SECTION V

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V. STRATEGIES TO ACHIEVE REGIONAL TARGETS

The results of the LEAP model provide one scenario of future energy use in the Northwest region that ensures that state and regional energy goals are met. However, the LEAP model only provides targets for energy conservation and generation. It does not provide details about how the region may attain the targets set by the model.

Section V addresses how the LEAP targets will be attained by examining specific goals, strategies, and implementation steps that the region may use to progress toward the 90 x 50 goal and a more sustainable future.

This section is guided by the following statements of policy. The NRPC adopts these statements of policy to affirm it commitment to meeting state and regional energy goals and to satisfy the determination standards established by the Vermont Department of Public Service:

STATEMENTS OF POLICY

- NRPC supports conservation efforts and the efficient use of energy across all sectors.
- NRPC supports the reduction of in-region transportation energy demand, reduction of single-occupancy vehicle use, and the transition to renewable and lower-emission energy sources for transportation.
- NRPC supports patterns and densities of concentrated development that result in the conservation of energy.
- NRPC supports the development and siting of renewable energy resources in the Northwest region that are in conformance with the goals, strategies, and standards outlined in this plan.

Section V is separated into conservation and generation strategies. The conservation strategies look specifically at the topics of electricity conservation, weatherization, and transportation, while the generation strategies explore how and where generation may be developed in the region.

Only strategies and implementation steps that can be completed by the NRPC are included in this plan. Many other strategies and implementation steps could help the region attain its energy goals, but these strategies cannot be achieved by the NRPC and require the action of the state agencies, municipalities, public utilities, and private individuals. The goals, strategies, and implementation steps outlined in this section are meant to evolve over time to reflect continuing changes in the Northwest region.

A. CONSERVATION

ELECTRICITY CONSERVATION

Additional electric generation and conservation are both required to ensure that the region can attain the targets set in the LEAP model and in state statutes. The following goals focus on electricity conservation. Policy makers must find ways to further electricity conservation efforts while also increasing the overall use of electricity compared to other energy sources (especially for space heating and transportation). The failure of conservation efforts could severely hinder the region's ability to achieve the 90 x 50 goal.

FIGURE 5.1
RECAP: LEAP ELECTRICITY CONSERVATION TARGETS

To meet the 90 x 50 goal, LEAP establishes the following targets:

- Total regional electricity demand projected to increase by 100% by 2050.
- Regional electricity use for transportation projected to increase .05% in 2010 to 33% in 2050.
- Use of electric heat pumps to projected to account for 52% of single family home energy thermal energy demand by 2050.

Strategies used to address electric demand focus on supporting further development of energy storage systems (i.e., batteries), which can help address peak-demand issues associated with renewable generation,

and on supporting existing programs that address the efficiency of appliances and lighting in Vermont. Smart rates, which use a rate structure that charges more for energy use during peak hours, can be used to reduce peak-hour electricity use.

1 GOAL

Use demand-side management to handle the expected doubling of electric energy demand in the Northwest region by 2050.

STRATEGIES

1. Encourage public utilities to move all customers to smart rates (i.e., charging higher rates during peak demand times), and encourage public utilities to mitigate any differential effects of smart rates on low-income customers.
2. Encourage legislature and/or public utilities to create programs that promote the use of energy storage systems. Using electric storage systems may reduce peak demand and provide emergency back-up power.
3. Support public utilities' efforts to increase customers' knowledge of their energy use. This may happen through increased outreach to and education of customers, but it may also occur through the use of new technology such as real-time monitoring of energy use.
4. Support the efforts of Efficiency Vermont to promote the selection and installation of devices, appliances, and equipment that will perform work using less energy (e.g., ENERGY STAR). This includes "load controllable equipment."
5. Encourage HVAC and weatherization providers to join the Building Performance Professionals Association of Vermont (BPPA-VT) to provide holistic energy advice to Vermonters.
6. Support and encourage school participation in Vermont Energy Education Program (VEEP) activities that foster an educational foundation geared toward energy savings.

IMPLEMENTATION

1. Work with GMP and regional partners to better promote the use of electricity conservation programs like the GMP eHome program and the Zero Energy Now program (in conjunction with GMP and BPPA-VT).
2. Support and provide outreach for EVT's customer engagement web portal and home energy reports.

THERMAL EFFICIENCY

Weatherizing structures to increase thermal efficiency is a very important part of reducing the region's energy demand by 2050. Outreach is one challenge that has limited building weatherization and the adoption of alternative heating systems in the region. An organization that can deliver both the message and the services doesn't exist. Businesses that deliver home heating oil, propane, and natural gas might be ideal for advocating weatherization efforts due to their connections to and frequent contact with business owners, homeowners, and landlords.

The amount of oil and gas being sold by most fuel dealers has declined in recent years, and further declines are expected. It may be in the interest of these companies—as well as the region—to begin transitioning their business

FIGURE 5.2
RECAP: LEAP THERMAL EFFICIENCY TARGETS

To meet the 90 x 50 goal, LEAP establishes the following targets:

- Total regional thermal energy needs for single family homes projected to drop by 9% by 2050.
- Use of cord wood to heat single family homes projected to decrease by only 20% by 2050.
- Use of electric heat pumps to projected to account for 52% of single family home energy thermal energy demand by 2050.
- Use of natural gas for single family home thermal energy expected to decrease by 68% by 2050.

models to become energy service providers (ESPs). Doing so will help them expand their current business model to include building audits, the sale of alternative heating systems, and other weatherization-related services. There may be value in working with regional partners to help orient area fuel dealers to this new market segment. Efficiency Vermont has created Efficiency Excellence Network, a program whereby contractors receive training in Efficiency Vermont–related efficiency programs and thus become eligible to be a "participating contractor," which offers benefits including receiving leads from Efficiency Vermont. However, more needs to be learned regarding this program to ensure that it is sufficient for both contractors and customers.

The availability of alternative, efficient heating sources is important to ensure greater thermal efficiency in the region. Heat pumps efficiently provide heat or supplement heat for residential and commercial buildings, particularly if the structure is airtight and well insulated. The NRPC will focus on coordinating with Efficiency Vermont and local public electric utilities to educate property owners about these heat pump systems and available incentives. At present, conversions to heat pump systems are not occurring at a high rate in the region. This may be due to high costs and inadequate incentives. The NRPC supports efforts to reduce the costs of converting to heat pump systems.

Other weatherization efforts can be completed by individual homeowners and businesses, or through several local organizations, both public and private, that provide weatherization services in the region. CVOEO provides full-service weatherization programs for low-income homeowners, from audits to financing to contracting. The organization has conducted hundreds of home energy audits and overseen many weatherization projects in the region, but it has not had a strong presence in the region compared to Chittenden County.

Efforts to weatherize existing structures should target the region's downtowns and village centers. These areas contain more residential and commercial units and include a very high percentage of rental housing, much of it in older houses that have been converted into multi-family units. Incentives for landlords to undertake energy efficiency improvements and install new alternative heating systems are limited, but the renters or landlords of these units could benefit from reduced heating expenses through such improvements. The region should also assess whether specific incentive programs should be created for older structures in rural areas, considering that many buildings in the region are located outside of existing downtowns and village centers.

The energy efficiency of newly constructed structures can be addressed through regulatory means. Efficiency Vermont recently adopted a "stretch" code for commercial and residential structures for use in Vermont. A stretch code has higher energy standards than the currently required Residential Building Energy Standards and the Commercial Building Energy Standards. The stretch code currently applies to all residential projects that are subject to Act 250 and can be used by commercial projects to demonstrate compliance with Act 250 Criteria 9(F). A stretch code can be adopted by municipalities to apply to new construction and rehabilitation of structures. Some municipalities may be interested in adopting a building code. Policy makers should remain aware that adoption of a stretch code or building code may increase up-front costs for new construction and renovations.

The potential of geothermal heating, also known as ground-source heat pumps, in the region is relatively unknown. However, the long-term economic benefits of utilizing such systems should be carefully considered by any multifamily residential, commercial, institutional, or industrial developers in the region and should be supported when such systems are feasible.

Several facilities in the region currently use biomass heating, but there aren't any district biomass heating facilities in the region (where a central biomass facility heats several structures). The use of biomass district heating at appropriate sites is critical to meeting thermal energy targets. The NRPC has developed a list of

candidate sites in the region (see Figure 5.3. The list includes large institutions, industrial parks, and areas of dense development are prime candidates). NRPC will work with regional partners to investigate the feasibility of district heating and combined heat and power at the identified candidate sites and in the region at-large.

1 GOAL

To reduce annual regional fuel needs and fuel bills for heating structures, to foster the transition from non-renewable fuel sources to renewable fuel sources, and meet regional targets for the weatherization of residential households and commercial establishments.

FIGURE 5.3 POTENTIAL DISTRICT HEATING SYTEM SITES

Municipality	Site Description: Potential District Heating System Sites
Alburgh	Town/Village Office/ surrounding village/industrial park
Bakersfield	Town Office/School and surrounding village
Berkshire	Town Office/School and surrounding village and East Bershire Village
Enosburgh	West Enosburgh Village
Fairfax	Village and School
Fairfield	Fairfield Village and East Fairfield Village
Fletcher	Binghamville Village and School
Franklin	Expand school sytem to village and East Franklin/East Berkshire
Grand Isle	Expand school sytem to village and Island Industrial Park
Highgate	Highgate Springs/Tyler Place and East Highgate Village
Isle La Motte	Village and School
Montgomery	Montgomery Village and Center Village
North Hero	Village
Richford	Village
St. Albans Town	St. Albans Bay Village
Sheldon	Sheldon Springs Village/School/Mill and Sheldon Village
South Hero	South Hero Village and Keeler Bay Village

STRATEGIES

1. Support efforts to transfer residential and commercial sectors from heating oil and propane to biofuels, biomass, and electric heat pumps.
2. Support changes that create simplified financing for fuel switching that links bill payments, home equity, and public sector incentives.
3. Support the use of geothermal heating and cooling systems for new residential and commercial construction in the region.
4. Support programs that provide assistance to low-income households to weatherize their homes.
5. Endorse the use of Downtown and Village Tax Credit programs to complete weatherization projects in the region's designated areas.
6. Support the creation of additional sustainable forest industries and biomass-related industries in the region to supply local biomass users.
7. Support greater state enforcement of existing state energy codes (e.g., RBES and CBES) to ensure that all renovations of existing structures are energy efficient and meet current standards.

IMPLEMENTATION

1. In partnership with municipalities, utilities, and other regional stakeholders, educate owners of rental housing about weatherization and funding opportunities, particularly in village areas. This may include investigating the creation and implementation of a revolving loan program to fund weatherization improvements to rental properties in the region.
2. Study and assess the feasibility of biomass district heating and/or combined heat and power systems in the region, particularly in areas of the region with large institutions.
3. Work with the county forester and state wood utilization forester to implement strategies identified in the Northwest Region Forest Stewardship Plan to encourage the sustainable development of wood products industries in the region. This includes utilizing low-quality wood locally for pellet production.
4. Provide technical assistance to municipalities to revise their zoning regulations to allow and encourage the location of forestry- and biomass-related industries in appropriate locations.
5. Provide outreach to municipal officials and contractors regarding the use and enforcement of residential and commercial building energy standards for all new construction, including new stretch codes.
6. Strategize with CVOEO about ways to increase the use of the weatherization assistance programs in the Northwest region.
7. Work with Efficiency Vermont to assess the effectiveness of the Efficiency Excellence Network in order to ensure that the program is effectively serving both consumers and contractors, and working toward state energy goals. Work with local fuel dealers, and other regional stakeholders such as Franklin County Industrial Development Corporation (FCIDC) and Lake Champlain Island Economic Development Corporation (LCIEDC), to encourage fuel dealers to become energy service providers.

FIGURE 5.4
RECAP: LEAP TRANSPORTATION ENERGY TARGETS

To meet the 90 x 50 goal, LEAP establishes the following targets:

- Total regional transportation energy demand projected to decrease by 58% by 2050.
- Gasoline and diesel demand projected to drop from 89% of demand in 2015 to 7% of demand in 2050.
- Electricity, ethanol, and biodiesel projected to account for 91% of transportation energy demand in 2050.

TRANSPORTATION

Transportation is an area that the NRPC has long been actively involved in and one that will greatly influence the region's ability to meet the targets set by the LEAP model. The state statute (Title 24 Chapter 117) enables the NRPC to have a considerable influence on land use and transportation issues in the region, especially in the Act 250 process and through the implementation of the Transportation Planning Initiative (TPI), a program through which the Vermont Agency of Transportation coordinates policy development and planning with regional planning commissions.

The following three goals are focused on three different issues that pertain to transportation: compact development, rail use, and fuel type. The compact development goal is focused on issues that the NRPC is already actively involved in promoting through the implementation of the Northwest Regional Plan: additional regional development in or near existing growth centers and villages, increased bicycle and pedestrian infrastructure, and increased access to public transportation. Compact development located in or adjacent to existing growth centers has the potential to significantly decrease regional transportation energy demand and costs by reducing VMT and potentially increasing the use of public transportation. The increasing use of rail in the region, by both passengers and freight, will also decrease energy demand and costs. Finally, transitioning from fossil fuels to renewable, cleaner sources of energy equates to more efficient energy use, but it will require addressing infrastructural challenges that come with changing fuels.

1 GOAL

Hold VMT per capita to 2011 levels through reducing the share of single-occupancy vehicle (SOV) commute trips by 20%, doubling the share of pedestrian and bicycle commute trips, increasing public transit ridership by 110% by 2050, and focusing regional development in or near existing growth centers and villages.

STRATEGIES

1. New public and private transportation infrastructure shall be designed and built to interconnect with existing adjacent land development(s) and with adjacent lands that have the potential for future land development. This will ensure more efficient traffic patterns and bicycle/pedestrian movement within the region.
2. Support efforts to make regional transit authorities like Green Mountain Transit statutory parties to all Act 250 applications in the region.
3. Require a public transit stop for all residential and large commercial land developments subject to Act 250 if a stop is not currently available.
4. Support planning for municipal streetscape improvements and on-street parking in state-designated village areas. This may require some cooperation with the Vermont Agency of Transportation in some villages due to the existence of state roads.
5. Support municipal efforts to plan for future compact development that includes opportunities for walking, use of public transportation, and other forms of transportation that are an alternative to the SOV. Municipal efforts may include capital budgeting, streetscape plans, revitalization plans, or adoption of an "official map" (as outlined in 24 V.S.A. Chapter 117, to identify future municipal utility and facility improvements such as road or recreational path rights-of-way, parkland, utility rights-of-way, and other public improvements) by the municipality.
6. Support changes to public transportation funding in the state that alters how public transit routes are funded. Support efforts for state funding of public transportation routes that serve stops on federal and state highways (in a similar manner to the existing highway funding system) and require municipal funding primarily for public transportation routes that serve local roads.
7. Investigate "cash out" programs that enable large employers to allow employees to "cash out," or obtain cash in exchange for the ability to park at their job site. Work with large regional employers to determine if such a model is viable in the region.

IMPLEMENTATION

1. Utilize Complete Streets implementation policies, as outlined in the Transportation section of the regional plan, when reviewing Act 250 applications within the region to ensure greater connectivity of bike and pedestrian networks within the region's city, villages, regionally designated growth centers, and transitional areas. This includes working with municipalities to adopt Complete Streets policies.
2. Study current park-and-ride capacity and identify future park-and-ride sites within the region in cooperation with VTrans. Support efforts to triple the number of park-and-ride locations in the region by 2050 as outlined in the Vermont Comprehensive Energy Plan.
3. Continue active participation with the Green Mountain Transit Board of Commissioners and support increased levels of public transportation service to the Northwest region.
4. Work with regional municipalities to investigate and institute local zoning changes that allow for greater residential density within regional downtowns, growth centers, and villages.
5. Provide education and technical assistance regional municipalities to decrease parking requirements in

[6]Vermont State Rail Plan – 2015, p.80.

their zoning regulations and to allow on-street parking in villages.
6. Develop ways to incentivize capital budgeting, official maps, and other planning efforts by municipalities to focus on expanding public infrastructure (including water and wastewater infrastructure) for future compact development.
7. Investigate methods that discourage sprawl and other types of land development, including subdivision, that threaten the regional working landscape and potentially increase transportation energy use.

2 GOAL

Quadruple region-based passenger rail trips (3,592/year in 2013), and double rail freight tonnage in the region (about 1,000 tons in 2011) by 2050.[6]

STRATEGIES

1. Support the extension of Amtrak Ethan Allen Express rail service from Rutland to Burlington, and bring Vermonter service to Montreal.
2. Support increased rail freight service to the region.

IMPLEMENTATION

1. Be an active participant in anticipated VTrans feasibility studies concerning commuter rail service between St. Albans and Montpelier to Chittenden County.
2. Work with municipalities to identify future passenger station sites in the region.
3. Work with New England Central Railroad, regional development corporations, VTrans, the Chittenden County Regional Planning Commission (CCRPC), the City of Burlington, the City of St. Albans, and other regional partners to study regional constraints and opportunities for increased freight traffic within the Northwest region.

3 GOAL

Increase the share of renewable energy in transportation to 10% by 2025 and to 90% by 2050 by increasing the use of renewable and less carbon-intensive fuels, such as electricity, biofuels, and compressed natural gas.

STRATEGIES

1. Require all commercial, industrial, and multifamily developments subject to Act 250 to provide electric vehicle (EV) parking spots and infrastructure to supply electricity for charging.
2. Continue to support Vermont Agency of Commerce and Community Development (ACCD) grant opportunities for municipalities to install electric charging stations, infrastructure, and supply in designated areas.
3. Support financial incentives for those that develop direct current (DC) fast electric charging stations.
4. Support the development and creation of biofuels production and distribution infrastructure in the region.
5. Support the efforts of municipal fleet operators to replace inefficient vehicles with more efficient vehicles, including heavy-duty vehicles that operate on biofuels.

IMPLEMENTATION

1. Work with VEIC and municipalities to identify local zoning barriers to allow for electric vehicle charging stations.

2. Partner with Drive Electric Vermont, LCIEDC and FCIDC to develop ways to celebrate and showcase employer investments in EV-friendly workplaces and new, innovative transportation programs in the region.
3. Work with municipalities to acquire grant funding for the installation of DC fast charging infrastructure at locations strategically located along major travel corridors, in transit hubs such as park-and-ride lots, and in designated downtowns and villages.
4. Work with state and regional partners, including UVM Extension, to assess the viability of using switchgrass and other crops in the production of biodiesel fuels.

OTHER STRATEGIES

There are several other strategies that can be used by the region to accomplish the goals of this plan that don't fit into major categories. Creating more municipal energy committees in the region will provide the support of additional regional volunteers to work toward accomplishing state, regional, and local energy goals and provide direct contact with citizens in each municipality. Municipal energy committees can aid municipal planning commissions and selectboards in writing energy chapters of municipal plans and accomplishing implementable projects for the municipality that are identified in the municipal plans. The NRPC will also work with Energy Action Network (EAN) to promote the use of the Community Energy Dashboard, an online tool that, according to EAN, will "enable communities to understand their energy use and make clean energy choices and investments across all energy sectors: electric, thermal, and transportation."

Support for the burgeoning local foods movement can also aid the region in meeting the goals of the plan. Increased production and consumption of local foods reduces the costs associated with transporting food to and from the region.

1 GOAL **Increase the number of municipal energy committees in the Northwest region.**

STRATEGIES

1. Support the creation of municipal energy committees in the Northwest region.

IMPLEMENTATION

1. Advocate for the creation of municipal energy committees in the region, and provide municipalities with technical support when creating such committees.
2. Work with Energy Action Network to promote use of the Community Energy Dashboard by municipal planning commissions and energy committees to aid municipal energy planning work.

2 GOAL **Increase local food production and consumption.**

STRATEGIES

1. Support the efforts of the Healthy Roots Collaborative and other regional organizations focused on expanding the local food system.

IMPLEMENTATION

1. Implement the existing language in the Northwest Regional Plan that calls for limiting the loss of primary agricultural soils and active farmland. In addition, implement the existing language in the Northwest Regional Plan that calls for mitigating the impacts to primary agricultural soils and active farmland when these areas are to be developed, including the construction of renewable energy generation facilities.
2. Work with regional municipalities to institute local zoning changes that provide additional protections to productive agricultural land and primary agricultural soils.

B. GENERATION

As seen in the results of the LEAP model, achieving the state's energy goals will take more than improvements to energy efficiency and reductions in energy use. It will also require additional energy generation, particularly of electricity.

ELECTRICITY GENERATION

Electricity generation strategies focus on continued support of existing state programs that encourage renewable generation development such as net-metering programs and the Standard Offer Program. Strategies also focus on the creation of more accessible, internet-based information for electricity generation developers and for the general public regarding grid limitations and the Certificate of Public Good process. Implementation will primarily focus on the NRPC aiding municipal energy planning efforts, which includes working with municipalities to identify preferred locations for future generation development in municipal plans. It also includes working with municipalities to identify and develop effective policies to protect significant cultural, historical, scenic, or natural resources. The development of these policies can address many of the concerns that communities and citizens in the region have expressed with regard to solar and wind generation facilities. The NRPC will work with municipalities to ensure that municipal plans receive an affirmative "determination" from the Northwest Regional Planning Commission.

The NRPC would like to further investigate the public benefits provided to municipalities either directly from renewable energy generation developers or as a condition of a Certificate of Public Good. The NRPC is interested in determining whether the current system creates equitable outcomes or if it can be improved to provide greater equity to all municipalities impacted by a renewable energy generation facility, even if the facility is only located in one municipality. This is particularly relevant when discussing "industrial" or "commercial" wind generation facilities.

Lastly, the NRPC finds it to be essential that all decisions regarding new renewable energy generation facilities take into consideration concerns about health and safety. The noise, vibration, glare, or other impacts from generation facilities shall be mitigated by developers to ensure that such impacts do not have an undue adverse impact upon neighboring properties. This includes any impacts that pertain from electric or magnetic fields, or from construction activities associated with the facility.

FIGURE 5.5
RECAP: LEAP ELECTRIC GENERATION ENERGY TARGETS

To meet the 90 x 50 goal, LEAP establishes the following targets:

- Total regional electricity consumption expected to double between 2010 and 2050.
- Regional generation needs project to be met by development of 208.5 MW of new solar generation, 19 MW of new wind generation, and 10 MW of a new hydro generation.

1 GOAL

Increase the renewable energy generation capacity in the Northwest region to include an additional 208.5 MW of new solar generation capacity, 19 MW of new wind generation capacity, and 10 MW of new hydro generation capacity by 2050.

STRATEGIES

1. Support the development of individual home and community-based renewable energy projects in the region through the following programs: Vermont Small Scale Renewable Energy Incentive Program, Clean Energy Development Fund, and tax and regulatory incentives including net-metering.
2. Support changes to net-metering rules and other regulatory tools to provide financial incentives in order to encourage siting of renewable generation facilities on the built environment (such as parking structures and rooftops) and other disturbed lands (such as former landfills, brownfields, or gravel pits). Support changes to net-metering rules that disincentivize development on land identified in this plan as a location with known and possible constraints. Encourage multiple uses in conjunction with the development of renewable generation facilities, such as grazing of livestock, recreation, or parking.
3. Continue to support the Standard Offer Program (Figure 5.6) to foster deployment of diverse and cost-effective renewable energy resources, and support the evaluation of this program after 2022 to determine if the program should be extended or changed.
4. Support the creation of "solar maps," like the maps developed by Green Mountain Power, to make interconnection information available to the general public and accessible online. Local electric utilities could partner with the NRPC to create these maps.
5. Support efforts by local utilities and private individuals to maintain and upgrade existing renewable electric generation facilities in the Northwest region and the state.
6. Support the development of additional methane digesters on farms in the Northwest region, especially those that utilize manure from multiple farms and/or food waste.
7. Support the creation of incentives for locating new renewable energy generation facilities within a half-mile of three-phase distribution line or electric transmission line infrastructure. Ensure new transmission lines and three-phase power lines associated with renewable energy projects do not create forest fragmentation or have an undue adverse impact on necessary wildlife habitats, ecological systems, and water and/or air quality.

FIGURE 5.6 STANDARD OFFER PROGRAM

In 2009, the Vermont legislature created the Standard Offer Program, which is designed to encourage the development of renewable energy generation facilities by establishing prices for new renewable energy generation facilities based on the cost of developing a project plus a reasonable rate of return. Through the program, renewable energy developers can receive a long-term, fixed-price contract for renewables facilities up to 2.2 MW in size. The original program cap was 50 MW, which was amended to 127.5 MW in Act 170 of the 2011–2012 legislative session. Facilities to meet the program cap will be built over time through 2022. All facilities to be built through the program are required to receive a Certificate of Public Good from the Public Service Board.

IMPLEMENTATION

1. Apply to the Public Service Department to have the Northwest Regional Energy Plan receive an affirmative determination of energy compliance in order to ensure that the plan is given greater weight in the Certificate of Public Good process.
2. Provide assistance to municipalities to identify potential areas for development and siting of renewable energy generation facilities. Work with municipalities to identify areas, if any, that are unsuitable for siting renewable energy generation facilities or particular categories of renewable energy generation

facilities. Ensure that municipalities include this information in their municipal plans and work to ensure that municipal plans are given an affirmative regional determination of energy compliance by the NRPC so that municipalities may receive "substantial deference" in the Certificate of Public Good process.

3. Work with municipalities to specifically identify significant cultural, historical, or scenic resources in their communities. Work with municipalities to protect these resources through the development of a statement of policies on the preservation of rare and irreplaceable natural areas and resources as well as scenic and historic features and resources, as required by 24 V.S.A. 4382, and include such policies in municipal plans.
4. Identify, catalog, and map potential brownfield sites and other previously disturbed sites in the region that may be appropriate for future solar generation facilities.
5. Investigate public benefits provided to municipalities either directly from renewable energy generation developers or as a condition of a Certificate of Public Good. Assess if the current system is equitable to all municipalities impacted by a renewable generation facility, or if the current system can be improved to provide greater equity to all municipalities impacted by a renewable energy generation facility.

ENERGY RESOURCE MAPS AND THE PUBLIC SERVICE BOARD

The Vermont Public Service Board has jurisdiction over all energy generation facilities that are a part of the public electrical grid. The board provides its approval to an energy generation facility by issuing a Certificate of Public Good to that facility. A proposed energy generation facility must meet the criteria found in 30 V.S.A. §248 in order to receive a Certificate of Public Good. The role of regional planning commissions in the Certificate of Public Good process is outlined in 30 V.S.A. §248(b)(1), commonly referred to as Section 248:

> *With respect to an in-state facility, will not unduly interfere with the orderly development of the region with due consideration having been given to the recommendations of the municipal and regional planning commissions, the recommendations of the municipal legislative bodies, and the land conservation measures contained in the plan of any affected municipality.*

In addition, regions and municipalities may receive "substantial deference" instead of "due consideration" during a Certificate of Public Good proceeding if the region or municipality has received an affirmative determination of energy compliance. This potentially provides regional and municipal plans with greater weight before the Public Service Board.

In recent Certificate of Public Good proceedings, the Public Service Board has frequently found that municipalities and regional planning commissions have not had language, or maps, that have provided for "land conservation measures" that are specific and/or well-reasoned enough to have a real impact on the siting of renewable generation facilities through the Certificate of Public Good process. Through the creation of the following regional energy generation maps, the NRPC is planning for the development of additional renewable generation facilities in the region (using the LEAP model targets as a basis of conversation) and providing for clarity regarding regional land conservation measures and specific policies.

The NRPC has developed renewable energy generation maps for four renewable energy resources: solar, wind, hydro, and biomass. The following subsection provides a basic explanation of how the maps were created and how they are intended to be used and/or integrated into the Northwest Regional Plan. This is followed by subsections explaining the intent behind the maps of each renewable energy resource. Maps created while developing this project are provided in Appendix C.

ENERGY GENERATION MAPS METHODOLOGY

NRPC staff worked with other regional planning commissions, the Department of Public Servie and other project partners in the state to develop criteria that would inform and guide the siting of renewable energy

generation facilities. The NRPC and the other RPCs each created maps that provide a macro-scale look at different factors that impact the siting of facilities.

Spatial data showing generation potential, which was originally compiled by the Vermont Sustainable Jobs Fund, formed the basis of the NRPC's mapping exercise. The NRPC then identified conservation resources in the region that were considered worthy of protection from development. These resources were selected through conversations with project partners, analysis of the current Northwest Regional Plan, and public input. Known and possible constraints were subsequently identified.

Known constraints are conservation resources that shall be protected from all future development of renewable generation facilities. Possible constraints are conservation resources that the NRPC intends to protect, to some extent, from the development of renewable generation facilities. The presence of possible constraints on a parcel does not necessarily preclude the siting of renewable generation facilities on a site. Siting in these locations could occur if impacts to the affected possible constraints are mitigated, preferably on-site.

When considering locations for future renewable energy generation facilities, the NRPC would like developers to target regional locations with generation potential that do not contain any known or possible constraints. These areas are shows as "prime" on the renewable energy generation maps in Appendix C. Further, if prime areas are located within a half-mile of existing transmission or three-phase distribution infrastructure, the NRPC finds that these areas should be given further preference by the Public Service Board. Areas with high generation potential but that also contain possible constraints are identified on the regional energy generation maps as "base" areas. These areas may be appropriate for the development of renewable energy generation facilities, but they should be given less preference than prime areas.

FIGURE 5.7 ROOFTOP SOLAR – POTENTIAL CAPACITY

NRPC has appoximated potential solar generation from both commercial/ industrial and residential rooftops in region. The analysis estimates that 25% of all residential, commercial and industrial structures may be correctly side for solar generation and have actually installed solar panels. NRPC then estimated that a typical residential system would generate 4 kW of electricity and that a typical commercial or industrial system would generate 20 kW of electricity.

Based on these assumptions, the Northwest region could potentially generate 28.8 MW of electricity from rooftop solar generation. About 21.6 MW would come from residential rooftops and 7.2 MW would come from commerical and industrial rooftops.

Additional development of structures in the region would provide additional generation capacity. While these assumptions allow for only rough approximations, they do provide a sense that rooftop solar may be a viable way to meet at least a portion of the regional generation targets.

A full list of the known constraints and possible constraints identified by the NRPC for each type of generation (solar, wind, biomass, hydro), along with information about data sources, may be found in Appendix B.

It should be noted that the energy generation maps are based on the best available geographic data. They are macro-scale maps meant to guide the development of renewable generation facilities. The NRPC expects that some applicants or parties will be able to provide on-site information that is more accurate regarding the presence of known and/or possible constraints. This information will need to be taken into account by the NRPC and the Public Service Board when reviewing applications for renewable generation facilities to ensure that known constraints are not impacted and to ensure that impacts to possible constraint areas are mitigated. The energy generation maps are not intended to be used without the accompanying goals and policies of the NRPC contained in this plan.

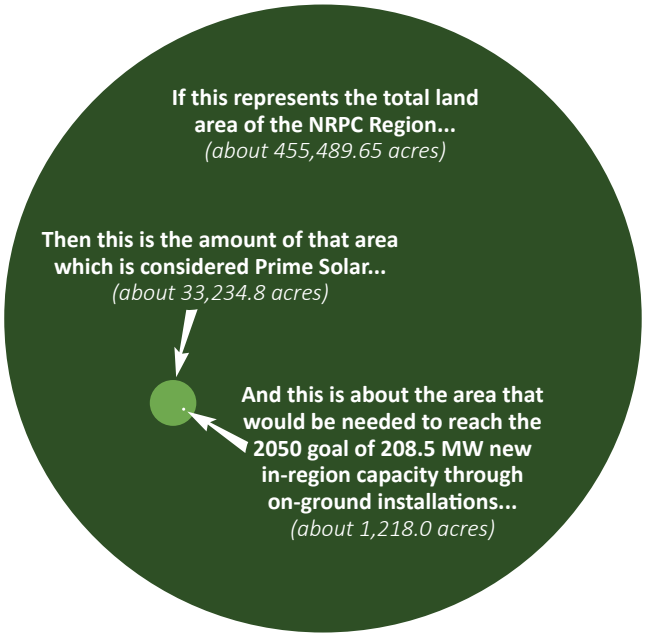
NORTHWEST REGIONAL ENERGY GENERATION MAPS AND STANDARDS

Solar Generation Facilities - LEAP Generation Target 208.5 MW

The NRPC has determined that several types of locations in the region should be targeted for future solar generation. These locations are not shown on the solar generation maps, yet are considered "preferred locations" by the NRPC. In no particular order, these preferred locations include the following:

- Rooftops of structures
- Former landfill sites
- Brownfield sites and Superfund sites that are not located in a state or regionally designated downtown or village center
- Abandoned and active earth resource extraction sites (sand pits, gravel pits, rock quarries)
- Surface parking lots

FIGURE 5.8 SOLAR POTENTIAL DIAGRAM



The preferred locations are often a good fit for solar generation facilities (provided that site-specific standards are met). These sites are typically underutilized (e.g., former landfill sites, brownfield sites, and earth resource extraction sites) or are already heavily developed (e.g., rooftops and parking lots). Solar siting should be prioritized in these locations.

There currently is a lack of geographic data that accurately shows parking lots, former landfills, existing and abandoned quarries and potential brownfield locations in the region. NRPC is actively working to develop this data to help provide additional guidance for future development of solar facilities.

The targets developed by the Department of Public Service and the regional planning commissions indicate that approximately 208.5 MW of solar will be needed in the region by 2050 to meet the 90 x 50 goal. Although this amount seems considerable at first glance, upon analysis the target seems much more achievable for the region. Acreage data from the solar regional energy generation maps shows that there are approximately 24,184 acres of "prime" solar in the region after land with known and possible constraint areas are removed.

To generate 208.5 MW of solar generation, approximately 1,459.5 acres are required given today's technology (approximately 7 acres per 1 MW of generation). The 1,459.5 acres needed to meet the target constitute 5.31% of the total acreage of prime solar (with known and possible constraints removed) and 0.32% of the total land area of the entire Northwest region. Therefore, the NRPC finds that the solar target is attainable.

Many parts of the region are suited to solar development, but western Franklin County and Grand Isle County stand out. Western Franklin County is where the greatest regional electrical demand is located, so developing solar in this area is ideal in terms of electrical grid efficiency. Grand Isle County has less electrical demand and may also have some grid capacity restrictions based on comments made by the public electric utility serving the area, Vermont Electric Cooperative. Both areas also have a substantial amount of area that is prime solar yet also contains a possible constraint. In many of these locations, the possible constraint on the site is typically primary agricultural soils or protected lands.

Based on conversations with the Department of Public Service and other RPCs, it is the NRPC's understanding that it is generally less expensive to interconnect ground-mounted solar when it is close to existing transmission lines or three-phase distribution lines. The NRPC analyzed the amount of prime solar acres located within a half-mile of transmission lines and three-phase distribution lines. The NRPC's analysis found about 10,259 acres of prime solar (with known and possible constraints removed) within a half-mile of transmission or distribution infrastructure. It is in these areas that the NRPC would like to target future solar generation (if generation is not to be located in "preferred locations," as identified above).

There is more electric infrastructure in southern and western Franklin County than in other parts of the region. These same areas also are close to Chittenden County, a region that may have a difficult time meeting its generation targets due to its considerable electric demand and smaller land mass on which to site generation facilities. There is some concern that southern and western Franklin County may see more than its fair share of new solar generation facilities. However, the NRPC understands that siting facilities in these areas will provide landowners with financial benefits and that it may be necessary to provide electricity to meet state economic and energy needs.

Wind Generation Facilities - LEAP Generation Target 19 MW

The Department of Public Service sets a lower target for wind generation than solar generation in the region. The Northwest region is already home to half of the Georgia Mountain Community Wind project, which generates approximately 10 MW of electricity (the electricity generated is purchased by Burlington Electric). The generation targets call for an additional 19 MW of new wind generation in the Northwest region by 2050.

Prime wind generation data is available from the Vermont Sustainable Jobs Fund. Wind potential at wind "hub" heights of 50 meters (164 feet) and 70 meters (230 feet), as provided in the dataset, have been regionally mapped (See Appendix C).

Smaller, net-metering scale wind generation may be possible throughout most of the region at lower elevations. More information is needed regarding the viability and affordability of these systems, but generally the NRPC views these types of facilities favorably provided that impacts to known constraints are avoided, impacts to possible constraints are mitigated, and site-specific concerns are addressed. NRPC does not support the construction of "industrial" or "commercial" wind generation facilities within the region. For more information please see Section IV.

The regional wind generation maps in Appendix C do not show many wind generation areas with high generation potential. This is due to the existence of known constraints, most notably conservation habitat design blocks and source protection areas for public water supplies. This is consistent with existing language in the Northwest Regional Plan.

As stated earlier, known constraint areas have been removed from the map and are not suitable for renewable generation development. The remaining portion of the region with considerable wind generation potential constitutes a relatively small area that can effectively generate electricity from wind. Meeting the 19 MW target for new wind generation in areas without known or possible constraint areas may be a challenge.

To compensate for the challenge of meeting the wind generation target, the NRPC may need to plan for additional generation from other renewable sources—most likely, solar. Hydro, biomass, and even geothermal sources would probably be insufficient to produce the amount of electricity required to keep the region on track to meet the 90 x 50 goal.

There has been an ongoing call from concerned citizens and advocacy groups for site-specific standards for large-scale wind generation facilities in Vermont, especially regarding sound. Concerns have also been raised regarding aesthetics, surface water degradation, and the "flicker effect" (caused by moving turbine arms in front of the sun). The Public Service Board has been tasked with creating sound standards for wind generation facilities per Act 174. These standards shall be adopted by the board by July 1, 2017. The NRPC finds that the other potential concerns raised regarding wind generation facilities should continue to be studied by the Department of Public Service and the Public Service Board but are not addressed by this plan.

Hydro Generation Facilities - LEAP Generation Target 10 MW

The LEAP model results follow the guidance from a study commissioned by the Department of Public Service. The study found that 10 MW of new hydro generation is possible in the region. This generation would come from 16 existing dams in the region that are not currently producing electricity (see Figure 5.9) and from retrofits to existing dams to generate additional electricity at those sites. Existing dams that are not currently producing electricity could only account for approximately 1,019 kW (or about 1 MW) of generation capacity. According to the Department of Public Service, most dams need to provide at least 500 kW of generation capacity to be cost effective. Therefore, it seems unlikely that many of the smaller existing dams in the region would be refitted in the future to provide generation capacity. It also means that the majority of untapped hydro potential in the region is located at existing dam sites that are already producing electricity.

The growth of hydro generating capacity in the region is desirable because of the positive effect it may have on baseload electrical production (according to the Department of Public Service, most new in-state hydro

FIGURE 5.9 EXISTING HYDRO FACILITIES WITH GENERATION POTENTIAL

Name	Stream	Owner	Year Built	Hazard Classification	Potential kW
Georgia-3	Lamoille River-TR				5
Sheldon-2	Goodsell Brook				0
Webster (Lower)	Black Creek				46
Mud Creek	Mud Creek	State of VT - DFW	1957	Low	8
Johnsons Mill	Bogue Branch	Perry Cooper	1928	Low	5
Trout Brook Reservoir	Trout Brook	Town of Enosburg		Low	4
Bullis Pond	Rock River	Town of Franklin	1843	Low	9
Lynch	Abenaki Bay-TR	Karen Lynch	1969	Low	1
Browns Pond	The Branch	Jamie Rozzi	1920	Low	29
Fairfield Pond	Dead Creek-TR	Swanton Light & Power Department		Low	15
Lake Carmi	Pike River-TR	State of VT - DEC	1970	Low	14
Fairfield Swamp Pond	Dead Creek	State of VT- DFW	1967	Low	18
Swanton	Missisquoi River	Swanton Light & Power Department	1920	Low	850
St. Albans North Reservoir	Mill River	City of St. Albans	1895	High	6
St. Albans South Reservoir	Mill River	City of St. Albans	1910	Significant	6
Silver Lake	Beaver Meadow Brook-TR	City of St. Albans	1912	Significant	3
				Total Potential kW	**1,019**

can't be considered baseload power because the dams are required to operate as "run-of-river" and therefore aren't always a reliable source of generation in the summertime). Hydro generation is a more consistent and reliable source of renewable generation than both wind and solar generation. Investment in existing and new hydro sites should meet environmental standards established by the State of Vermont Agency of Natural Resources.

The NRPC supports continued import of hydro-generated electricity from the New York Power Authority projects in the St. Lawrence River Valley and from Hydro-Québec. However, the commission is concerned about the long-term price of electricity from these projects. In recent years, several projects have been proposed in Vermont and New York to construct privately owned DC transmission lines from the Canadian border to various points on the New England grid, including several locations in Vermont. These transmission lines will allow additional electricity to be transmitted to the United States from Canada, primarily from Hydro-Québec, which will subsequently be sold on the ISO New England grid. This potentially will mean that Vermont public utilities will be competing with public utilities from southern New England for electricity generated by Hydro-Québec. The NRPC is concerned that this increased competition with public utilities from outside the state may lead to higher wholesale electricity costs and higher electricity rates for Vermonters. Although the region and state may need to continue to rely on Hydro-Québec for some hydro generated electricity to ensure that the 90 x 50 goal is met, the NRPC finds additional in-state renewable generation to be preferable.

The NRPC generally supports hydro generation in the region—but due to the regulatory complexity of permitting dams, the cost of refurbishing existing dams, and the potential effects that dams may have on wildlife, it finds that meeting the LEAP target of 10 MW of new generation capacity by 2050 would be tremendously difficult. The NRPC is committed to planning for and exploring hydro generation at existing sites, but the commission believes that planning for additional generation from other renewable sources and advances in electricity storage may be needed to ensure that the 90 x 50 goal can be attained.

Biomass Generation Facilities

Biomass, in various forms, can be used to produce heat and electricity. For several reasons, the LEAP model does not provide a target for biomass electric generation or thermal generation (or at least for thermal generation from a "district heating facility"—a central facility that would provide heat to several structures).

Electrical generation from biomass is specifically not addressed by LEAP due to concerns about how additional large-scale biomass electric generation, from both wood and methane sources, may impact climate change and air quality in the region. There are also concerns about the efficiency of using biomass to generate electricity. However, in the event that a biomass heating facility is proposed in the region, it would certainly make sense to have the proposed facility operator assess whether the facility could also cost effectively provide electrical generation (i.e., a Combined Heat and Power [CHP] facility).

Some farms in the Northwest region currently use "cow power" biomass to generate electricity. "Cow power" utilizes methane released from cow manure to fuel an engine. The engine, in turn, creates electricity. There are five "cow power" facilities located on farms in Franklin County. A currently proposed facility in St. Albans Town is slated to use manure and food scraps from the solid waste district to generate electricity. Food scraps are another fuel source that may open up possibilities for additional generation. The NRPC supports using cow power to the greatest extent possible in the region given its renewable nature, the financial support it can provide to regional farmers, and additional water quality benefits.

Thermal generation is the more probable route for utilizing biomass, especially from forests (i.e., "woody biomass") in the region. The LEAP model also does not provide a target for thermal generation from a central biomass facility (i.e., district heating), but instead it provides some targets for distributed thermal generation

that are addressed in Section VI and Appendix A. New district heating facilities that utilize woody biomass for thermal generation should be located in areas that have a relatively dense collection of possible system users. Downtowns and villages (and probably some hamlets) should be targeted as possible future sites of district heating facilities.

The development of a district heating facility entails high capital costs for both the "power plant" and the distribution network. Ensuring buy-in from prospective local users is necessary for economic viability and is certainly a challenge to facility development.

Developing future district heating facilities may be difficult, especially in the short term, because many ideal sites are served by relatively low-priced natural gas. Future district heating ideally would be located in eastern Franklin County, where biomass resources are most abundant. Grand Isle County may also be a potential location for a district heating facility due to a lack of competition with natural gas. However, Grand Isle County lacks local biomass resources and would most likely need to be supplied from other parts of the region, or from outside the region, making such a facility less economically viable.

When discussing the use of woody biomass, it is important to consider the long-term sustainability of the region's forest. It takes time for forest regeneration to occur after logging. The region should not become overly reliant on biomass for electrical or thermal generation in order to ensure that the region's forests are sustainable over the long term. That said, woody biomass will continue to be an important, affordable, and accessible fuel source for heating individual structures in rural locations in the region.

Biomass from agricultural crops can be used in the production of biofuels. Although the research in this field is evolving, using agricultural land to produce crops to be manufactured into biofuels in the region could provide an economic opportunity for regional farmers. Ideally, production facilities where agricultural products are manufactured into biofuels would be located on farms or in appropriate locations within the region's villages.