Energy

Purpose of the Plan

The Addison County Regional Planning Commission (ACRPC) developed the Region's first regional plan including an energy section in 1994. The policies in that plan expressed concern about the future location of large-scale electric generation and transmission facilities in the Region. It supported the development of locally generated energy sources and pointed to their potential contribution to the Region's economy. The plan also recommended encouraging the concentration of new residential development near existing employment centers and discouraging a scattered pattern of residential development in the rural countryside, thus reducing gasoline consumption. ACRPC subsequently updated its Energy plan in 1994, 2005, 2011, 2018, and 2024. ACRPC's completion of in-depth energy planning enables Vermont to achieve state and regional energy goals including:

A. To make efficient use of energy, provide for the development of renewable energy resources, and reduce emissions of greenhouse gasses. Including: increasing the energy efficiency of new and existing buildings; identifying areas suitable for renewable energy generation; encouraging the use and development of renewable or lower emission energy sources for electricity, heat, and transportation; and reducing transportation energy demand and single occupancy vehicle use. 24 V.S.A. § 4302(f)(1)

B. Greenhouse gas (GHG) reduction requirements under 10 V.S.A. § 578(a)
   - 26% from 2005 levels by 2025
   - 40% from 1990 levels by 2030
   - 80% from 1990 levels by 2050

C. The 25 x 25 goal for renewable energy under 10 V.S.A. § 580
   - 25% in-state renewables supply for all energy uses by 2025

D. Building efficiency goals under 10 V.S.A. § 581
   - e.g., reduce fossil fuel consumption across all buildings by 10% by 2025

E. The recommendations for regional and municipal 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

F. 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

Although the energy picture often appears abstract and beyond the influence of local communities, sound regional and municipal planning can effectively guide certain types of energy decisions. The Addison Region can move toward a position of sustainable energy use that will maintain a healthy environment and build a foundation for economic vitality. ACRPC and its member municipalities can promote appropriate land use patterns, participate in energy generation development decisions, facilitate alternative transportation options and encourage energy conservation strategies in the Region. The purpose of this plan is to identify the opportunities for the Region and member municipalities to facilitate the transition to a more efficient and sustainable energy system.

Introduction

ACRPC created this Plan, within the overall energy planning framework of the State Comprehensive Energy Plan, to plan for our future energy usage and infrastructure in accordance with the guidance provided by the Public Service Department. This Plan advances three key energy policy goals for the Addison Region:

- Pursuing a Just Energy Transition
- Improving our Climate Change Resilience;
- Enhancing our Energy Security.

ENERGY JUSTICE

Profound changes to the energy system of Vermont have been underway—our Brave Little State has been a leader in pursuing renewable energy development for decades. To have a just energy transition however, it is crucial that all Vermonters are treated fairly as these changes unfold. As such, it is critical to consider these four questions so that we can conduct more just energy planning in Addison County:

1. Who is being helped?
2. Who is being harmed?
3. Who is missing from the conversation?
4. How will we respond?

Table 1: Total Energy Burden by Town

	Total Energy Burden
Addison	8%
Bridport	12%
Bristol	9%
Cornwall	8%
Ferrisburgh	8%
Goshen	10%
Leicester	13%
Lincoln	11%
Middlebury	9%
Monkton	7%
New Haven	9%
Orwell	12%
Panton	10%
Ripton	8%
Salisbury	9%
Shoreham	10%
Starksboro	10%
Vergennes	10%
Waltham	9%
Weybridge	7%
Whiting	11%

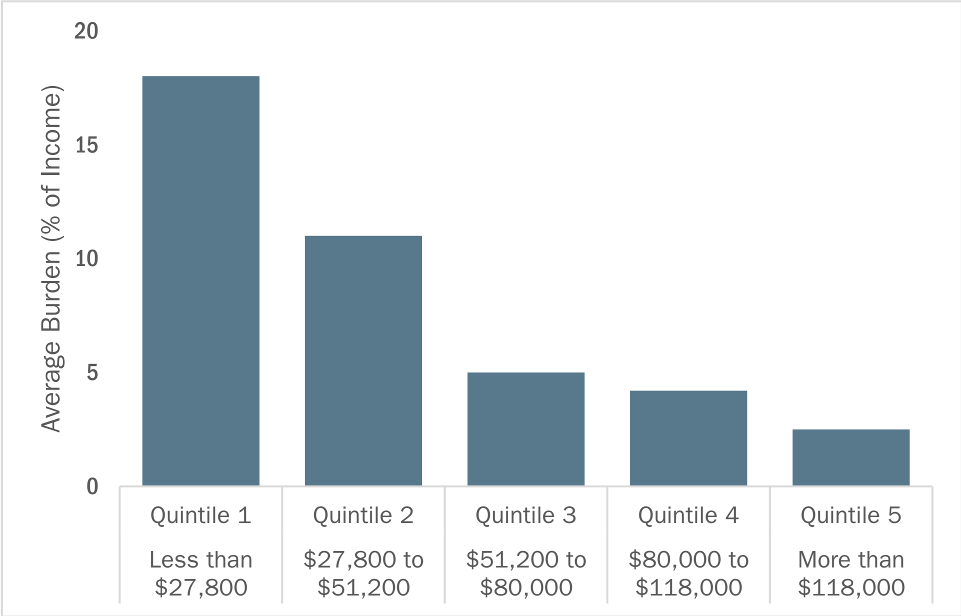
In addition, ACRPC's Energy Plan incorporates the ideals detailed in the Energy Equity Project (EEP) Framework[1] and establishes the following priorities:

- Reliability and affordability serve as the two foundational energy goals of the region
- Utilities should prioritize affordability in the energy projects they provide to minimize the energy burden on consumers

Beyond these basics, ACRPC supports energy choices that address climate change, reduce social inequity, and encourage participation in energy decision-making at the state, regional, and local levels.

Ultimately, ACRPC's Regional Energy Plan strives to improve the outcomes for environmental justice populations, as defined by Act 154. For more information on how to internalize equity into policy and a list of populations vulnerable to the impacts of climate change, see the State of Vermont Climate Council's Guiding Principles for a Just Transition.[2]

Figure 1: Total Energy Burden in Vermont by Income



Our Region's strategy for enhancing environmental and energy justice is two-fold:

1. transitioning from fuels that produce pollutants that have negative public health impacts;
2. reducing the "energy burden," defined as the proportion of household income spent on energy costs, for our communities.[3]

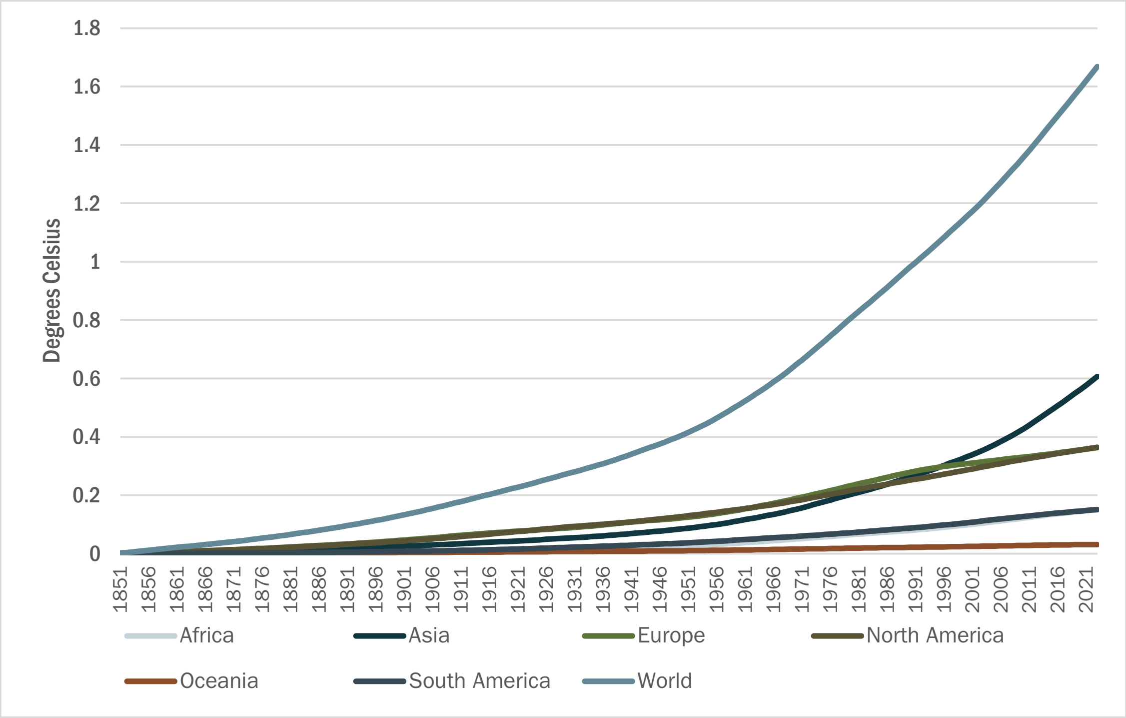
On average, Addison County residents face an energy burden of approximately 10% of the median household income, totaling +/- $7,300 in annual energy costs per household. **Table 1** provides a municipality-level breakdown of energy burden within the Region. Of Addison County household average energy costs, nearly half (45%) is spent on transportation, followed by heating (33%), then electricity expenses (22%). Nationally, an energy burden greater than 6% is considered high and is correlated with a "greater risk for respiratory diseases, increased stress and economic hardship, and difficulty in moving out of poverty."[4] These high energy costs take up a large share of household income, often forcing families to make difficult choices between essentials like food, medical care, and safe energy use.

Energy burden data plays a key role in shaping state, regional, and local energy programs. It helps direct resources to the households most in need due to limited income.

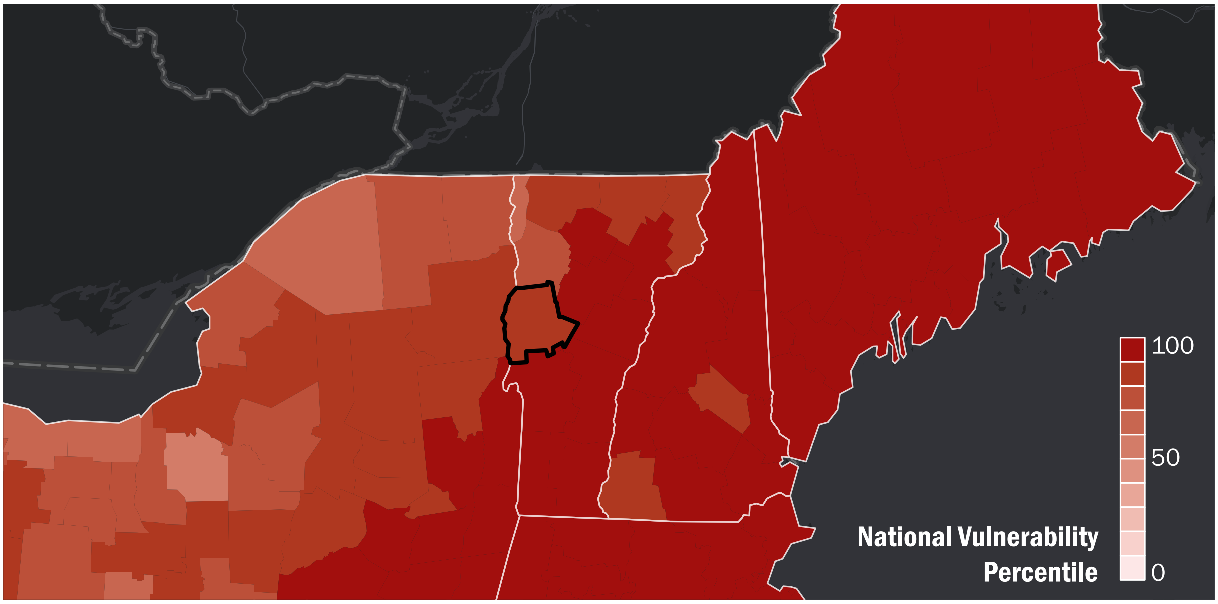
In Vermont, energy expenses disproportionately hurt rural, lower-income, non-white, and non-homeowners.[5] Energy spending often competes with other basic needs such as housing, healthcare, and food. According to one Energy Action Network report (see **Figure 1**), households earning less than $27,800 spend more than 18% of their income on heating and electricity bills, compared to less than 5% for households earning more than $80,000.[6] Lower-income households are more likely to rent or own older homes, which are less efficient and more expensive to heat and cool.[7]

Vermont has long benefited from energy produced outside its borders, enjoying clean air and a healthy environment while avoiding many of the environmental impacts tied to polluting energy sources. One example is the effect on Indigenous communities in Canada, where large-scale projects have been developed by Hydro-Québec. As Vermont moves toward a future powered by distributed renewable energy, it must also take responsibility to contribute equitably to energy generation. This means embracing local, renewable energy systems that reduce reliance on out-of-state power and ensure that the benefits and challenges of energy generation are shared fairly. Vermont can lead by example by demonstrating how states can contribute to a more just and sustainable energy system.

Figure 2: Change in Global Mean Surface Temperature Caused by Greenhouse Gas Emissions



Map 1: Climate Vulnerability From Extreme Events



CLIMATE CHANGE RESILIENCE

This plan seeks to enable greater climate resilience, defined as the ability to mitigate climate change through greenhouse gas emissions reductions, while preparing for and adapting to the impacts of climate change across Addison County.[8]

There is strong scientific consensus that the burning of fossil fuels has substantially increased the concentration of greenhouse gases in the Earth's atmosphere over the last two centuries. This trend began with the widespread adoption of coal and oil-based fuels during the Industrial Revolutions in Great Britian and the United States. It accelerated after World War II, as economic recovery in North America, Europe, and parts of Asia drove a sharp rise in fossil fuel consumption—particularly in the 1950s—and continues today.

Greenhouse gases released from burning fossil fuels—especially in transportation, electricity generation, and heating—have a direct impact on the Earth's climate and natural systems. One of the most significant effects has been the substantial rise in the average global surface temperature (see **Figure 2**).

Another extremely potent source of GHG emissions are refrigerants that leak from air conditioners, refrigerators and freezers, and heat pumps. Addison County's climate resilience will increase as actions are taken to transition away from fossil fuel powered energy generation and minimize energy consumption as a whole.

Vermont is a small state, and its per capita CO2 pollution from energy use is already much less than other U.S. states.[9] Vermonters can take pride in their state's relatively low per capita greenhouse gas emissions compared to national averages. In fact, because of its forests, Vermont absorbs more CO2 than it produces. Within that context, climate change is real. The threats of climate change require continued and meaningful action. ACRPC recognizes its responsibility to contribute to state, national, and global climate goals, while also upholding the Region's core planning values. Protecting the Region's natural beauty and environmental integrity remain a priority. Accordingly, ACRPC strongly supports best practices for orderly development and land-use—including siting energy generation and transmission projects in suitable locations, avoiding over-development, and designing projects that are compatible with local habitats.

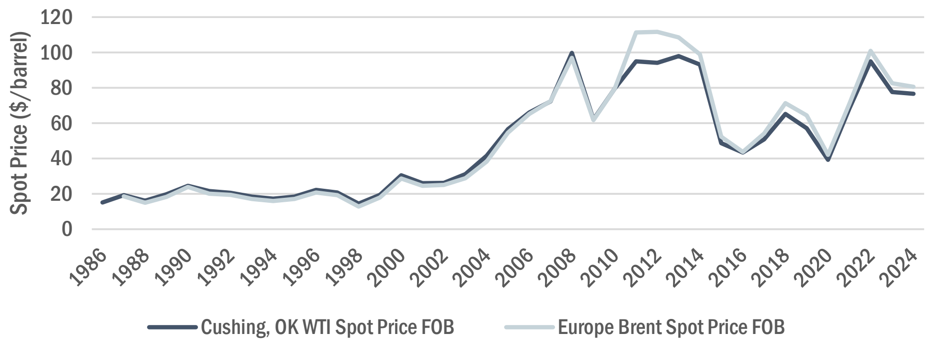
The Addison Region is already experiencing the effects of climate change. (See **Map 1**) Since 1900, Vermont's average temperature has risen about 3°F and is expected to continue rising. These warmer temperatures pose risks to human health and disrupt ecosystems. Indigenous species that rely on cold winters are migrating north, while invasive species are expanding into Vermont. In addition, Vermont's average annual precipitation has increased nearly six inches since the 1960s, causing more frequent and significant flooding across the state. These extreme rainfall and flooding events threaten private and public infrastructure, including energy generation and transmission systems.

This trend is likely to continue. The U.S. Climate Vulnerability Index, for example, ranks Vermont as the 7th most vulnerable state to climate change influenced extreme weather events (Figure 3).[10] This ranking is most likely due to vulnerability to flood events. For more information on this issue, please see the Flood Resilience Section. To build a climate resilient future, the Region must reduce fossil fuel use and adapt its infrastructure and natural systems to withstand more frequent and severe extreme weather events.

Green Mountain Power's "Zero Outages Initiative" is one noteworthy case that, among other measures, pairs the "hardening" of rural distribution infrastructure with strategically placed battery systems to enhance energy system resilience in the region.[11] Further, with a target of 2030, their initiative will enhance the resilience of the Region's energy system in advance of the delivery of other important climate proposals and as the effects climate change are emerging.

A two-pronged approach to climate resilience—focusing on both climate change prevention and adaptation—is essential to securing a safe, just, and prosperous future for the Region. In "Building for a Resilient Tomorrow: How to Prepare for the Coming Climate Disruption," researchers Alice C. Hill and Leonardo Matinez-Diaz argue that "cutting emissions is the best resilience strategy of all because it can safely spare us from some of the worst impacts of Climate Change." The authors note that adaption measures function as shock absorbers against climate change influenced disruptions—much like a seat belt or an airbag—and reduce harm during disruptive events and expedite recovery.

Figure 3: WTI and Brent Crude Spot Prices (1987-2024)



While adaptation is critical for limiting damage and speeding recovery, it cannot fully protect us from the most extreme climate threats. Just as a seat belt has limits, so too does our capacity to adapt to a rapidly warming world. A climate resilient region is one that has done what it can to limit the warming of planet while also addressing the negative outcomes that come with a warmer world because there is likely to be a limit to our ability to adapt to that warmer world. As such, the Region supports both climate change prevention and adaption as the core elements of its climate change resilience goal as it pertains to energy planning.

ENERGY SECURITY

From the oil crisis of the 1970s to the global disruptions caused by the COVID-19 pandemic and the 2022 expanded Russian invasion of Ukraine, geopolitical events have repeatedly posed threats to our energy system and exposed vulnerabilities.

The more an energy system depends on non-domestic sources, the more it is at risk of disruptions beyond its control. Over time, the importance of enhanced energy security has revealed itself through the impacts of increased and unstable energy prices and, in extreme cases, outright scarcity. As can be seen in **Figure 3**, the price of the primary input to the oil-based energy products that many Vermonters rely on is increasingly unstable and trending upwards as well.

ACRPC emphasizes that energy security, defined as access to reliable and affordable energy resources, is a central focus of the regional energy plan to support public health and economic security.

Since 2004, ACRPC's Energy plan has recommended reducing regional energy use through conservation, efficiency, and the transition to renewable energy. This includes replacing fossil fuel-based technologies with electric alternatives powered by clean energy sources. To support this vision, ACRPC has engaged in several planning projects to support this approach such as energy production on municipally owned properties and conducting local outreach and education on energy conservation.

ACRPC believes the Region has both the potential and the responsibility to reduce energy demand and increase local energy supply in ways that strengthen energy security. This includes expanding renewable energy generation and investing in advanced infrastructure like energy storage systems, SMART Grid, and thermal energy networks.

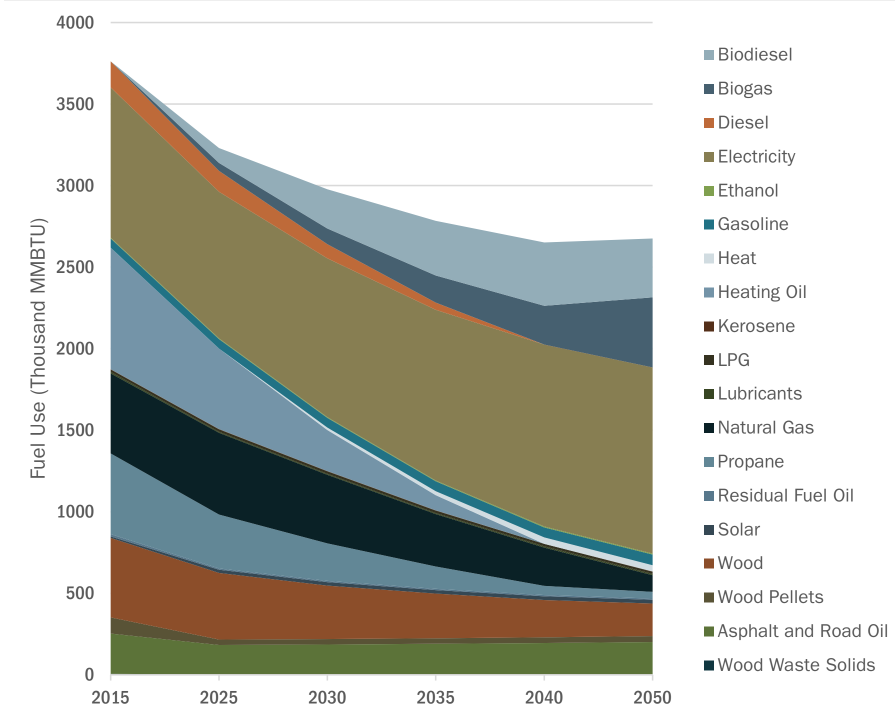
ACRPC is planning for our region's energy future by promoting energy justice, climate resilience, and enhanced energy security. These goals will be pursued in balance with other key social and environmental priorities, including orderly development and sustainable land use. Through this approach, the plan aims to promote the health, safety, opportunity, and well-being of Addison County's residents, Vermonters, and the global community.

Energy Use

The Addison Region's 36,000+ residents use energy for transportation, space and water heating, and to power lights and appliances. This energy plan identifies technologies and practices that support a shift away from greenhouse gas-intensive systems, providing the region with tools to help achieve Vermont's energy goals. **Figure 4**—Projected Energy Use by Fuel Type illustrates how energy use could evolve over the coming decades. In this scenario, Total Energy Use is projected to decline modestly, driven by a combination of reduced demand, fuel switching, and improved energy efficiency.

Figure Note. Projected energy use reduction by fuel type under the climate mitigation pathway to meet state emissions targets.[12]

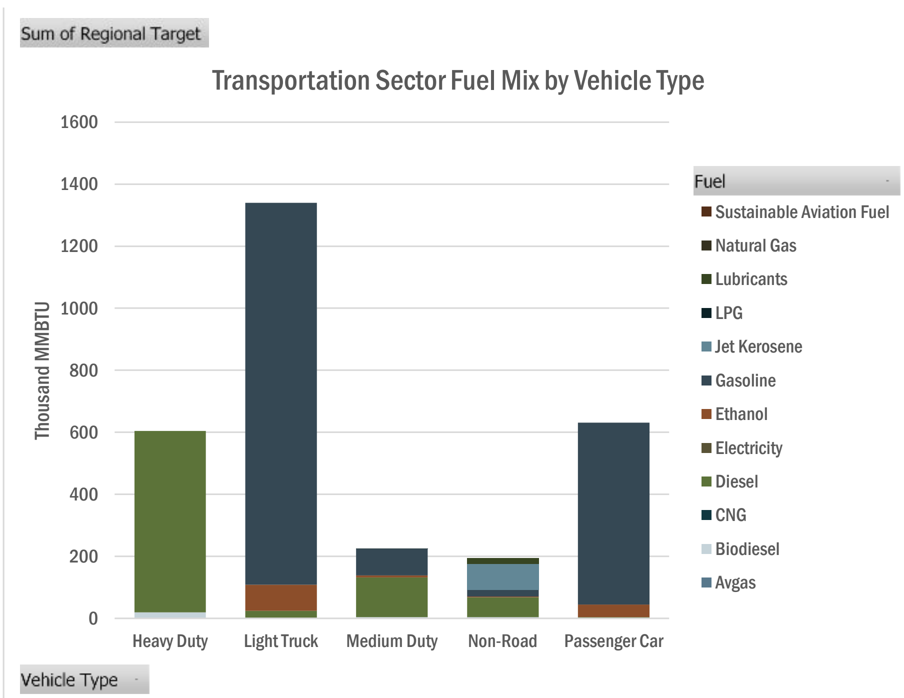
Figure 4: Regional Energy Use Targets by Fuel Type



THE TRANSPORTATION SECTOR

The Addison Region is a predominately rural area, characterized by working farms, forests, small villages, and rural residential single-family homes, along with three more densely populated urban centers. Most commercial and industrial development activity is concentrated in these urban hubs. Due to the region's dispersed settlement pattern, many residents rely on personal vehicles for commuting to work, school, and accessing services and recreation. As a result, transportation accounts for a significant share of the energy use in the Region—estimated at 1,591,281 thousand MMBTUs annually. **Figure 5** shows fossil fuels remain the dominant source of energy for transportation in the region.

Figure 5: Transportation Sector Fuel Mix by Vehicle Type



Most of that fossil fuel use comes from passenger vehicles and light trucks. Some

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of that demand could be reduced through increased use of public transportation, carpooling, walking, or biking to destinations. Many of these options are easy to access through the Go! Vermont website.[13] Additionally, the adoption of electric vehicles or "EVs," internal combustion engine or "ICE" powered vehicles, will itself reduce overall energy demand.[14] Further, while the Region desires to retain its rural feel, it can adopt land use policies that encourage more densely settled, urban centers while maintaining its rural aesthetic. These urban centers have the capacity to allow for more transportation alternatives within those areas, like walking or biking, which reduce energy use and promote public health. As with other conservation goals, conserving energy by reducing the need for cars can be more cost effective than fuel-switching to electric or other alternatively powered vehicles. Therefore, the Land Use section of this Plan promotes greater density and housing options in the Region's villages.

The third largest consumer of transportation fuels in the Region are Heavy Duty vehicles, a class that consumes nearly as much energy as passenger vehicles. Heavy-Duty vehicles are almost exclusively fueled by climate change inducing fuels (**Figure 5**). Unfortunately, alternatives—both fuel switching and behavioral changes—are currently more limited for Heavy-Duty vehicles than they are for Passenger and Light Duty Truck vehicles. The LEAP model created for the previous version of this plan assumed that heavy biofuels would replace fossil fuel in this area. Those technological advances have not happened. As such the Plan continues to support research, development, demonstration, and deployment projects for low-to-no CO2 equivalent Heavy-Duty Trucking, while also remaining technologically neutral in the process.

From Gasoline to Electricity

Gasoline in the region is primarily distributed through individual stations affiliated with major oil companies. In rural towns, these are often small, locally owned convenience stores under franchises. Along major highways, stations are more likely to be corporate-owned chains.

This distribution network has historically met the region's needs, with gas readily available. However, over the past 30 years, economic shifts, changing consumer habits, and stricter regulations on underground storage tanks have affected the gasoline distribution system. Smaller stores, especially in rural areas, struggle to justify the costs of maintaining fuel services. Consequently, residents in these areas are gradually losing local access to fuel and must travel farther to refuel, increasing both inconvenience and dependence on personal vehicles.

The above-ground storage and transport of highly flammable petroleum products pose fire and explosion risks to communities throughout the region. In the 1980s, transport of petroleum products to the region shifted modes from a combination of Lake Champlain barge, rail and truck to primarily truck transport with limited rail use. A 2003 study of the region's major highways found that over 75% of all hazardous materials transported were petroleum-based. In addition, local roads also carry risk, as petroleum products used for heating and cooking are regularly delivered to homes and businesses across the Region.

This plan aims to reduce the region's dependence on gasoline and other petroleum-based fuels by shifting to renewably generated electricity. It supports lowering gas use through efficient vehicles, public transportation, and active transportation, while promoting a transition to electric vehicles. This Plan supports the expansion of EV infrastructure and discourages new fossil fuel-based infrastructure that increases greenhouse gas emissions.

As of spring 2024, there are nearly 400 public EV charging stations across the state. In Addison County, public chargers can be found in 20 locations with about 32 level 2 chargers[15] located in Ferrisburgh, Panton, Starksboro, Shoreham, New Haven, Vergennes, and Middlebury. The 18 fast chargers in the region are located in Vergennes and Middlebury.[16] While many EV drivers charge at home, expanding public and workplace charging is essential—especially for longer trips and commutes, visitors, or those without home access. The ACRPC supports installing EV chargers at key locations such as transit stops, workplaces, schools, community centers, recreation sites, libraries, and village centers, including existing service stations, to provide broad and equitable access.

THE THERMAL ENERGY SECTOR

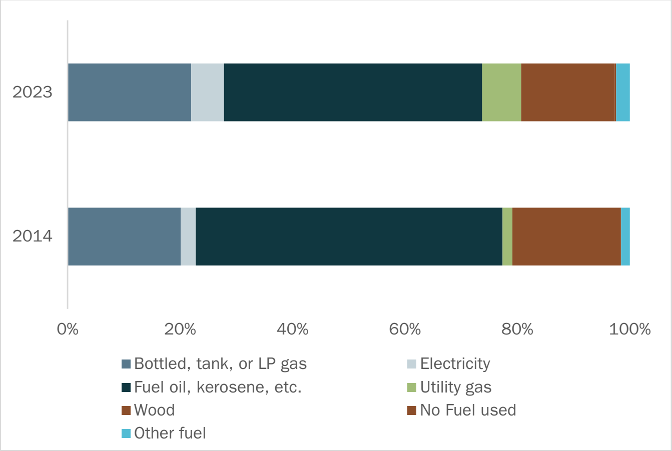
Residential

Residential users are the largest consumers of thermal energy in the Region. After transportation, the greatest share of residential energy use goes toward space heating, cooling, and domestic hot water. Using housing data from the American Community Survey (ACS) and a heating model from the Public Service Department, regional residential heating demand is estimated at approximately 1,610,180 million British Thermal Units (MMBtu), as shown in **Table 2**—Estimated Residential Thermal Energy Demand below. This represents about 12.1% of the State's residential space heating consumption .[17]

Table 2: Estimated Residential Thermal Energy Demand

Households in the Region	Average Annual Heating (MMBtu)	Total Residential Heating Demand (MMBtu)
14,250	110	1,567,500

Table 3: Residential Heating by Fuel Type



A breakdown of that total demand can be seen in **Table 3**. It contains five-year average estimates of the share of the Addison Region households that use a given fuel to heat their homes. According to 2023 ACS data, most homes in the Region heated with fuel oil (about 46%), followed by propane (about 22%) and wood (about 17%). These three fuels comprise approximately 85% of the region's residential heating fuel mix. Notably, the estimated share of households using fuel oil declined by about 16% over the ten-year period ending in 2023. The share of households using wood declined by ~13% during the same period; however, the share of households using propane increased by ~9%. Two other key changes highlighted within Table 3 are the increases in the share of households that are using electricity (~117%) and natural gas (~289%) to heat their homes. Although these two fuel sources currently make up a small share of household heating—about 6% and 7%, respectively—they represent the fastest growing segments of heating demand in the Region. Electricity use is expected to rise with more heat pumps in the area. Natural gas use is also growing due to VGS pipeline expansion, which made inexpensive utility gas more accessible.

Fossil fuels such as fuel oil, propane, and conventional natural gas are limited in supply, and their use contributes to climate change. Dependence on these fuels undermines our region's energy security and climate resilience. To meet State mandates and climate goals, this plan supports the State goal to largely eliminate these fuels by 2050. While fuel oil use has declined, a growing share of households use propane and natural gas.

There are three key strategies to reducing fossil fuel consumption in residential heating:

- Improve thermal efficiency of homes through weatherization and insulation
- Upgrade to more efficient heating technologies to reduce energy consumption
- Switch to renewable, net-zero or lower greenhouse gas emitting fuel sources such as electricity, advanced biomass, or geothermal.

The upfront cost of new equipment is the primary barrier to fuel switching. While the Region cannot control energy pricing, it can promote conservation, efficiency, and affordability especially for low-income households. Incentives like subsidies and tax credits can help ease the financial burden of making the transition to cleaner technologies.

Services available currently providing cost subsidies and/or promoting weatherization and efficiency include:

- The Champlain Valley Office of Economic Opportunity (CVOEO)
  - provides fuel assistance to income-qualified

residents either on a seasonal basis (call CVOEO at 800-479-6151) or on a crisis basis (call CVOEO Addison Community Action at 388- 2285). The CVOEO website CVOEO.org describes additional fuel assistance programs available to Vermont residents;[18]

- Champlain Valley Weatherization Service, part of CVOEO, provides free weatherization services to income-qualified Addison County households;

- Efficiency Vermont has several programs to improve energy efficiency.[19]
- Neighborworks of Western Vermont also offers audits and subsidized weatherization services through their HEAT Squad program;[20]
- Lastly, several of the Region's municipalities run services that supply firewood or other sources of heat to their residents.

Vermont has enacted new residential energy standards. The **Residential Building Energy Standards (RBES)** contains minimum standards and stretch code for energy efficiency for all new residential construction in Vermont.[21] The Vermont Residential Energy Code Handbook 2024[22] includes two primary requirements:

1. A list of technical requirements that includes minimum standards for energy-efficient building components and construction practices; and
2. A certification requirement for reporting compliance. Upon completion, State law requires every Vermont builder to self-certify that the home complies with the RBES standards as built. The builder must complete and sign a certificate and submit it to the Town Clerk for filing. This must be on record before the Zoning Administrator issues a Certificate of Occupancy.

The code assigns local Zoning Administrators the duty to distribute information about the Energy Codes. In theory this provides an opportunity for all towns to communicate with homeowners regarding energy programs and conservation opportunities. In practice, information is rarely distributes and municipalities struggle to enforce the code.

Finally, not all barriers to fuel switching, particularly in the residential space, are financial. Some are behavioral and social.[23] There is also simply a "How do I do this, and where do I begin?" problem. The complexity of personally undertaking an energy transformation project is overwhelmingly– difficult to know where to start, who to call, how to pay, how to choose the best option, and how to know what will actually work, especially for a particular house or building. The cost of getting off of fossil fuel in an existing building is substantial and the process is complex. With the right incentives and tax credits (some eliminated by recent federal legislation), financing, and guidance, however, it can be affordably managed by almost anyone. Without that guidance, it is much more hit-or-miss, likely to be more expensive and less satisfactory. Programs such as the Climate Economy Action Center of Addison County's (CEAC) "Energy Navigator" program which provides residents of the region with energy-use and weatherization consultations from volunteers from within their community is one attempt to address these bundled or aggravated problems of residential fuel switching. Another is the Zero Energy Now (ZEN) program, which undertakes a strategic project design, tying together all the project components with incentives and financing to develop a work scope that is customized, effective, and affordable. ACRPC supports these and similar expanded efforts to address the challenges that prevent residents from adopting new technologies.

Commercial

Estimating thermal energy use in the commercial and industrial sectors is challenging due to Greater variation in energy use of businesses within and between economic sectors. **Table 4** provides an estimate of total commercial energy use (thermal and electricity) based on data from the Vermont Department of Labor (VT DOL) and the Vermont Department of Public Service (PSD)[24]. While approximate, these figures highlight the significant thermal energy use by commercial establishments in the Region, underscoring the importance of their role in conservation and efficiency efforts.

Table 4: Estimated Commerical Thermal Energy Demand (5-year average)

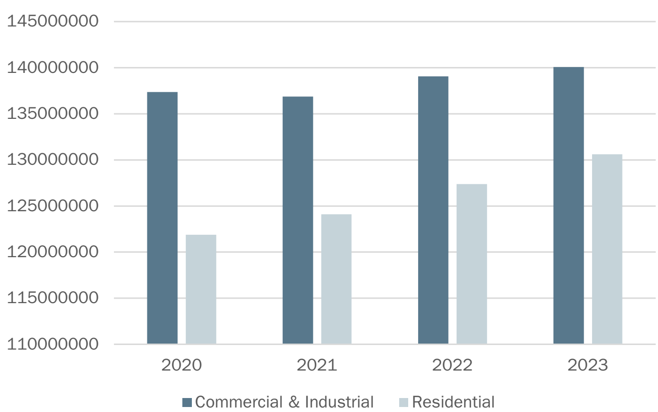
Number of Commercial in the Region	Average Annual Heating Load per Building (MMBTU)	Total Heating Load for Commercial Buildings (MMBTU)
967	1,776	1,717,885

The total thermal energy demand shown in Table 4 represents the thermal demand from the Region's commercial buildings. Estimates of thermal demand by type of commercial building category was provided by the state. The Average Energy Demand presented in the table is the average of the weighted demand estimates for the categories of buildings in the region and is not reflective of the true commercial building thermal demand for the Region.

THE ELECTRIC SECTOR

Electricity constitutes a significant portion of the Region's current energy use. **Figure 6** illustrates recent and current electricity demand in the Region. This Plan anticipates a major shift from non-renewable fossil fuels to electric-powered vehicles, heat pumps, and other new technologies, driving increased electricity demand. At the same time, the supply of locally generated, renewable electricity is expected to grow, changing the traditional model of centralized energy generation and delivery.

Figure 6: Regional Demand for Electricity



Residential Use

Efficiency Vermont data estimated that residential electricity demand for the region increased from about 115,000 MWh to about 139,500 MWh between 2019 and 2023. This corresponds with an average change in the electricity demanded of about 5% annually during that period. Additional data about regional, residential electricity demand can be viewed in **Table 5**.

This increase is to be expected. As shown in **Table 3**, the American Community Survey (ACS) estimates that the number of households in the Region grew by about 3% between 2014 and 2023. As more households in the Region adopt electric appliances and vehicles, electricity demand is expected to rise. However, both policymakers and residents should remain aware of this growth and explore formal and informal strategies to help limit overall consumption. Encouraging energy-efficient technologies, promoting behavioral changes, and supporting local and state-level initiatives will be key to managing this transition sustainably.

Table 5: Regional Electricity Demand, Residential (MWh)

End User Type	Residential
2019	115,091
2020	127,369
2021	134,454
2022	136,588
2023	139,482
Avg. Change	4.98%

Simple, inexpensive actions can significantly reduce energy use. Turning off lights in empty rooms, switching to energy-efficient bulbs, and using timers or sensors to regulate lighting, heating, and cooling are easy ways to cut consumption. Weatherization and insulation of buildings—both new and existing—can greatly improve energy efficiency. Additionally, upgrading to efficient appliances, motors, and heat pumps can further reduce electricity use and lower energy bills.

Commercial and Industrial Use

As shown in **Table 6**—Regional Electricity Demand, Commercial and Industrial (MWh), commercial and industrial users in the Region consumed about 146,159

Table 6: Regional Electricity Demand, Commercial (MWh)

End User Type	Commercial & Industrial
2019	138,092
2020	134,912
2021	140,627
2022	140,543
2023	146,158
Avg. Change	1.47%

mega-watt hours of electricity in 2023, the most recent year with available data. This amount slightly exceeds residential demand and accounts for just over half of the electric energy used in the Region. Though commercial and industrial customers used more electricity than residential consumers, their demand has increased at a lower rate on average. Between 2019 and 2023, commercial and industrial users' electricity demand increased by about 1.5% from about 138,092.25 to 146,158.67 MWhs.

Businesses in the Region rely on electricity to power industrial equipment as well as everyday operations like lighting and computers. As sectors continue to electrify, some growth in demand is expected—but must be managed. Profitability gives businesses a strong incentive to use electricity efficiently. Green Mountain Power has some excellent business focused efficiency programs and incentives. To meet future energy goals, ACRPC encourages further investment in conservation and cost-saving measures.

Generation and Infrastructure

Energy more than ever powers the modern world. Businesses and business growth demand it to produce goods and services, including new AI services, which are proving to create massive demand. Homes and the comfort of modern conveniences also demand consistent (24/7/365) supplies of affordable energy. New competitively priced local generation can turn the Addison Region into a provider of clean power rather than a consumer of imported power. Distributed generation is beginning to offer this choice for a greater share of the power the Region consumes. Power from solar and wind, made more consistently deliverable by battery storage technology, renewable gas and heat from our farms and waste systems and thermal networks all offer generation potential to help power the Region. In order to continue to support their production the Region needs right sized infrastructure to deliver the power to the people and businesses that need it. Infrastructure such as electricity distribution lines, gas pipelines, and sewer systems support development by lowering costs and improving access. Decisions about extending or upgrading infrastructure should carefully consider potential impacts on regional growth patterns.

ENERGY ACCESS IN THE REGION

Residents and businesses in the Region access energy through a combination of the electric grid, delivered fuels (e.g., oil and propane), and the Vermont Gas Systems (VGS) natural gas pipeline. The grid includes:

- Transmission infrastructure that feeds or passes through the Region,
- Distribution infrastructure that delivers electricity to end users, and
- Local generation facilities that contribute to the Region's energy supply.

Electric Transmission

The Vermont Electric Power Company (VELCO) manages the transmission of electricity across Vermont and as part of the broader New England grid. VELCO updates its Long-Range Transmission Plan every three years. The 2024 Plan projects that peak electricity demand will rise due to the electrification of heating and transportation. While the transmission system is expected to meet demand for the next 10 years, load management will be essential to accommodate high electrification levels over the 20-year horizon.

Addison County Reliability Concerns

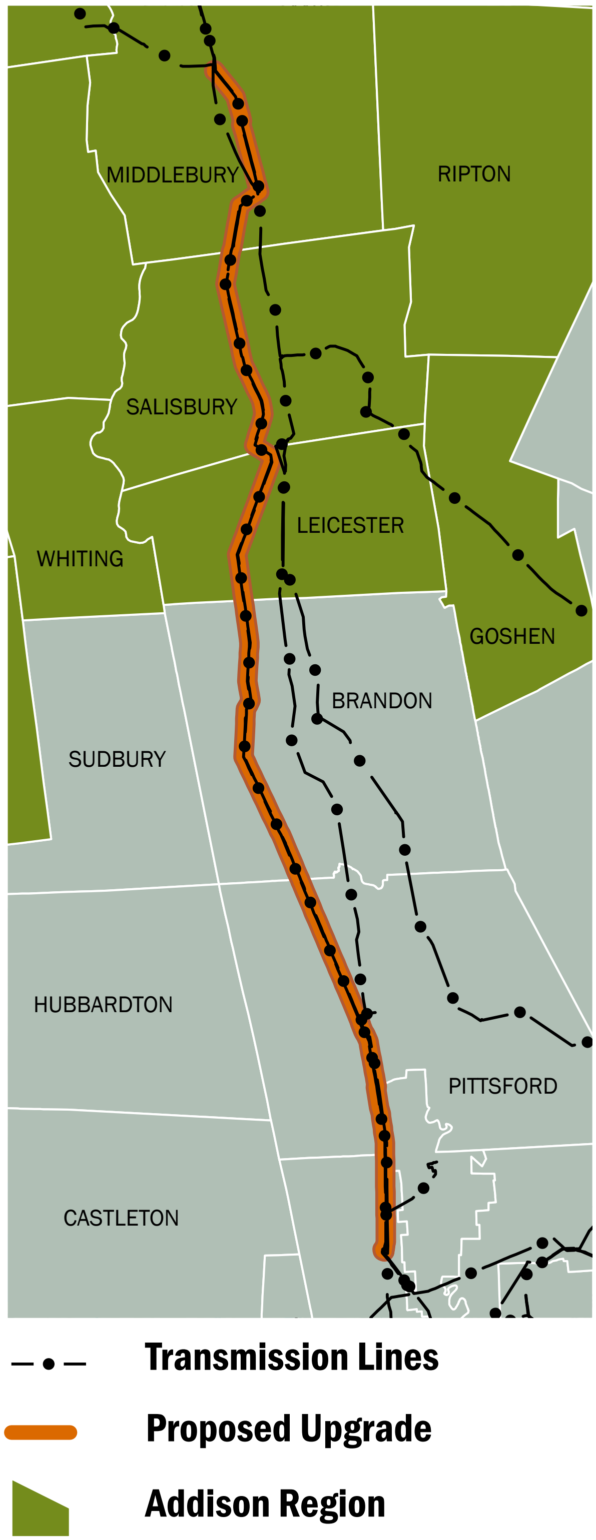
Within the 10-year planning window, sub-transmission reliability issues—such as high/low voltage and thermal overloads—are anticipated. A key concern is the Middlebury transformer, which is projected to fail between 2029 and 2033, depending on load growth, if it is not improved or other large-scale changes are not made prior to that timeframe.

VELCO's proposed solution is to increase the capacity of the West Rutland to Middlebury 115kV line, shown in orange on the adjacent map. The estimated cost of this upgrade is $215 million.

An alternative approach would reduce projected load growth by 80 MW by 2033, allowing existing infrastructure to remain functional short-term. This reduction could be achieved through:

- Weatherization
- Energy efficiency improvements
- Flexible load management
- Energy storage solutions

Figure 7: Regional Transmission Upgrades



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ACRPC supports cost effective improvements including exploring alternative organizational models, to enable targeted infrastructure investments that meet local needs.

Electric Distribution

In 2021, Vermont distribution utilities purchased over 5.8 million MWh of electricity and retired just over 4 million renewable energy certificates[25] (representing just over 4 million MWh of electricity) to meet their obligations under Vermont's Renewable Energy Standards. 72% of the electricity Vermont accounted for was renewable; 90% was low-carbon with the inclusion of nuclear generation.[26]

Green Mountain Power (GMP) serves most of Addison County except for a portion of Starksboro served by the Vermont Electric Co-op. **Figure 8** shows sources of electricity distributed by GMP in 2021 (before the sale of renewable energy credits (RECs)[27]. GMP owns several generation facilities, enters into power purchasing agreements with individual power suppliers, and purchases power from the wholesale electricity market, ISO-NE[28], delivered to the Region through the Transmission system described above. Green Mountain Power draws electricity from the transmission grid into substations that stepdown the voltage and distribute it through the distribution grid. Currently, the substation and distribution grids constitute the biggest contract in the electric system on the Region's ability to locally generate energy.

Distributed Generation and Grid Coordination

Currently, distributed generation (DG) projects—such as solar and wind—are reviewed individually, without considering their cumulative impact on the transmission system. This approach must evolve.

To avoid overloading the grid, Vermont must pursue coordinated, statewide transmission modernization. As more DG and storage projects come online, collaboration among VELCO, developers, municipalities, and regional planners will be critical to achieving energy and emissions goals.

This coordination must also prioritize equity and environmental stewardship, ensuring that:

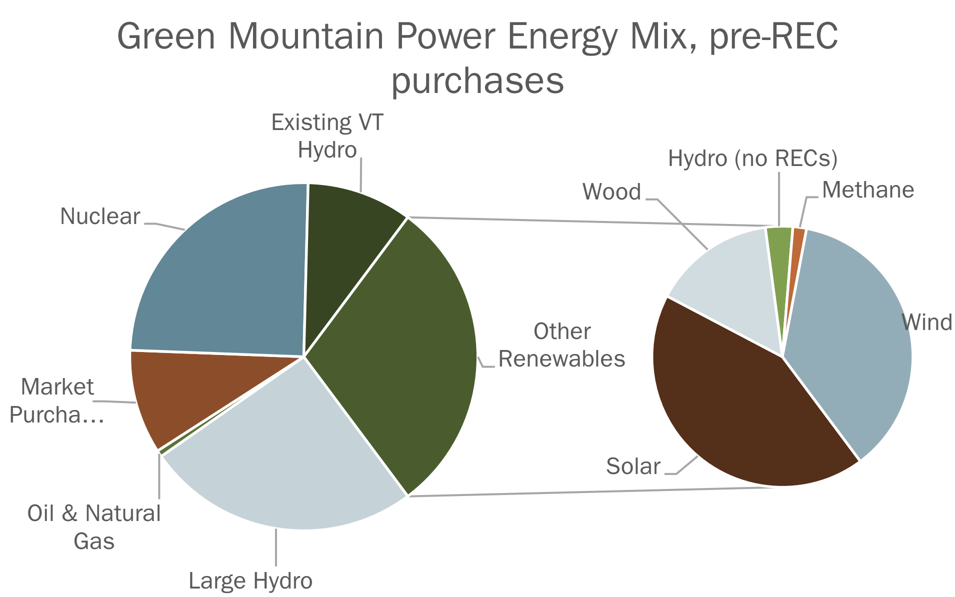
- Landscapes and natural resources are protected,
- Benefits are shared broadly, and
- Historically burdened communities are not left behind.

Delivered Fuels

Several companies in the Addison Region deliver propane and fuel oil to residential, commercial, and industrial customers, primarily for space heating and cooking. These fuels are mostly trucked into the Region, with additional deliveries and storage occurring at a rail facility in Leicester Junction. Retail distribution is available throughout the area.

While this Plan supports a long-term phase-out of fossil fuel use, it also acknowledges the essential role these businesses have played and continue to play in the community. ACRPC supports a just transition for fuel providers and the customers they serve, ensuring that economic and social impacts are addressed as the Re-

Figure 8: Green Mountain Power Energy Mix, pre-REC purchases



gion moves toward cleaner energy sources. The transition, while important, must be accomplished within the context of keeping power reliable and affordable.

Natural Gas

Vermont Gas Systems (VGS) has extended a 41-mile natural gas pipeline into the Region and continues to expand secondary distribution. The pipeline serves or is expected to serve customers in up to seven communities, including two of the Region's three employment centers—Vergennes and Middlebury—as well as village areas in Monkton, New Haven, and parts of Weybridge and Ferrisburgh.

The pipeline has been a source of regional debate. When proposed, natural gas offered a lower-cost alternative to other fuels. However, many residents opposed investing in long-term fossil fuel infrastructure. After extensive discussion, ACRPC conditionally supported the project through a Memorandum of Understanding (MOU) with VGS. Key conditions included:

- Extending service to villages along the pipeline route to support compact, planned growth,
- Providing training for local first responders, and
- Incorporating renewable natural gas (RNG) from agricultural and food waste into the fuel mix.

VGS is working to make RNG opportunities available to local farmers and food manufacturers.

Although natural gas was intended as a transitional fuel, its lower cost has generated strong interest in communities with access to the VGS network, helping reduce energy burdens in the short term. ACRPC will continue to collaborate with VGS to support sustainable economic development while exploring long-term solutions that align with climate and equity goals. These include additional opportunities to generate renewable natural gas from farm and waste products and creating and expanding thermal networks in the Region.

LOCAL GENERATION

The Region's energy generation is largely consistent with statewide patterns. As of October 2024, roughly 2,055 sites generate 225,428 MWh of solar, wind, hydro and bio-methane power annually within the Region (Table 7)[29]. The discussion below covers renewable generation types available to the Region's residents and how they might harness them to meet statewide generation targets. A map of existing renewable generation systems in the Region with capacities above 15 KW can be found in the Appendix (**Figure 12**).

Table 7: Regional Renewable Generation

Technology	Capacity (MW)	Annual Generation (MWh)
Farm Methane	1.67	10,983
Hydro*	10.70*	46,866*
Solar	63.61	82,368
Wind	0.42	833
Biomass	1.93	11,847
Grand Total	87.69	152,898.03

Hydropower

The Region was historically developed with hydropower. The Middlebury River, New Haven River, and Otter Creek powered the first mills in Middlebury, Bristol, and Vergennes respectively. Green Mountain Power now owns seven hydropower facilities in the Region five on Otter Creek, and one each on Sucker Brook and Leicester River. These facilities range from under 7,000 MWh to over 22,000 MWh annually, collectively producing close to 85,000 MWh, approximately 33 percent of the Region's electricity consumption.

Hydropower comes with benefits and drawbacks. Environmental impacts can be significant: projects can change stream character upstream, downstream, and at dam locations, and can alter water chemistry and biology. Both run-of-river and reservoir-based systems can also limit fish mobility and block spawning access. Reservoir fluctuations can cause shoreline erosion, habitat degradation, and harmful phosphorus and nitrogen levels in sediment collected behind the dam.

Climate change presents both challenges and opportunities. Drought threatens water availability and future capacity. However, climate change in Vermont has generally increased rainfall, generally increasing hydropower potential. Hydropower also offers substantial ben-

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efits: controllable, carbon-free renewable energy—a critical advantage over intermittent sources. When properly designed and managed, systems also contribute to flood control, increasingly important as climate change makes flooding more likely. Overall, the benefits of locally sourced renewable energy through limited hydropower outweigh the burdens, especially if those burdens are managed and mitigated through run of river systems, required fish ladders or programs, where applicable, access improvements and other programs.

Solar

Photovoltaic systems currently provide about one third of the generation capacity in the Region. Most PV systems in the region have a nameplate capacity below 15 kW. The RPC expects solar generation to grow to meet future generation targets. Doing so would improve the Region's resilience to climate change—by reducing greenhouse gas pollution—and enhance its energy security with more domestic production; however, more solar generation will likely result in land-use changes that could impact social and environmental considerations like rural river sheds or habitat connectivity. As **Figure 9** shows, the land-use needs of commercial-scale and utility-scale solar can be substantial.

Careful consideration of such impacts is essential for a just energy transition in the region. Fortunately, project design and development practices for solar PV that enhance eco-system function and enable continued agricultural use do exist. Referred to as "eco-voltaics," ecologically informed solar facilities on agricultural land can support energy development, habitat needs, and agricultural policy goals.[30]

Beyond photovoltaics, passive solar through proper building orientation and high-efficiency insulation can offset 15-50% of lighting and heating costs.[31] Solar water heating can reduce water heating costs by up to 65%. This plan supports additional commercial and residential solar projects within the region. Commercial solar development must include design features preserving river sheds and must be located within areas designated by the local municipal energy plans.

Figure 9: Comparison of PV Sites by Facility Type

Residential scale	Commercial scale	Utility scale
Capacity < 15 kW	Capacity > 15 kW and < 500 kW	Capacity > 500 kW

Wind

Wind represents less than 1MW of generation capacity in the Region, mostly from systems under 15kW. The National Renewable Energy Laboratory identifies most of the Region as having Class 1 winds (below 12 mph), unsuitable for commercial-scale wind power. This Plan supports small residential wind development with sufficient setbacks following Public Service Department guidelines in "Siting a Wind Turbine on Your Property".[32]

A small portion of the Region has Class 3 winds (around 12 mph at 100 meters), marginally suitable for large-scale installations. Ridgelines at 2,000-3,500 feet elevation are ideal for wind generation. Areas in Starksboro, Lincoln, and Ripton have Wind Power Class 3 or greater, making large-scale generation feasible. However, much of this land lies in the Green Mountain National Forest, with significant portions designated as Wilderness. This Plan opposes commercial development within "Known Constrained" areas on Map 4, including wilderness areas, but sets no further restrictions on commercial wind generation and supports member municipalities' wind policies.

Biogas and Biomass

Biomass resources—including manure, food waste, cheese whey, slaughterhouse waste, and brewery residuals—can produce renewable natural gas, often referred to as "Farm Methane" in state databases. While these projects require significant upfront investment, resulting in relatively few operations in Addison County, they offer valuable co-benefits:

- Diverting waste from landfills
- Producing fertilizer as a byproduct
- Generating methane for energy production
- Creating waste heat for capture through thermal energy networks

Biogas systems raise similar concerns as natural gas because they produce greenhouse gases—mainly methane during compost breakdown, and CO_2 when burned. However, due to the co-benefits listed above and the absence of extractive mining, biogas is considered a more sustainable, preferrable alternative to traditional natural gas. These climate and co-benefits are part of why the State of Vermont views biogas as one climate solution for the State's agriculture sector.[33] Challenges with this solution remain, including finding ways to capture a greater share of the gases produced, preventing "fugitive leaks" of the methane captured, and minimizing the impacts of distribution from producers to customers.[34] As such, the ACRPC supports climate solutions like biogas for rural and agricultural settings and encourages the adoption of strategies that minimize the social and environmental costs such as the recommendations from the Natural Gas STAR Program.[35]

Another primary form of biomass used to satisfy energy demand—particularly heating demand—in the Region is wood. The use of wood for heating—and electricity in the case of wood-fired power plants – supplied about 6% of the nation's total energy consumption as of 2005, and, while 23% of wood energy used at that time was consumed residentially, 70% of residential wood energy went to heat rural homes.[36] A similar trend can be seen in the Addison Region: about 16.5% of the Region's homes were still heated primarily by wood stoves as of 2023. Wood heating using wood chips and pellets has also been encouraged as a heating solution for schools and other public or commercial buildings in Vermont. Due to the abundance of wood in Vermont, the renewable nature of the energy source, and its lower carbon footprint when compared to fossil fuels, wood energy will likely remain a key component of the fuel mix in the region.

This understanding is confirmed by State determined LEAP targets for the region: targets for residential, commercial, and industrial wood energy use for the region are 13.20%, 17.41%, 1.07% of total energy use by sector, respectively. As such, ACRPC recommends three primary actions be undertaken to support wood energy use into the future.

1. When residential, commercial, and industrial heating systems need to be replaced, we recommend that folks consider shifting from old-fashioned wood stoves and fossil fuel powered systems to advanced wood pellet stoves, such as "Catalytic Stoves" which are significantly more energy efficient and that produce less air pollution.[37]
2. The further development of the local wood-based economy including new "densified biomass fuel manufacturing facilities" and distribution centers to fuel the transition to advanced wood heating.[38]
3. The expansion of public wood banks such as Monkton and Starksboro Wood Banks as well as the subsidization of the upfront costs of switching to advanced wood stoves so that low to moderate income Vermonters in our region can benefit from this transition.

Energy Storage

The Addison Region currently hosts about 4.5 megawatts of battery storage capacity.[39] More than 60 percent comes from two large GMP projects in Ferrisburgh and Panton, with the remainder distributed across other municipalities.

- While lithium-ion batteries dominate modern renewable energy storage, alternative solutions include:
- **Thermal energy storage:** Stores heat in materials like molten salts or water for later electricity generation or direct heating/cooling use
- **Pumped hydro storage:** Uses excess energy to pump water uphill, storing gravitational potential energy that can be released through turbines
- **Solid-state batteries:** Next-generation technology using solid electrolytes instead of liquid, potentially offering greater energy density and safety

Each storage technology has distinct benefits and drawbacks. However, all address peak energy demand periods and transmission capacity limitations.

The Region strongly supports pairing new commercial or industrial generation facilities with storage capacity. Storage improves local energy system resilience and reduces expensive peak power purchases. Battery storage costs are declining rapidly at both industrial and residential scales.

At the residential level, programs like GMP's Tesla Powerwall offering demonstrate this potential. The program provides homeowners with a Powerwall and operating software in exchange for allowing GMP to draw power during peak demand. Homeowners gain backup power for several hours of typical use during outages. The ACRPC supports this and similarly designed programs that address high upfront storage costs while fairly distributing benefits and costs.

Thermal Networks

Infrastructure investments that maximize co-benefits and energy efficiency—such as capturing waste heat or creating thermal energy networks—reduce demand on electric infrastructure while supporting cost and emissions reductions.[40]

Thermal networks capture existing waste heat from building ventilation or wastewater and use it to heat or cool buildings with air-to-water heat pumps, which are far more efficient than air-to-air source heat pumps. The ACRPC is developing a pilot thermal energy planning map to support consideration of thermal energy networks in future development (See **Figure 17** in the Appendix).

Integrating waste heat recovery into planned wastewater system upgrades offers communities a significant opportunity. Heat recovery from wastewater can produce potable hot water and provide heating and cooling for buildings. Wastewater is a continuous, existing source of thermal energy—average residential wastewater temperature is 70°F, while commercial and industrial wastewater can reach 140°F or higher. Heat recovery systems are simple, low maintenance, scalable from single buildings to large district networks, and offer customers lower, predictable heating and cooling bills.

Emerging Technology

The energy resource and storage landscape is rapidly evolving. As new technologies become viable, ACRPC will continue to analyze and distribute information on appropriate uses for orderly economic development and land use in the Region.

Current Municipal Generation

Table 8 displays renewable generation capacity in the Region by municipality as of January 2024. The data comes from several sources and should be considered an estimate, as new renewable generation sites may emerge, and existing sites may expand or close.

Table 8: Renewable Energy Generation Capacity, by Municipality, by Generation Type

Municipality	Farm Gas (MW)	Hydro (MW)	Solar (MW)	Wind (MW)	Biomass (MW)
Addison	0.45	-	1.79	0.008	-
Bridport	0.01	-	3.13	0.02	-
Bristol	0.45	-	4.79	-	-
Cornwall	-	-	1.26	0.03	-
Ferrisburgh	-	-	10.83	0.15	-
Goshen	-	-	0.11	-	-
Leicester	-	-	0.47	0.01	-
Lincoln	-	-	0.85	<0.01	-
Middlebury	0.76	2.25	14.56	0.02	1.78
Monkton	-	-	1.7	-	-
New Haven	-	5.85	8.8	0.01	-
Orwell	-	-	1.19	0.01	-
Panton	-	-	6.23	-	-
Ripton	-	-	0.41	<0.01	-
Salisbury	-	-	0.82	-	-
Shoreham	-	-	1.81	-	-
Starksboro	-	-	1	<0.01	-
Vergennes	-	2.6	1.96	0.1	-
Waltham	-	-	0.57	<0.01	-
Weybridge	-	-	0.56	-	0.16
Whiting	-	-	0.76	-	-
TOTAL	1.67	10.7	63.6	0.358	1.94

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Goals, Objectives, and Actions

GOAL 1: Build regional capacity for energy planning and public engagement to support the transition to renewable energy and improved energy efficiency.

Objective 1:

Educate consumers regarding efficiency and energy conservation.

a. Regularly host a regional energy fair.

Objective 2:

Expand targeted ACRPC energy services for municipalities.

a. Expand the regional staff position to focus on developing municipal energy projects and advising municipalities on regulations and enforcement.

b. Work with municipalities to learn what types of energy projects are needed in each town.

GOAL 2: Increase the Region's thermal energy efficiency through municipal leadership and support for residential and commercial heating improvements to meet local and State targets of 90% renewable energy by 2050.

Objective 1:

Promote energy efficiency in municipal buildings.

a. Work with towns to develop and implement MERP energy assessment recommendations, including facilitating access to grant or bond funding and group purchasing programs to reduce costs.

b. Advocate for a state-wide, municipal utility tracking software to support ongoing evaluation of the costs and benefits of municipal energy efficiency and weatherization projects.

Objective 2:

Encourage local and sustainably harvested wood and efficient wood heating.

a. Promote EPA III approved energy efficient wood stoves through education and outreach.

b. Promote sustainable timber harvest from regional and town forests, in accordance with Natural Resources goals, to provide local heating and electricity fuel sources, prioritizing access for low-income citizens.

Objective 3:

Support weatherization efforts and optimize building design for energy conservation.

a. Coordinate with CVOEO, Neighborworks, Efficiency Vermont, VEEP, and CEAC's Energy Navigator program to encourage weatherization participation, including event support, grant assistance, project development, and education/outreach collaboration.

b. Promote the installation of air source and geothermal heat pumps.

c. Support thermal energy network development and explore community-based utility models (municipal, neighborhood, cooperative) that build local capacity and resilience.

d. Encourage municipalities, businesses, organizations and homeowners to build to higher energy standards (RBES/CBES "Stretch energy code") and work with willing local planning commissions to incorporate these standards into municipal plans and zoning regulations.

John Graham ZEM program KTP Bristol

GOAL 3: Modernize the Region's electrical systems and promote efficient energy use in buildings.

Objective 1:

Support energy conservation and efficient use of electricity in buildings.

a. Discourage the use of "always on" lighting in parking lots and other indoor and outdoor lighting in public places. Encourage the use of technology like motion sensors to light areas when needed.

b. Advocate for the availability of smart meter technology to help consumers understand and regulate their electricity usage.

Objective 2:

Work with municipalities, electric utilities and community groups to modernize grid infrastructure and support the clean energy transition.

a. Help the Region's municipalities investigate and install, or purchase, cost-effective municipal solar and/or wind net-metered facilities to power municipal energy use.

b. Work with GMP to ensure that as the Region transitions to distributed electric generation and increased electricity reliance, GMP regularly updates its distribution and transmission infrastructure to provide cost-effective, reliable service to all communities and eliminate current congestion in the Addison Region.

c. Advocate for appropriate cost allocation policies: globalizing costs for residential-scale distributed generation while requiring commercial/industrial generators to fund improvements necessary for their projects.

d. Share info with VELCO, GMP and VECOOP to ensure that targets for renewable generation in the Region and across the state are optimized to enhance the cost effectiveness of the transmission and distribution system for the State of Vermont. Support grid upgrades where they will provide the greatest cost/benefit.

e. Strongly encourage the Region's electric utilities to adopt the new standards for digital substations from the National Electrical Manufacturers Association.

f. Suggest that new renewable energy projects in the region be designed in such a way so that they are "storage ready," or are capable of being connected to onsite or nearby storage projects without significant retrofitting.

g. Require newly installed generation systems to meet the following standards when relevant IEEE1547-2018, IEEE2800-2022, IEEE 2030-2011, and IEEE 2030.7-2017 for connection to the grid.

GOAL 4: Reduce transportation energy consumption by transitioning to electric vehicles and promoting mode shift away from single-occupancy vehicles.

Objective 1: Support the development of electric vehicle infrastructure and promote EV adoption.

a. Plan for and install electric vehicle charging infrastructure on municipal property.

b. Encourage major employers in the Region to install (additional) EV charging stations for employees.

c. Develop an EV Readiness report that includes strategic infrastructure improvement recommendations as well as assessments of municipal fleets.

d. Promote the Drive Electric Vermont website and resources.

Objective 2:

Reduce vehicle miles traveled and support the development of alternative transportation options.

a. Support Walk-Bike Council of Addison County efforts to increase safe walking and biking access by facilitating complete streets infrastructure and helping municipalities secure funding for incremental bicycle and pedestrian improvements.

b. Support public transit expansion by working with TVT to improve rural service access, encouraging municipal representation on transit boards, promoting park-and-ride and ride-sharing programs, and advocating for enhanced public transit access during planning proceedings.

c. Support employer programs to encourage telecommuting, carpooling, vanpooling, for employees' commute trips.

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GOAL 5: Transition medium and heavy-duty transportation to cleaner fuel alternatives.

Objective 1:

Support improvements to rail infrastructure and encourage cleaner fuels for large vehicle fleets.

a. Support transportation goals for expanding passenger and freight rail service (see Transportation Section) to reduce vehicle miles traveled and fossil fuel consumption.
b. Work with Clean Cities Coalition to encourage large vehicle fleets to switch to conventional natural gas use in situations in which switching to EVs or renewable natural gas is not feasible.

GOAL 6: Advance renewable electricity generation while protecting natural resources.

Objective 1:

Encourage municipal renewable energy generation.

a. Analyze the feasibility and support the installation of additional municipal solar and/or wind net-metering facilities that are compliant with the standards enumerated in this plan to off-set municipal electric use.

Objective 2:

Support responsible siting and development of renewable energy resources.

a. Work closely with the municipalities impacted by proposed energy development projects to ensure responsibly sited and developed renewable energy projects are implemented in the region.
b. Expand regional and local energy storage and promote local microgrids to improve energy system reliability and resiliency.
c. Support local on-farm or residential scale renewable distributed generation projects.
d. Support municipal enhanced energy plans by the development of generation utilities in identified preferred locations over the development on other sites.

Objective 3:

Encourage compact settlement patterns and conserve forest land as renewable resources.

a. Support housing goals for compact development, infill, village center growth, and shared utility infrastructure (see Housing Section) to reduce transportation energy demand and enable efficient energy systems.
b. Discourage the conversion of forest blocks and other important ecosystems into exclusively energy generating sites.

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