Central Vermont Regional Planning Commission

Regional Plan Committee

January 7, 2025 at 4:00 pm

29 Main Street, Suite 4, Montpelier, VT 05602

To join Zoom meeting:

https://us02web.zoom.us/j/87815276521?pwd=Mmw5U080SGpCTUFNVHZFSERQUll0dz09

Meeting ID: 878 1527 6521, Passcode: 783374

One tap mobile 1(929)436-2866 or 1(301)715-8592

Persons with disabilities who require assistance or alternate arrangements to participate in programs or activities are encouraged to contact Nancy Chartrand at 802-229-0389 or chartrand@cvregion.com at least 3 business days prior to the meeting for which services are requested.

AGENDA

4:00 pm[2]	**Adjustments to the Agenda**
	Public Comment
4:05 pm	**Approval of Minutes**[3]
	October 2024 and December 2024 minutes
4:10 pm	**Energy Chapter review** (discussion)
5:30 pm	**Adjourn**

Next meeting: January 21, 2025

[1] Dial-in telephone numbers are "Toll" numbers. Fees may be charged to the person calling in dependent on their phone service.

[2] All times are approximate unless otherwise advertised

[3] Anticipated action item.

Central Vermont Regional Planning Commission

MEMO

Date: December 30th, 2024 (modified from December 20th and previously November 16th)
To: Regional Plan Committee
From: Sam Lash, Climate & Energy Planner
Re: Key discussions for Regional Plan Committee to support update of Energy Chapter and Supplement (Enhanced Energy Plan)

This memo provides a brief synopsis of the status of the Regional Energy Chapter (Element)/Enhanced Energy Plan and more so was intended to guide discussion at the November 24th, 2024 meeting to get content specific feedback from the committee to enable analyses and mapping to be completed and drafting to be streamlined into deliverables.

Approach to the chapter: The current "interim" enhanced energy plan (100+pages) was structured explicitly to follow the Act 174 standards (main audience Public Service Department & technical stakeholders). Hearing clearly the desire of this committee to have a plan that was more accessible to the general public, this iteration is substantially abbreviated, with much of the required material, especially town level data, provided as a supplement instead of integrated into the main text of the chapter.

Attached December 30th

- Abbreviated Energy Chapter draft
- Infrastructure and Transportation Energy Excerpts (for reference)

What you had for the November 24th meeting in the packet and in supplements:

- Abbreviated chapter draft
- Infrastructure Excerpt
- Supplement (in progress)
- Placeholder Maps (conversation in live map envisioned- video workshop available online how to use Act 174 tab of the ACCD Planning Atlas)

Key Discussions (please feel free to share additional feedback and/or meet with Sam as well- ***note the discussion for November was originally envisioned to be split into two parts, the first focused on the analysis & targets across the Thermal, Transportation, and Electric Sectors as well as overall organization, audience, etc. And the second on mapping and siting)***

New Policies/Potential

- High Efficiency Cord Wood Stove Targets and Policy Pages 12-14; Page 7 supplement

1. ***This section describes how the states' electrification approach to space heating, specifically in the residential sector, fails to consider the important role cord wood specifically plays in many Central VT communities. This was a hot button issue for many of our board members and communities during the last plan that some felt we failed to address and comes up often while doing Municipal Enhanced Energy and Town Plans. Note this is specifically regarding cord wood and space heating- not to be conflated with biomass for electric generation.***
2. *CVRPC supports the transition from fossil fuel heating fuels using not only heat pumps (air and ground sourced), but also strongly supports the conversion of inefficient wood stoves to advanced wood heat stoves to reduce air pollution emissions, reduce heating costs, amount of wood fuel used, and provide an accessible option for many Vermonters- our targets for the thermal sector reflect this commitment. Page 14;*

- To "right-size" the impacts of renewable energy generation infrastructure in Central VT in terms of land use- keeping in mind key priorities like conservation of forest blocks, resilient & compact housing, and flood mitigation- there are three main key points put forth throughout the plan:
    1. Community-scale measures to reduce future electric demand growth are crucial to an equitable transition in Central VT (emphasize our consistent dedication to energy conservation and efficiency- basically let's reduce how much we *need* to electrify in the first place):
        a. Small role re coordination in terms of demand management and storage; but a much clearer role for us and a large state gap in focus on wasteheat recovery, ground source heat pumps, Thermal networks/district heat)- these tend to be popular in community discussions but extremely underemphasized in state approach- great gap to emphasize at the regional scale (can provide context in meeting)
        b. I have embedded language throughout building off existing language and also have begun developing tools such as Municipal Toolkit and TENS OPPORTUNITIES MAP that can be integrated into our housing and land use conversations with the committee and board's support
        c. Designated Village Centers are present opportunity areas from which we can identify future or expansion opportunities that are most likely/ feasible
    2. Energy conservation, efficiency, green infrastructure options, resilience, and renewable energy generation & storage should be integrated into other types of development planning- where possible the region prefers overlapping these development footprints- we should be maximizing co-benefits- **see section Future Renewable Energy Generation starting page 40 especially** but integrated throughout.
    3. Discuss limited role biomass and wind likely to play in region re electric generation, the limits of small scale solar in terms of project and infrastructure costs despite strong preference, and the VT moving forward (many up for FERC recommissioning which is a costly & lengthy process, but yet hydro makes up a significant portion of our current generation. What is the potential appetite for other types of hydro? For new hydro projects?
        - Hydroelectric dams are perfect example of where RPC could be useful scale and perspective to balance priorities e.g. flood mitigation, energy generation, recreation, and minimizing/remediation negative ecological impacts of our infrastructure
        - Dam vs in line vs pumped?
        - Policies?

Other Key Issues:

- Compare our goals and example goals (e.g. collaboration with ACRPC, TRORC, and RRPC- we can integrate our targets INTO our goals instead of confusing things- I demonstrated what this might look like with the thermal sector- thoughts?)
- Local Reliability and Resilience in the face of widening infrastructure gaps, changing climate conditions, and extreme weather are brought up throughout- would love to hear if this is getting across or if we can put a finer point on things- for example:
    1. DU scale- outages (increasingly vulnerable to high wind and heavy precipitation), this is expensive
    2. access to interconnection, demand management, special rates, incentives, etc. varies across distribution utilities- how, as a region, can we better address our strengths and vulnerabilities while ensuring access for all communities?

Methodological Choices/Decision Points:

- Residential LEAP targets for the thermal sector- as % of homes (do we account for change in rate of housing units based on housing targets or flat historical rate?)
- New Renewable Energy Generation Target
    - Interest in a second analysis which takes into account WEC's current interconnection moratorium (redistribute new renewable generation targets)
    - Distribution across tech type
        - I will put back in blurbs on each technology type and emphasize SCALE
        - Is there support for a future land use impact study? Something staff are really interested

Organization/Scope:

- integrate transportation targets into transportation chapter,
- keep infrastructure excerpt in infrastructure chapter, what about section, **starting page 51, *Key Issue: Grid Capacity and Infrastructure Needs***, should this go in the Infrastructure chapter or stay here?
- (see potential for integrating into other regional plan chapters in Table Below)

Table 1 Potential Integration into Full Regional Plan Update (2025) or leave in supplement! (at least integrate references)

Chapter	Components
Infrastructure	Introduction to Electric Infrastructure & Stakeholders, Distribution and Transmission constraints and improvements; Regional Trends, Grid Modernization and Resilience; other Energy Infrastructure
Transportation	EV &EVSE (existing), EV-&EVSE-ready regs/policies, transportation sector use, analyses and targets (Enhanced Energy Plan components); implications of electrification; municipal fleet inventories, policy changes, goals re electrification, efficiency, reducing VMT, etc.
Housing/Healthy Communities/Economy	RBES, Net Zero Ready by 2030, EVSE& Solar Ready, Energy Burden, Affordable Heat Act, Thermal Sector; CBES, renewable energy industry hub; Intersection Affordable Housing, Health, Aging, Resilience, and Renewable Energy&Storage

Tone/Audience Check:

- Is it at the right level? Too much taken out? Simplify/summarize further? Specific places for either?
    - Are the definitions and call-out boxes helpful or distracting? Would some really basic graphics like https://eanvt.org/wp-content/uploads/2024/11/EAN-APR-2024-Nov20.pdf be useful to replace some of the paragraphs/tables?
    - Will continue to simplify sentence structure. Did having the key issues first help? Is it too repetitive?
- Highlights on municipal role/actions?
    - E.g. summary analysis of common municipal projects identified via MERP assessments and potential energy use & GHG emissions reductions and significant savings (challenge for some to electrify without on-site generation & storage) these could highlight RPC and Municipal work and connect readers to ongoing initiatives- thoughts on including some?

Next: resource potential areas, siting energy infrastructure, and revisit Goals/Policies/Recommendations:

- Technology Type and Scale (policies, distribution of generation goal, etc.)
    - Balancing energy goals with other land use priorities including natural resources requires us to integrate energy much more so in development planning (especially housing and intentional growth areas)- where are the key places in the regional plan to ensure cross over (Housing Chapter, Land use Chapter- specific mentions?)
    - Small scale, distributed renewable energy generation (mostly solar) predominates in Vermont although this is the most expensive approach- how do we account for this? Ensure access for all? How can we adjust to higher up-front costs but lower operating and maintenance costs for mechanisms that would reduce future electric sector demand and thus shrink our new renewable energy generation targets? (geothermal, heat recovery)
- Revisit RPC constraints
- Preferred Siting and Preferred Project Characteristics
- Is there interest in developing a process to create siting guidelines based on project size and type that builds off of the municipal work going on right now on enhanced energy planning?
- Regional Strengths & Gaps
    - Target implementation
    - Energy infrastructure (rural infrastructure gap widening)
- Defining Substantial Regional Impact
- How do we fund and implement community scale and resource efficient decarbonization?

CENTRAL VERMONT REGIONAL PLANNING COMMISSION
Regional Plan Committee
Draft Minutes
October 15, 2024 4:00 – 5:30 pm

29 Main Street, Suite 4, Montpelier, VT 05602
Remote Access Via Zoom

Committee Members:

X	Alice Peal, Waitsfield Alternate Rep
	Alice Farrell, Barre Town Rep
X	Doug Greason, Waterbury Rep
X	Mike Miller, Montpelier Alternate Rep
X	John Brabant, Calais Rep

Staff: Christian Meyer, Brian Voigt, Will Pitkin, Eli Toohey, Niki Sabado, Pamela Sonn (in person)
Zoe Christiansen – East Montpelier Rep, Lee Cattaneo – Orange Rep, Bob Blodgett – Moretown Planning Commission member

Adjustment to the Agenda
No adjustments.

Public Comment
No public comment.

Approval of Minutes
M. Miller moved to accept September 2024 draft meeting minutes, D. Greason seconded. All in favor, motion carried.

Discussion

Act 181 Presentation
Staff presented on recent reforms to Act 250 and the State Community Investment Program (formerly known as the State Designation Program). Topics included how current designated areas inform interim Act 250 exemptions and the Regional Plan Future Land Use Map (FLU Map), then how the FLU Map informs long-term Act 250 exemptions and the reformed designation program. Long-term Act 250 exemptions will use a tier-based system to determine Act 250 jurisdiction; the FLU Map land use categories will determine areas' eligibility for tiers that receive Act 250 exemptions.

VAPDA established 10 land use categories that will now be standard across all Regional Plans' FLU Maps statewide; VAPDA is still developing the methods by which FLU Maps define which areas fall under each land use category.

The Land Use Review Board (LURB – currently known as the Natural Resources Board) will need to approve the FLU Maps and possibly the entire Regional Plan. J. Brabant asked how much influence the LURB will have in reviewing Regional Plans, whether there will be an appeals process if the LURB rejects

the Regional Plan and/or FLU Map, whether the LURB review will be just a yes or no determination or if the LURB will supply corrections to rejected Regional Plans and/or FLU Maps. Discussion followed; staff noted that many of the new rules are still being made over the next several years. Staff then highlighted several ongoing questions and potential conflicts that Act 181 introduces.

A. Peal asked what Act 181 means for municipalities and how it might change municipalities' actions. A. Peal also noted potential conflicts between the Act 250 exemptions and flood risk mitigation. M. Miller noted that municipal regulations may ensure that development in floodplains can be done properly in a way that does not increase flood risk and highlighted recent proposed developments in Montpelier that have been delayed by Act 250 review. J. Brabant noted the benefits of Act 250 for areas downstream of those that would be exempt.

W. Pitkin spoke about Act 121, The Flood Safety Act, and how that will shift river corridor and floodplain regulation to the State, which may reduce the potential flood risk impacts of exempting areas from Act 250 review. He noted a loophole in which priority housing projects are exempt from Act 250 review even in river corridors and floodplains. M. Miller is a member of the senate committee that will develop the rules for statewide river corridor and floodplain regulation and will report back to the committee on future updates.

A. Peal expressed concern that Act 181 and the statewide conversation about Act 250 review does not sufficiently account for increased risk of flooding and other hazards due to climate change.

C. Meyer asked what the next steps were related to Act 181's reforms for the committee and for staff.

Z. Christiansen spoke about the high cost of developing new housing and questioned the value of housing that is not affordable. She suggested other avenues of increasing housing stock, including restricting short-term rentals and reoccupying existing vacant housing.

A. Peal and Z. Christiansen referenced the importance of certain populations, including homeless and low-income, being housed closed to services.

M. Miller spoke about the challenges municipal officials have in developing municipal plans and regulations to conform to the new rules, especially with so many details still to be determined. He stated that Regional Planning Commissions can provide value through municipal technical assistance that helps ensure municipal conformance with new requirements.

Z. Christiansen and C. Meyer spoke about additional needs and constraints for affordable housing development, including sidewalks and public transit.

C. Meyer and N. Sabado provided further information on the timeline of the Regional Plan, specifically the Land Use draft chapter. Outside factors include VAPDA's development of the methods to define the land use categories in the FLU Map.

D. Greason stated that a key area will be where the Regional Plan's Land Use chapter goes beyond or

differs from simply meeting statutory requirements.

Draft Housing Chapter

Discussion began with written feedback that A. Peal previously provided. E. Toohey spoke about the statewide and countywide housing targets in the VT Housing Needs Assessment that the VT Housing Finance Authority and the VT Agency of Commerce and Community Development just published. E. Toohey addressed factors that CVRPC is using to disaggregate countywide targets into municipal targets for each member municipality.

Discussion included availability of housing data and gaps in that data, including in seasonal/second homes and short-term rentals, and possible ways to gather more data to fill those gaps. Some towns in VT, including Warren, have hired consultants to gather this data.

E. Toohey spoke about factors that CVRPC is considering using in its formula to disaggregate countywide housing targets to the municipal level. Factors under consideration include school capacity, grocery stores, access to healthcare, roads, public transit, water and wastewater infrastructure. Discussion included affordable housing and how different demographics have different needs for housing locations. J. Brabant spoke about what value Act 250 review has added to communities where previous housing developments were sited and how areas that will be exempt from Act 250 review can ensure that municipal review maintains those benefits.

M. Miller liked the housing continuum and suggested that affordable housing be restated as “subsidized housing” and requested that the housing continuum include the additional category of congregate housing, which may include dormitory-style housing or shared living situations.

Z. Christiansen began a discussion about the “build it and they will come” mentality in housing development and the extent to which new housing development will translate into increased permanent housing stock when short-term rentals are often more profitable. A Peal questioned the future economic prospects of short-term rentals in relation to climate change, as ski areas see less snow in the future. Discussion touched on the economic and impact of short-term rentals, possible short-term rental regulation, and what CVRPC can do to encourage increased regulation at the state and municipal levels.

A. Peal requested that previous written feedback on the Housing draft chapter be distributed to the entire committee.

A. Peal moved to adjourn, J. Brabant seconded, all in favor, motion carried.

CENTRAL VERMONT REGIONAL PLANNING COMMISSION
Regional Plan Committee
Draft Minutes
December 17, 2024 4:00 – 5:30 pm

29 Main Street, Suite 4, Montpelier, VT 05602
Remote Access Via Zoom

Committee Members:

X	Alice Peal, Waitsfield Alternate Rep
	Alice Farrell, Barre Town Rep
X	Doug Greason, Waterbury Rep
X	Mike Miller, Montpelier Alternate Rep
X	John Brabant, Calais Rep

Staff: Eli Toohey, Keith Cubbon, Christian Meyer, Will Pitkin, Niki Sabado (in person)

Adjustment to the Agenda
A. Peal adjusted agenda to move scheduling discussion before Infrastructure draft chapter review.

Public Comment
No public comment.

Approval of Minutes
Committee approved November draft minutes. Note: still need to approve October draft minutes, as those were not approved at the November meeting.

Discussion

Meeting began at 4:02pm.

Staff presented on the timeline of the new Regional Plan adoption process following changes in Act 181; Future Land Use (FLU) Map needs to be approved by the Land Use Review Board (LRB) by the end of 2025, will be much easier to have the LRB also adopt the entire Regional Plan at the same time, which means CVRPC will have to finish the Regional Plan by April 2025.

Discussion followed to which chapters will be reviewed in each of the coming months and how to involve full CVRPC Board of Commissioners and municipal planning commissions/selectboards in the review process. Committee agreed to meet twice per month for the first few months of 2025. Discussion also included when CVRPC will consult with member municipalities regarding FLU Map and housing targets and consistent formatting/structure across chapters.

Infrastructure draft chapter review: committee and staff discussed whether to split the chapter back into physical and social infrastructure or keep it as one chapter. Staff spoke on the drafting process and the statutory requirements. Committee agreed to stay with one chapter.

Committee discussed approach to aspiration and introduction for the combined chapter; M. Miller

presented feedback on specific parts of the chapter. Committee, K. Cubbon, and E. Toohey discussed the goals and strategies of the draft chapter compared to those of the previous Regional Plan's chapter including ones related to flood issues and the use of directive language to give the Regional Plan more influence in state permitting.

The committee discussed the strategy moving forward with the Energy Element and settled on an Energy Chapter with an overview and a more detailed and technical Energy Plan. Committee members requested drafts in Word documents. Committee discussed timing, requested drafts by 12/27.

Committee discussed schedule for future meetings, decided to meet first and third Tuesdays at 4pm.

M. Miller moved to adjourn, D. Greason seconded, all in favor.

A. Peal adjourned meeting.

Minutes taken by W. Pitkin

Energy Chapter

3

Aspirations

Accommodate the development of reliable and affordable energy supplies, increased energy efficiency, and diverse renewable energy resources and facilities.

Guide construction and maintenance of cost-effective infrastructure that supports public health and environmental sustainability.

Minimize contribution to a changing climate and be prepared to mitigate impacts from increased natural hazards.

Introduction

Energy is a vital component of modern life. When sources of power are lost or interrupted, even temporarily, the rhythms of our lives are profoundly interrupted. Business and industry halt and residents and goods dependent on electricity and other types of power are at great risk. Our electric infrastructure in Vermont is increasingly vulnerable to extreme weather conditions due to climate change. This comes at a time when we anticipate significant increases in demand for reliable and affordable electricity due to overlapping causes including addressing rural infrastructure gaps, regional growth and development, increasing need for heating & cooling, as well as electrification of the thermal and transportation sectors.

While existing and potential sources of electric power in the region are more than adequate (see Enhanced Energy Element), the region's electric infrastructure is aging and reaching performance limits. While the costs of developing new infrastructure are high upfront, potential long-term cost savings are increasing as technology is rapidly advancing and markets are shifting to match needs and the urgency of the climate crisis. Integrating renewable energy infrastructure more comprehensively into all scales of our planning across the region is important to not only maximize associated community benefits but also to minimize negative environmental and land use impacts of electric generation, transmission, and distribution. CVRPC's objective is to ensure that our energy infrastructure- from the building to the community to distribution & transmission system scales, is located, designed, and correctly sized to support the Region's community and economic needs, which increasingly means it must be reliable, resilient, and affordable as well as sustainable to reduce operational costs and Green House Gas emission contributions (further reducing long-term costs).

This chapter and its supplements, as well as relevant sections in the Infrastructure, Transportation, Natural & Working Lands, Climate, Housing, and Land Use chapters, constitute Central Vermont's Enhanced Energy Plan meeting the standards outlined in Act 174 (see Supplement Section: Standards) in addition to meeting the statutory requirements for the regional plan energy element (Title 24, Chapter 117, section §4348a(a)(3)). The primary purpose of this chapter is to identify a path toward achieving our regional share of the State's overarching energy and climate goals in a manner consistent with our regional priorities and needs. For an introduction to existing energy infrastructure please see pages ## in the Utilities and Facilities (Infrastructure) Chapter.

A brief overview of overarching goals is followed by a summary of current energy use estimations (see supplement for town-by-town breakouts). This chapter then presents key regional energy issues in energy reliability & resilience, equity, and land use. These framing considerations are intended to ensure implementation of this plan centers an energy transition that is both expedient and accessible for all members of our communities and responsive to future demands and conditions while minimizing impacts to our ecosystems. This is followed by a summary of our future regional targets for the thermal and transportation sectors as well as our target for new renewable energy generation. This section includes a more in-depth discussion of siting and project characteristics for energy infrastructure in the Central Vermont Region and includes mapping products and analyses. Finally, this chapter details the region's energy goals, targets, policies, and strategies.

Goals

The following section outlines the general goals that will help shape the energy future of Central Vermont. Detailed targets, policies, and strategies are included at the end of this chapter, however the themes are

included herein to provide an overall sense of the direction being provided. As noted previously, energy touches multiple sectors and elements of the 2025 Central Vermont Regional Plan therefore these tenants are woven throughout the various plan sections for consistency and integration across multiple elements.

Conservation & Efficiency:

- **Goal** : Increase conservation of energy by individuals, organizations, and municipalities. Reduce the amount of energy needed to support existing and future buildings, facilities, and infrastructure; reducing GHG emissions especially via the reduction/elimination of fossil fuel use**.**

Development & Siting of Renewable Energy Generation

- **Goal:** "Right-size" new renewable energy generation infrastructure to support thriving communities in intentional growth areas, increase local resilience & reliability while minimizing negative landuse impacts especially on forest blocks and corridors
- **Goal:** at least 25% of regional demand is generated locally from renewable resources
- **Goal:** Evaluate municipal buildings, facilities, and parcels for on-site renewable generation and storage projects in line with municipal goals and needs including to make electrification financially solvable, to address frequent and/or long duration outages, to support emergency operations and/or community resilience hubs, and to creature sustainable funding for energy projects, etc.

Energy Resilience, Reliability, & Equity

- **Goal**: Improve resilience and reliability of region's electric grid infrastructure (least coast long-term) and work with municipalities and communities to build local energy resilience
- **Goal:** Ensure all municipalities and Central VT residents have access to affordable, resilient & reliable energy; as well as access to the environmental, economic, and social benefits of local renewable energy

Transportation Energy Demand and GHG Emissions

- **Goal**: Promote the shift away from gas/diesel vehicles to electric and non-fossil fuel transportation options to reduce dependency on non-renewable fuel sources for transportation
- **Goal:** Promote the shift away from single-occupancy vehicle trips and adoption of alternative modes to reduce per capita energy intensity of transportation.
- **Goal:** Facilitate the development of walking, biking, and rolling infrastructure to provide alternative and multi-modal transportation options for communities and to promote interconnection within the region's transit systems.

Land use & Energy Conservation

- **GOAL:** land use policies support compact development in mixed-use centers (smart growth)

State and Regional Context

The first comprehensive state energy plan was created in 1991, however, Vermont's contemporary energy planning began earlier in response to the oil crisis of the 1970s. The most recent update of the State's Comprehensive Energy Plan (CEP) was completed in 2022, and Vermont's energy policy, codified in 30 VSA § 202a establishes the following goals:

"To assure, to the greatest extent practicable, that Vermont can meet its energy service needs in a manner that is adequate, reliable, secure, and sustainable; that assures affordability and encourages the state's economic vitality, the efficient use of energy resources, and cost-effective demand side management; and that is environmentally sound."

"To identify and evaluate, on an ongoing basis, resources that will meet Vermont's energy services needs in accordance with the principles of reducing greenhouse gas emissions and least-cost integrated planning, including efficiency, conservation, and load management alternatives; wise use of renewable resources; and environmentally sound energy supply.

"To meet Vermont's energy service needs in a manner that will achieve the greenhouse gas emissions reductions requirements under 10 VSA § 578 and is consistent with the Vermont Climate Action Plan adopted and updated under 10 VSA § 592."

Table ## in the supplement summarizes the more specific goals and targets established by the State of Vermont (page ##).

Regional Energy Use Summary

Definition:

"Energy" refers to all forms people use for transportation, thermal (heating space & water primarily), and electricity.

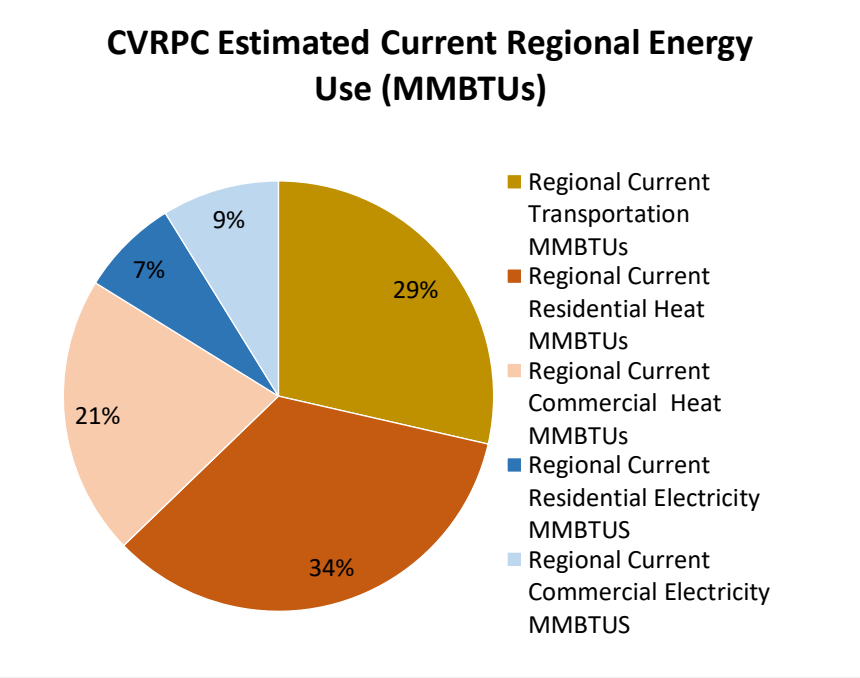
There are many different "units" of energy such as kilowatt-hours or gallons of gas, which can be converted and expressed in the common unit:

British Thermal Units (BTUs) or million BTUs (MMBTUs).

This allows us to compare across sectors but is often difficult to understand. Where possible, targets have been translated into more tangible metrics such as the number of homes to be weatherized (based on an average savings in MMBTUs per weatherized house).

Broadly across 2020-2023, the thermal sector is still the largest energy use at 55% including both residential and commercial space and water heating. Transportation is the second largest energy use in the region accounting for 29% of total usage although it is important to note that the reported estimates are limited to light-duty vehicles (commercial and medium- and heavy-duty data not available at this time). The electric sector makes up approximately 16% of the region's energy use.

Table 1 Estimates Current Regional Energy Use



Sector	Current Regional Energy Use (MMBTUs)
Transportation (LDV)	**2,829,963**
Residential Thermal	3,386,790
Commercial Thermal	2,083,630
Total Thermal	**5,477,225**
Residential Electric	729,483
Commercial & Industrial Electric	872,505
Total Electric	**1,601,987**

Source: Municipal Consumption Worksheet Department of Public Service- ACS 5 Year Estimates

The supplement focus on the electric, thermal, and transportation sectors one at a time, introducing current use, regional targets, key challenges, and pathways; this chapter summarizes our current use and then key discussions and targets.

Thermal Sector- Residential

Heating homes in Central Vermont is our greatest energy use. Together oil and propane were reported in 78% of the region's households (82% of renter-occupied homes and 77% of owner-occupied homes). Wood/biomass is used in approximately 14% of the region's homes (18% owner-occupied and only 4% renter-occupied homes). Variation across our region is high; however, in a quarter of the towns in our region wood is used in 34-43% of homes (see supplement and some discussion below, page ##). Approximately 6% of homes report electricity as their heat source, this is a slight increase from the previous plan; the increase in electricity is likely newly adopted heat pumps while some of the baseline is residual electric resistance heat. Although electric resistance heating has very low upfront and installation costs, it is one of the most expensive heating options for Vermonters. Low-income renters are disproportionately burdened by this inefficient equipment (EAN Annual Progress Report p28). The adoption of air sourced and ground source heat pumps may be partially obscured here and, in the future, if only primary heating sources continue to be reported and included. The predominance of fossil fuel in the residential heating sector is a cost burden to our region's residents and contributes a relatively small amount of in-state labor to our economy (in comparison to cordwood or even electricity which keep more jobs and dollars local); there is a clear opportunity and responsibility across the region to consider fuel-switching (primary heating source or entirely), weatherization and other efficiency measures which will reduce fuel use and emissions contributions (see below).

Table 2 Current Regional Residential Fuel Use (see supplement for expanded data and Town breakout)

% of Fuel Use by Tenure	**2020 Regional Estimate**					
	Owner Occupied		Renter Occupied		**Regional Total**	
	Totals	%	Totals	%	**Totals**	**%**
Utility gas	238	1%	337	5%	**575**	**2%**
Bottled, tank, or LP gas	5,108	25%	2,252	32%	**7,360**	**27%**
Electricity	548	3%	986	14%	**1,534**	**6%**
Fuel oil, kerosene, etc.	10,355	51%	3,021	43%	**13,376**	**49%**
Coal or coke	15	0%	0	0%	**15**	**0%**
Wood	3,613	18%	262	4%	**3,875**	**14%**
Other Fuel	491	2%	165	2%	**656**	**2%**
No fuel used	15	0%	19	0%	**34**	**0%**

Source: 2016-2020 5 Year American Community Survey; 2011-2015 ACS; DPO4, B25117, B25010

Table 3 Current Regional Residential Heating Cost Estimate

Fuel Type	Standard Unit	BTUs/Unit	Cost/Unit	Total Regional Current Costs	Source (cost/unit)
Fuel Oil, kerosene, etc.	Gallon	140,000	$4.133	40,869,208.29	Vermont Average Residential-EIA (March 2024)

Bottled, tank, or LP gas (propane)	Gallon	91,000	$3.575	30,470,927.14	Vermont Average Residential-EIA (March 2024)
Coal or coke	Ton	19,590,000	$500	44,949.46	VT newspapers and quote VT&NH suppliers
Wood (seasoned)	Cord	20,000,000	$350	7,709,887.50	(275 green-450 kiln dried) VT newspapers and quoted VT suppliers
Wood Pellets	Ton	16,400,000	$405		Vermont wood/pick-up; Energy Co-op of VT
Electricity	Kilowatt hour	3,412	$0.2109	3,939,594.36	**VT State Energy Profile, US Energy Information Administration**
Other				4,142,353.99	
Regional Total Cost				**$87,176,920.74**	

Tables 2 & 3 are based on total occupied units, but there are many seasonal, recreation, and/or occasional use (2nd) homes across the region (2022 ACS 5-Year Average B25004 Vacancy Characteristics). Table 7, in the supplement, supplies an additional adder to take into consideration thermal use in these homes: 4,137 additional homes across the region account for approximately 97,201.5 additional MMBTUs of energy use (conservatively).

Thus far, fewer low-temperature degree days in the winter have yet to result in reduced fuel consumption in the winter (without stable declining temperatures, residents may not adjust as naturally to cold temperatures). Furthermore, more frequent high-temperature degree days are associated with increased heat-related health issues (VDH Climate Dashboard) including Central Vermont where few have adopted air conditioning and the threshold for health impacts is lower (86F as compared to 90F in Burlington). The increased use of air conditioning and associated electricity will need to be assessed in future updates as we continue to experience increasingly extreme storms, loss of stable seasons, and overall warmer, wetter conditions associated with Climate Change.

Thermal Sector- Commercial

Table 4 Current Regional Commercial Thermal (Heating) Energy Use

# Commercial Establishments	Average Thermal Energy Used Per Establishment (MMBTUs)	Regional Commercial Thermal Energy Use (MMBTUs)
2231	934	2,083,630

Source: Municipal Consumption Tool, CVRPC & Department of Public Service using data from the Department of Labor

Most of the region's commercial/industrial energy usage can be attributed to space heating and process heating. There is less distinction between many of our region's business buildings and the residential sector, though in more developed towns we do have more conventional commercial premises. Many of our region's schools are on wood heat, and several of our larger businesses have championed net-zero buildings and

practices. Harnessing the expertise and capacity of our region's experts to mentor and support small commercial businesses to do the same may be a keyway to implement our targets (see below).

Transportation Sector

Transportation is the second largest use of energy in Central Vermont, accounting for a little less than a third of total usage measured in MMBTUs (see Table 1). Fossil fuels account for approximately 94% of the energy statewide we currently use for transportation- a much higher share of fossil fuel dependence than in the other energy sectors.

The Table 5 below provides an overview of light duty (passenger) vehicles and use in the region. The vast majority of residents in the state, including Central Vermont, use personal vehicles for their daily travel needs. Approximately 3.5% of the 43,506 light duty vehicles in Central Vermont are electric vehicles (including all electric and plug-in hybrid electric vehicles registered by January 2024 (Drive Electric Vermont[1])). The total number of vehicles in the region has decreased slightly, while the number of EVs (Electric Vehicles) has increased quickly in the last few years, increasing by approximately 40% in 2023 alone coincident with the expansion of state, utility, and federal incentive programs. Light Duty Fleet Electrification and EV charger planning is covered in the Transportation Chapter of this plan (pages ##-##).

Table 5.Current Regional Transportation Energy Use

Transportation Data	Regional Data 2022 5-YR ACS			Regional Data 2011-2015 (ACS)
Fuel Type	**Internal Combustion Engine (ICE)**	**Electric Powered (EV)**	**Total**	Internal Combustion Engine (ICE)
Total # of Light Duty Vehicles	41,989	1,517	**43,506**	45,584
Average Miles per Vehicle	12,500	9,000		287,500 (12,500/vehicle)
Total Miles Traveled	524,862,500	13,653,000	**538,515,500**	567,650,000
Total Use per Year	23,857,386 gallons	4,551,000 kWh		30,518,817
Transportation MMBTUs	2,701,858	15,528	**2,717,386**	3,396,000
Average Cost per unit	$3.37/gallon	$0.2109/kWh		$2.31
Cost per Year	$80,399,391	$959,806	**$81,359,197**	$70,488,465

Source: Municipal Consumption Tool (Department of Public Service) which uses Table DP04, 2022 ACS 5-Year Estimate used to estimate the count of vehicles associate with area housing units, and State DMV data averages; cost per gallon of gas was taken from EAN Annual Progress Report 2023. EV data was provided by Drive Electric based off DMV registrations as of January 2024. Comparable public transportation and medium and heavy-duty vehicle data is not available, additional information is provided in the Transportation Chapter.

[1] http://www.driveelectricvt.com/buying-guide/why-go-electric

Table 6. EV Registrations

	EV Registration Jan. 2023			EV Registration Jan. 2024			Increase 2023-2024	
	AEV	PHEV	Total EVs	AEV	PHEV	Total EVs	Count	%
REGIONAL TOTAL	588	497	**1085**	921	596	**1517**	**432**	**40%**

According to the 2024 Energy Action Network Annual Progress Report on Emissions, Energy, Equity, and the Economy, nearly 70% of Vermont's transportation climate pollution comes from the use of motor gasoline for on-road use of light-duty passenger vehicles. Thus, reducing our reliance on fossil fuels used for personal vehicles presents a key opportunity to reduce GHG emissions from fossil fuel use overall. However, land use choices are inextricably linked with our transportation system, the transportation sector cannot be effectively nor sustainably addressed at the individual scale alone, instead, it is important to recognize that Vermont's dispersed pattern of development is a key reason why our transportation energy demand (and burden) is so high. Vermont's historically dispersed settlement pattern still holds much appeal for many moving to and in the state, however, communities have been working hard to designate and develop small villages and downtowns, promote infill housing development, and improve walk/roll-ability to shift residential development to intentional growth areas and focus infrastructure investment. The Land Use and Transportation chapters in this regional plan detail these priorities.

Electric Sector-Current Use

The Central Vermont Region currently uses approximately 469,522[2] Megawatt hours of electricity on an annual basis across the residential, commercial, and industrial sectors (see Table below for use by sector and supplement for use by town and by sector).

Table 7 Current Regional Electricity Consumption

CVRPC Electricity Consumption	2016 CVRPC Regional Plan	kWh Usage by Year (Efficiency VT)		
Sector	2016 Plan	2020	2021	2022
Commercial & Industrial	353,117,000	239,531,296	247,455,287	255,723,111
Residential	241,268,000	203,571,494	211,580,064	213,799,098
Total	**594,385,000**	**443,102,791**	**459,035,351**	**469,522,209**
Average Residential Use		6,520	6,734	6,765

Data Source: Efficiency Vermont Regional Summary Report for CVRPC, June 2023.

[2] incomplete demand data is known at least for Woodbury from Efficiency Vermont's annual regional data report; strengthening relationships with our Distribution Utilities directly will ensure more accurate and comprehensive data will underlie future planning efforts. This total is thus an underestimate of total demand (use).

As a comparison to Central Vermont's 6,765kWh per year, the US average residential electricity usage was 10,632kWh in 2021, an average of about 886kWh per month (EIA). Electricity consumption is expected to increase as electrification continues to be a central approach of the State to meeting GWSA targets and transitioning away from fossil fuels given that Vermont is rapidly decarbonizing its electric sector resources (see Chapter 2 Infrastructure). Fuel switching in the thermal sector and switching to alternative fuels and electric vehicles in the transportation sector are both discussed in the following sections. As electric consumption is projected to rise, the most useful targets include those around energy efficiency and conservation, critical to ensuring electrification has the intended outcome from the ground up to the State's legally binding GWSA goals. It is of note, however, that since the 2018 Enhanced Energy Plan, reported electricity consumption in central Vermont has declined by approximately 20% overall (approximately 11% decrease in the residential sector and 28% in the commercial and industrial sectors)- it is difficult to know if this is associated with changes in usage over the pandemic, a lack of consistent reporting from the DUs to Efficiency Vermont, or evidence of the successful implementation of efficiency and conservation measures (see below). Most likely, it is a mixture of all three.

Existing electricity infrastructure is detailed in the Infrastructure Chapter excerpt. Efficiency and conservation measures are integrated into the thermal and transportation sectors. CVRPC did not find it necessary to add additional targets pre-empting a statewide, RPC-supported, approach being developed, given especially the focus on weatherization and efficient residential heating systems above that fits well with the region's vision and current approach.

Key Issues

Energy Resilience, Reliability, and Independence

The increasing severity, frequency, and unpredictability of extreme weather in Vermont has greatly exacerbated existing rural infrastructure gaps, leaving many Vermonters, and the physical and social infrastructure they rely on, without reliable access to electricity. Washington County is tied for the second most disaster-prone county in the US in terms of federal disaster declarations due to extreme weather (Rebuild by Design). While extreme flooding is at the forefront currently, many of those events are localized winter storms characterized by high wind and heavy wet snow that cause up to 8-day outages in some of our most rural towns. Major electric utility companies have active, ongoing programs to improve system reliability and protect facilities from damage by ice, severe winds, and other hazards. Typically, these programs focus on trimming trees to prevent encroachment of overhead lines, strengthening vulnerable system components, protecting equipment from lightning strikes, and placing new distribution lines underground. Other major problems include closed roads and restricted transportation. The costs of these events are worrisome, and CVRPC promotes working with DUs to harden infrastructure and build local reliability at the community level.

Outages are a significant barrier to electrification in many of our communities and generators are one of the most common unfunded requests we hear from municipalities. Despite this, our communities are dedicated to climate and resilience planning, recognize the role of distributed renewable energy and storage, and support robust energy and GHG emissions goals. In 2023 19 out of the 20 municipalities in Washington County have received investment-grade energy audits of 2 or more municipal buildings via the State's Municipal Energy Resilience Program. As we develop and phase these key community facility projects (first building envelope/weatherization & HVAC, second on-site renewable energy & storage), we have repeatedly heard

concerns about increased costs associated with electrification without on-site renewable energy. Addressing this gap will be critical for a just transition in Central Vermont.

Energy Conservation

Given our aging building stock and inconsistent record of compliance with the Residential and Commercial Building Energy Standards (RBES and CBES respectively), weatherization and equipment efficiency and conversion remain critical pathways towards energy conservation and steps to reduce our GHG emissions as well as energy operating costs. Energy efficient building designs provide benefits to the owners and occupants by reducing the amount of energy needed to heat, cool, and maintain the mechanical systems within the building. Establishing and promoting energy efficiency in design, construction, retrofits, and renovations will ensure new and existing buildings and building practices will be more efficient into the future. These efficiencies promote conservation of energy resulting in cost savings and increased affordability for owners and renters. There is a disjoint, however, between our ambitious State's goals and the building-by-building focused implementation programs. The region has an important role to play in planning for and implementing community scale conservation and efficiency projects, which while may have higher upfront costs, have significantly reduced long term costs especially for system users (Central Vermonters!). Furthermore, community scale thermal networks and district heat systems and waste heat recovery systems for example, have an important role to play in ensuring that electrification can go further, faster, in our region without severely stressing our existing electric infrastructure and triggering costly investments by reducing the amount of energy demand from the thermal sector that needs to be electrified in the first place. Such strategies, along with energy storage and load management at the household to utility scale, also importantly reduce our estimated future electric demand growth, reducing required investments in renewable energy generation and associated land use impacts. While we will certainly have to invest in and expand our electricity infrastructure, by better integrating and prioritizing energy conservation measures at a larger scale, we can ensure our long term and user costs remain lower while reaching our goals faster.

Energy Justice & Accessibility

CVRPC has approached this plan, including supporting analyses, with an explicit priority on access, affordability, and participation considering those most burdened by the impacts of climate change and the costs of energy in Vermont *first* (including those with low or fixed incomes, residents of color, renters, electrically dependent residents, some of our rural communities, etc.). Implementation of this plan should maintain this approach to ensure that no community nor community members are left without access to the energy transition. CVRPC has adapted the guiding principles and assessment rubric[3] from the Just Transitions sub-committee of the Vermont Climate Council for use in future planning as well as project development and prioritization processes. Near-term costs can present equity challenges for programs and policies that deliver positive outcomes in the medium and long term while barriers to access and incentive structures (e.g. reimbursement, loans, tax incentives), perpetuate existing disparities. CVRPC, in partnership with THRIVE Community Health partners and our energy committees and coordinators, works with income-based and recovery adder programs (e.g. with Efficiency Vermont) and the State to develop programs like ChargeVT, that cover upfront costs, allow sliding scale match. Furthermore, municipal and regional energy project savings can be optimized to establish revolving loan funds and/or community funds to lower barriers and/or support future projects with community benefits.

At all scales, the time frame used to determine the least cost affects analytical outcomes and resulting decisions: longer-term cost horizons are critical when considering the benefits and costs of a just transition. Clean,

[3] Vermont Climate Council's Guiding Principles for a Just Transition

affordable, resilient, and reliable energy is a critical component of building social as well as physical infrastructure and community resilience. To leverage federal and state funding opportunities the region must build administrative and procurement capacity, establish community benefit agreement models, and foster community expertise sharing. Transitioning away from fossil fuels, promoting energy efficiency, weatherization, and renewables, while addressing energy burden will have direct and positive impacts on all Vermonters.

Community asset inventories, needs assessments, engagement, and related efforts will be necessary to drive frontline community identification for prioritization. An iterative process at the project scale is an effective strategy for ensuring that projects align with community needs and priorities, fostering more equitable outcomes and sustainable development in the long run. This approach allows for continuous feedback and adaptation, enabling stakeholders to respond to the evolving challenges and opportunities within the community (**see Equity Metrics in Supplement**). The implementation actions identified in this section focus primarily on integrating these considerations into existing local land use, transportation, environmental, and health equity planning activities.

Economic Needs & Opportunities

While Central Vermont is home to key members of the Clean Energy Industry, not only in Vermont but nationally, workforce constraints are a significant challenge in the implementation of the region's energy goals. Supporting workforce development at a rapid rate must become a key priority for all those engaged with climate and energy planning. The Clean Energy Industry Report has tracked Vermont's employment in the clean energy sectors since 2014. As of 2020, clean energy jobs made up about 6% of total employment in Vermont. Generally, the median wage for clean energy jobs (approx. $27/hour) is much higher than the statewide median wage (approx. $19/hour). Meeting our climate commitments via investments in energy efficiency and clean energy can be a win for Vermont consumers, the Vermont economy, and Vermont workers.

Land Use and Balancing Regional Priorities

Towns and regions have experience with, and see the direct local impacts of, land use planning. This includes planning for shared and beneficial infrastructure of many kinds, such as roads and industrial and commercial developments. Energy infrastructure similarly serves a public purpose, while also creating both costs and benefits that are not distributed evenly. Energy planning is not just about siting electricity generation, however (which will be discussed at length below!). Over half of Vermont's energy use is for heat and transportation, and local and regional decisions regarding buildings, roads, and other built infrastructure also have significant energy implications. For example, building a home or commercial building in a particular location will have implications for the energy required to travel to and from that building for decades. Given the pressing economic and environmental challenges associated with the use of fossil fuels, all aspects of planning must be undertaken with energy implications in mind. Municipal and regional planning that better integrates energy and resilience as it does economics and conservation will improve Vermonters' quality of life.

Future Considerations (Targets)

As part of Vermont’s Comprehensive Energy Plan (CEP) and Climate Action Plan (CAP), developed to meet our legally-binding greenhouse gas emissions reductions goals (per the Global Warming Solutions Act), state wide targets for energy use have been established. These targets provide a sense of scale overall by sector and for key types of actions that will get us to our goals- they are not binding requirements and regions and towns are encouraged to customize them to better suite their circumstances. While a summary of results is included below

and referenced throughout this chapter, a walkthrough of the methods, data sources, and steps are included in the supplement and accompanying tools and supporting resources hosted by the Department of Public Service. Furthermore, full details of the LEAP Model methods, data sources and assumptions may be found as Appendix D to the 2022 Comprehensive Energy Plan[4]. Municipal analyses and targets will be made available on the CVRPC website and in the supplement. Priority targets discussed below are accompanied with data, as available, of recent progress in each measure.

Thermal Sector Targets

Weatherization

A portion of Central Vermont's housing stock is older and was constructed at a time when no specific codes existed for energy efficiency. Residential Building Energy Standards (RBES) and the Commercial Building Energy Standards (CBES) for new construction set minimum thresholds for energy efficiency. This will encourage new construction to address energy efficiency, however a lack of enforcement may hinder implementation.

Weatherization of our buildings across sectors is one of the most important pathways for our region; it is not only a key conservation of electricity and emissions reduction strategy but also has significant health and financial benefits Energy-burdened Vermonters spend disproportionately more of their income on energy, especially heating, heating (and increasing cooling) that escapes through leaky windows, cracks in the doors, and poorly insulated building envelopes. Recent research on energy burden and the need for integrated low-income housing and energy policy shows multiple, interrelated health risks are linked to and intensified by energy burden[5]. For example, high and/or overdue energy bills can contribute to stress and mental health concerns, which can exacerbate adverse decision-making about heating/cooling, which can then further exacerbate health issues such as asthma, heart disease, and malnutrition, as well as physical inactivity.

> *"The largest barrier to low-income home weatherization continues to be the presence of vermiculite insulation, a material known for containing asbestos. Unfortunately, there are also many other structural issues present in Vermont's older housing stock which can prohibit Weatherization such as leaky roofs, wet basements, knob and tube wiring, and other structural issues. Historically, these issues would "defer" weatherization of a home indefinitely. Vermont's Weatherization Program has adopted a "zero deferral" policy in recognition that addressing non-energy related issues that otherwise prevent weatherization is a critical equity policy. OEO secured $125,000 of Vermont Low Income Trust for Electricity (VLITE) funds for vermiculite remediation and continues to leverage Zonolite Trust Funds. Additional funding to address deferral issues comes from the Vermont Community Foundation, as well as ARPA State Fiscal Recovery (SFR) funds."* **Performance Indicators for the Weatherization Assistance Program Report to the Vermont Legislature 2022**

Most weatherization assistance funds in Vermont are available to homeowners, and some to commercial properties as well. Renters have been identified as a group underserved by the health, comfort, and financial savings associated with weatherization (see Energy Action Network Working Group on Renter Weatherization

[4] https://publicservice.vermont.gov/content/2022-cep-analysis-greenhouse-gas-emission-reduction-pathways-vermont
[5] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4819257/

led by Rights & Democracy for more[6]). Rental housing represents about 30% of Vermont's housing stock- including 25% of occupied units in Central Vermont- and almost 75% of people who rent their homes have incomes under Vermont's median household income of approximately $63,500. Tenants often cannot weatherize their homes because it is cost-prohibitive, but also because major structural changes to a building must include a willing landlord to participate. Both "weatherization-ready" and rental programs have been identified by the current Climate Action Plan update as priorities.

Table 11 Residential Weatherization Targets

Regional **Residential** New Retrofits (Number of Housing Units)						
Scenario	**2020**	**2025**	**2030**	**2035**	**2040**	**2050**
Baseline Scenario	1,378	2,847	4,205	5,496	6,833	9,658
CAP Mitigation	2,202	7,758	13,314	16,767	20,219	27,125
Target % of Homes Weatherized*						
Baseline Scenario		10%		18%		30%
CAP Mitigation		28%		56%		85%

Table 11 identifies the number of existing residential structures in Central Vermont that would need to be weatherized by each of the target years to meet the State's energy goals (CAP Mitigation is our target and Baseline Scenario indicates business as usual). Targets are cumulative.

In Central Vermont, there are 2 main entities involved with weatherization: **Capstone Community Action** provides weatherization for lowest-income residents (see table below for number of homes weatherized per year in recent years), while **Efficiency Vermont** provides weatherization services and income-based incentives for other residents and businesses. (see supplements for savings and breakdown). Capstone Community Action administers Vermont's Weatherization Assistance Program in Central VT which aims to help low-income Vermonters save fuel and money by improving the energy efficiency, health, and safety of their home while reducing carbon emissions. On average, the program makes about $10,000 worth of improvements per home, installs about 1,500 square feet of insulation, and reduces drafts by about 40%[7] (see table below for project counts). The data below indicates the number of weatherization and energy efficiency projects completed per year across Central Vermont via these two key partners, while this is not comprehensive, it provides some indication of progress. The supplement includes a more detailed summary including savings and the issue of baseline, however, it is worth noting at the current rate, weatherizing between on average 280 but up to 700 homes a year the region is on pace to meet the baseline scenario provided in Table 11 but falls short of our regional CAP target.

[6] https://eanvt.org/network-action-teams/tenant-wx/; https://eanvt.org/network-action-teams/weatherization-at-scale-action-team/

[7] https://legislature.vermont.gov/Documents/2022/WorkGroups/House%20Appropriations/Reports%20and%20Resources/W~Department%20for%20Children%20and%20Families~Performance%20Indicators%20for%20the%20Vermont%20Weatherization%20Assistance%20Program~1-28-2022.pdf

There are several likely contributing factors to the near doubling of projects this past year including severe residential damage in the July 2023 flood event that prompted additional state incentives/rebates for affected properties, as well as the launch of major federal incentives provided via the Inflation Reduction Act. For example, the **Home Energy Performance-Based Whole-House Rebates (HOMES) Program** will provide eligible households with rebates of $2,000 to $8,000 for whole-home energy-saving retrofits and weatherization such as improving insulation and methodically sealing air leaks. The region has a key opportunity through 2031 to support weatherization and draw down investments which will substantially improve the condition of our housing stock, improve health and wellbeing, and reduce energy burden on top of reducing fossil fuel use and GHG emissions. Additionally, affordable and expanded housing is a key priority for our region and municipalities, building these to energy code (and better yet, to stretch code or higher energy standards) will contribute to the region's weatherization targets.

Table 12 Summary of 2020-2023 Residential Weatherization

Year	Total	Capstone (Homes)	Efficiency Vermont (Projects)
2020	**262**	78	184
2021	**333**	143	190
2022	**264**	112	152
2023	**173**	173	

Efficiency Vermont projects include Home Performance with Energy Star, other weatherization projects, and residential new construction projects; their total savings include all measures) (see supplement for expanded table by region and by town)

Weatherization of commercial and other buildings will also play a role in meeting our energy goals; focusing on municipal buildings and facilities, schools, and other key community buildings will also support community resilience and health. CVRPC is in the process of developing custom targets for the region based on municipal participation in the Municipal Energy Resilience Program and similar programs (see box below).

System Conversions (Fuel Switching)

Many of our regions buildings have outdated and inefficient mechanical systems that can be replaced and updated in tandem with weatherization (or after). These often include oil-based heating systems, propane, or inefficient wood-fired units. With advances in technology, cold weather heat pumps, high-efficiency wood stoves, and other mechanical systems can provide significant efficiency improvements for existing buildings that reduce fuel use and thus cost and significantly improve the health of occupants. System conversion, and the building modifications sometimes required to do so, can however be a challenge for residents with low and fixed incomes.

Vermonters face on average a thermal energy burden of roughly 4%, while some communities face even higher upwards of 6-7%, with individual Vermonters greater still. Research by Efficiency Vermont shows that towns identified as most severely burdened by thermal costs tend to show low overall thermal spending but have household income well below the statewide median. Furthermore, Efficiency Vermont reports that household fuel use is correlated with income and whether a home is owner or renter-occupied, with lower-income households disproportionately using fuel oil and inefficient resistance heating systems while owner-occupied homes are much more likely to heat with wood and less likely to heat with inefficient aged electric resistance than rental properties (163 CEP). Spending is relatively inelastic- consumers do not have a lot of control over the amount of energy they use on an ongoing basis.

As discussed above, there are a considerable number of income-based incentives, rebates, and programs for residents and business owners alike (Efficiency Vermont, Capstone Community Action, and now substantial federal programs- see the State Comprehensive Energy Plan or reach out to your local energy committee for a comprehensive overview). Increasingly, distribution utilities offer programs for income-eligible Vermonters to help lower the cost of energy and take part in the energy transition, this includes incentives for heat pumps, efficient wood stoves, and more for homes, businesses, schools, and municipalities.

CVRPC continues to provide information and support to municipalities to promote these programs and opportunities while working with administrating bodies to remove barriers for lowest-income Vermonters and renters. As noted previously, new construction will generally include these high-efficiency systems which will help address energy conservation. Additional Efficiency Vermont Efficiency Measures include appliances, lighting, motor controls, etc., and future, continuing these measures also important contribute to our targets as outlined below and for total residential demand as included in the supplement.[8]

Table 13 Efficiency Vermont Regional Summary Selected Measures

	2020	2021	2022	Total
Heat Pump Water Heat Installations	260	321	307	**888**
Cold Climate Heat Pump Installations	618	711	817	**2146**
Wood Heating Installations	178	240	82	**500**
Total Regional Quantity Additional Efficiency Measures				
Air Conditioning Efficiency	299	269	371	**939**
Behavior	0	0	0	**0**
Cooking and Laundry	1,058	1,254	1,044	**3,356**
Flexible Load Management	0	17	9	**26**
Health and Safety	1	0	0	**1**
Hot Water	619	597	628	**1,844**
Lighting	34,390	12,661	10,467	**57,518**
Motors and Motor Controls	738	644	1,036	**2,418**
Office Equipment/Electronics	43	0	0	**43**
Refrigeration	1,381	1,352	774	**3,507**
Space Heating	1,632	1,158	1,073	**3,863**

[8] The High-Efficiency Electric Home Rebate Program will be another additional residential energy program run by the Department of Public Service through 2031 (IRA) to support existing incentives and technical assistance. This program will provide point-of-sale rebates to low- and moderate-income households for a variety of electric technologies, including heat pumps for space heating and cooling, heat pump water heaters, electric stoves and ovens, and electric service upgrades. Eligible households will be able to receive up to $14,000 for installing energy-efficient electric equipment, including up to $8,000 for heat pumps, $1,750 for heat pump water heaters, and $840 for electric stoves. Complementary programs including Energy Efficiency Contractor Training Grants to support workforce development, tax credits, and direct pay options for homeowners, municipalities, and other eligible participants for energy efficiency home improvements, on-site renewable generation, and storage, up to 30% are also available through 2032.

Thermal Shell	535	539	66,260	**67,334**
Transportation	0	5	93	**98**
Ventilation	78	208	106	**392**
Water conservation	23	41	61	**125**

Tables 14- 17 Provide Thermal Targets for new Residential and Commercial Heat Pumps and Heat Pump Hot Water Heaters; the regional LEAP targets provided by the Public Service Department showing the Baseline trajectory and the Climate Action Plan Mitigation State approach (CAP) are available in full in the supplement.

Tables 14-17 See full Regional LEAP results in the supplement, and municipal target breakouts on CVRPC's website.

Regional **Residential** New Cold Climate Heat Pump Target (number of new heat pumps- cumulative)						
Technology	**2020**	**2025**	**2030**	**2035**	**2040**	**2050**
ASHP 2 Head	423	2,549	4,686	6,836	8,995	10,093
ASHP Central	658	3,964	7,311	10,705	14,155	15,727
ASHP HE	622	3,743	6,882	10,039	13,210	14,821
GSHP HE	77	463	851	1,241	1,633	1,832
Total	**1,780**	**10,720**	**19,730**	**28,820**	**37,993**	**42,473**

Regional **Residential** New Heat Pump Water Heater Target (Number of Units)						
Scenario	**2020**	**2025**	**2030**	**2035**	**2040**	**2050**
Baseline Scenario	483	569	573	578	581	593
CAP Mitigation	483	7,046	15,213	23,465	31,809	32,196

These original targets overemphasized the electrification of the thermal sector for the region and undervalued the role of efficient wood stoves. CVRPC supports the transition from fossil fuel heating fuels using not only heat pumps (air and ground sourced), but also strongly supports the conversion of inefficient wood stoves to advanced wood heat stoves to reduce air pollution emissions, reduce heating costs, amount of wood fuel used, and provide an accessible option for many Vermonters- our targets for the thermal sector reflect this commitment. These targets were adjusted for the region (methodology and discussion on wood heat in the supplement). Based on Table 13 above and the current pace of projects is maintained, CVPRC is likely on track to meet the heat pump target (approximately 1270 a year needed per year over the next 25 years to make the target), but only at around 1/3 of the adoption rate needed to meet the heat pump water heater target. While on target for heat pumps, rising electric rates and particularly the ability of existing infrastructure and systems

to integrate a large electric demand increase from the thermal sector are major concerns (see below for grid and infrastructure conditions and limitations).

Table 18 CAP Mitigation Regional Residential Thermal Demand (Thousands MMBTUs)

CAP Mitigation Regional **Residential** Thermal Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	120	264	376	487	595	633
HP	1	136	231	322	413	453
HPWH	2	23	49	76	103	104
Electric Resistance	40	29	21	14	8	7
~~Wood~~	~~910~~	~~733~~	~~535~~	~~400~~	~~286~~	~~182~~
Propane	475	375	273	183	101	67
Wood Pellets	225	69	57	50	45	42
Biodiesel	-	51	224	285	245	176
Heating Oil	1,140	827	404	140	-	-
Biogas	-	-	-	-	-	-
Natural Gas	-	-	-	-	-	-
Total	**2,870**	**2,318**	**1,869**	**1,544**	**1,272**	**1,100**

Table 19 Targets for Residential High Efficiency Wood Heat Conversions

	2025	2030	2035	2040	2050
Existing Wood (homes)	4000	3200	2400	1600	800
New High Efficiency Wood Heat (homes)	0	800	1600	2400	3200
% converted	0%	20%	40%	60%	80%
Total Cords Used	22730	19725	16691	13656	10621
Thousands MMBTUs	454.608	394.507	333.813	273.120	212.427

Community Scale Decarbonization

Weatherization and fuel switching are two core components of CVRP's multi-pronged approach to meeting thermal and electric sector goals but there is a key gap in statewide policy and building specific targets- municipal and community scale infrastructure.

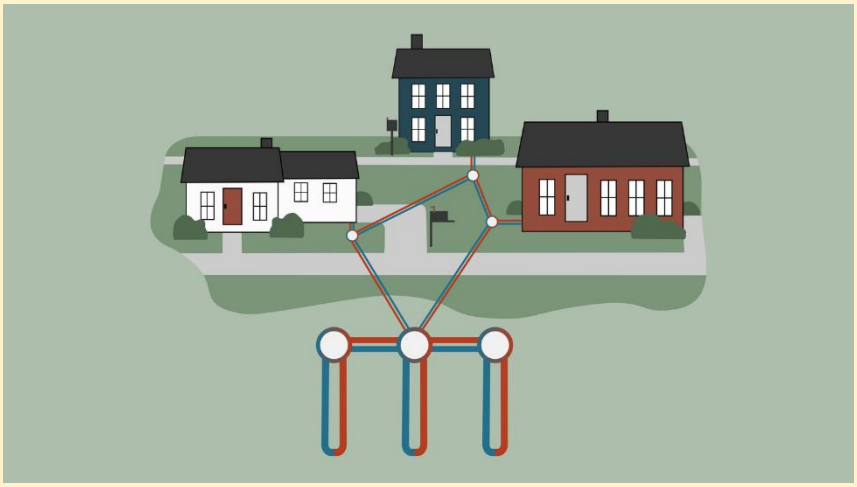
Act 172 Municipal Energy Resilience Grant Program:
Regional Analyses in Progress

- Establish Energy Use Baseline for each town (municipal buildings & facilities)
  - Annual Energy use across sectors
  - Building Audit results
- Town and Regional Goals
  - Cost Savings
  - Resilience
  - Future Demand
  - GHG Emissions
- Resident Uptake Efficiency Measures

Baseline Regional **Commercial** New Cold Climate Heat Pumps						
	2020	**2025**	**2030**	**2035**	**2040**	**2050**
New CCHP	316	960	1,827	2,333	2,580	2,710

CAP Mitigation Regional **Commercial** New Cold Climate Heat Pumps						
	2020	**2025**	**2030**	**2035**	**2040**	**2050**
New CCHP	316	5,682	11,298	17,184	21,120	21,977

Maximize Infrastructure Investments: Wasteheat Recovery

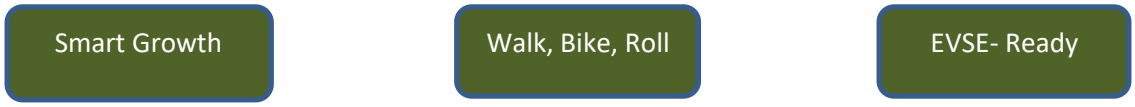


Many Vermont communities have taken advantage of state and federal funding to install, expand, and/or upgrade local water and wastewater systems. Integrating wasteheat recovery into wastewater systems is a terrific way to maximize the benefits of such an investment by recovering heat from wastewater to make potable hot water and to heat buildings (wastewater can also be used as a heat sink to cool buildings). Wastewater is a continuous and existing source of thermal energy; the average residential wastewater temperature is 70°F while commercial and industrial wastewater can be up to 140°F or higher. Heat recovery systems are simple, low maintenance, offer lower, predictable customer heating and cooling bills, and are scalable from one building/facility to much larger community or district thermal energy networks.

For more on how Thermal Energy Networks can be key opportunities to meet local infrastructure needs while reducing energy burden, GHG emissions, and thermal sector energy demand visit Vermont Community Geothermal Alliance for toolkits and more information.)

Transportation Sector Targets (pages ##, Transportation Chapter)

Note that fleet electrification and alternative fuel programs cover a wide variety of equipment; in addition to battery all-electric vehicles (BEV/AEV) and plug-in hybrid electric light-duty vehicles (PHEV), there are current incentives and options for electric passenger, cargo, and adaptive bicycles, motorcycles, snowmobiles, all-terrain vehicles (ATVs), lawn mowers and leaf blowers, and a range of alternative fuel, electric and low emissions diesel medium and heavy duty vehicles and equipment.



CVRP's Multi-Pronged Approach to the Transportation Sector includes Smart Growth, and Walk, Bike, Roll initiatives in addition to fleet electrification/EV adoption (see Land Use, Transportation, and Health Communities Chapters for more detailed discussion of smart growth and walk, bike, roll)

Ultimately, to achieve our comprehensive energy goals, transportation energy use must be reduced by embracing smart growth that directs development into existing centers, providing cost savings for households and municipalities, reducing the extent of development pressure on the environment, and building physical and social infrastructures to support thriving communities (cite mention of Act 138, Complete Streets, and designation programs in other chapters).

Renewable Energy Resources and Siting Energy Infrastructure

This section and the supplement allow the region to consider land and resource availability for different types of renewable energy generation and thus their suitability based on size, type, and proximity to demand in addition to location-based environmental and social considerations. The supplement combines resource information with specific known and possible constraints to the development of renewable energy generation at the state, regional, and local levels. This plan is intended to be a starting point and not the only basis for siting and project development. CVRPC intends for these mapping products and targets to catalyze collaboration; CVRPC encourages municipalities and communities to take an active role in project development to support their needs and demonstrate the types of projects that work well for them within their existing and future visioning for their community.

Potential Municipal Roles

- Policy: update zoning and plans to remove barrier and integrate priorities
- Community Outreach: support local partnerships and share information; develop committee/coordinator role; project working groups, etc.
- Investment: participate/host project
- Ownership/Project Development

CVRPC and ACRPC Energy Planners led a three-part workshop series in 2023 on Municipal Solar- see for more information and resources: https://centralvtplanning.org/programs/energy/webinars-and-workshops/

The siting and generation of renewable resources is a critical part of how successful the region will be in meeting our share of the state's renewable energy goals by 2050, especially in terms of maximizing co-benefits for our communities and ensuring access to affordable and reliable local energy while mitigating further impacts on our climate. The analyses described in the supplement determine where resources are available throughout the region to work towards optimizing our regional resources but also to ensure no one municipality is unduly burdened with supporting more than should be reasonably anticipated. Finally, this information will better position the region and its municipalities to evaluate the renewable energy generation options that are available to meet these goals to focus investment and address existing and potential vulnerabilities. There are also significant local benefits if distributed energy projects are developed with intentionality and community collaboration:

Community Benefits

- Cost savings (direct & indirect)
- Creative ownership models; incorporate affordability, educational, and dual use programs
- Investment in physical and social infrastructure
- Meet increased demand and expand needs met (e.g. cooling & warming centers)
- Energy Resilience, Reliability, Independence

Financial Benefits:

- Reduce Municipal costs (direct and indirect)
- Draw down funding for investment in social and physical infrastructure
- Reduce community energy burdens
- Municipal tax
- Resilience of operations
- Support targeted growth areas

Environmental Benefits:

- Support electrification of thermal and transportation sectors to go further faster and be accessible to all
- Reduce fossil fuel use and GHG Emissions
- Resilience and Reliability (increased severe storms and outages)

New Renewable Energy Generation

CVRPC's objective is to ensure that energy generation, distribution, and transmission facilities are located, designed, and correctly sized to support the Region's community and economic needs, which increasingly means it must be reliable, resilient, and affordable as well as sustainable to reduce operational costs and Green House Gas emission contributions (further reducing long-term costs). At the State level, supporting policies and programs are being revisited to consider key issues including adequate electricity, affordability of rates, cost-effective and efficient use of resources, economic vitality, environmental justice and energy equity, reliability, security, sustainability, and limiting negative environmental impacts. Many, if not all of these, apply to the regional and municipal, as well as the state level. However, priorities may differ, given the unique characteristics of each region.

Long-term energy resilience (adaptability, affordability, and crucially reliability) is critical to supporting thriving communities in Central Vermont. CVRPC advocates for the regional and municipal scales to be considered in the planning of local generation and energy transformation policies, especially as local communities increasingly experience:

- Increasing duration and frequency of outages (especially in our rural communities),
- Increasingly disparate electric rates and opportunities to invest in on-site renewable generation and storage alternatives based on distribution utility territory and proximity to energy infrastructure,
- Increased reliance on municipal and community hubs to provide critical care and resources.

Investing in infrastructure choices that maximize co-benefits and energy efficiency in complementary infrastructure such as capturing waste heat and/or creating thermal energy networks will reduce demand on existing electric infrastructure and further support cost and emissions reductions.

Did you know?

Black, Indigenous, People of Color, (BIPOC), as well as low-income, and rural Vermonters have largely been left out from major economic, social, and environmental benefits associated with investments in climate resilience and renewable energy infrastructure. BIPOC Vermonters were seven times more likely to have gone without heat in the past year, over two times more likely to have difficulty affording electricity, and seven times less likely to own solar panels than white Vermonters (Act 154 Sec 1.10), while rural and low-income communities consistently carry the highest energy burden.

CVRPC is updating both resources used to support project review at the regional level and materials to support municipal and community project development- want to learn how to get involved and change these trends in our region for the better? Get involved with your local energy committee, planning commission, and reach out to your RPC town representative!

Overview: Known & Possible Constraints, Preferred Site Types & Project Characteristics

The supplement provides detailed definitions, discussions, and mapping methods of known and possible constraints, preferred site types and project characteristics (page ##). The tables below provide the overall summary:

Table 27 Summary of State Known and Possible Constraints

State	
Known Constraints	Possible Constraints
• Vernal Pools (confirmed) • DEC River Corridors • FEMA (Federal Emergency Management Agency) Floodways • State-Significant Natural Communities and Rare, Threatened and Endangered Species • National Wilderness Areas • Class 1 and Class 2 Wetlands • Regionally or Locally Identified Critical Resources	• Vernal Pools (potential and probable) • (Prime) Agricultural Soils • FEMA Special Flood Hazard Areas • Protected Lands (State fee lands and private conservation lands) • Act 250 Agricultural Soil Mitigation areas • Deer Wintering Areas (DWA) • Highest Priority Interior Forest Blocks, Connectivity Blocks, Physical Landscape Blocks, Surface and Riparian Areas (ANR) • Hydric Soils • Regionally or Locally Identified Resources

See Supplement for Descriptions of State Known and Possible Constraints; Act 174 Planning Atlas for layer sources.

Table 28 Summary of Regional Possible Constraints

Regional Possible Constraints
• Elevations Above 2500 ft: excludes rooftop and associated with existing development • Slopes Greater than 25%: excludes rooftop and associated with existing development (unless presents new concerns for landslides)

- Municipal Owned Lands; excludes rooftop and associated with existing development
- 250ft Lake Shore Protection Buffers, excludes rooftop and hydroelectric facilities

State Preferred Sites	Additional Regional Preferences
• Rooftops and Impervious Surfaces (e.g. Parking Lots) • Gravel Pit, Quarry, or Similar Mineral Resource Extraction Site (Lawful and Reclaimed) • Brownfield Sites • Sanitary landfills • National Priorities List (e.g. Superfund Sites) • On same parcel or directly adjacent to customer allocated more than 50% of the net-metering system's electrical output • **A site identified in municipal plan or joint letter of support from municipality and RPC (Regional Planning Commission)**	• Proximity to use: density centers including designated downtowns, village centers, new town centers, growth centers, and neighborhood development areas; commercial and industrial areas; adjacent to large farms • Schools, Libraries, Municipal buildings facilities, and critical community spaces, • Solar Carports • Location served by existing roads and energy infrastructure (e.g. 3 phase) OR addresses existing gap • Designated a preferred site in Town Plan or by Town leadership (as consistent with broader planning)
Preferred Regional Project Characteristics	
• Minimize vegetation impact especially forest clearing and fragmentation; plant screen trees & pollinator habitats • Combined with storage; micro-grid potential or functions • Creates dual land use opportunities (e.g. agrivoltaics) • Includes design/build techniques that reduce embedded carbon of program (e.g. alternatives to concrete pylons) • Engage community in development process (early) • Local off-taker and/or community benefit agreement	

New Regional Renewable Energy Generation Potential & Targets

Table 29. Potential New Regional Renewable Energy Generation

	Existing Renewable Generation (MW)	Multiplier (distribution across technology type)	Incremental Regional Capacity Target (MW) 25% In- State			Resource Available (MW)	Prime Land Available (Acres)
			2025	2035	2050		
Ground Mount Solar		25%	5.1	18.5	31	1500.4	10,503

Rooftop Solar	47.17	50%	10.6	38.3	64.2	162.7	244
Wind	0.24	20%	2.7	9.9	16.5	867.6	34,795
Hydroelectric	26	5%	0.3	1.1	1.9	1.9	N/A
Biomass (Wood, methane, farm biogas)	0	0		0		0	0
Totals	73.42	100%	18.8	67.7	113.6MW	2532.7 MW	45,452 Acres

The constraints outlined above have been evaluated to ensure sufficient resource area exist to meet the region's share of the state's renewable energy targets (above, see methods and discussion in supplement). Central Vermont has more than sufficient potential renewable energy resources available, even with a conservative estimation, to meet 25% of the demand met by in-state renewable generation (different distributions across technology types are also certainly possible**). This includes sufficient resources available for each technology type for each municipality**. Maintaining this at the municipal level becomes more difficult if rooftop solar is changed to account for more than 50% of the share of new generation, although certainly, CVRPC supports refining this analysis to add different distributions by the municipality and maximizing our strengths across the region. . The Generations Scenario Tool analyses do not take into account storage and offsetting electric demand from the thermal sector via cordwood, waste heat recovery, and geothermal which are all key pieces of Central Vermont's approach to the energy transition. These would reduce the incremental energy targets required and total new renewable energy generation capacity needed which further emphasizes CVRPC's confidence that as a region we can not only achieve but comfortably exceed a 25% match if we wanted to set a regional target concerning a % of our regional demand in the future. Lastly, the potential energy generation for Central Vermont could increase if we include biomass, biogas, and methane, however, we do not currently have any such sites located in the region, therefore calculating a potential for generation would be difficult.

Key Issue: Grid Capacity and Infrastructure Needs

The following section summarizes some of the key known issues our electricity infrastructure presents in terms of existing and new renewable generation (and electrification).

Some Central Vermont communities have extremely limited or no three-phase power but do have prime resource areas to support renewable energy development. While, as previously noted, smaller generation projects (including residential and some municipal and small businesses) can typically be accommodated by single transmission even when not located close to load, medium and larger scale projects rely on three-phase power. In data provided by the Public Service Department, Cental Vermont's transmission capacity is limited to approximately 41.5 MW with transmission grid upgrade costs estimated at $40.1 million (see supplement). Again, there are significant and rapidly evolving opportunities to mitigate some, but certainly not all, of these upgrades and costs. While CVRPC conducts further analyses to help municipalities understand how these limitations may impact their energy planning, the region also recognizes that significant investment in our

energy infrastructure is required to support thriving communities in our region and these costs should not be borne by those who are already most burdened by infrastructure challenges which furthermore limit their access to draw down federal and state funds to participate in a just transition. CVRPC again emphasizes the importance of integrating energy into land use planning and working with energy stakeholders to ensure that energy planning not only is consistent with local regulations and visioning but also accounts for targeted growth and likely demand.

Further engagement with VELCO's Long Range Transmission planning process, our Distribution Utilities' integrated resource planning processes, and the State's energy planning will strengthen these efforts at all scales. The Department of Public Service highlights this, including the role of RPCs, in the 2022 Vermont Comprehensive Energy Plan (pg 87).

Resilience and Reliability

The State's "Electrify Everything" approach does raise specific concerns for some of our municipalities and communities given these interconnection limitations, rural infrastructure gaps, and annual longer-term outages.

CVRPC continues to advocate for wider scale policies and programs to address reliability and local resilience (the most recent Renewable Energy Standard Update included a series of technical analyses, none of the scenarios modeled yielded significant reliability benefits). CVRPC also supports municipalities, affordable housing partners, community groups, and businesses to consider integrating on-site energy generation, storage, and back-up power into their capital improvement planning.

Several substations presently pose significant barriers to expanding renewable generation in our region (summary below). For the substations in GMP territory, substation transformer capacity can be viewed on their Solar Interconnection Map[9] which highlights circuits based on having at least 20%, less than 20%, less than 10%, or severe limitations (higher costs and delayed interconnections)(although two GMP feeders that serve Roxbury, Northfield, and Woodbury are blank due to lack of data from municipal utilities). For other distribution utilities, it is harder to plan in real time based on potential technical limitations due to the lack of publicly available data. Our region has approximately 267.5MW of Distribution Headroom according to data supplied by the Department of Public Service in the Generations Scenario Tool which is well above our Capacity Target for 25% in state generation, although not sufficient for the 50% in state generation scenario. While this headroom is ample at a regional glance, there are issues at the municipal scale including, as noted above, that Calais, Orange, Plainfield, Washington, and Williamstown have capacity targets that exceed their distribution headroom. These town's capacity targets exceed provided distribution headroom by less than 1MW in 3 cases (Calais, Orange, and Plainfield), by 1MW in Washington, and by 4.2MW in Williamstown which hosts 2 of the region's largest solar arrays (utility-owned). Depending on the size of the proposed projects, these may or may not present significant interconnection barriers but are representative of the longer-term challenges we face in implementing our energy goals. Distribution headroom is not provided for Northfield, Roxbury, and Woodbury. CVRPC continues to work with DUs on data gaps and to integrate their Integrated Resource Planning into regional and municipal

[9] https://www.arcgis.com/apps/webappviewer/index.html?id=4eaec2b58c4c4820b24c408a95ee8956

planning and project development and to advocate that regional and municipal energy planning and goals in turn are considered in their Integrated Resource Planning Processes. Key issues included:

- Many substations across our region, regardless of utility territory, must be upgraded to address transmission ground-fault overvoltage (TGFOV) concerns (see figure below), these are subject to an additional Tariff fee of $47 per kW of AC capacity authorized by VT PUC Docket #19-0441-TF.
- Two such systems in WEC (Washington Electric Coop) territory have issues that are so severe that they are currently objecting to any further interconnection and the risk that it could adversely affect system stability and reliability. This severely impacts the portions of Barre Town, Berlin, Northfield, Orange, Roxbury, Washington, and Williamstown that are in WEC territory. Existing substation voltage regulators and transformers have to be upsized which in turn requires support structure adjustments. A timeline has not been established for such a project.
- Summer loading in the Woodbury Lakes area creates a sizeable circuit imbalance and an imbalance on the Hardwick Substation transformer for several months of the year, converting from a V-phase to a full three-phase feeder along with additional reliability improvements is included in Hardwick Electrics 2021 Integrated Resource Plan.

In the short term, costs of additional renewable energy infrastructure will be lowest in areas that do not have TGFOV tariff fees and with substation transformers that have at least 20% capacity remaining (although the tariff fees are a key mechanism for paying for necessary updates to DU infrastructure). In the long term, many of these infrastructure upgrades are necessary and inevitable; again, better coordination among planning efforts can help our region transition and make sure no one is unduly burdened by cost or left out.

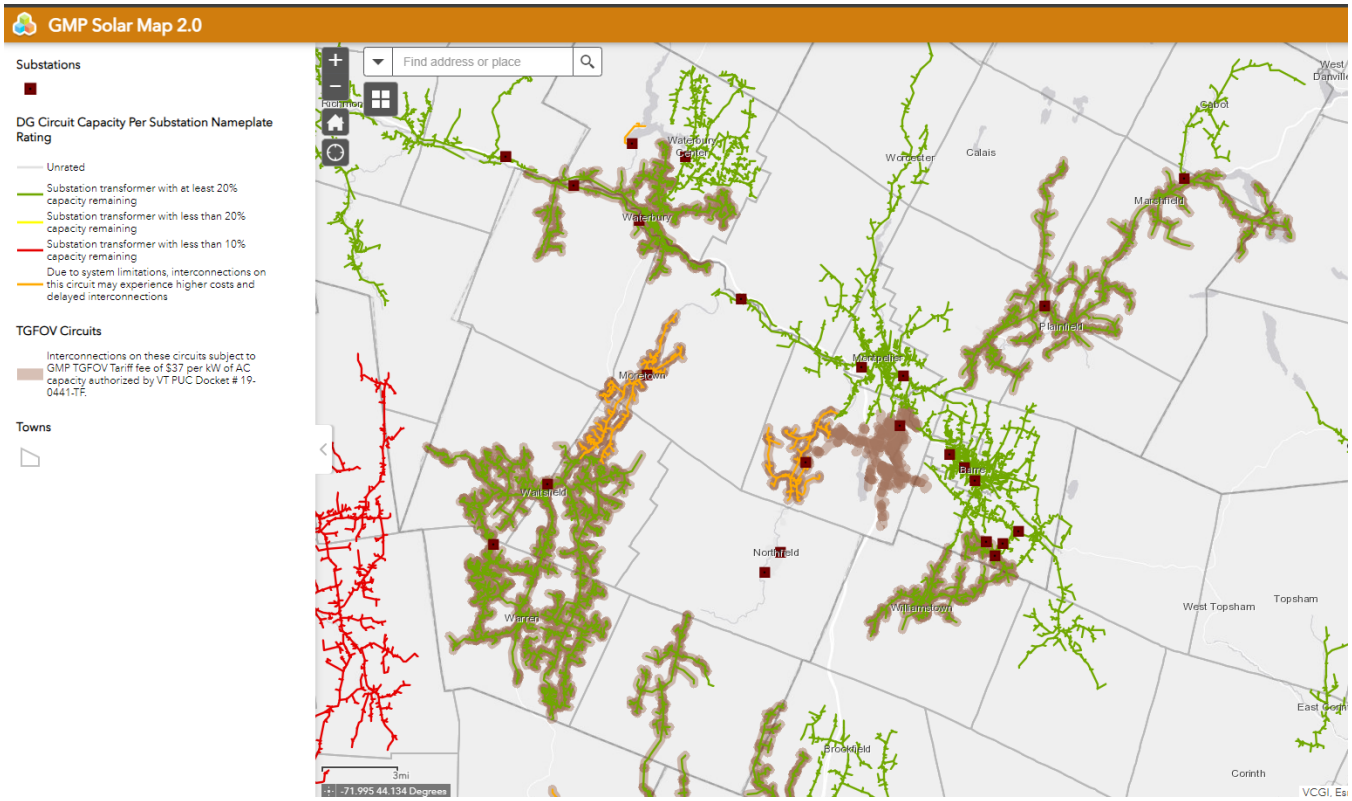


Figure 8 : Snapshot of CVRPC territory via GMP's Solar Map- lines circuits with brown shading have transmission ground-fault overvoltage (TGFOV) concerns, those in yellow have less than 20% capacity remaining.

Renewable Energy Generation Resource Areas by Technology Type and Scale

CVRPC acknowledges there is a tendency for preferred sites at all scales to favor small and medium projects, while this is in line with many municipal and community preferences and many regional priorities, it requires new models for how projects may be aggregated to take advantage of economies of scale, for local and state investment, as well as increased capacity at DUs for interconnections and load demand management (which may be viewed as both an opportunity and burden). It is also important to remember that preferred site designation is required for projects 150kW-500kW to participate in net metering and while we have comparatively few projects at this scale in our region (see below, approximately 23) they do provide approximately 10% of our region's existing generation. Not having a preferred site status does not prevent the project from being implemented, it just excludes it from the financial incentives provided via the net-metering program. The best way for projects of this scale (and all projects but especially this scale and larger) to attain preferred site status is to reach out early and often to the town and community including local energy committees and coordinators. Furthermore, CVRPC does encourage municipalities to work with local landowners and the broader community to consider potential and parcel-specific opportunities for large projects- only 23 projects out of the region's 2463 and counting renewable energy generation projects are 500kW and more, yet they contribute 1/3 of our region's total nameplate generation. As the state continues to electrify and move towards 25% of demand produced by in-state renewable energy generation, it is important to consider and direct where these large-scale projects may be located and how they fit into local and regional visioning of our communities. To this end, CVRPC has begun to analyze potential resource areas (Figures above) to identify contiguous areas that may meet basic technical requirements and facilitate community conversations around the development and use of renewable energy generation.

So where are projects being located?

Many of the projects in terms of numbers are small residential scale (many rooftop but not all)- important to consider that siting guidelines are best developed with clear references to different scales.

Total from State Energy Programs	MW	# Projects	
Generation <15kW Category I	14.69856	2233	Many are rooftop as residential scale
Generation 15kW to <150kW (Category II)	6.56739	184	Generally includes Municipal/Community Scale (not limited to)
Generation 150kW to <500kW (Category III)	6.18665	23	Currently have to be preferred sites to participate in net metering
Generation 500kW+	22.944	23	Most Standard Offer projects are 1-2.2MW
Total (not regional total):	50.3966	2463	

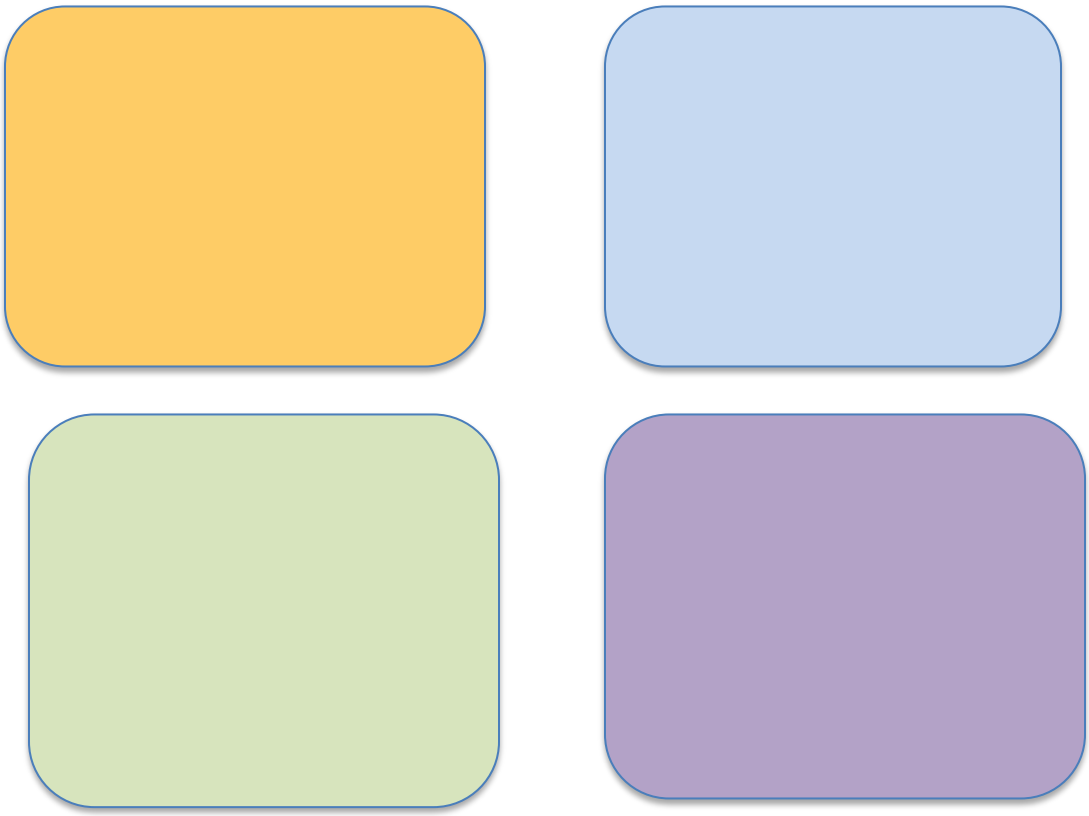
Noted trends in current project development (Figure to be added)

- projects that have been co-developed by municipalities/schools are often preferred site types and are typically smaller from residential to community scale,
- projects that are developer/DU led typically are larger, many do develop at least some green field space, some are on landfills/gravel pits

CVRPC thus identifies a critical need to connect stakeholders and their planning processes:

- work with Distribution Utilities to establish annual data updates for local and regional planning processes, understand short, medium, and long term infrastructure improvement plans, and provide regional summaries for integration into integrated resource planning efforts
- encourage towns to highlight opportunities and mechanisms for project development in town plans and website; encourage Dus and developers to consult towns and town plans early on in project development

Add back in summary by Technology TYPE re scale once review supplement!



Changes in Technology

Storage is a key and rapidly changing area for future planning.[10]. At the grid scale, most storage is generally currently 3-6hours of very big amounts of energy, while critical to keep continue power supply at the transmission and distribution scales, these don't address many of the reliability and resilience, not to mention seasonal, challenges we face in Central Vermont. Diversified and complimentary generation sources- for example, solar with daytime and summer peaks paired with wind with night and winter peaks- are one component of planning for seasonality and reliability and important to keep in mind when thinking about the types of infrastructure to plan for. Distributed storage, smaller scale typically chemical storage (battery) tied to renewable generation is currently the dominant approach in our region. DUs are integrating grid-tied storage systems at the customer scale; ensuring that this approach allows for the provision of backup power in outage events for those with on-site generation is a keyway that Central Vermont can enhance resilience in our region and ensure every community can meet critical needs and operations.

As noted previously, the state's comprehensive energy plan and subsequently the Central Vermont Regional Energy Plan are both written with electricity as the primary power source. This direction includes renewable energy technology that exists today such as wind, solar, hydroelectric, biomass, and biogas. As technologies change and advancements are made in both efficiency and sources of renewable energy generation, the region's municipalities will need to be flexible and adaptable to these changes.

[10] The Vermont Public Utility Commission had an excellent series of Energy Storage Systems Workshops in late Fall 2023, for an excellent introduction to energy storage technologies, the role of energy storage in transforming the grid, storage policy at the state and federal level, interconnection, and more access them at https://energy.sandia.gov/programs/energy-storage/policy-and-outreach/regulatory-webinars/vermont-public-utility-commission-energy-storage-systems-workshops/.

With this in mind, the Central Vermont Regional Energy Plan acknowledges and recommends consideration for changes in technology that do not limit renewable energy development to known sources. This concept will need to be continually revisited to ensure current technologies are considered and outdated technologies are not recommended. Examples of CVRPC's commitment to working on solutions that fit well for different communities in our region include our emphasis on exploring the role waste heat recovery and geothermal can play in energy conservation and reducing thermal electric demand, continued emphasis on cordwood and efficient wood stoves over pellet and wood chips as key accessible and affordable sources of residential heat, and a fierce determination to emphasize the need for local reliability and resilience considerations at the broader scale of state and NE regional energy planning. CVRPC is committed to helping municipalities explore fossil fuel-free alternatives for back-up power which can leverage funding to meet a common municipal demand that lacks existing funding. Technologies including bi-directional EV chargers, power storage, mobile solar generators, and Meter-Socket Adapters can be integrated into existing and new energy systems across our region at all scales to transform our region into one dotted with micro-grid capabilities. This is key as we face increasingly extreme weather and storm events, resulting in many of our communities experiencing outages of longer duration (up to 8 days) annually (See Climate Chapter for the role of on-site generation and storage in municipal buildings and facilities and Community Resilience Hubs).

Goals, Targets, Policies, & Strategies

CONSERVATION & EFFICIENCY

Goal 1 : Increase conservation of energy by individuals, organizations, and municipalities. Reduce the amount of energy needed to support existing and future buildings, facilities, and infrastructure; reducing GHG emissions especially via the reduction/elimination of fossil fuel use.

Targets:

1. By 2035, weatherize 16,767 housing units; 27,125 by 2050 (subject to change based on State LEAP modelling updates); identify a commercial building weatherization target, and weatherize all municipal buildings & facilities by 2050.
2. By, 2025, 30% of new buildings built to net zero energy ready standards and 100% by 2030
3. By 2050, install 42,473 new cold climate heat pumps (both air-sourced and ground-sourced) and approximately 32,196 heat pump hot water heaters in the residential sector; and 21,977 commercial cold climate heat pumps.
4. By 2035, 50% of new residential, commercial, and industrial developments of 20,000sqft and above will use geothermal heating systems, and/or be part of a thermal energy networks and/or include wasteheat recovery.

Policies:

A. Beneficial and resource-efficient electrification of thermal loads should be considered in all new buildings, facilities, and infrastructure design, as well as retrofits, this includes:
   a. Maximizing (waste)heat recovery,
   b. air and ground source heat pumps, as well as, where appropriate high-efficiency cordwood stoves
   c. community scale thermal networks/district heat and/or procurement at scale

B. Promote energy efficiency and net-zero ready design, construction, renovation, operation, and retrofitting of systems for buildings, facilities, and infrastructure- via… connect this to RBES/CBES? Other (see strategies below)?

C. Promote utility-scale demand management

Strategies

i. CVRPC shall not support new residential, commercial, and industrial development subject to Act 250 that uses fossil fuel combustion as a primary heating source OR As a condition of CVRPC support, developers of new residential, commercial, and industrial projects subject to Act 250 shall demonstrate due consideration of air-source and/or ground-source heat pumps as a method of heating and cooling. Developer must also demonstrate due consideration of heat recovery technologies such as Energy Recover Ventilators (ERVs) and heat recovery from refrigeration, wastewater, and/or commercial and industrial processes as applicable.

ii. Assist in the identification of waste heat recovery opportunities, thermal resources, and the siting of infill development in proximity to alternative thermal sources to maximize capture and use to reduce electricity load from electrification of heating sector

iii. CVRPC provides technical assistance to municipalities on weatherization and fuel switching projects, and supports states, municipal & community weatherization and weatherization-ready programs (e.g. education & outreach, program development & rollout, community-based implementation, and establish stable funding) especially for low- and moderate- income Vermonters

iv. Work with the Department of Public Service and other RPCs to integrate storage and thermal sector offsets to forecasted electric demand (via advanced woodheat, waste heat recovery, geothermal, etc) into modeling and generations scenario tool.

v. CVRPC shall provide letters of support for net-zero energy construction throughout the Region.

vi. CVRPC shall provide technical assistance for the creation of enforcement mechanisms to enhance compliance with Vermont's Residential and Commercial Building Energy Standards (RBES and CBES).

DEVELOPMENT AND SITING OF RENEWABLE ENERGY GENERATION

Goal: "Right-size" new renewable energy generation infrastructure to support thriving communities in intentional growth areas, increase local resilience & reliability while minimizing negative landuse impacts especially on forest blocks and corridors

Goal: at least 25% of regional demand is generated locally from renewable resources

Goal: Evaluate municipal buildings, facilities, and parcels for on-site renewable generation and storage projects in line with municipal goals and needs including to make electrification financially solvable, to address frequent and/or long duration outages, to support emergency operations and/or community resilience hubs, and to creature sustainable funding for energy projects, etc.

Targets:

1. Incremental Renewable Energy Targets (last update DG inventory)

Policy:

A. Where possible renewable energy generation and storage should be integrated with/co-located with other forms of development (to maximized co-benefits and meet local needs) [As a condition of CVRPC support, developers of new residential, commercial, and industrial projects subject to Act 250 shall demonstrate due consideration of on-site renewable energy generation & storage]

B. CVRPC determines preferred sites based on the preferred site types and project characteristics detailed herein (for net-metering under PUC rule 5.100):
   a. Region adopts the state's preferred site list and provides additional preferred site types and project characteristics in line with the region's broader land use approach to reducing GHG emissions and conserving energy while investing in shared community infrastructure (pages ##)

C. Review in relation to regional plan including for substantial regional impact as part of the 248 process will consider known and possible constraints, preferred sites and project characteristics, as well as current & future land use policies herein; CVRPC has a strong priority for projects that serve local off-takers/RECs are retired in-state, are community scale, reduce vegetation impacts and are co-located with other development, and/or are co-developed with the municipality or community.

D. CVRPC supports optimizing existing, and exploring new, hydroelectric generation projects in Central Vermont
   a. CVRPC will consider flood mitigation, ecosystem impacts, energy generation, and recreation in our support, or lack there of, for infrastructure projects including but not limited to the region's dams

E. Other

Strategy:

i. Assist municipalities, affordable housing partners, community groups, and businesses in integrating on-site energy generation, storage, and back-up power into their capital improvement planning and project development;
ii. Provide technical assistance to municipalities for enhanced energy planning, integrating energy and climate into their town plans, by laws, and procurement policies, etc.
iii. Conduct further analyses in collaboration with municipalities to refine regional constraints and clarify local constraints so they can also be integrated into local and regional mapping.
iv. Improve accuracy and accessibility of existing generation and preferred siting maps (regional and municipal), as well as resource potential and constraints map resources for municipalities to use in their Enhanced Energy Planning processes to determine the potential impact of additional constraints or adding preferred sites to local maps.
v. Develop thermal energy resource map to support the consideration of thermal energy network (focused existing building and facilities, proposed projects, and potential for infill.
vi. Develop resources for towns and developers to identify opportunities to maximize priorities including advance housing delivery, forest and land conservation, flood and climate resilience, and renewable energy development and energy infrastructure.
vii. work with Distribution Utilities (and other energy stakeholders) to fill data gaps and coordinate Integrated Resource Planning with regional and municipal planning and project development to ensure alignment in goals and energy planning efforts
viii. Provide model/guidance/best practices towns to highlight opportunities and mechanisms for project development in town plans and website; encourage DUs and developers to consult towns and town plans early on in project development.

ENERGY RESILIENCE, RELIABILITY, & EQUITY

Goal 1: Improve resilience and reliability of region's electric grid infrastructure (least coast long-term) and work with municipalities and communities to build local energy resilience

Goal 2: Ensure all municipalities and Central VT residents have access to affordable, resilient & reliable energy; as well as access to the environmental, economic, and social benefits of local renewable energy

Targets:

1. Develop and implement municipal and/or community resilience hubs in every town
2. Wood heat

Policies:

A. CVRPC supports the transition from fossil fuel heating fuels using not only heat pumps (air and ground sourced), but also strongly supports the conversion of inefficient wood stoves to advanced wood heat stoves to reduce air pollution emissions, reduce heating costs, amount of wood fuel used, and provide an accessible option for many Vermonters- our targets for the thermal sector reflect this commitment

B. In addition to heat pump and EV adoption, CVRPC advocates that utility stakeholders including distribution and transmission utilities take current and future land use planning, especially intentional growth areas, into consideration regarding future demand modeling and investment prioritization; similarly, future land use planning considers existing energy infrastructure (and gaps)

Strategies:

I. Develop a summary of needs and measures across municipal buildings & facilities starting with the Municipal Energy Resilience Grant Program assessment reports, establish municipal energy use baselines, model project development and develop funding stacks and support capital planning, and provide technical assistance for implementation.
II. Provide technical assistance to municipalities in developing municipal bylaws that promote energy conservation and the development of renewable energy resources.
III. Advocate for program models that cover up front costs, have minimal eligibility requirements and administration, and can meet acute needs (at point of failure) to maximize access for underserved residents and all municipalities
IV. Develop regional GHG emissions inventory and identify key priorities and co-benefits
V. Identify opportunities to integrate energy storage technologies such as on site generation & storage into capital planning projects to support micro-grid systems and diversify emergency back-up power resources.
VI. Provide opportunities for community education and engagement around the role of renewable energy generation and storage in emergency management (recovery & response) as well as the costs, benefits, and challenges associated with these technologies.
VII. Work with municipalities, distribution and transmission utilities, the Department of Public Service, and others to support the deployment of storage, extension of 3-phase power, the hardening and/or advanced reconductoring of electric lines, etc. targets both those most burdened by reliability and resilience issues (typically more rural residents) as well as our designated growth areas.
VIII. Assist municipalities in establishing fossil fuel free alternatives to back-up power
IX. Provide support and education around existing technologies including how bi-directional EV chargers, power storage, mobile solar generators, and Meter-Socket Adapters can be integrated into existing and new energy systems across our region at all scales to transform our region into one dotted with micro-grid capabilities
X. .

REDUCUE TRANSPORTATION ENERGY DEMAND AND GHG EMISSIONS

Goal 1: Promote the shift away from gas/diesel vehicles to electric and non-fossil fuel transportation options to reduce dependency on non-renewable fuel sources for transportation

Goal 2: Promote the shift away from single-occupancy vehicle trips and adoption of alternative modes to reduce per capita energy intensity of transportation.

Goal 3: Facilitate the development of walking, biking, and rolling infrastructure to provide alternative and multi-modal transportation options for communities and to promote interconnection within the region's transit systems.

Targets:

1. 33,359 EVs by 2050
2. Municipal fleet target?

3. VMT/reiterate region share of state goals?

Policies:

A. Municipal and community fleet electrification and EVSE planning should consider bi-directional options which can be integrated into back-up and emergency power plans
B. CVRPC supports the deployment of off-grid EVSE (solar) especially in rural communities with high duration and frequency of outages
C. Support regional infrastructure projects that enable commuter to use alternative modes including multi-town greenways/paths, satellite co-working spaces/transportation hubs. Ensure continued support for inter-municipal and inter-regional public transit.
D. Require large scale developments to consider transit, multi-modal, and EVSE infrastructure within development proposals.
E. Regional transportation initiatives should coordinate with and integrate existing community-supporting organizations and non-profits; center underserved communities in decision making, prioritization, and planning (Key partners include Capstone, Central Vermont Mobility Committee; Center for Independent Living, PrideRidesVT, FreeRide, LocalMotion, GMT, etc.)

Strategies: **Cross ref with Transportation**

i. Develop recommended criteria for supporting public and ridesharing infrastructure integrating health equity recommendations such as curb cuts, cross walks, raised and sheltered bus stops/benches, accessible transit stop sitting, etc.; identify gaps in service and accessibility
ii. Work with municipalities to ensure land use regulations do not prohibit the installation of electric vehicle supply equipment (EVSE, aka charging stations) or similar alternative fuel technologies (such as biodiesel) and identify model language for municipalities to adopt
iii. Promote EVSE ready building practices and retrofits (electrical panel needs); promote the use of EV Meter Socket Adapters to mitigate common obstacles to adoption and enable bidirectional EVSE for charging, vehicle to grid configurations, connection to solar and stationary storage, etc.
iv. Conduct outreach and provide technical assistance to municipalities to participate in State EVSE and fleet electrification programs (via support to ACCD and DHCD (Department of Housing & Community Development), VTrans, and Drive Electric), as well as EVSE planning and funding.
v. Identify fleets suitable for full or partial conversion to electric, low-emissions, and/or alternative fuel vehicles and provide technical assistance
vi. Identify opportunities for municipal transportation asset sharing and procurement
vii. Support DriveElectric and VTrans to maintain inventory of existing EVSE, condition, and recruit potential site hosts; identify infrastructure gaps and facilitate region-wide access for EV operators; develop template criteria for EVSE location prioritization to improve access and equity
viii. Provide training to local zoning and development review boards to consider infrastructure for alternative transportation in their review of site plans.
ix. Support employer programs to encourage telecommuting, carpooling, vanpooling, walking, and biking for employee commute trips (including flexible work hours, remote work options, discounted transit fair, health bonuses, etc.)
x. Work with utility companies and municipalities to inventory and map infrastructure such as fiber optic cable to identify gaps that may prohibit information accessibility or telecommuting options
xi. Work with VTrans and Green Mountain Transit to identify future growth areas or development centers to ensure public transit will be accommodated in these locations including access to park & ride locations when appropriate.

xii. Work with providers of transportation services and other partners to identify underserved communities including unhoused community members, rural areas, low-income neighborhoods, night shift work sites, etc. to identify strategies for serving these locations (and connections to critical services)

xiii. Provide technical and grant writing assistance to municipalities who plan for multi-modal transportation and better connectivity with alternative transportation modes. Prioritize implementing the strategies and priorities identified in the Vermont Health Equity Planning Toolkit that are relevant to the region. Develop project prioritization criteria that integrate energy, climate, and health equity considerations.

xiv. Develop model regulations to be evaluated by municipalities that require walk/bike/roll infrastructure in downtowns, village centers, growth areas, or locations that propose high density development patterns; demonstration of consideration for walk/bike/roll infrastructure is a condition of CVRPC support for designation application and for projects under Act 250

xv. conduct gap analyses and identify high priority projects that connect residents with diverse needs to food assets, schools, public transit, libraries, etc.; potentially as part of developing a regional walk/bike/roll master plan

xvi. Other?

PATTERNS AND DENSITIES OF LAND USE LIKELY TO RESULT IN CONSERVATION OF ENERGY cross ref Land USE

GOAL: land use policies support compact development in mixed-use centers (smart growth)

Policies:

A. Central Vermont is committed to reducing sprawl and minimizing low-density development by encouraging density in areas where infrastructure exists or is planned to support growth.

B. Strongly prioritize development in compact, mixed-use centers when feasible and appropriate; and identify ways to make compact development more feasible throughout Central VT

C.

Strategies: Pull from above

Energy Planning Standards for Regional Plans

Instructions

Before proceeding, please review the requirements of Parts I and II below, as well as the Overview document. Submitting a Regional Plan for review under the standards below is entirely voluntary, as enabled under Act 174, the Energy Development Improvement Act of 2016. If a Regional Plan meets the standards, it will be given an affirmative "determination of energy compliance," and its land conservation measures and specific policies will be given "substantial deference" in the Public Utility Commission's review of whether an energy project meets the orderly development criterion in the Section 248 process. Specifically, with respect to an in-state electric generation facility, the Commission:

> *[S]hall give substantial deference to the land conservation measures and specific policies contained in a duly adopted regional and municipal plan that has received an affirmative determination of energy compliance under 24 V.S.A. § 4352. In this subdivision (C), "substantial deference" means that a land conservation measure or specific policy shall be applied in accordance with its terms unless there is a clear and convincing demonstration that other factors affecting the general good of the State outweigh the application of the measure or policy. The term shall not include consideration of whether the determination of energy compliance should or should not have been affirmative under 24 V.S.A. § 4352*

Regional Plans may be submitted to the Department of Public Service (PSD) for a determination of energy compliance (determination), along with the completed checklist below. After a Regional Plan and completed checklist have been submitted to the PSD, the PSD will schedule a public hearing noticed at least 15 days in advance by direct mail to the requesting regional planning commission, on the PSD website, and in a newspaper of general publication in the region. The Commissioner of the PSD shall issue a determination in writing within two months of the receipt of a request. If the determination is negative, the Commissioner shall state the reasons for the denial in writing and, if appropriate, suggest acceptable modifications. Submissions for a new determination following a negative determination shall receive a new determination within 45 days.

The plans that Regions submit must:

- Be adopted
- Include the energy element as described in 24 V.S.A. § 4348a(a)(3)
- Be consistent with state energy policy (described below), in the manner described in 24 V.S.A. § 4302(f)(1)
- Meet all standards for issuing a determination of energy compliance (see below)

Regions are encouraged to consult with the PSD before undertaking the process of plan adoption, which may help in identifying any deficiencies or inconsistencies with the standards or other requirements that would be more difficult to remedy after a plan has gone through the formal adoption process.

The 2022 Comprehensive Energy Plan (CEP), published on January 14, 2022, includes several important updates to the Act 174 enhanced energy standards:

- A revised set of standards, presented in this document, updated to reflect current developments in state energy policy

- An updated suite of recommendations tailored specifically toward the work of the regions and municipalities. Unlike the set of recommendations published with the original standards, which were written prior to the passage of Act 174, these recommendations are included in the 2022 CEP itself.

In addition, a revised guidance document will be published within six months after the publication of the 2022 CEP to reflect new issues and best practices that have emerged from the regions and municipalities that have gone through an initial process of applying for a determination of energy compliance. This document will also include the recommendations for regions and municipalities outlined in the 2022 CEP.

Affirmative determinations are valid for the life cycle of a revision of the Regional and/or Municipal Plan. Plans submitted after the 2022 CEP is issued are expected to meet the updated Standards issued with the 2022 CEP, with the exception of plans for regions or municipalities who can demonstrate they had meaningfully initiated the planning process (ex. through proof of a publicly noticed meeting) before the 2022 CEP was published. Regions are encouraged to consult with the PSD regarding interim amendments that might affect any of the standards below, to discuss whether a new review is triggered. Plans approved under the previous Standards will not lose their existing determination of energy compliance as a result of new Standards being issued.

If you wish to submit your Regional Plan to the PSD for a determination, please read closely the specific instructions at the start of each section below, and attach your Regional Plan to this checklist.

Determination requests and any other questions should be submitted to: PSD.PlanningStandards@vermont.gov.

Part I: Applicant Information	
Applicant:	Click or tap here to enter text.
Contact person:	Click or tap here to enter text.
Contact information:	Click or tap here to enter text.
Received by: Click or tap here to enter text.	**Date:** Click or tap here to enter text.

Part II: Determination Standards Checklist

The checklist below will be used to evaluate your plan's consistency with statutory requirements under Act 174, including the requirement to be adopted, contain an enhanced energy element, be consistent with state energy policy, and meet a set of standards designed to ensure consistency with state energy goals and policies.

Please review and attach your plan (or adopted energy element/plan, along with supporting documentation) and self-evaluate whether it contains the following components. Use the Notes column to briefly describe how your plan is consistent with the standard, including relevant page references (you may include additional pages to expand upon Notes). If you feel a standard is not relevant or attainable, please check N/A where it is available and use the Notes column to describe the situation, explaining why the standard is not relevant or attainable, and indicate what measures your region is taking instead to mitigate any adverse effects of not making substantial progress toward this standard. If N/A is not made available, the standard must be met (unless the instructions for that standard indicate otherwise) and checked "Yes" in order to receive an affirmative determination. There is no penalty for checking (or limit on the number of times you may check) N/A where it is available, as long as a reasonable justification is provided in the Notes column.

Plan Adoption Requirement

Act 174 requires that regional plans be adopted in order to qualify for a determination of energy compliance. The plan adoption requirement can be met through an amendment to an existing plan in the form of an energy element or energy plan, as long as the amendment or plan itself is duly adopted as part of the regional plan and incorporated by reference or appended to the underlying, full plan (i.e., is officially "in" the regional plan). If this route is chosen, regions should also provide a memo that discusses the internal consistency of the energy plan/element with other related elements of the underlying plan (particularly Transportation and Land Use), and/or whether the energy plan/element supersedes language in those other elements. Standards 1 and 2 below must be answered in the affirmative in order for a plan to receive an affirmative determination of energy compliance.

1. Has your plan been duly adopted?	☐Yes Adoption date: Click or tap here to enter text.	☐ No	Click or tap here to enter text.
2. Is a copy of the plan (or adopted energy element/plan, along with underlying plan and memo addressing consistency of energy element/plan with other elements of underlying plan) attached to this checklist?	☐Yes	☐No	Click or tap here to enter text.

Energy Element Requirement

To obtain a determination of energy compliance, Act 174 requires regions to include an "energy element," revised through Act 174 to explicitly address energy across all sectors and to identify potential and unsuitable areas for siting renewable energy resources, as described in 24 V.S.A. § 4348a(a)(3):

An energy element, which may include an analysis of resources, needs, scarcities, costs, and problems within the region across all energy sectors, including electric, thermal, and transportation; a statement of policy on the conservation and efficient use of energy and the development and siting of renewable energy resources; a statement of policy on patterns and densities of land use likely to result in conservation of energy; and an identification of potential areas for the development and siting of renewable energy resources and areas that are unsuitable for siting those resources or particular categories or sizes of those resources.

The standards below are generally organized to integrate each component of the enhanced energy element with related determination standards that evaluate the plan's consistency with state goals and policies. **Energy element components are identified in bolded text.**

While regions may choose to primarily address energy used for heating, transportation, and electricity in the required energy element, they may also choose to address some of these components in related plan elements (e.g., Transportation and Land Use) and should indicate as much in the Notes column. To the extent an energy element is designed to comprehensively address energy, it should be complementary to and reference other relevant plan elements.

3. **Does the plan contain an energy element, as described in 24 V.S.A. § 4348a(a)(3)?** *Individual components of the energy element will be evaluated through the standards below.*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text.

Consistency with State Goals and Policies Requirement

Act 174 states that regional and municipal plans must be consistent with the following state goals and policies:

- Greenhouse gas 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)
- 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)
- Building efficiency goals under 10 V.S.A. § 581 (e.g., reduce fossil fuel consumption across all buildings by 10% by 2025)
- State energy policy under 30 V.S.A. § 202a and 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
- 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

The standards in the checklist below will be used to determine whether a plan is consistent with these goals and policies. The standards are broken out by category. *Analysis and Targets* standards address how energy analyses are done within plans, and whether targets are established for energy conservation, efficiency, fuel switching, and use of renewable energy across sectors. *Pathways (Implementation Actions)* standards address the identification of actions to achieve the targets. *Mapping* standards address the identification of suitable and unsuitable areas for the development of renewable energy.

Regions may choose to incorporate the information necessary to meet the standards in their energy elements, and/or in other sections of their plans (many transportation items may fit best in the Transportation chapters of plans, for instance). However, plans must be internally consistent, and applicants should cross-reference wherever possible.

Analysis and Targets Standards

For the analysis determination standards below, regions are expected to develop or update their own analysis (which the PSD will support through regionalization of the modeling efforts conducted to support the 2022 CEP), and to then break out the analysis for their municipalities, who can use their region-provided analysis to meet the municipal *Analysis & Targets* standards. The PSD and regional planning commissions developed several guidance documents to explain the expected level of detail in and suggestions regarding data sources and methodologies available for meeting the *Analysis & Targets* standards below. These guidance documents can be retrieved from the following links:

- In 2017, the PSD developed two guidance documents, one for regional plans and one for municipal plans:
  - Guidance for Regional Plans
  - Guidance for Municipal Plans
- In addition, in 2019 the Northwest Regional Planning Commission, with input from all 11 RPCs in the state, created a best practices and resources guide for municipalities to use when undertaking enhanced energy planning.

The guidance developed by the PSD will be updated in 2022 to incorporate best practices that have emerged from the regions and municipalities who have completed an initial round of energy plans. Note that standards 4A-4E are all derived directly from requirements in Act 174 (with minor modifications to make them feasible) and must be met affirmatively in order for a regional plan to receive an affirmative determination of energy compliance. Standard 5 is also required and addresses "municipalization" of analysis and targets; regions should check "Yes" if they have or if they have a plan to supply this information to their municipalities.

Targets set by regions should be aligned with state energy policy (see the goals and policies listed above). Where targets (and efforts to reach them) depart significantly from state energy goals and policies, an explanation for how the plan otherwise achieves the intent of the state goal or policy should be provided. The guidance document also offers additional clarification on alignment with state goals and policies.

The analysis items below are intended to provide regions with an overview of their current energy use, and with a sense of the trajectories and pace of change needed to meet targets, which can be translated into concrete actions in the *Pathways* standards below. Targets provide regions with milestones or checkpoints along the way toward a path of meeting 90% of their total energy needs with renewable energy, and can be compared with the potential renewable energy generation from areas identified as potentially suitable in the *Mapping* standards exercise below to give regions a sense of their ability to accommodate renewable energy that would meet their needs.

4. **Does your plan's energy element contain an analysis of resources, needs, scarcities, costs, and problems within the region across all energy sectors (electric, thermal, transportation)?**	☐Yes	☐No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.

Note: You may want to reference the guidance document, developed by Northwest Regional Planning Commission, with input from all 11 regional planning commissions, on best practices for conducting such an analysis, including examples and suggested units to use when developing analyses.			
A. Does the plan estimate current energy use across transportation, heating, and electric sectors? *As noted in the Guidance Document, plans meet this standard by transparently calculating estimated energy consumption by region by 1) transportation, 2) building heat, and 3) electricity consumption. More detailed support is available in Appendix A of the Guidance developed by the PSD.*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
B. Does the plan establish targets for 2025, 2035, and 2050 for thermal efficiency improvements and use of renewable energy for heating and evaluate the amount of thermal-sector conservation, efficiency, and conversion to alternative heating fuels needed to achieve these targets?	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
C. Does the plan establish targets for 2025, 2035, and 2050 for use of renewable energy for transportation and evaluate transportation system changes and land use strategies needed to achieve these targets?	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
D. Does the plan establish 2025, 2035, and 2050 targets for electric efficiency improvements and use and renewable energy for electricity and evaluate electric-sector conservation and efficiency needed to achieve these targets?	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
5. Has your region provided (or do you have a plan to provide) a breakout of the analyses and targets above to your municipalities? *Please explain your timeline for completing this task in the Notes column.*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.

Pathways (Implementation Actions) Standards

This section examines whether plans meet the Act 174 expectation that they include pathways and recommended actions to achieve the targets identified through the *Analysis and Targets* section of the Standards (above). Plans are expected to include or otherwise address all of the pathways (implementation actions) below, unless N/A is provided as an option. There is no penalty for choosing N/A one or more times, as long as a reasonable justification is provided in the Notes column, preferably including an explanation of how the plan alternatively achieves attainment of the targets should be included. If N/A is not provided as an option, the plan must meet the standard, and "Yes" must be checked, in order for the plan to meet the requirements for a determination (unless the instructions particular to that standard indicate otherwise).

PSD will be updating its guidance documents in 2022 with potential implementation actions included in the 2022 Comprehensive Energy Plan, from existing regional plans that have received a determination of compliance, and from other sources. We also offer potential starting points for consideration as italicized text under each standard. Plans are encouraged to promote as diverse a portfolio of approaches as possible in each sector, or if not, to explain why they take a more targeted approach. Implementation actions may fit best in a holistic discussion contained within a plan's energy element, though cross-referencing to other relevant plan elements is also acceptable. Regions must demonstrate a commitment to achieving each standard in policies, objectives, and implementation actions in clear, action-oriented language. Definitions of policies, objectives, and actions can be found on p. 52 of the Vermont State Planning Manual Module 1.			
6. **Does your plan's energy element contain policies or objectives on the conservation and efficient use of energy in buildings?**	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
A. Does the plan encourage conservation by individuals and organizations? *(Actions, objectives, and policies could include educational activities and events such as convening or sponsoring weatherization workshops, supporting local energy committees, encouraging the use of existing utility and other efficiency and conservation programs and funding sources, etc.)*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
B. Does the plan promote efficient and climate resilient buildings? *(Actions, objectives, and policies could include education on and promotion of residential and commercial building energy standards for new construction and existing buildings, including additions, alterations, renovations and repairs; promoting the implementation of residential and commercial building efficiency ratings and labeling; assistance to municipalities considering adopting stretch codes; identification of buildings and facilities that serve critical community functions, etc.)*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
C. Does the plan promote decreased use of fossil fuels for heating? *(Actions, objectives, and policies could promote switching to wood, liquid biofuels, biogas, geothermal, and/or electricity (e.g. beneficial electrification). Suitable devices include advanced wood heating systems and cold-climate heat pumps, as well as use of more energy efficient heating systems; and identifying potential locations for, and barriers to, deployment of biomass district heating and/or thermal-led combined heat and power systems in the region)*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.

D. Other (please use the notes section to describe additional approaches that your region is taking)	☐ Yes	☐ No ☐ N/A	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
7. **Does your plan's energy element contain policies and objectives on reducing transportation energy demand and single-occupancy vehicle use, and encouraging use of renewable or lower-emission energy sources for transportation?**	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
A. Does the plan promote a shift away from single-occupancy vehicle trips through strategies appropriate to the region? *(Actions, objectives, or policies could include facilitation of rideshare, vanpool, car-sharing, or public transit initiatives; working with public transit providers and other stakeholders to identify and develop new public transit routes and promote full utilization of existing routes; efforts to develop or increase park-and-rides; enhancement of options such as rail and telecommuting; deployment of broadband to support remote services such as teleworking or telemedicine, education; intergovernmental cooperation; or assistance with grants related to any of the above, etc.)*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
B. Does the plan promote a shift away from gas/diesel vehicles to electric or other non-fossil fuel transportation options through strategies appropriate to the region? *(Actions, objectives, or policies could include developing a plan for preferred siting of charging infrastructure (ex. placement of fast or level two chargers), installing or promoting the installation of electric vehicle charging infrastructure, providing education and outreach to potential users, supporting electric and non-fossil fuel vehicle availability through outreach to vehicle dealers, etc.)*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
C. Does the plan facilitate the development of walking and biking infrastructure through strategies appropriate to the region? *(Actions, objectives, or policies could include studying, planning for, seeking funding for, or implementing improvements that encourage safe and convenient walking and biking; adopting a "Complete Streets" policy, etc.)*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
D. Other (please use the notes section to describe additional approaches that your region is taking)	☐ Yes	☐ No ☐ N/A	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.

8. **Does your plan's energy element contain policies and objectives on patterns and densities of land use likely to result in conservation of energy and climate resilience?**	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
A. Does the plan include land use policies (and descriptions of current and future land use categories) that demonstrate a commitment to reducing sprawl and minimizing low-density development? *(Actions, objectives, or policies could include promoting wastewater infrastructure in planned growth areas, policies or zoning that require design features that minimize the characteristics of strip development [multiple stories, parking lot to the side or back of the store], requirements that development in those areas be connected by means other than roads and cars, policies or zoning that limits conversion and fragmentation of forest blocks and impacts to primary agricultural soils, etc.*)	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
B. Does the plan strongly prioritize development in compact, mixed-use centers when physically feasible and appropriate to the use of the development, or identify steps to make such compact development more feasible? *(Actions, objectives, or policies could include promoting and assisting with municipal participation in the state designation programs; facilitating the exploration of water or sewage solutions that enable compact development; working with state agencies and local utilities to identify priority areas for EV charging, storage, and other resources to promote downtown economic and energy resilience; etc.)*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
C. Other (please use the notes section to describe additional approaches that your region is taking)	☐ Yes	☐ No ☐ N/A	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
9. **Does your plan's energy element contain policies and objectives on the development and siting of renewable energy, storage, and transmission and distribution resources?**	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
A. Does the plan evaluate (estimates of or actual) generation from existing renewable energy generation in the region, and break this information out by municipality?	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
B. Does the plan analyze generation potential, through the mapping exercise (see *Mapping* standards, below), from potentially suitable areas in the region, and break this information down by municipality?	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.

C. Does the plan identify sufficient land in the region for renewable energy development to reasonably reach 2050 targets for renewable electric generation, based on population and energy resource potential (from potential resources identified in the *Mapping* exercise, below), accounting for the fact that land may not be available due to private property constraints, site-specific constraints, or grid-related constraints?	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
D. Does the plan ensure that any regional or local constraints (regionally or locally designated resources or critical resources, from 12B and 12C under *Mapping*, below) do not prohibit or have the effect of prohibiting the provision of sufficient renewable energy to meet state, regional, or municipal targets?	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
E. Does the plan include policies and objectives to accompany maps (could include general siting guidelines), including policies and objectives to accompany any preferred, potential, and unsuitable areas for siting generation (see 12 and 13 under *Mapping*, below)?	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
F. Does the plan prioritize maximizing renewable generation on preferred locations (such as the categories outlined under 12E in the *Mapping* standards, below)?	☐ Yes	☐ No ☐ N/A	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
G. Other (please use the notes section to describe additional approaches that your region is taking)	☐ Yes	☐ No ☐ N/A	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
10. Does your plan's energy element assess the potential equity impacts of the policies and objectives included to meet standards 6-9? *Such an assessment could consider, for example, what communities will be most impacted by the policy or objective, the distribution of benefits and burdens related to specific actions, whether actions will address existing inequities, or the extent to which communities were or will be consulted in the development of any programs or actions.*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.

Mapping Standards

Act 174 requires plans to identify potential areas for the development and siting of renewable energy, storage, transmission, and distribution resources and areas that are unsuitable for siting those resources or particular categories or sizes of those resources. It furthermore requires that the standards address the potential generation from the potential siting areas. Lastly, it requires that – in order to receive an affirmative determination – regional plans allow for the siting in the region of all types of renewable generation technologies.

The *Mapping* standards lay out a sequence of steps for planners to examine existing renewable resources and to identify potential (and preferred) areas for renewable energy development, and to identify likely unsuitable areas for development, by layering constraint map layers on to raw energy resource potential map layers. The maps should help regions visualize and calculate the potential generation from potential areas, and compare it with the 2025, 2035, and 2050 targets from the *Analysis and Targets* standards to get a sense of the scale and scope of generation that could be produced within the region to meet the region's needs. The PSD will provide additional guidance to accompany the standards that fleshes out the steps, layers, and standards more fully. Plans must include maps that address all of the standards below, unless N/A is provided as an option, in which case a compelling reason why the standard is not applicable or relevant should be provided in the Notes column. Regions must develop their own maps, and to then break out the maps for their municipalities, who can use their region-provided maps to meet the municipal *Mapping* standards. The map and the text describing the policies or rules used to construct the map, as well as the text describing specific policies applicable to map features, should be complementary. That should help ensure that any "land conservation measures and specific policies" that might be given substantial deference in the context of a particular project review under 30 V.S.A. § 248 are clearly identifiable in the text, should a map lack sufficient clarity or granularity regarding the area in which a project is proposed. Policy language must be clear, unqualified, and create no ambiguity in relation to the specific area and the type of permissible development. Consistent with the Climate Action Plan and Act 171 of 2016, the 2022 update to the Act 174 standards adds standard 12F to emphasize the value of forest lands in sequestering and storing carbon. By the 2028 update to the standards, the Department expects to incorporate Vermont Conservation Design priority interior forest and connectivity blocks into the possible constraints in standard 12C.			
11. Does the plan identify and map existing electric generation sources? *Maps may depict generators of all sizes or just those larger than 15 kW, as long as information on generators smaller than 15 kW is summarized and provided or referenced elsewhere. It is expected that the best available information at the time of plan creation will be used. This information is available from the PSD.*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
12. **Does the plan identify potential areas for the development and siting of renewable energy resources** and the potential generation from such generators in the identified areas, taking into account factors including resource availability, environmental constraints, and the location and capacity of electric grid infrastructure? *Maps should include the following (available from VCGI and ANR), and the resulting Prime and Secondary Resource Maps will together comprise "potential areas"*:	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
A. Raw renewable potential analysis (wind and solar), using best available data layers (including LiDAR as appropriate).	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.

B. Known constraints (signals likely, though not absolute, unsuitability for development based on statewide or local regulations or designated critical resources) to include: • Vernal Pools from Vermont Center for Ecostudies (VCE; confirmed layers) • DEC River Corridors • FEMA Floodways • State-significant Natural Communities • Rare, Threatened, and Endangered Species • National Wilderness Areas • Class 1 and Class 2 Wetlands (VSWI and advisory layers) • Regionally or Locally Identified Critical Resources *If areas are constrained for the development of renewable energy due to the desire to protect a locally designated critical resource (whether a natural resource or a community-identified resource), then the land use policies applicable to other forms of development in this area must be similarly restrictive; for this category, policies must prohibit all permanent development (and should be listed in the Notes column).* *These areas should be subtracted from raw renewable energy resource potential maps to form Secondary Resource Maps*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.

C. Possible constraints (signals conditions that would likely require mitigation, and which may prove a site unsuitable after site-specific study, based on statewide or regional/local policies that are currently adopted or in effect), including but not limited to:
• Vernal Pools from VCE (potential and probable layers)
• Agricultural Soils
• FEMA Special Flood Hazard Areas
• Protected Lands (State fee lands and private conservation lands)
• Act 250 Agricultural Soil Mitigation areas
• Deer Wintering Areas
• The following features from ANR's Vermont Conservation Design:
  ○ Interior Forest Blocks – Highest Priority
  ○ Connectivity Blocks – Highest Priority
  ○ Physical Landscape Blocks – Highest Priority
  ○ Surface Water and Riparian Areas – Highest Priority
	☐ Yes	☐ No	Page: Click or tap here to enter text.
			Paragraph: Click or tap here to enter text.
			Notes: Click or tap here to enter text.

• Hydric Soils • Regionally or Locally Identified Resources *If locations are constrained for the development of renewable energy due to the desire to protect a locally designated resource (whether a natural resource or community-identified resource, like a viewshed), then the land use policies applicable to other forms of development must be similarly restrictive (and should be listed in the Notes column).* *These areas should be subtracted from Secondary Resource Maps to form Prime Resource Maps.*			
D. Transmission and distribution resources and constraints, as well as transportation infrastructure. *(Including three-phase distribution lines, known constraints from resources such as Green Mountain Power's solar map, known areas of high electric load, etc.)*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
E. Preferred locations (specific areas or parcels) for siting a generator or a specific size or type of generator, accompanied by any specific siting criteria for these locations *Narrative descriptions of the types of preferred areas in accompanying plan text are acceptable, though mapping of areas and especially specific parcels (to the extent they are known) is highly encouraged, to signal preferences to developers, particularly for locally preferred areas and specific parcels that do not qualify as a statewide preferred location under i. below.* *The locations identified as preferred must not be impractical for developing a technology with regard to the presence of the renewable resource and access to transmission/distribution infrastructure.*	☐ Yes	☐ No ☐ N/A	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
i. Statewide preferred locations such as rooftops (and other structures), parking lots, previously developed sites, brownfields, gravel pits, quarries, and Superfund sites. *Note: These preferred locations align with the locations identified in the net metering rule 5.100. As of January 14, 2022 that rulemaking is currently active. Should the preferred locations identified in the rule change during that rulemaking, plans would be required to consider the updated preferred locations identified.*	☐ Yes	☐ No ☐ N/A	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.

ii. Other potential locally preferred locations *For example, customer on- or near-site generation, economic development areas, unranked and not currently farmed agricultural soils, unused land near already developed infrastructure, locations suitable for large-scale biomass district heat or thermal-led cogeneration, potential locations for biogas heating and digesters, etc.* *These are particularly important to map if possible (with the input of municipalities), as "a specific location in a duly adopted municipal plan" is one way for a net metering project to qualify as being on a preferred site.*	☐ Yes	☐ No ☐ N/A	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
F. Does the plan (a) evaluate whether forest blocks or habitat connectors identified pursuant to 24 V.S.A. § 4348a(a)(2)(F) [for regional plans] and 24 V.S.A. § 4382(a)(2)(D) [for municipal plans] should be treated as possible constraints, and (b) ensure that land conservation measures and specific policies established for the development and siting of renewable energy resources incorporates consideration of the evaluation undertaken in part (a)?	☐ Yes	☐ No ☐ N/A	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
13. **Does the plan identify areas that are unsuitable for siting renewable energy resources or particular categories or sizes of those resources**? *Either Yes or No ("No" if the plan chooses not to designate any areas as unsuitable) is an acceptable answer here. "Resources" is synonymous with "generators."*	☐ Yes ("Yes" for A and B must also be selected below)	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
A. Are areas identified as unsuitable for particular categories or sizes of generators consistent with resource availability and/or land use policies in the regional or municipal plan applicable to other types of land development (answer only required if "Yes" selected above, indicating unsuitable areas have been identified)? *If areas are considered unsuitable for energy generation, then the land use policies applicable to other forms of development in this area with similar*	☐ Yes	☐ No ☐ N/A (if no unsuitable areas are	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.

impacts should similarly prohibit those other types of development. Please note these policies in the Notes column.		identified)	
B. Does the plan ensure that any regional or local constraints (regionally or locally designated resources or critical resources, from 12B-12C above) identified are supported through data or studies, are consistent with the remainder of the plan, and do not include an arbitrary prohibition or interference with the intended function of any particular renewable resource size or type? *Please explain in the Notes column.*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
14. Does the plan allow for the siting in the region of all types of renewable generation technologies?	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.
15. Has your region provided (or do you have a plan to provide) a breakout of the map product(s) above to your municipalities? *Please explain your timeline for completing this task in the Notes column.*	☐ Yes	☐ No	Page: Click or tap here to enter text. Paragraph: Click or tap here to enter text. Notes: Click or tap here to enter text.

(under 2. Climate Impacts & Vehicle Emissions)

2.1: Electric Vehicles

Alongside reducing vehicle miles traveled, light-duty and fleet electrification is a key part of the State's plan to reduce GHG emissions from the transportation sector (see Energy Chapter for an overview of State Goals and Policies and full sector targets). The tables below represent Central Vermont's share of the State targets of EV adoption (replacement of fossil fuel vehicles), required to meet our broader State energy and emissions goals (according to the current LEAP pathway model). While Central Vermont is on track for our 2025 goal, and in fact surpassed it, targets increase rapidly thereafter. CVRPC continues to support municipalities and other fleet operators especially schools, and town energy committees to promote education and participation in State, Utility, and Federal incentive programs. See the supplement for additional transportation targets including medium- and heavy-duty vehicles and non-road energy demand and for the baseline (aka business as usual) comparison. CVRPC is working to pull together municipal fleet inventories to better adjust these targets and provide municipalities municipal fleet recommendations.

Table 1: EV Ownership by Type Targets

CAP Mitigation Regional **Passenger Car & Light Duty Truck EV and PHEV Stock** (Number of Vehicles)						
Vehicle Type	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Battery Electric	3	1,163	6,926	16,289	24,669	33,219
Plug In Hybrid	33	122	169	161	107	40
Total	**36**	**1,285**	**7,095**	**16,450**	**24,776**	**33,259**

Ready? You don't need a lot to get started:

- Vehicle Inventory (make & model, year)
- Annual data per vehicle: Vehicle Miles Traveled (VMT), Gallons of fuel used, MPG
- Replacement Schedule

To learn more about technical assistance and funding support for fleet electrification and EVSE CVRPC, Drive Electric, VTrans, and Vermont Clean Cities Coalition are all at the ready. Municipalities can develop fleet electrification and EVSE plans, host EV community events, and support local partners as well.

The Table below provides an overview of light duty (passenger) vehicles and use in the region. The vast majority of residents in the state, including Central Vermont, use personal vehicles for their daily travel needs. Approximately 3.5% of the 43,506 light duty vehicles in Central Vermont are electric vehicles (including all electric and plug-in hybrid electric vehicles registered by January 2024 (Drive Electric Vermont[1])). The total number of vehicles in the region has decreased slightly, while the number of EVs (Electric Vehicles) has increased quickly in the last few years, increasing by approximately 40% in 2023 alone coincident with the expansion of state, utility, and federal incentive programs.

[1] http://www.driveelectricvt.com/buying-guide/why-go-electric

Table 2.Current Regional Transportation Energy Use

Transportation Data	Regional Data 2022 5-YR ACS			Regional Data 2011-2015 (ACS)
Fuel Type	Internal Combustion Engine (ICE)	Electric Powered (EV)	**Total**	Internal Combustion Engine (ICE)
Total # of Light Duty Vehicles	41,989	1,517	**43,506**	45,584
Average Miles per Vehicle	12,500	9,000		287,500 (12,500/vehicle)
Total Miles Traveled	524,862,500	13,653,000	**538,515,500**	567,650,000
Total Use per Year	23,857,386 gallons	4,551,000 kWh		30,518,817
Transportation MMBTUs	2,701,858	15,528	**2,717,386**	3,396,000
Average Cost per unit	$3.37/gallon	$0.2109/kWh		$2.31
Cost per Year	$80,399,391	$959,806	**$81,359,197**	$70,488,465

Source: Municipal Consumption Tool (Department of Public Service) which uses Table DP04, 2022 ACS 5-Year Estimate used to estimate the count of vehicles associate with area housing units, and State DMV data averages; cost per gallon of gas was taken from EAN Annual Progress Report 2023. EV data was provided by Drive Electric based off DMV registrations as of January 2024. Comparable public transportation and medium and heavy-duty vehicle data is not available, additional information is provided in the Transportation Chapter.

Table 3. EV Registrations

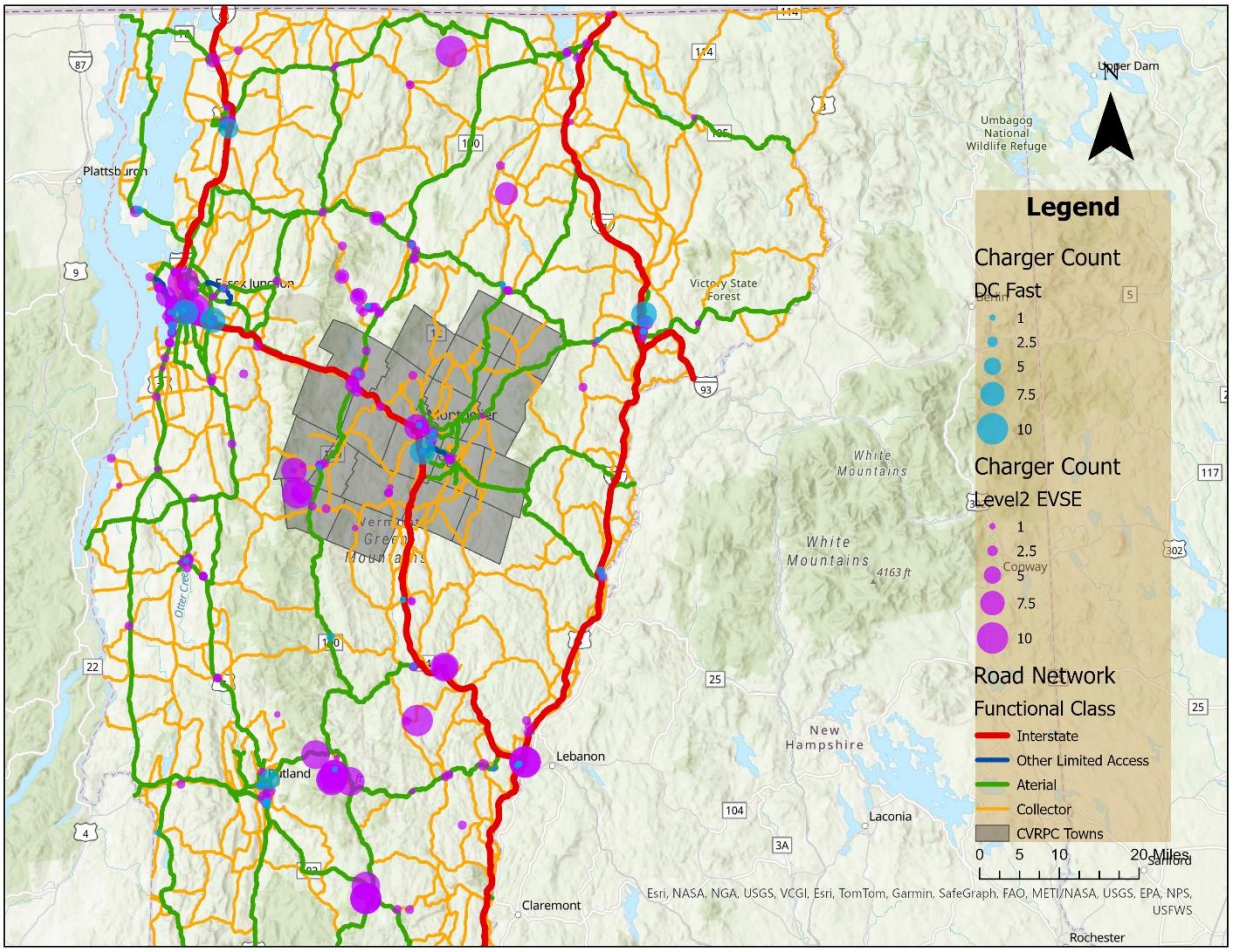
	EV Registration Jan. 2023			**EV Registration Jan. 2024**			**Increase 2023-2024**	
	AEV	**PHEV**	**Total EVs**	**AEV**	**PHEV**	**Total EVs**	**Count**	**%**
REGIONAL TOTAL	588	497	**1085**	921	596	**1517**	**432**	**40%**

EV adoption rates will continue to be driven by the real and perceived viability of EVs performance in Central Vermont, local electric infrastructure and capacity, and the availability of charging infrastructure. As of spring 2024, there are nearly 400 public EV charging stations across the state[2], though not widely distributed throughout Central Vermont. In Central Vermont public chargers can be found in Cabot, Plainfield, Middlesex, Berlin, Northfield, and Roxbury located at schools, municipal buildings, and food coops; with higher density of chargers located in the Mad River Valley (many at ski resorts), Waterbury, and Montpelier. Figure 5 shows the locations, numbers, and types of charge points in CVRPC and adjacent regions. While many EV drivers across the state charge at home (typically overnight), increasing workplace and public charging infrastructure has been identified as key to support longer trips/commutes, visitors, or those without charging access at home. CVRPC continues to encourage municipalities and local businesses to install EV charging stations at convenient and desirable locations

[2] https://www.driveelectricvt.com/about-evs/charging-map?gad_source=1&gclid=CjwKCAjwtqmwBhBVEiwAL-WAYU8qVxhVDK55M5TSzltPA6SYiVI69Np0Ns-JkkqeFql6e-6UIHCP8xoCsgEQAvD_BwE

including workplaces, schools, community centers, recreation sites, libraries, multi-unit buildings, etc., where users could park for several hours in our regional downtowns, village centers, and other designated growth area (e.g. Vt Community Charging program[3]; become a host or solicit community hosts[4]).

The electrification of the transportation sector will require upgrades throughout our energy system. At the residential and commercial scale, panel upgrades are already being integrated into EV and EVSE state and utility programs. Furthermore, meter socket adapters have been developed and now deployed to enable both solar and EV interconnection without a panel upgrade. To minimize costly energy



infrastructure upgrades at the distribution and utility scale, demand-management and enhanced coordination via integrated resource

Figure 5: EV Charger Locations

planning and long range transmission planning, are critical. Lastly, measures that reduce future electric demand growth, especially in the thermal sector, will reduce the cost and infrastructure concerns in Central Vermont from EVs (see Energy Chapter and appendix).

[3] https://www.chargevermont.com/
[4] https://survey123.arcgis.com/share/8c15711e4e404a7ca9ed3979640b0121

Continued increasing flexibility in existing programs to address interconnection barriers, and new opportunities to include off-gird chargers and charging to Vermonters with high outage frequencies and duration will be necessary to meet our regional targets. Furthermore, as medium and heavy duty options come on the market, regional or state cohort procurement programs would significantly reduce the difficulty in navigating ever-changing funding programs and allow for the development of best practices suited to local concerns and needs. Increased weight of electric vehicles will also need to be considered in planning and budgeting for roadway maintenance, especially unpaved roads where higher axle weights will increasingly impede traversability during storms and thaws.

Equity considerations must be thoughtfully integrated throughout ESVE planning process to ensure benefits and costs are fairly distributed. Historically, clean energy and transportation innovations have not been deployed evenly across communities -- resulting in higher energy burden, rural, and lower-income communities being left behind. EVSE equity concerns include a project's affordability, accessibility, reliability, location, safety, and related employment and economic opportunities. Drive Electric's Charging Installation Guide provides thorough guidance and workflow for Vermonters and Vermont communities, CVRPC recommends when integrating EVSE into new builds and parking lot upgrades alike, that proximity to electrical panel, zoning setbacks, and other technical considerations are made in addition to including EVSE supported handicap spots.

Hidden Resilience Co-Benefits of EVs and EV Charging Infrastructure

Much of the discussion of EVs and EVSE focuses on GHG emissions & fossil fuel use reductions, as well as long term financial benefits to individual households and to the local economy. Perhaps the most appealing co-benefit, however, is that some EVs can provide backup power to communities through vehicle to building (V2B) charging as a microgrid, or provide power to grid through vehicle to grid (V2G) charging. Both V2B and V2G can complement other distributed energy resources (DERs), or supplement diesel generators as backup power and a mobile source at that! This is a particularly important aspect of EVs and EVSE for municipal operations (especially town garages), schools, libraries, and other locations that provide critical social and physical infrastructure on a daily, emergency, and recovery basis.

Off-grid EV chargers- like Solarflect- can provide a relatively affordable option for municipalities, public entities, commercial properties, and even homes to support critical loads during outages!

The VTrans NEVI (National Electric Vehicle Infrastructure) program and the U.S. Department of Transportation's Toolkit for Planning and Funding Rural Electric Mobility Infrastructure offers helpful equity planning considerations and strategies relevant to Central Vermont. When assessing where EV charging stations should be located, engagement with rural, underserved, and high energy burden communities is essential to prevent delayed and diminished access to clean energy and transportation

infrastructure vital to a healthy economy. Furthermore EVSE-Ready requirements for new buildings can be explored at the municipal level (see Climate Change and Land Use).

According to the U.S. Department of Energy (DOE), over the long term, EV ownership is typically less expensive than ownership of fossil-fuel vehicles. Additionally, low operation costs make some EVs less expensive on a monthly basis compared to equivalent fossil-fuel vehicles (when the vehicle purchase is financed). Therefore, increased EV adoption in Central Vermont could contribute to community-wide reductions in transportation energy cost burdens. As stated by Drive Electric Vermont, "It costs less to own an EV. Plugging in is like paying $1.50 a gallon, and EVs need less maintenance than gasoline cars." Like fossil fuel vehicles, how cars handle in Vermont's winter and mud seasons varies from make to model. Opportunities for medium and heavy-duty vehicles are expanding; CVRPC strongly encourages municipalities and other fleet operators in the region to consider low diesel and alternative fuel options when replacing these in their fleet to take advantage of State and federal incentive programs[5].

The lowest-carbon modes will always be active modes, including electric-assist bikes (electrocycles or e-bikes). Given the long lead time for full turnover of the residential fleet, it is recommended that a regional trail network paralleling the arterial network be developed to provide safe, conflict-free routes for travelers using active and electric micro-mobility modes. This low-stress stress arterial network should be paired with local complete streets retrofits in villages and downtowns. At the same time, towns should be leading on the issue by preferentially buying electric when purchasing vehicles for their municipal fleets.

[5] Drive Electric provides the most comprehensive and up to date snap shot of State, Distribution Utilitiy, and Federal incentives, rebates, and inclusions: https://www.driveelectricvt.com/?gad_source=1&gclid=CjwKCAjwtqmwBhBVEiwAL-WAYbmxAzFQ9-5GP2WHd7oP5AzQhS3OPMRCUhERxSZwW2b9d0Fv9rEvyhoCuDIQAvD_BwE , State Diesel Emissions Reduction Assistance Program https://dec.vermont.gov/air-quality/mobile-sources/diesel-emissions/vt-diesel-grant#:~:text=The%20Vermont%20Diesel%20Emissions%20Reduction,diesel%2Dpowered%20engines%20and%20the ; Vermont Clean Cities Coalition provides direct support to municipalities https://cleancities.energy.gov/coalitions/vermont#:~:text=The%20Vermont%20Clean%20Cities%20works,advanced%20vehicle%20technologies%20in%20transportation

Infrastructure Chapter Excerpt

Energy Infrastructure: Electricity

This section details existing infrastructure including generation, key trends, and challenges (including outages). Energy analyses and targets for the electricity, thermal, and transportation sectors, renewable energy generation siting, and recommendations can be found in the Energy Chapter.

Energy is a vital component of modern life. When sources of power are lost or interrupted, even temporarily, the rhythms of our lives are profoundly interrupted. Business and industry halt and residents and goods dependent on electricity and other types of power are at great risk. Our electric infrastructure in Vermont is increasingly vulnerable to extreme weather conditions due to climate change. This comes at a time when we anticipate significant increases in demand for reliable and affordable electricity due to overlapping causes including addressing rural infrastructure gaps, regional growth and development, increasing need for heating & cooling, as well as electrification of the thermal and transportation sectors.

While existing and potential sources of electric power in the region are more than adequate (see Enhanced Energy Element), the region's electric infrastructure is aging and reaching performance limits. While the costs of developing new infrastructure are high upfront, potential long-term cost savings are increasing as technology is rapidly advancing and markets are shifting to match need and the urgency of the climate crisis. Integrating renewable energy infrastructure more comprehensively into all scales of our planning across the region is important to not only maximize associated community benefits but also to minimize negative environmental and land use impacts of electric generation, transmission, and distribution (see Enhanced Energy Element). CVRPC's objective is to ensure that energy generation, distribution and transmission facilities are located, designed, and correctly-sized to support the Region's community and economic needs, which increasingly means it must be reliable, resilient, and affordable as well as sustainable to reduce operational costs and Green House Gas emission contributions (further reducing long-term costs).

Electric Distribution Utilities (DUs):

In 2021, Vermont distribution utilities purchased over 5.8 million MWh of electricity to meet the demand of their customers, of this 64% came from renewable resources and 18% came from carbon free resources. Also in 2021, Vermont distribution utilities retired just over 4 million renewable energy certificates[1] (i.e. equivalent to just over 4 million MWh of electricity) to meet their obligations under Vermont's Renewable Energy Standards, of this 72% of the electricity Vermont accounted for was renewable; including nuclear 90% of it was low-carbon[2].

[1] Renewable energy credits (RECs) are the accounting system used to track all renewable electricity generation in or sold into ISO New England's regional electric system (ISO= Independent System Operator). These certificates ensure no two entities claim credit for that electricity, and provides a mechanism to buy and retire (aka take credit) for renewable energy generation regardless of their own production and use (or rather to compensate for it).

[2] See 3 one-page resources for more info: *Where does Vermont's electricity come from*, *Current policies & programs*, *and Tradeoffs between different sources of electricity*- these were made as part of the Say WATT? Regional Event Series in the fall of 2023 during which the Department of Public Service partnered with the RPCs to offer a series of engagement opportunities for Vermonters to weigh in on renewable electricity policies and programs: https://publicservice.vermont.gov/renewables

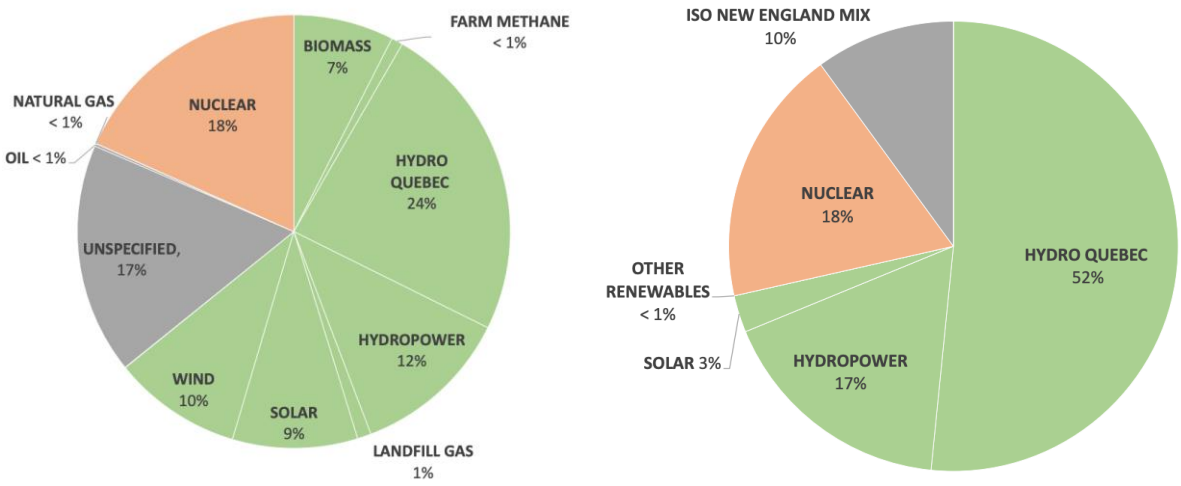


Figure 1: 2021 Vermont Electricity Characteristics: the left shows the electricity Vermont utilities generated and bought to meet demand, the right shows how renewable Vermont's electricity is considered based on renewable energy certificates (*Department of Public Service Webinar: Where Does VT Electricity Come From?* *https://publicservice.vermont.gov/sites/dps/files/documents/Webinar%201%20-%20Where%20does%20VT%20electricity%20come%20from.pdf*)

Central Vermont is served by four different distribution utility companies including Green Mountain Power, Washington Electric Cooperative, the Northfield Electric Department, and the Hardwick Electric Department (see Table 1, below, for customer counts and types by town; and Figure 2 for DU territory). Green Mountain Power (GMP) and Washington Electric Cooperative Inc. (WEC) are the region's primary distribution utilities, geographically covering most of the region. Central Vermont is unique in that most municipalities are served by at least two distribution utilities (exceptions are Warren, Waterbury, and Barre City served only by GMP; Northfield, Moretown, Berlin, and Calais are each served by 3 DUs). GMP territory is located primarily in the more populous valley areas such as Barre City, Montpelier, and many of the villages along the major transportation routes (Figure 2 above); WEC territory fills in the more rural, and primarily residential, areas. The Northfield Electric serves part of Northfield, as well as small parts of Moretown and Berlin; The Hardwick Electric Department serves much of Woodbury and a small sliver of Calais. Three phase power is limited in the region to where GMP provides it (see Figure 2 above), this is important for siting distributed generation projects but not absolutely required for most residential and even some smaller municipal/commercial plants.

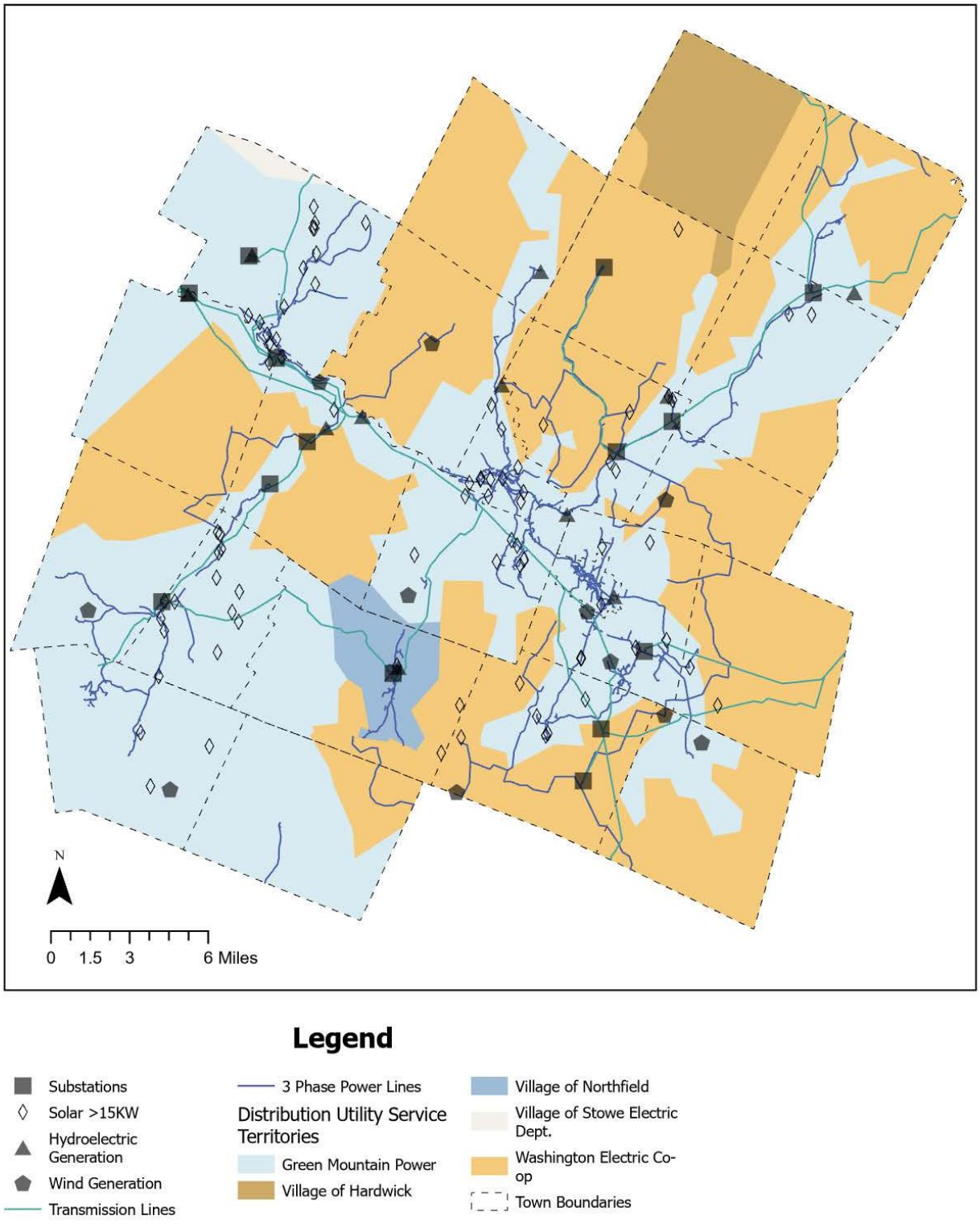


Figure 2: CVRPC Distribution Utility Territory and Infrastructure (substations, transmission lines, 3 phase power lines) Place Holders: Distribution Utility Territory Map (only shows substations and transmission lines; distribution circuits GMP only available here)

Table 1: Customer/Member by Town and Distribution Utility (DU)

	GMP	WEC	Northfield	Hardwick

Regional Total	**27,246**	**7,167**	**2,200**	**738[3]**
Barre City	4,525			
Barre Town	3,745	412		
Berlin	1,398	83	*	
Cabot	297	508		
Calais	121	733		*
Duxbury	208	471		
East Montpelier	599	753		
Fayston	710	346		
Marshfield	547	202		
Middlesex	306	578		
Montpelier	4,794	18		
Moretown	585	325	*	
Northfield	271	289	2124[4]	
Orange	55	494		
Plainfield	406	355		
Roxbury	269	111		
Waitsfield	1,376	50		
Warren	2,494			
Washington	334	223		
Waterbury	3,072			
Williamstown	901	892		
Woodbury		78		
Worcester	233	246		

Table 2: Customer/Member by Type and Distribution Utility (DU)

DU	Dairy Farm	Residential	Commercial	Large Power	**Total**
GMP		22,337	4,909		**27,246**
WEC	33	6,725	398	11	**7,167**
Northfield					**2,200**
Hardwick					**738**

The Washington Electric Cooperative Inc. (WEC), a member-owner utility run by a 9-person member elected board, provides electricity to the more rural areas throughout Central Vermont. Its service territory covers a larger area geographically in Central Vermont than any other utility, serving approximately 7,167 customers. **Due to the rural nature of WEC's service area, residential users account for an unusually high proportion of total demand; furthermore, the rural infrastructure is not co-located as often with roads nor hardened (buried), making it both more susceptible to Vermont's increasingly frequent extreme weather and more difficult to maintain and repair.**

[3] Northfield Electric and Hardwick Electric did not provide updated customer counts by towns, these numbers come from their Integrated Resource Plans and the number from Hardwick Electric specifically reflects the number of customers on the Woodbury Circuit which may or may not reflect the true total customers in the region (a map of their circuits is not available online). Data requests were sent over the course of Fall 2023 and Winter 2024.

[4] Northfield has not provided specific customer counts by town; 2200 customers are served according to the Integrated Resource Plan; Efficiency VT data reported 2,124 residential premises served in Northfield, subtracting those reported by GMP and WEC gives this number although it should be noted that Efficiency Vermont data is simply given as residential premises not customers.

Central Vermont has 32 substations in 14 of our towns; most towns are at least partially served by additional substations outside the region. Distribution substation location, condition, and headroom capacity are important to consider when proposing distributed generation (DG) projects (see Enhanced Energy Element for a description of barriers and costs). Ultimately, the different distribution utilities in our region have unique challenges and benefits, most towns can utilize coverage by 2 or more DUs to maximize opportunities and minimize limitations, however at the individual scale this is rarely possible. **The municipality can thus play a critical role in supporting residents and businesses to access key energy opportunities including renewable generation and storage, EVSE, energy efficiency measures, and more (see enhanced energy element).**

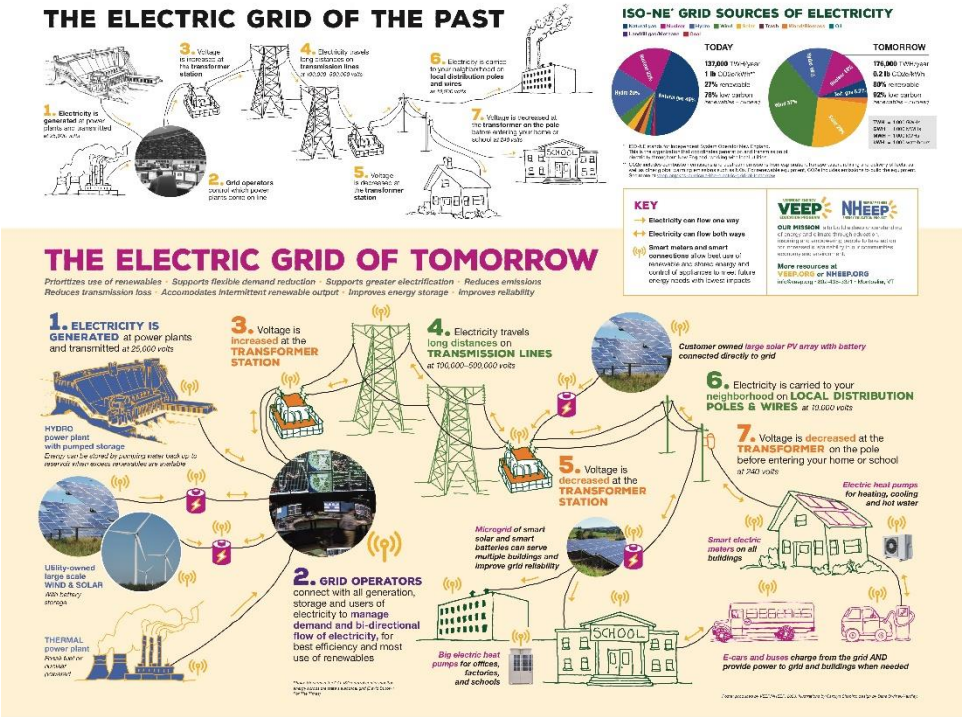


Figure 3: Electrical Grid Systems Primer, Poster from Vermont Energy Education Program[5]

Electric Transmission

The Vermont Electric Power Company, Inc. (VELCO) manages the safe, reliable, cost-effective transmission of electric power throughout Vermont and as part of the integrated New England regional network. VELCO updates its Long Range Transmission Plan every 3 years. The 2021 Long Range Transmission Plan[6] highlights that peak demand is forecast to grow due to accelerating electrification of the heating and transportation sectors. While the transmission system has sufficient capacity to serve expected future demand for the first 10-years of the 20-year planning horizon:

- Load management is necessary to serve high electrification loads consistent with Vermont's total energy goals in the 20-year planning horizon,
- Currently, DG projects are reviewed on a project-by -project basis without regard to transmission system impact, to prevent further stressing transmission and distribution systems careful coordinated statewide planning is required to successfully integrate future distributed generation and storage without significant grid reinforcements;
- There are sub-transmission scale reliability issues (categorized as causing high or low voltage, or a thermal overload in which equipment exceeds its rate temperature).

[5] Vermont Energy Education Program provides resources and curricula including additional posters on Energy Audits and Actions, Heating Vermont Homes, Vermont's Climate Action Plan, VT Electricity Use and Sources, the Climate Impact of Getting to School and more (https://veep.org).

[6] https://www.velco.com/assets/documents/2021%20VLRTP%20to%20PUC_FINAL.pdf

As DUs take on more and more interconnection of distributed energy projects, coordination between VELCO, DUs, the region[7], and municipalities will be increasingly important to ensure not only Vermont and its stakeholders can meet their respective goals, but that we do so in a manner that minimizes negative impacts to our landscapes and natural resources and maximizes benefits to all Vermonters foremost those who have been disproportionately burdened by energy costs and reliability issues to build resilience for all. CVRPC continues to work with DUs to integrate their Integrated Resource Planning into regional and municipal planning and project development and to advocate that regional and municipal energy planning and goals in turn are considered in their Integrated Resource Planning Processes.

Efficiency Utility

Efficiency Vermont is the statewide energy efficiency utility; it provides technical advice and financial incentives to residents, businesses, non-profits, and municipalities alike to reduce their energy use and costs with efficiency buildings, equipment, and lighting. CVRPC works closely with Efficiency Vermont to connect municipalities with opportunities and to provide support to energy committees and coordinators with resources for their communities. CVRPC also works with Efficiency Vermont to provide data on consumption and efficiency measures implemented, as well as to adapt incentives programs and support in recovery situations (e.g. July 2023 floods). More information about energy efficiency and conservation, as well as supporting partners can be found in the Enhanced Energy Element of this plan. Additional key partners include Capstone Community Action who provide income-based fuel support, weatherization, and more to community members with the lowest incomes and highest needs.

Existing Generation & Storage Facilities

For an in-depth discussion of future renewable generation in the context of demand and energy planning see the Enhanced Energy Element, this section summarizes existing energy infrastructure including non-combustion-based renewables (solar, wind, and hydroelectric), combustion-based renewables (biomass specifically for electricity generation- for discussion on biomass and the thermal sector see the Energy chapter), nuclear energy, and fossil fuels (as categorized by the 2022 State Comprehensive Energy Plan).

There is one remaining fossil fuel peaking power plant in Central Vermont in Berlin run by Green Mountain Power:

Table 3: Regional Fossil Fuel Generation

Resource Type	MW	Town	Name	Details
Fossil Fuels	46.5MW	Berlin	Berlin 1	Gas Turbine, 46yo. Largest peaking plant in VT consisting of a gas turbine generator and 2 engines run on low-sulfur kerosene fuels. Full winter output is 50MW; 40MW in summer. Improvements were made in 2008, 2012, 2013, 2019, and 2020[8].

Existing Renewable Energy Generation has noticeably increased since the last plan:

Table 4: Existing Renewable Electricity Generation

Existing Generation	April 2024		2016	
Resource Type	MW	MWh	MW	MWh
Solar	47.17	60943.74	24	29,919
Wind	0.24	465	0.14	486
Hydroelectric	26	134,861.4*	25	88,467
Biomass (wood, methane, farm	0	0	3	13,091

[7] noted also by the Department of Public Service in the 2022 Vermont Comprehensive Energy Plan (e.g. pages 68, 87) https://publicservice.vermont.gov/sites/dps/files/documents/2022VermontComprehensiveEnergyPlan_0.pdf

[8] page 192 of Green Mountain Power's 2021 Integrated Resource Plan https://greenmountainpower.com/wp-content/uploads/2021/12/2021-Integrated-Resource-Plan.pdf

biogas)				
Total Existing Regional Renewable Electricity Generation	**73.42**	**196,270.16**	52.14	131,963
Total Storage	**8.18MW****			

Sources: Distributed Generation Survey (Distribution Utilities, Public Utilities Commission, Department of Public Service), Distribution Utilities Integrated Resource Plans, Federal Energy Regulatory Commission, Low Impact Hydropower Institute (Hydroelectric), Town Plans, State Comprehensive Energy Plan.
**calculated using constants provided in the supplement (consistent with those used by the Public Service Department and the Generations Scenarios Tool), except for hydroelectric which was taken directly from DUs IRPs, FERC, and LIHI.*

The closure of the Moretown Landfill is a significant change for Central Vermont; while there are thus no longer biomass electricity generation facilities in the region, WEC acquired a significant portion of their power to serve their territories including Central Vermont from the Coventry Landfill facility among others biomass facilities just outside the region. CVRPC does not anticipate biomass becoming an electricity generation source in the region, although it plays a critical role in the thermal sector for both space and water heating and will continue to be a key resource for residential heating in particular (see Enhanced Energy Element).

The region's hydroelectric facilities, though few in number make up over a third of the region's renewable generation, balancing ecological considerations, flood management, and energy generation potential at these and potential future sites is a high priority topic for future planning efforts (see Map of existing and potential hydroelectric sites in the Enhanced Energy Element). These are not new resources, despite the contrast in the table above, they were not reported in the previous plans assessment which likely was sourced specifically from the distributed generation inventory (DG Survey, see below) based off the Public Utilities Commission which focuses, generally, on smaller projects most participating in the State's net-metering program.

By and large the most change has been solar generation; in terms of numbers most are small residential scale plants (many, but certainly not all, are rooftop- we do not have data specifying the type. Below, in the table of renewable distributed generation in our region (<5MW), there is a clear preference, or at least ability to access and implement, smaller scale projects.

Table 5 Distributed Generation Projects <5MW (DG Inventory as of 2/2024)

Total from DG Survey (not regional total)	MW	# Projects	
Generation <15kW Category I	14.69856	2233	Residential scale- most solar.
Generation 15kW to <150kW (Category II)	6.56739	184	Generally includes Municipal/Community Scale (not limited to)
Generation 150kW to <500kW (Category III)	6.18665	23	Currently have to be preferred sites to participate in net metering
Generation 500kW+	22.944	23	
DG Total:	50.3966	2463	

Source: Public Service Department 2/1/24, Current DG Survey (<5MW), see Methodology for aggregation below

This is very much in line with the results of community engagement efforts CVRPC conducted in the fall of 2023 in partnership with the Department of Public Service and the other RPCs. CVRPC found that in addition to consistent support for a diversity of renewable resources, that support was bounded by scale- as in support

decreased with the scale of the project increasing (see full report[9]). C**VRPC has found both in these engagement opportunities and while working with municipalities more broadly, technology type is not generally the key factor except for strongest opposition. Instead scale, location, and perceived community benefits/burdens are important to the region. An emphasis on local, community-scale, generation and storage is paired with other measures including efficiency/weatherization, waste heat recovery opportunities, dual land use, energy independence, and more representing a more holistic view of energy systems that stemmed from a wider variety of perspectives than are often considered. See the Enhanced Energy Element for considerations and discussion of future renewable energy generation and more.**

Inset box on Current State Renewable Electricity Policies/Programs

Siting new renewable generation and storage in close proximity to existing energy infrastructure with interconnection capacity (and for projects larger than 15kW 3-phase power) is a known priority for distribution utilities and many developers to reduce their short-term project costs and manage system limitations. While some municipalities do and may list these as additional preferred site criteria[10], the region does not limit preferred sites by these technical considerations but instead encourages closer collaboration with our distribution utilities:

- 3 phase power is not available throughout our region's designated growth centers, excluding some of our more rural designated areas adds additional barriers to the very locations where renewable energy generation projects might play an even more important role in supporting local economic and community development (see Figure 2 Infrastructure Excerpt),
- Known capacity and interconnection concerns (see below) have already resulted in significant curtailment of projects especially in the southeast quarter of our region; focusing on concentrating projects in fewer and fewer areas without such constraints is an incomplete and short-sighted approach that may unduly burden communities with remaining capacity while also severely limiting many of our municipalities and their residents from not only meeting their energy goals but drawing down federal and state investment to support energy infrastructure, energy resilience, and energy independence in their communities.

Thus below, this plan highlights both those “low-hanging” interconnection opportunities that DUs and developers may find most suitable to encourage community engagement and project development, and encourages DUs and developers to consider community needs and project priorities in their planned infrastructure improvements and potential expansions.

Key Challenge

Vermont Distribution Utilities, to varying degrees, are implementing programs to smooth energy demand peaks and valleys through flexible load management, incentives, and battery storage. These initiatives are intended to increase system reliability, help address the climate crisis, and lower customer costs. The 2021 Vermont Long-Range Transmission Plan continues to emphasize the importance of thoughtful siting of generation with respect to interconnection and grid capacity, grid automation, deployment of battery storage and flexible load management programs, grid reinforcements, as well as the communications infrastructure necessary to synchronize energy demands with supply across DUs, to ensure Vermont’s transmission grid reliably serves expected load growth. **The implications for our regional infrastructure, to the municipal, and**

[9] CVRPC Report on Renewable Energy Standards Update Regional Engagement Events
https://publicservice.vermont.gov/sites/dps/files/documents/CVRPC%20RES%20Event%20Summary.pdf

[10] For example, Middlesex and Northfield Enhanced Energy Plans do include language such as within 1 mile of 3-phase power and locations served by existing roads and energy infrastructure; CVRPC supports municipal inclusion of these technical priorities with due consideration

household scales, include the importance of the "get ready" approach to retrofitting/switching over individual systems and components to be in line with, and thus benefitting from these broader investments which includes at times, higher up front costs and/or more intentional and longer-term phased planning- the Enhanced Energy Element will touch on many specific measures further. CVRPC thus anticipates, the key challenge facing our region is the capacity and coordination to draw down unprecedented funding and invest in not only transforming the energy sectors to meet legally binding GWSA goals to mitigate future climate change, but to support all our communities down to the local scale so that none are left behind or without options.

The vulnerability of our critical infrastructure including our energy systems to high wind, wet heavy snow, and flooding has become increasingly apparent (see Climate Chapter). In the last 5 years or so, CVRPC has noticed the increased consideration of climate impacts in DU planning, for example GMP has conducted topographical surveys of their substations to assess their location in relation to FEMA-designated floodplains.[11] While the Middlesex transmission station and hydro generation are both located on ground higher than the 100-year and 500-year floodplain, the Waterbury distribution substation was rebuilt outside the 100-year flood plain (moved from 48 Winooski Street, Waterbury to Cloverdale Lane), and the Barre South End distribution substation was raised three feet at its current location (121 South Main Street Barre City) so that it is above the 100-year floodplain (Riverton in Berlin remains in the 500-year floodplain). **Again, due to structure, dominant customer type and distribution, not to mention historical development, our region's DUs are not equipped equally to handle large infrastructure projects nor the increasingly demanding recovery efforts in response to extreme weather (see outages table)**. CVRPC will continue to work with regional and state stakeholders, including the DUs themselves, to **identify opportunities for funding and technical assistance**, **build transparency in planning processes, and promote public data sharing to support municipal and community efforts including Local Hazard Mitigation and Local Emergency Management Planning, as well as the development of projects and programs that promote on-site back-up power and/or the establishment of community micro-grids.**

[11] 2021 GMP IRP Appendix I: Substations https://greenmountainpower.com/wp-content/uploads/2022/01/Appendix-I-Substations.pdf;