mixed-use development is constructed.
b	Promote housing development in existing downtown and village centers that meets the demands of the population	St. Johnsbury Planning Commission, St. Johnsbury Housing Committee	High	Most potential work force and senior housing is built in existing downtowns and village centers
c	Promote walking and bicycling as transportation and support the development of walking and bicycling infrastructure	Bike and Walk Advisory Committee Local Motion Energy Committee	High	Bicycle lanes, sidewalks, crosswalks, bicycle storage and parking are installed to meet local demand and safety.
d	Encourage the future needs of transportation when redeveloping parking lots and/or sidewalks to save costs and energy in construction	St. Johnsbury Planning Commission, Local Businesses, EV Charging Companies, Vermont Agency of Transportation, Go! Vermont, Drive Electric Vermont	Medium	Parking lot reconstruction will plan for conduits for future EV charging station wiring Additional sites or parking spaces will be added to meet Park and Ride demands Consideration will be given during construction and planning for the future needs of EV technology