Town of Westminster
Town Plan Enhancement for Energy Standards

1. Importance of Enhanced Energy Planning

Introduction

Energy planning is important to Westminster and its residents because our Town is rich in resources, natural beauty, and history. We realize the importance of protecting our environment and to cherish and protect these resources for the future. Westminster is and will continue to be, very pro-active in the process of the State energy goals, as outlined in the 2016 Comprehensive Energy Plan, by continuing to enhance opportunities to create renewable energy sites, construction which encourages green development, promote transportation opportunities for carpooling and innovative vehicles, and availability to educate our residents in energy conservation. Though Vermont’s energy transformation may take years to implement, it will enhance the vitality of the state and local economy by reducing money spent on fossil-fuels pumped, mined or generated elsewhere, improve our health through reduced emissions and increased bicycle and pedestrian mobility options, and improve the quality of our local and global environment through reduced greenhouse gas emissions. This robust energy plan is used as a tool to advance the economic and environmental well-being of Westminster, thereby improving the quality of life for its residents. Furthermore, these energy goals will reduce Westminster’s vulnerability to energy-related economic pressures, climate change-related natural disasters in the long term, and overall promote long-term community resiliency in a variety of contexts.

The cost of energy in Westminster, including residential, commercial and governmental use (for heating, electricity, transportation, etc.) is estimated to be about $11,650,000 per year (see Chart 3 “Westminster’s Annual Energy Expenditures” in the sections below). Because a large majority of this energy is imported from outside of the town and Windham Region, most of the money spent on energy does not directly benefit the local economy. Efforts to reduce the use of energy sources from outside the Town, or shift reliance to locally produced energy, can improve household financial security and strengthen the local economy.

From an environmental perspective, petroleum and other hydrocarbon-dependent energy is a significant cause of localized environmental damage where those fuels are produced and refined, and the emissions from their use is responsible for human-induced climate change, related climate-change disasters, and ecological degradation. Any efforts to reduce the use of non-renewable energy and shift to more environmentally-sound energy sources will benefit the town’s environment by promoting our walk paths, our park & ride program, enhancing and maintaining our Village Centers which directly decreases from transportation needs, and by Municipal incentives to promote energy savings in the Commercial/Industrial District.

While Westminster can do little to shift the broader state or federal policies, we can influence energy use and production on a local level. In this energy plan, we hope to address Westminster’s local actions for increasing our energy efficiency and promoting renewable energy generation, and overall pathways to become more resilient.

Long-Term Vision & Petroleum Dependence

There is a trend toward factoring the “societal costs” into the price of energy; society pays for health costs associated with pollution, environmental clean-up, military protection of petroleum sources, and the continued failure of the Federal government to address the disposal of radioactive wastes. And in the long-term, communities who depend on fossil-fuels are vulnerable to risks associated with their price and production volatility.
These challenges may significantly increase the cost of conventional energy sources within the next ten to twenty years. As a result, Westminster will seek to establish reliable energy resources for townpeople and municipal operations, to protect against the increasing volatility of hydrocarbon prices, and to reduce the environmental impact of our energy use. The role of clean, alternative energy sources will be expanded and supported.

2. Westminster’s Current Energy Use

The following paragraphs describe Westminster’s current estimated energy demand in detail. These current use estimations provide a starting point from which the town can develop informed energy policies that directly address its current context and opportunities going forward.

In order to provide a more accurate picture of the energy planning requirements in Westminster, energy consumption, generation targets, and efficiency targets need to be broken down into three distinct energy sectors. Those sectors are electricity, transportation, and heating.

![Chart 1: Westminster's Annual Energy Consumption](image)

The chart above (Chart #1) shows how energy consumed in the town is divided between these sectors, and that the estimated energy consumption between the three sectors is relatively equal. The sections below explain the calculations and describe the assumptions made to arrive at these final energy consumption figures.

Current Electricity Demand

Westminster’s main supplier of electric energy comes from Green Mountain Power Corporation (GMP). In 2013, GMP projected multiple sources of purchased electricity to cover the State’s needs. The breakdown of these sources can be located in the “Energy Planning” portion of the Town Plan (3rd paragraph).
The demand for electricity in Westminster was estimated by using regional metered data from Efficiency Vermont, and finding average rates of consumption based on population, housing units, and commercial establishments for towns in Windham Region. It is estimated that Westminster consumed about 116,500 million Btu's (MMBtu's) of electricity in 2014. This translates to being about 34,147,000 kWh worth of electricity. Based on the ratio of business/industrial facilities and residences in the Town and the average regional demand, it is estimated that residences consumed about 60,500 MMBtu's while commercial and industrial buildings consumed about 56,000 MMBtu's. This shows that although there are many more residences than commercial/industrial buildings, those facilities demand electricity at a higher rate than housing units.

To translate this energy demand into dollar amounts, we can use a cost estimate of $0.1435 per kilowatt-hour (Vermont state average for electricity costs across all sectors in 2016). Based on the above data, residences in town paid approximately $2,545,000 dollars in 2014 for electricity and commercial/industrial facilities together paid roughly $2,355,000 dollars for their electricity. In Together, the total cost of electricity in Westminster is estimated to be about $4.9 million dollars.

Current Transportation Use

According to 2010 U.S. Census Bureau data, Westminster has 1,298 primary housing units, (not vacant or used for seasonal/recreational purposes). Based on that number of households, it can be estimated that there are 2,229 light-duty vehicles on Westminster’s roads, which consume just over 1,152,000 gallons of fossil fuel each year. To get this gallon/year rate, you multiply the number of vehicles (22,290) by estimated vehicle miles traveled (12,500) divided by average fuel economy (22) and remove 9% of usage because of ethanol in gasoline. Below is a table summarizing the averages and estimates used to arrive at those figures.

Eventually, we arrive at an estimated energy consumption of 149,405 MMBtu per year in Westminster from light/duty vehicles (with internal combustion engines).

<table>
<thead>
<tr>
<th>Estimating current light-duty vehicle (LDV) energy consumption.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,298 Number of primary housing units.</td>
</tr>
<tr>
<td>2,229 Number of fossil-fuel burning light-duty vehicles (LDV).</td>
</tr>
<tr>
<td>12,500 Estimate of the average annual number of miles travelled by an LDV in the area (for Vermont as a whole, total vehicle miles traveled per registered vehicle was around 12,500. The vast majority of LDV in Vermont can safely be assumed to drive between 9,000 and 15,000 miles annually).</td>
</tr>
<tr>
<td>22 Estimate of the average fuel economy of fossil-fuel burning LDV fleet in the area, in miles per gallon (state-wide average fuel economy).</td>
</tr>
<tr>
<td>1,152,500 Estimated number of gallons of fossil fuel consumed annually in Town, calculated from the values above.</td>
</tr>
<tr>
<td>139,750 Number of Btu in a gallon of fossil fuel, computed as a weighted average of the individual heat contents of gasoline (95%) and diesel (5%).</td>
</tr>
<tr>
<td>149,405 This is the estimated total annual energy consumption of internal combustion vehicles in the area, in millions of Btu.</td>
</tr>
</tbody>
</table>
Including the heavy-duty vehicle fleet and electric vehicles, we estimate that the total amount of energy consumed by transportation-related activities in Westminster is roughly 151,700 MMBtu.

To estimate the cost of this consumed energy, we assumed a cost of $2.34 per gallon (Vermont state average for fuel costs in 2015). In Westminster, consumers spent almost $2.7 million on transportation fuel costs alone.

**Current Heating Demand**

To account for the different building types and their respective uses, the following estimates divide thermal energy demand by either residential or commercial use (industrial building thermal demand is not included).

For residential buildings, it was assumed that average annual heating load of area residences is 110 million Btu, for both space and water heating (Vermont state average). With 1,298 primary housing units in the town, this arrives at an estimated 142,900 MMBtu annual total heat consumption for residential buildings.

Furthermore, census data also provides information on the home heating fuels used for these primary housing units. Chart 2 below shows a comparison of owner and renter-occupied housing units and their respective fuel use.

**CHART # 2**

![Westminster's Home Heating Fuel Types](chart.png)

An estimated total of just under $3.0 million was spent in home heating based on averages on fuel costs in the state.
In Westminster, there is also a low percentage of seasonal homes (89% of housing units are primary/"occupied" homes, while 11% are seasonal/"vacant" homes). Based on the energy model projections from the state (created by the LEAP, or Long-Range Energy Alternatives Planning model), it can be assumed that seasonal homes only use about 15% of the energy of a primary home, due to more occasional use and a presumed higher energy efficiency of those buildings. As such, seasonal homes in town are estimated to consume only about 2,647 MMBtu annually (compared to the 142,780 MMBtu for primary residences).

For commercial establishments, it is estimated that the total heating load is 693 MMBtu each year. Based on the types of commercial buildings in Westminster, the heating load was calculated to be less than state average which is 700 to 750 MMBtu’s. With about 53 commercial establishments, there is an estimated thermal energy demand of 36,700 MMBtu. These businesses pay about $900,000 each year in heating expenses.

Taken residential, second home, and commercial heating demand into account, the overall estimated energy consumption for heat in Westminster is about 182,000 million Btu, and about 40% of the Town’s overall energy use (as seen in Chart #1).

Total Energy Costs

In summary, Westminster pays a staggering amount in energy across the three use sectors (see Chart 3 below). The total estimated cost to the town for electricity, heating, and transportation is roughly $11.6 million dollars each year.

There are real financial incentives for the town to move toward energy efficiency, on behalf of both the residents and its business owners (see section “4. Energy Targets and Conservation Challenges” of this plan for more detail about energy efficiency, conservation and fuel conversion targets).

Chart # 3

Westminster's Annual Energy Expenditures

- Electricity: $4,900,138 (42%)
- Heating: $4,055,002 (35%)
- Transportation: $2,699,659 (23%)


The energy resource availability within Westminster are all renewable resources; and are currently limited to wood (biomass) and solar resource at this time. Wind has been looked at, but not applied for yet (additionally, the relative amount of restriction placed on wind development verses other generation resources makes wind energy unlikely and not preferred in Westminster, see the “Wind Resource Maps” section below). In order to reduce dependence on conventional energy sources, of which the costs and availability are outside residents’ control (see the “Current Energy Use” section above), the use and generation of alternative energy sources is encouraged.

Resource Mapping Process and Policy Tool

The suite of maps included with this Enhanced Energy Element were developed using state-wide GIS data that modeled resource potential for solar and wind energy, identified potential constraints on renewable energy development, and created a energy potential map.

This energy potential map provides energy planners and developers with a “coarse screen” method to roughly identify areas in Londonderry that may have energy generation potential. These maps are not siting maps, and further site analysis would need to be done to determine if a proposed generation facility is appropriate and comports with Westminster’s Town Plan policies. Instead, these maps provide Westminster planners and representatives with tools to develop sound and informed energy generation policies within this Enhanced Energy Element.

Land use and education must be the force which determines the Town’s potential and will limit destruction of lands through carefully thought-out strategies which keep Westminster the beautiful and scenic township that history remembers. In conclusion of this process, Westminster will indeed be a leader in the proper siting and abundance of energy opportunities that will help Vermont achieve its goal of 90% of renewable energy consumption by 2050.

Solar Resource Maps
(see attached Solar Resource and Solar Energy Potential maps)

The Town of Westminster has a relatively equal amount of modeled solar resource availability as compared to other towns in the Windham Region. The Town supports solar facilities that are properly sited, the where the development conforms with the siting policies outlined in this Town Plan. Refer to the “Energy Goals, Policies, and Action Steps” section below for policy statements regarding solar generation.

Most of the large swaths of modeled solar energy is present in low-lying areas in the eastern side of Town, and generally along the valley of the Connecticut River and adjacent to Route 5. Though these may be good areas for larger solar installations, the Town is also incentivized to protect its agricultural resources that are also present in abundance in this general area, and protect the scenic resources along this important local corridor. Westminster’s Agricultural Land Overlay District is shown on the attached “Possible Constraints for Energy Generation Map 2 of 2” map, along with other potential state-wide constraints on energy generation development.

There are other smaller patches of modeled Prime Solar Resource Potential (see Solar Energy Potential map), and these are generally decentralized areas on south-facing slopes in the north-central area of Town west of I-91 and east of Westminster West Road. Though these may show good modeled potential, this area of Town is largely wooded, and larger installations may require clearing tracts of land that would be inappropriate (the state-used GIS model to create solar resource layers does not take land cover into account). Instead, the Town would promote that installations in forested areas be confined to previously-cleared areas of land that would benefit from regular maintenance, or along field edges.
Generally speaking, the Town believes that it can achieve its energy generation targets (see sections below) without having to change the pattern of the landscape with large solar installations. The Town gives preference to siting solar on previously-cleared or disturbed sites and on rooftops. Refer to the “Energy Goals, Policies, and Action Steps” section below for more specific policy statements regarding solar generation.

**Wind Resource Maps**  
*(see attached Wind Resource and Wind Energy Potential maps)*

The attached Wind Resource map logically shows modeled wind generation potential on the high-elevation areas of Westminster, including Windmill Mountain and The Pinnacle, Hartley Hill, Hickory Ridge, and Rocky Ridge. Even though there is energy potential on these ridges, the potential is relatively fair, showing that only small-scale commercial generation would likely be viable (as opposed to industrial-scale wind installations).

The Town of Westminster, through this mapping exercise, has found that wind energy has a lot of restrictions where the best sites would normally be. The Town’s Ridgeline Protection Overlay District (see the “Possible Constraints for Energy Generation Map 2 of 2” map) prevents construction over the tree line, and that can be observed from any roadway within the town. This Ridgeline Protection area covers the broad majority of modeled wind resource potential.

Therefore, the Town of Westminster does not view industrial or commercial wind energy generation in town as viable or appropriate, based on these existing land use policies.

The Town of Westminster also has restricted forests, whether privately owned or town owned, that wouldn’t allow wind development. These also are shown on our maps.

**Westminster’s Preferred Locations**

The Town of Westminster supports locally sourced and renewable energy generation facilities in a manner that supports existing and proposed land use designations, does not adversely affect the landscape pattern or character of the Town, and supports positive community development.

Generally, the Town promotes energy generation development in locations that are previously disturbed and do not offer significant opportunities for future development. These areas may include former gravel pits, former and existing parking lots, landfills, etc. Extra consideration should be given to these under-utilized and previously disturbed areas that exist within the areas modeled to have prime resource potential (see Energy Maps), and do not conflict with existing and proposed designated land uses.

**Areas Unsuitable for Renewable Energy Siting**

As shown in the Known Constraints map, there is a suite of geographic characteristic that are deemed to exclude any energy generation development. They are mapped vernal pools, Class 1 and 2 wetlands, DEC River Corridors and/or FEMA floodways, National Wilderness Areas, and State-significant Natural Communities and Rare, Threatened, and Endangered species.

The Possible Constraints are a set of data layers that don’t necessarily exclude energy development, but give a signal to potential developers and planners that more site analysis may be required. These layers include hydric soils, FEMA Special Flood Hazard Areas, Protected
lands, deer wintering areas, Vermont Conservation design highest priority forest blocks, and agricultural soils. If generation facilities are proposed in these areas, due diligence is required in the siting of those facilities to ensure there is no adverse affects on the landscape. Westminster has included two of its land use designations (Agricultural and Ridgeline Protection Overlays) to this Possible Constraints map.

**Existing Renewable Energy Generation**

As mentioned above, the Town of Westminster has considered itself a regional leader in installing energy generation facilities, and is now looking to how it can continue to be in a way that is appropriate for the Town. The image below is a map created by the VT Energy Dashboard’s Energy Atlas, and shows renewable energy generation sites across all technologies and generation sizes.

It shows that the dominant installed renewable energy technology is solar, in the form of small roof-top installation, ground-mount arrays, and solar hot water. In total, the listed solar installations have a total of 615kW of name-plate capacity.

At this time has only one producer of energy other than solar and it is the Goodell Farm, which has a 450 kW-capacity anaerobic digester. If the Town could mandate this, we would be looking for more farms to use this method and the remainder would be more strategically placed solar projects. There is also a wood-chip heating system at the Westminster Center School, which also helps to demonstrate the Town’s leadership in pursuing progressive energy policies that are in the best interest of its residents.
Below is a chart summarizing the existing sources of renewable energy in Westminster, based on 2016 data from the Department of Public Service. It shows that this farm digester (shown in the table under “biomass”) greatly contributes to Westminster’s energy generation totals, even though it has a lower overall MW installed capacity than solar. This is due to the high annual generation energy rate of anaerobic digesters compared to solar or wind (as reflected in the “Annual MWh generated” column). These sources of energy are independent of resource availability fluctuations, unlike solar or wind energy, which MWh output will change throughout the day, season, and with weather variability.

<table>
<thead>
<tr>
<th>Westminster’s Existing Renewable Energy Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renewable Energy Type</strong></td>
</tr>
<tr>
<td>Total solar installations.</td>
</tr>
<tr>
<td>Total wind installations.</td>
</tr>
<tr>
<td>Total hydro-electric installations.</td>
</tr>
<tr>
<td>Total biomass installations.</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td><strong>Total existing renewable energy generation:</strong></td>
</tr>
</tbody>
</table>

4. **Westminster’s Energy Targets and Conservation Challenges**

The Windham Region was given an overall renewable energy generation target, as determined by the Department of Public Service, and based on its percentage of the state’s population (which directly affects its share of statewide consumption). The Windham Regional Commission (WRC) then determined energy generation targets for each of their member-towns, based on both the resource availability in town and its population, therefore attempting to make municipal energy generation targets the most equitable. The resulting town generation targets are an average between those two variables.

**Energy Generation Targets**

In Westminster, it is estimated that 3,544 megawatt-hours (MWh) of renewable energy should be generated each year to meet the Town’s energy demands and help reach the State’s goals (this is in addition to what is already being generated, as outline in the section above).

This estimated generation target serves as a starting point from which the town can develop policy and promote desired land-use strategies to address its energy needs, and there are no regulatory implications for this targeted generation amount.

Below is a chart that shows one pathway through which Westminster may attain this generation goal by 2050. These percentages over the benchmark years (2025, 2035, and 2050) were established in the State’s 2016 Comprehensive Energy Plan.
Westminster’s Generation Targets at Benchmark Years

<table>
<thead>
<tr>
<th>Target Description</th>
<th>MWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>This is the target amount of renewable energy generation in town by 2025 (25% renewables goal)</td>
<td>984</td>
</tr>
<tr>
<td>This is the target amount of renewable energy generation in town by 2035 (40% renewables goal)</td>
<td>1,575</td>
</tr>
<tr>
<td>This is the target amount of renewable energy generation in town by 2050 (90% renewables goal)</td>
<td>3,544</td>
</tr>
</tbody>
</table>

To translate these MWh targets into what kinds of installations would be required, 3,544 MWh of renewable energy each year would require a total of 2,726 kilowatt-capacity of solar photovoltaic installations (using the assumption that only solar energy would contribute to the overall energy generation target in the Town, and not any other generation sources).

On the landscape, this could mean that the Town identifies 164 acres of solar-capable land. This is a very conservative figure; as it is assuming that each mega-watt of solar energy requires 60 acres (on average, solar installations actually produce a single mega-watt over 8 acres). Using the 60 acres/megawatt energy production rate is used as a planning contingency; meaning that it reserves space for landowner, grid, or spatial constraints that may limit development. This ensures enough space would be delineated. Realistically, the acreage would be around 22 acres of land actually used for solar installations.

Through the resource mapping process described in the above sections, it is identified that Westminster has about 1,956 acres of prime solar resource (meaning there are no known or potential constraints in these areas). Westminster Town has a total of 28,935 acres. Of those 1,956 acres of prime solar resource only about 22 are needed for the installations (or, only 1.11 percent of the area identified as a prime solar resource, and 0.08 percent of the total area in Town). This demonstrates that there is plenty of area available in Westminster for meeting the State’s energy goals, even if the local possible constraints, in this case Agricultural Lands and Ridgeline Protection Overlays, are applied.

These estimated 22 acres also do not include the potential capacity created by roof-top solar on existing structures. It is estimated that of the roughly 1,200 viable structures in Town (as determined by E911 GIS data) Westminster could produce almost 2,000 MWh of renewable energy on these roof-tops. This figure assumes that only 20 percent of the existing residential structures and 25 percent of commercial structures are suitable for photovoltaic installations. Overall, this estimated roof-top solar potential would meet just over half (56%) of Westminster’s overall energy generation target (or, would remove about 12 acres of estimated solar ground-mounted installations).

In addition to the above targets for renewable electricity generation, the Town could anticipate the fuel conversions to renewable in the other two sectors (transportation and heating). The chart below shows the relative percentage of the use of renewable energy in these sectors, and was created with information given from the WRC under guidance from the Department of Public Service. Transportation usage may switch to electric or biodiesel vehicles. Heating fuel may switch to electric heat pumps, wood-based fuel sources, or bio-distillates. For more targets and fuel conversions see the sections below.

<table>
<thead>
<tr>
<th>Target Description</th>
<th>2025</th>
<th>2035</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation (as a percentage of total Btu's consumed)</td>
<td>10%</td>
<td>31%</td>
<td>90%</td>
</tr>
</tbody>
</table>
Although renewable energy generation can occur in the town and supply its residents with reliable, affordable, and clean power, the town is challenged by the current amount of energy being consumed. In order to minimize the amount of energy generation required, the town must first develop strategies to reduce the amount of energy consumed.

*Projected Energy Use: LEAP Model Results*

To help inform the town’s policies on energy conservation measures, Westminster used guidance from the LEAP (Long-Range Energy Alternatives Planning system) model, conducted by the Vermont Energy Investment Corporation as part of the state’s comprehensive energy planning initiative.

The LEAP model is used to guide the state’s regions towards reducing the amount of greenhouse gas emissions and consuming 90% renewable energy by 2050 (referred to as the “90x50” goal). To accomplish the state’s energy goals, there are several interim benchmarks built into the LEAP model which ensure a progressive pace in attaining that “90 x 50” goal. The state energy goals are:

- Greenhouse gas reduction goals of 50% from 1990 levels by 2028 and 75% by 2050.
- 25% of energy supplied by renewable resources by 2025 (25 x 25).
- Building efficiency of 25% of homes (80,000 units) by 2020.

Incorporating those goals into the model produced energy generation, conservation, and fuel conversion targets for benchmark dates for all regions in the state, and is informed by the region’s current energy profile. The WRC received the results from this model and was tasked with making those results relevant to its member-towns. The WRC therefore divided its region-wide benchmark targets among its towns based on their population (which is assumed to most directly impact the amount of energy the towns consume).

The following paragraphs and figures show Westminster’s LEAP model results, and how much energy could be conserved in order to reduce the burden of energy generation facilities in the region.

*Residential Heating Conservation & Fuel Conversion*

In order to determine how much energy would have to be conserved or how much fuel conversion to renewable energy, the LEAP model produced both a “Reference” and “90x50” scenarios. The Reference scenario is meant to depict energy use over the decades if no major changes were made in our energy profile. It is the “business as usual” scenario. The “90x50” scenario shows one pathway that communities can adopt in order to reduce greenhouse gas emissions, conserve energy, and generate renewable energy so as to meet the state’s goals. This pathway is translated to Westminster’s use, and is shown below. It is another data estimate that serves to help inform the town to develop its own policies for energy conservation and fuel conversion.

Chart #4 below shows the LEAP results for Westminster’s residential heating sector. In both the Reference and 90x50 scenarios, energy consumption is modeled to decrease (on account of technological improvements, building innovation, and home efficiency improvements).
However, the 90x50 scenario shows a sharper increase in the amount of energy conserved in residential heating. Chart # 6 B shows how much energy should be conserved, through 2025, 2035, and 2050, to help the town arrive at these energy goals. Not only would energy need to be solely conserved by building efficiency measures, but fuel conversion to more efficient energy sources would be promoted.

To translate the above bar graphs into more meaningful and tangible data points for the Town, some estimates were made that provide a pathway to more energy conservation and efficiency over the target years of 2025, 2035, and 2050. Below is a chart outlining the heating (or, “thermal”) efficiencies and building weatherization targets that could be made in Westminster to meet these targets.

<table>
<thead>
<tr>
<th>Efficiency Targets at Benchmark Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use/Sector</strong></td>
</tr>
<tr>
<td><strong>Residential thermal</strong> (increased efficiency and conservation):** Percent of municipal households to be weatherized over benchmark years to meet efficiency targets.</td>
</tr>
<tr>
<td><strong>Residential thermal</strong> (increased efficiency and conservation): Estimated number of municipal households to be weatherized.</td>
</tr>
<tr>
<td><strong>Commercial thermal</strong> (increased efficiency and conservation): Percent of commercial establishments to be weatherized over benchmark years to meet efficiency targets.</td>
</tr>
<tr>
<td><strong>Commercial thermal</strong> (increased efficiency and conservation): Estimated number of commercial establishments to be weatherized.</td>
</tr>
</tbody>
</table>

The following chart shows what kind of fuel conversions, for both residential and commercial buildings, could be made to meet the proposed targets. This also includes the increased use of heat pumps:
## Heating-Related Fuel Switching Targets

<table>
<thead>
<tr>
<th>Use/Sector</th>
<th>2025</th>
<th>2035</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential and Commercial Thermal Fuel:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated <strong>new efficient wood heat systems overall</strong> (in units) in the LEAP 90x50 scenario (this includes both wood stoves and wood pellet burners for homes and businesses).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This number may decline over the target years, which indicates an overall trend toward energy conversation and building weatherizing, which reduces the demand on heating systems.</td>
<td>929</td>
<td>875</td>
<td>862</td>
</tr>
<tr>
<td>Residential and Commercial Thermal Fuel:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated <strong>new wood pellet systems only</strong> (in units) in the LEAP 90x50 scenario.</td>
<td>168</td>
<td>184</td>
<td>231</td>
</tr>
<tr>
<td>Residential and Thermal Fuel:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated <strong>new heat pumps</strong> (in units).</td>
<td>298</td>
<td>589</td>
<td>832</td>
</tr>
</tbody>
</table>

### Transportation System Changes

The LEAP model created benchmark targets for both light and heavy duty vehicles, assuming a difference in residential and industrial energy needs and changes over time. Below are the two interpretations of these sector’s efficiencies over time. This can be seen below on Charts # 5 & 6.

**CHART # 5**

**Light-Duty Vehicle Consumption (LEAP Model Scenario)**

**Light-Duty Vehicle Energy Conserved to Reach 90x50 Goals**

**CHART # 6**
Light-duty vehicle consumption represents a larger portion of the total amount of energy consumed by the transportation sector, and there is a large amount of energy conservation required. The LEAP model projects much of this conservation of energy comes from the electrification of the vehicle fleet, especially as market demand changes and technology improves. This reduction in gasoline consumption and electrification of the car motor comes in addition to increased cluster developments and other land use changes that improve the efficiency of our community’s transportation network.

Heavy-duty vehicle consumption doesn’t show the same curves as per light-duty vehicles, since commercial and industrial applications for this vehicle fleet isn’t anticipated to change as much. However, efficiency in this sector is achieved by changing the fuel type for these vehicles from diesel to bio-diesel. Below is a chart showing the number of vehicles that would undergo fuel conversion in Westminster to meet efficiency targets over the benchmark years.

<table>
<thead>
<tr>
<th>Transportation-Related Fuel Switching Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use/Sector</strong></td>
</tr>
<tr>
<td>Transportation Fuel: Estimated number of <strong>new electric vehicles, in town.</strong></td>
</tr>
<tr>
<td>Transportation Fuel: Estimated number of <strong>biodiesel-powered vehicles, in town.</strong></td>
</tr>
</tbody>
</table>

*Electricity Conservation*

Over the benchmark years, electricity rates are anticipated to increase in the Reference scenario, due to a combination of more amenities, appliances, and motors being supplied by electric power, and an increase in the number of people using those products. The 90x50 scenario promotes electricity conservation in the form of energy-efficient appliances, lighting, and heating/cooling.
Again, this information would be more helpful if it were translated into units being conserved over the benchmark years. Below is a chart outlining the efficiency pathway for electricity conservation.

<table>
<thead>
<tr>
<th>Electricity Efficiency Targets at Benchmark Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use/Sector</td>
</tr>
<tr>
<td>Electric: Number of kilo-watt hours to be conserved, annually, over the target years.</td>
</tr>
<tr>
<td>Electric: Percentage of number of homes and buildings that will have been upgraded with electric efficiency improvements.</td>
</tr>
</tbody>
</table>

Conservation and Efficiency Strategies

With total energy expenditures in the Town in excess of 8.9 million dollars, there is considerable opportunity for savings from various energy conservation and improved efficiency measures. Because most of the energy use in Westminster is for private uses (home heating, commuting, etc.), savings would accrue primarily to residents. Public education is one of the most effective strategies to bring about savings through energy conservation and improved efficiency, though there are some specific policies that can also move the community in that direction.

Most new construction in Westminster is required to meet or exceed the Vermont Building Energy Standards (for both residential and commercial buildings) through the use of insulation, heating systems, and weatherproof windows and doors. Current building codes provide basic energy efficiency requirements for buildings; however, technology advancements have generated higher standards such as net-zero energy construction standards in which buildings generate as much energy as they consume. Green construction and LEED Construction (Leadership in Energy and Environmental Design) standards promote the use of natural, recycled and durable building materials, as well as energy efficiency. These efficiency standards are also applied to landscaping, advocating for native plantings that are low maintenance.
The siting, design, and construction of buildings strongly influences the amount of energy needed for heating as well as the amount of electricity needed for lighting. Proper subdivision design, building orientation, construction and landscaping provide opportunities for energy conservation such as less vehicular travel, and by designs incorporating passive solar space and domestic hot water heating, natural lighting and photovoltaic electricity production.

Energy savings can be realized by retrofitting existing buildings with insulation, installing high-performance windows and doors to reduce heat loss, weather-stripping, replacing incandescent lights with fluorescent, and using energy efficient appliances. The following programs are available to residents of Westminster:

- **Southeastern Vermont Community Action (SEVCA):** SEVCA is the service provider in Windham County that runs the Weatherization Assistance Program. Weatherization services, which include an energy audit, diagnostic tests, analysis and installation measures, are available at no cost to income-eligible homeowners and renters. SEVCA is also available to help in the event of a heating emergency. They can help purchase oil, kerosene, propane or wood. In addition, they also work with electric companies in order to prevent disconnection and help negotiate payment plans.

- **Efficiency Vermont:** Efficiency Vermont is the State’s provider of energy efficiency services. They provide technical and financial assistance to electrical consumers for the purpose of improving the efficiency of existing and new facilities.

- **ENERGY STAR Home Rebates:** Energy Star Homes meet strict energy efficiency guidelines set by the U.S. Environmental Protection Agency and U.S. Department of Energy. Efficiency Vermont provides free financial, design, and technical to help build an ENERGY STAR qualified home. Benefits of being an ENERGY STAR home include financial incentives such as product rebates; utility savings; higher resale value; increased comfort and air quality; and other environmental benefits.

- **Vermont Housing Finance Authority’s Energy Saver Loan Program:** Administered by Windham Housing Trust, this program offers low interest loan funding for homeowners for an energy audit and improvements specified in the audit.

Transportation-related efficiency strategies are a very significant part of Westminster’s efforts, since it represents a significant portion of the energy demand. Simple changes, such as ride-sharing, combining trips and using alternative transportation, will conserve fuel and reduce wear and tear and maintenance costs on individual vehicles. Fuel efficient and electric cars will use less gasoline and emit less pollution.

Effective land use planning can promote energy conservation. Targeting new development toward areas located close to the community’s major roads and existing settlements will minimize the energy consumed by residents commuting, and will reduce the energy required to deliver essential services to residents and businesses.

5. **Energy Goals, Policies, and Action Steps**

Goal 1: Westminster will reduce its total energy use by promoting energy conservation and efficiency measures.

Policy 1.1: **Encourage appropriate energy conservation and efficiency measures and renewable energy generation by individuals and organizations through public education, awareness, and engagement.**

*Action Steps*

1. Make energy efficiency and energy conservation information available in the Town Hall for the public.
2. The Town will re-establish a Town Energy Committee to help keep the town informed of all significant energy issues, and communicate the issues with residents effectively.

Policy 1.2: Support programs for insulation and weatherization of new and existing dwellings, especially for low and moderate-income households.

*Action Steps*
1. Enforce compliance with the Vermont Residential Building Energy Code by ensuring that certificates are filed upon completion of construction.
2. The Town shall work to make residents aware of recent state energy codes.
3. Promote implementation of residential and commercial building efficiency ratings and labeling.
4. Residential energy conservation programs that conduct energy audits and/or provide weatherization services for existing homes, especially for low income homes, should be fully utilized and promoted through information outreach.
5. Encourage the retro-fitting of existing structures with energy saving measures such as insulation, storm windows, heating equipment, and energy efficient appliances.

Policy 1.3: Encourage housing development that considers energy conservation by siting buildings for solar gains and minimized road construction.

*Action Steps*
1. The Town will provide information about resources for building energy efficient homes and businesses, including The Vermont Residential and Commercial Building Energy Codes and LEED, Leadership in Energy and Environmental Design.
2. The Town shall develop guidelines for energy conservation to be used in site plan or conditional use review. Whenever possible, development should be encouraged only in areas with characteristics most suitable for maximum energy conservation, including southern orientation and protective wind barriers.

Policy 1.4: Encourage and support awareness programs on energy conservation and the availability and use of renewable and alternative fuels.

*Action Steps*
1. Promote switching to wood, liquid biofuels, biogas, geothermal, and/or electricity as fuel sources, when applicable.
2. Promote other suitable devices such as advanced wood heating systems and cold-climate heat pumps, or other energy efficient heating systems.
3. The Town shall encourage the institution of an energy awareness curriculum in schools.

Policy 1.5: Commit to energy conservation in all Town properties, facilities, and vehicles.

*Action Steps*
1. All affordable efforts to improve energy efficiency should be used when constructing, maintaining, to retrofitting public facilities.
2. Continue to highlight the benefits of the wood-chip heating system in Westminster School, and will use this as an example for other properties.

Policy 1.5: Support the use of energy efficient automobiles, appliances, heating units, lighting, and other powered devices.

*Action Steps*
1. Review, update, and implement street lighting plan town-wide using efficient light fixtures and renewable energy, as feasible.
2. Examine opportunities for providing home energy audits for resident and property owners so that they may take action to conserve energy and reduce related costs.
Goal 2: Westminster will promote the reduction of transportation energy demand and single-occupancy vehicle use, while encouraging use of renewable or lower-emission energy sources for transportation.

**Policy 2.1: Encourage the increased use of public transit, as appropriate.**
1. The Town shall promote carpooling through maintenance of park and ride at Exit 5. Further efforts could go to developing carpool boards, located at Town Hall and in Westminster West Village.

**Policy 2.2: Promote a shift away from single-occupancy vehicle trips through strategies identified in the Transportation chapter.**

**Policy 2.3: Encourage, through transportation policies, opportunities for walking, and cycling, or other energy efficient alternatives to the automobile.**
*Action Steps*
1. Consider implementing improvements that encourage safe and convenient walking and biking.
2. To promote connections between major activity centers by bicycle/foot paths to encourage non-automobile travel. These paths can be tied into neighboring bike paths, including Walpole’s.

**Policy 2.4: Promote the individual use of electric vehicles, instead of fossil fuel consuming light-duty vehicles.**

**Policy 2.5: The Town of Westminster will lead by example in terms of transportation-related energy use.**
*Action Steps*
2. The Town shall encourage the posting of “No Idling” signs at public facilities and businesses.

**Policy 2.6: To encourage land use patterns that concentrate housing, work opportunities and social services toward the existing villages in order to conserve energy by placing less demand on transportation. For example: encourage Planned Unit Developments on small lots in villages.**

**Policy 2.7: To ensure that future energy infrastructure falls within (or as closely as possible) to existing rights-of-ways or corridors.**

Goal 3: Westminster promotes the appropriate land use patterns and development densities that result in the conservation of energy.

**Policy 3.1: Maintain the Town’s scenic resources and Ridgeline Protection Overlay District by protecting them from commercial energy generation and new transmission facilities.**

**Policy 3.2: Minimize the need for new facilities and reliance on the private automobile by directing development to designated concentrated development, and limiting such development in the least accessible areas of the community.**

**Policy 3.3: Promote land use and conservation policies that encourage ongoing forest management to maintain a local source of fuel-wood and local agriculture to maintain and increase the supply of locally produced food.**
Goal 4: Westminster will locate zones and/or areas appropriate for renewable energy generation based on resource potential and development constraints.

Policy 4.1: Support appropriate renewable energy generation in Westminster, including biomass using local wood supplies, solar, and dispersed small-scale wind, solar and hydro-power sources.

Action Steps
1. Support incentive programs for small-scale net-metering energy production and energy conservation for private use.
2. Support the preference of small-scale active and passive solar installations, specifically on rooftops, rather than larger scale ground mounted utility installations.
3. Support small-scale, residential wind generation facilities where there are no adverse visual, ecological, or sound affects to nearby residences.
4. Support permit-able small-scale micro-hydro systems where there are no adverse affects on the geomorphic stability or ecological health of the respective water body.

Policy 4.2: Discourage overall any industrial-scale renewable energy generation.

Policy 4.3: Encourage any potential commercial generation facilities to be within the areas deemed most suitable as described in this Enhanced Energy Element and within the Energy Generation Potential maps, and maximize potential for those facilities in these preferred areas:
- Former gravel pits, quarries, or other heavily disturbed areas,
- Parking lots and gas station canopies,
- Existing commercial buildings or facilities with generous rooftop availability that is capable of hosting solar photovoltaic installations.

Policy 4.4: When considering upgrades to or expansion of transmission infrastructure or 3-phase power lines, encourage the strategic development of energy generation facilities so that community centers and local businesses may benefit from the infrastructure upgrades, thereby maximizing positive community development overall.

Policy 4.5: Promote the siting of renewable energy generation facilities within compatible Land use districts, namely within Rural Residential and Commercial/Industrial District, and in such a manner that minimizes site disturbance and development, reduces impacts on local roads and infrastructure, and maximizes energy resource availability so as to provide the most benefit.

Policy 4.6: Encourage energy generation facilities in existing or prospective agricultural areas, where the energy generation installations conform to, compliment, or add value to the agriculturally-productive landscape or to the surrounding ecosystem services, and do not adversely impact the Connecticut River Conservation District.

Policy 4.7: Discourage any renewable energy generation facilities in these identified unsuitable areas, identified by the Town of Westminster:
- Within the three resource overlay districts (Ridgeline Protection, Flood Hazard, Agricultural Land),
- Fragile natural areas, as determined by the Land Use chapter of the Westminster Town Plan,

Policy 4.8: Prohibit any renewable energy generation facilities in the designated Village land use district that do not conform with existing land use or landscape patterns, or do not conform with the Village character.
Policy 4.9: Town of Westminster will demonstrate leadership by example with respect to the deployment of renewable energy by promoting energy generation facilities on all town buildings and/or property, where appropriate, viable and feasible.
Windham Regional Commission

24 V.S.A. §4352 Determination for the Municipality of Westminster

Certificate of Energy Compliance

On this 9th day of August, 2018, Windham Regional Commission determined that the Westminster Plan duly adopted on May 24, 2017, complies with the energy planning requirements set forth in 24 V.S.A. §4352 and is consistent with the Windham Regional Plan.

Dated on this 9th day of October 2018.

Gabrielle Ciuffreda, Chair
Windham Regional Commission
Windham Regional Commission

24 V.S.A. §4352 Determination for the Municipality of Westminster

Determination of Energy Planning Compliance Pursuant to 24 V.S.A. §4352 For Westminster’s Municipal Plan

I. Introduction

The Windham Regional Commission (WRC) received a request for review and determination of energy compliance on the Town of Westminster’s Municipal Plan’s Enhanced Energy Element. As per statute, a hearing was held not less than 30 days following the request and the Determination was voted upon not more than 60 days following the request. The WRC staff and energy committee reviewed the plan in reference to the State standards. The energy committee found the plan compliant with the standards and recommended developments for future iterations of the plan. The determination was voted on by the Executive Board on October 9th, 2018.

II. Procedural History

1. On August 17, 2018, the Town of Westminster submitted the Westminster Municipal Plan to the Windham Regional Commission (“WRC”) for a determination of compliance with the enhanced energy planning standards set forth in 24 V.S.A. §4352.

2. On August 20, 2018, notice of a public hearing scheduled for Westminster was posted on WRC’s website.

3. On August 20, 2018, notice of a public hearing scheduled for Westminster was mailed directly to the Town of Westminster.

4. On August 30 and September 3, 2018, notice of a public hearing scheduled for Westminster was published in the Brattleboro Reformer and the Westminster Gazette respectively.

5. On September 18, 2018, WRC’s Energy Committee convened a public hearing at the Westminster Town Hall located at Westminster Center, Vermont. After the public hearing, the Energy Committee recommended that the Westminster Municipal Plan received a determination of compliance with the enhanced energy planning standards
set forth in 24 V.S.A. §4352 with the recommendation that in future iterations, the plan clarify policies 4.6 and 4.7.

6. On October 9, 2018, WRC’s Executive Board reviewed the recommendation of the Energy Committee and voted to approve an affirmative determination of energy compliance.

III. Public Comments

No comments were submitted by the public.

IV. Conclusions

1. The Westminster Municipal Plan includes an energy element that has the same components as described in 24 V.S.A. §4348a(a)(3) for a regional plan and is confirmed under the requirements of 24 V.S.A. §4350.

2. The Westminster Municipal Plan is consistent with following State goals:

   A. Vermont's greenhouse gas reduction goals under 10 V.S.A. § 578(a);

   B. Vermont's 25 by 25 goal for renewable energy under 10 V.S.A. § 580;

   C. Vermont's building efficiency goals under 10 V.S.A. § 581;

   D. State energy policy under 30 V.S.A. § 202a and the recommendations for regional and municipal energy planning pertaining to the efficient use of energy and the siting and development of renewable energy resources contained in the State energy plans adopted pursuant to 30 V.S.A. §§ 202 and 202b (State energy plans); and

   E. The distributed renewable generation and energy transformation categories of resources to meet the requirements of the Renewable Energy Standard under 30 V.S.A. §§ 8004 and 8005.

3. The Westminster Municipal Plan meets the standards for issuing a determination of energy compliance included in the State energy plans as developed by the Vermont Department of Public Service.

Dated this 9th day of October 2018.

[Signature]
Gabrielle Ciuffreda, Chair
Windham Regional Commission