Norwich Turnpike Solar Project
Turnpike Road, Norwich, Vermont
Aesthetics and Orderly Development Assessment Report

June 18, 2020

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Overview

SE Group, a Vermont-based landscape architecture, and planning firm specializing in community planning and scenic resource analysis, has completed an assessment of potential aesthetic impacts attributable to the "Norwich Turnpike Solar Project" or "Project." This Aesthetics and Orderly Development Assessment Report is being provided to Norwich Turnpike Solar, LLC's ("Applicant") to address the Project's potential impacts on aesthetics and orderly development of the region pursuant to 30 V.S.A. § 248(b)(1) and (b)(5). SE Group completed this assessment using the most current design and layout for the Project, a Geographic Information System (GIS) desktop analysis, a site visit to the Project area, and a thorough review of local and regional planning documents.

Project Description, Context, and Setting

The proposed Project is a 150 kW (alternating current (AC)) solar electric generation facility to be located at 645 Turnpike Road in the Town of Norwich, Vermont. The context and setting for the Project are shown graphically in Figure 1.

The parcel (Parcel Span Number 450-142-12932) hosting the Project is approximately 8.5 acres, and access is provided via an existing private access off Turnpike Road. The overall area encompassed by the array is approximately 1 acre, with the Project site being located on the southern end of the large parcel, near the existing access. The photovoltaic modules, mounted on metal fixed-tilt racks and mounted at 30 inches above natural grade, are about ten (10) feet in total height. The array, set back approximately 112 feet from the edge of Turnpike Road, includes multiple rows that are nominally 30 feet apart, and the entire system oriented towards the south to maximize its solar exposure. String inverters are mounted on the backsides of the racking system. The power will travel underground to an AC disconnect and then interconnect to Green Mountain Power's (GMP) distribution system via a new GMP 150 kVA pole-mounted transformer. The Project Site Plan is included with the Applicant's Section 248 application as Exhibit MS-2 and identifies the relevant components of the Project.

The Project parcel is largely open meadow with a small pond and some roadside vegetation. As shown on Figure 1, the area is rural and is characterized by low-density single-family homes, open fields, and forest. More broadly the landscape is dominated by forested areas including the Brookmead Conservation Area, Norwich Town Forest, and Norwich Municipal Forest. Much of the natural woodland vegetation in the area, and along the periphery of the Project site is mature and comprised of a mix of hard and softwood species. Figure 1 presents the Project site in context with the surrounding landscape.

The Project site sits between 760- and 790-feet above sea level, on a slightly east tilted bench along the western edge of a valley defined by Turnpike Road. The regional terrain is variable and hilly, particularly to the northeast and northwest of the Turnpike Pike corridor where gradients in terrain often foreshorten longer range views. Figure 2 illustrates the topographic

context for the site. The terrain southeast of Turnpike Road is generally flatter, making foreground obstructions more effective at limiting distant views.

The Norwich Selectboard and Planning Commission and the Two Rivers Ottauquechee Regional Planning Commission ("TRORC") have each designated the Project location as a Preferred Site for solar. The preferred siting designation is supported by the Norwich Town Plan solar siting policy that states "For solar generation projects sized from 15kW to 500kW the presumption is that all of Norwich meets the Public Utility Commission definition of 'preferred site'…" (p.21).

Field Evaluation and Photographic Documentation

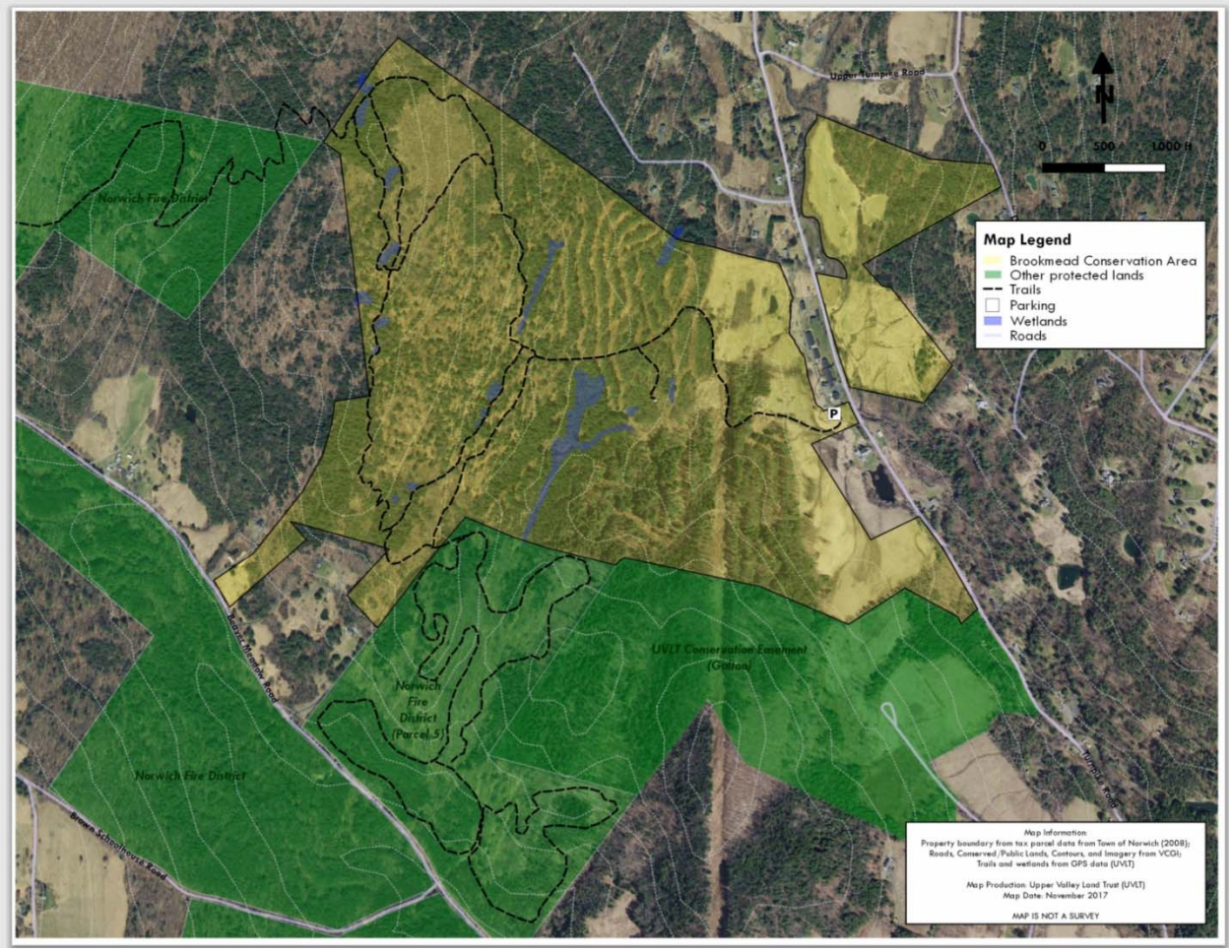
SE Group conducted a field visit to the area on April 29, 2020, to inspect for potential visibility of the site and validate the desktop analysis. Photographs were taken from along Turnpike Road. Turnpike Road is a locally serving town road. In total, photographs were collected from six vantage points within a 1-mile radius from the Project site. These locations are shown on Figure 1 and the collected site photographs are provided in Figures 3 to 4. Specific information about these viewpoints are provided below.

Viewpoint	Location	Distance to Project Site (feet)	Visual Characteristics and Observations
1	Turnpike Road	945	View looking southeast from Turnpike Road. Roadside vegetation filters direct views of the Project site even during leaf-off conditions. See image on Figure 3.
2	Turnpike Road	355	View looking southeast from Turnpike Road. Roadside vegetation becomes more extensive with a mix of scrub/shrub and deciduous trees. Roadside powerlines are visible from this location. A pond near the Project is just to the right, outside of the view of the image provided on Figure 3.
3	Turnpike Road	125	Roadside vegetation thins somewhat within this very narrow portion of the frontage. Project site rises from this vantage point. See the image on Figure 3.
4	Turnpike Road	115	View looking southeast towards the proposed access point into the Project site and shows the increasing roadside vegetation. The curb cut to the most proximate residential neighbor is observed on the left side of the image on Figure 4.
5	Turnpike Road	300	View looking northwest towards the Project Site. The Project site is generally out of view due to foreground vegetation, including mature trees. See the image on Figure 4
6	Turnpike Road	590	View looking northwest towards the Project Site. Views are precluded due to intervening terrain and vegetation features. See the image on Figure 4

In combination, the field and photographic information affirm what the desktop investigation concluded, namely that existing vegetation and changes in topography limit the potential views of the Project. While the Project site is minimally about 112 feet from the nearest public vantage points along Turnpike Road, its visibility is significantly impeded by natural topographic changes and existing roadside vegetation. Travelers on Turnpike Road might have a partially

filtered view of the Project site, but such views would likely be fleeting given changes in terrain in the mid-ground and the effectiveness of the vegetation in masking the array from offsite. Based on this assessment and given the vehicular travel speed along the roadway (25 mph), and orientation of the view (to the west) visibility would be of short duration.

An existing conservation area, the Brookmead Conservation Area, is managed by the Upper Valley Land Trust and extends to the north, west, and south of the Project. Within portions of this area is a network of recreation trails that emanate from a trailhead/parking area north of the Project site located at the Norwich Farm Creamery complex. A field review of portions of these trails showed that direct or unfiltered visibility of the Project was unlikely even during leaf-off conditions because of the dense natural woodlands and topographic changes within the conservation area. Glimpses of the Project site from areas outside of established trails might be possible, based on the official trail map which is included below.



Brookmead Conservation Area Trail Map (https://uvlt.org/wp-content/uploads/2017/11/BROOKMEAD_brochuremap.pdf)

Aesthetics Analysis

In determining whether a proposed project would have an undue adverse impact on aesthetics, the Commission has adopted the so-called Quechee test. The Commission has previously summarized the Quechee analysis:

> In order to reach a determination as to whether the project will have an undue adverse effect on the aesthetics of the area, the [Commission] employs the two-part test first outlined by the Vermont Environmental Board in Quechee, and further defined in numerous other decisions. Pursuant to this procedure, first a determination must be made as to whether a project will have an adverse impact on aesthetics and the scenic and natural beauty. In order to find that it will have an adverse impact, a project must be out of character with its surroundings. Specific factors used in making this evaluation include the nature of the project's surroundings, the compatibility of the project's design with those surroundings, the suitability of the project's colors and materials with the immediate environment, the visibility of the project, and the impact of the project on open space.
>
> The next step in the two-part test, once a conclusion as to the adverse effect of the project has been reached, is to determine whether the adverse effect of the project is "undue." The adverse effect is considered undue when a positive finding is reached regarding any one of the following factors:
>
> > 1. Does the project violate a clear, written community standard intended to preserve the aesthetics or scenic beauty of the area?
> >
> > 2. Have the applicants failed to take generally available mitigating steps which a reasonable person would take to improve the harmony of the project with its surroundings?
> >
> > 3. Does the project offend the sensibilities of the average person? Is it offensive or shocking because it is out of character with its surroundings or significantly diminishes the scenic qualities of the area?
>
> In addition to the Quechee analysis, the [Commission]'s consideration of aesthetics under Section 248 is *"significantly informed by overall societal benefits of the project."*

Joint Petition of Green Mountain Power Corp., Vt. Elec. Coop., Inc., Vt. Elec. Power Co., Inc., and Vt. Transco LLC, Docket No. 7628, Order of 5/31/2011 at 82-83 (emphasis added)(quoting *In Re: Northern Loop Project*, Docket 6792, Order of 7/17/03 at 28).

Quechee Analysis Step 1 - Assessment of Adversity

The first step of the Quechee Analysis asks whether the Project results in an adverse impact on the aesthetics and scenic beauty of the area. The following questions and their responses help inform our assessment of adversity.

1. *What is the nature of the project's surroundings? Is the project located in an urban, suburban, rural, or recreational resort area? What land uses presently exist? What is the topography like? What structures exist in the area? What vegetation is prevalent? Does the area have particular scenic value?* The Project site is located about 2 miles outside of Norwich Village Center. The area surrounding the project is rural and is characterized by low-density single-family homes. The vegetation to the east of the project site from Turnpike Road includes mature softwood species and a thick layer of deciduous shrubs. The Brookmead Conservation Area borders the Project parcel to the north, west and south. The area is similar to many roadside views throughout rural Vermont. Changes in topography and roadside vegetation restrict long-range views. Turnpike Road has not been designated a scenic road in the Norwich Town Plan.

2. *Is the project's design compatible with its surroundings? Is the architectural style of the buildings compatible with other buildings in the area? Is the scale of the project appropriate to its surroundings? Is the mass of the structures proposed for the site consistent with land use and density patterns in the vicinity?* The array's low profile and scale is compatible with its surroundings. Some of the Project's equipment is placed between the rows while other is underground, reducing their presence. Other equipment is located near the access point into the property where the existing GMP distribution system runs parallel to Turnpike Road. The property adjacent to the array is a designated conservation area with public trails, a dairy and creamery operation, and several residential structures. The surrounding area also has some low-density residential uses, however the distance and position of the array relative to them does not impact the character of the area. The connection of the Project to the existing distribution network relies only on the installation of a single 150 kVA pole-mounted transformer, on an existing wooden distribution pole. This will not change the character of Turnpike Road.

3. *Are the colors and materials selected for the project suitable for the context in which the project will be located?* The character of the array and associated equipment is visually consistent with similar solar projects located throughout Vermont and is suitable for the context in which the array will be located. The solar array equipment, other than the crystalline panels themselves, will be galvanized steel and will have a light gray finish. The panels will have an anti-glare coating and are expected to be a dark color. Other equipment including combiner pad and disconnect pedestal will be of low profile and of a character like electric equipment commonly observed in working landscapes for farm operations, etc.

4. *Where can the project be seen from? Will the project be in the viewer's foreground, middleground or background? Is the viewer likely to be stationary so that the view is of long duration or will the viewer be moving quickly by the site so that the length of view is short?* The Project site is over 20 feet higher in elevation and separated by intervening vegetation from the nearest public roadway. The array has a low profile and is set back from the nearest public vantage point by about 112 feet. Areas beyond the Project site are subject to natural terrain and vegetated features that either preclude or diminish the potential for views. Areas where limited potential views exist are largely of short duration (i.e. along Turnpike Road) or from areas where the public is not expected to congregate. Views from the nearby Brookmead Conservation Area are minimal due to the distance (generally more than 400 feet), changes in topographic condition between that area and the Project site, and the presence of dense natural woodlands.

5. *What is the project's impact on open space in the area? Will it maintain existing open space, or will it contribute to the loss of open space?* The array itself encompasses only approximately 1 acre and its presence would have a negligible impact on the broader existing land use pattern. Furthermore, the regional or municipal plans have not designed the area as open or conservation lands. While adjacent to such open space and conservation lands, the Project and its components are entirely outside of identified areas.

Overall, the Project site avoids offsite visual impacts. We conclude that the Project **WOULD NOT create an adverse impact** under the first step of the Quechee Analysis. The level of visibility is modest, and the Project would create only a modest change to the surrounding landscape. The preservation of natural vegetation on the eastern periphery of the Project site and its elevated position to more proximate public areas dramatically reduces its visual profile and corresponding impact.

Quechee Analysis Step 2 – Determination of Undue Condition

Irrespective of the conclusion above, in order to conduct a fully comprehensive review, we proceed to the second step of the Quechee Analysis, which asks whether an adverse impact is undue. The three questions comprising the second part of the Quechee Analysis ask:

1. Is the Project shocking or offensive to an average person?

No. To reach the threshold of being "shocking or offensive," a project needs to be so out of character that a disinterested average person who can observe it, is left concluding that it does not belong. The test definition of an average person means "the average member of the viewing public who would see a particular project from the vantage point of the public" and "from an objective, as opposed to subjective and neighborly, perspective." *In re Petition of Rutland Renewable Energy, LLC. for Certificate of Public Good Pursuant to 30 V.S.A. § 248*, 2016 Vt. 50, ¶ 22. The factors to be considered when addressing this question include the form of the project, its presence and compatibility in the landscape, and the characteristics of those expected to observe it.

Our analysis and assessment indicate that the Project would not create such a significant visual impact on the surrounding landscape to shock or offend the average member of the viewing public who might observe it. Firstly, its location and setting limit potential observers from nearby public areas and roadways. The Project site is over 100 feet from public vantage points along Turnpike Road. Foreground vegetation and changes in elevation obstruct and screen direct views of the Project site from the proximate public roadway, Turnpike Road. The placement and orientation of the panels conform to the general shape of the underlying terrain, and with their low height and relatively small footprint, reduce the Project's potential to shock or offend.

2. Does the Project violate any clearly written community standard?

Although Section 248 does not require municipal zoning approval of projects seeking a Certificate of Public Good, the second prong of the Quechee analysis considers local plans and regulations where a project may have a potential adverse visual impact. The Public Utility Commission has noted that "[in] order for a provision to be considered a clear, written community standard, it must be 'intended to preserve the aesthetics or scenic beauty of the area where the proposed project is located and must apply to specific resources in the proposed project area." *Petition of Georgia Mountain Community Wind, LLC, Docket No. 7508, Order of Vt. Pub. Util. Comm'n. (June 11. 2010) at 52*. The Commission clarified that generalized statements and general scenic resource policies that do not focus on a scenic resource or that fail to offer specific guidance or measures to protect those resources are not "clear written community standards." *Id. at 53*.

SE Group reviewed the most recently adopted Town (Town of Norwich) and regional plans

(Two Rivers-Ottauquechee Regional Commission, or TRORC). Our review of relevant portions from these documents is below. Included as an attachment to this report are relevant excerpts from the Town and regional plans as well as from the TRORC's adopted Regional Energy Plan.

The Town of Norwich does not have any applicable solar screening requirements or bylaws.

Norwich Town Plan (2020): The recently adopted Norwich Town Plan ("Town Plan") is from March 7, 2020. Relevant information from this Town Plan is considered for this part of the Quechee analysis.

Below are some key elements of the Town Plan that are relevant to consider for the Project.

On page 21 of the Town Plan, Norwich introduces a set of energy objectives and policies. The objectives include reducing greenhouse gas emissions, shifting energy use to renewable resources, and increasing the amount of renewable energy being produced in Norwich. As stated in the Town Plan, renewable energy should be developed in a manner that is consistent with the goals, objectives, and policies of the Town Plan. Relevant policies (pp. 21-22) include:

> *For solar generation projects sized from 15kW to 500kW the presumption is that all of Norwich meets the Public Utility Commission definition of 'preferred site', notwithstanding the existing areas of local concern including the Ridgeline Protection Overlay Area, Shoreline Protection Overlay Area and the historic village district as identified in the Norwich Land Use Regulations.*

The Town Plan Energy Chapter contains numerous references to redirecting energy demand to renewable sources in order to meet Town goals and Vermont's '90 by 50' goal of having an energy portfolio consisting of 90% renewable energy by 2050.

The 150 kW Project does not fall within an existing area of local concern as defined by the Town Plan. Further, the Project moves Norwich and Vermont closer to reaching renewable energy goals. The proposed Project serves to enhance the energy system capacity and security by providing local, clean, and renewable energy to the community.

From a land-use perspective, the Town Plan identifies the Project site as part of the Residential Land Use Area. In the Town's Future Land Use Plan (pp. 8-9), the Project falls within the Rural Planning Area. The Town Plan states that the Future Land Use Map identifies planning areas, not future zoning districts. The Rural Planning Area is defined on page 8 of the Town Plan as "lands outside the village that retain their rural character, although largely subdivided into residential lots." The intent for this Planning Area is defined on page 9 of the Town Plan. Norwich wishes to "protect the rural character and

maintain a low overall density of development in these areas which are further from the village and major transportation corridors."

The goals for the Residential land use designation and the Rural Planning Area do not preclude a solar energy facility of the form and type contemplated by the Project. This conclusion is reinforced by the fact that the plan includes the express presumption that all of Norwich is a preferred site for solar with the exception of certain protected overlay districts not included in the Project area.

Page 28 of the Town Plan states a set of six renewable energy project siting standards. The Town supports renewable energy so long as its development is balanced with Town Plan policies related to:

- *Protecting natural resources environmental quality, scenic resources and rural character*
- *Maintaining viable farms and the working lands needed to sustain them*
- *Focusing development in those areas of town already served by existing public infrastructure*
- *Preserving cultural resources within Norwich village*
- *Preserving the recreational and natural value of those lands identified in the Ridgeline Protection Overlay Area and Shoreline Protection Overlay Area*
- *Increasing the supply, diversity and affordability of housing in Norwich*

The Project location is not part of the Ridgeline or Shoreline Protection Overlay Area nor does it require significant extensions of public infrastructure (roads, sewer lines, emergency services, etc.). The Project is not located on a working farm and the Project does not preclude long-term reuse of the property following the decommissioning of the facility.

The preferred site presumption noted above is also conditioned on the following standards outlined on page 29 of the Town Plan:

- *For individual or group net metered renewable energy projects, the property owner must take reasonable measures to site and/ or screen the installations to minimize any visual or noise impacts beyond the property line, particularly on sites where there are neighboring homes in close proximity.*

The closest neighboring residence lies to the east of the Project site where existing roadside vegetation and topographic changes largely screen the view of the solar panels. Consistent with the relevant standard above, the Applicant has proposed additional plantings to further mitigate if potential negative visual impacts. These measures are discussed in the

mitigation discussion, below.

Based on the above, we conclude that the Project does not constitute an undue adverse impact on area aesthetics. The Project would not violate any clearly written community standard in the Town Plan relevant to the potential aesthetic impacts of the Project. The proposed use is of a scale and form that is visually compatible with the area and represents a land-use form that does not preclude long-term reuse of the property following the removal of the facility.

Two Rivers-Ottauquechee Regional Plan (2017): This planning document acts mainly as a "roll-up" of local (Town) plans with a greater emphasis on addressing issues and development of policy at the regional scale. The most relevant elements of the Regional Plan for this Project are related to Scenic Resources. Within the Scenic Resources element, the Regional Plan identifies a variety of policies concerning proposed development in scenic areas. The Scenic Resources section of the Regional Plan (pages 207-212) defines areas with scenic significance as:

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1. Shorelands immediate to public lakes, rivers, or ponds;

2. Areas immediately adjacent to scenic corridors;

3. Prominent ridgelines, mountain tops, or excessively steep slopes that can be readily viewed from public corridors;

4. Exceptional agricultural and historic areas, recognized as outstanding resource values;

5. Areas within or immediately adjacent to natural areas (i.e. wetlands) designated by the State; and

6. Areas of high scenic quality which are publicly recognized as exceptionally unique or are noted examples of the dominant characteristics of an area in the region.

According to the Regional Plan, any proposed development in these areas must:

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a. Maintain the prominent natural feature of the developed area;

b. Work toward enhancing or retaining views;

c. Minimize adverse impact on views and areas of historic significance;

d. Minimize contrasts with areas of historic significance; and

e. Reflect traditional settlement patterns.

The proposed Project is not in conflict with an existing identified scenic resource, and its design and proposed siting plan reduce the possibility of the Project to adversely affect long-range views.

The TRORC recently adopted (July 2017) Energy Plan meets the requirements for enhanced energy planning (VSA §4352) and is included by reference within the Regional Plan. The Energy Plan states:

Based on the Two Rivers regional share of the overall state population, and the current renewable energy generation, the regions target generation is 349,307 MWh of electric energy. To reach this goal all towns have a responsibility to contribute to

producing renewable energy generation in the state.

Town level targets are allocated based on each municipality's share of the region's population. Within the region the targets range from around 1,800 MWh to 62,000 MWh.

The region has identified the need for more renewable energy development to meet the stated goals. In describing the policies for siting of renewable energy facilities, the TRORC Regional Plan states the following concerning "solar farm" siting:

Sites with raw solar potential are flat to gently sloping and face east, south, or west. Significant growth in the solar energy production sector in Vermont has sometimes led to a backlash against proposed facilities. The primary concern is one of aesthetics. For some, it is challenging to reconcile the appearance of a solar farm with the traditional rural character of the region. Residents may also perceive a loss of property value when a solar facility locates near their home, although there is no hard data available to support this perception.

Also of concern are the natural resource implications of solar farms. Often these facilities are proposed in areas that are being used for agricultural purposes on valuable prime agricultural soils. While it is possible to conduct some forms of farming on land occupied by a solar system, most agricultural uses become impractical.

The Project does not conflict with the TRORC Regional Plan. The Project does not significantly impact prime agricultural soils (0.03± acres) (see Exhibit MS-2) nor does it unduly adversely impact natural resources (see Exhibit DB-2). The scale and form of the Project are considerate of the setting and the Project avoids impacts to identified resources within the Town and regional plan.

In consideration of both the local and regional plans, SE Group has concluded that the Project **does not violate any clear, written community standards intended to protect or preserve the scenic beauty** that applies to the Project or that the Project would violate.

3. Has the Petitioner taken reasonably available mitigating steps to reduce the Project's visual impacts?

The Project site avoids offsite impacts. The existing vegetation and natural terrain features provide screening and are effective at minimizing offsite impacts. That being said, as previously noted, along a short segment of Turnpike Road, visibility into the Project site, particularly in leaf-off conditions, is more likely. While visibility from within this small segment of public roadway is also of short duration and does not establish an adverse impact with respect to these areas, SE Group suggested a series of eight (8)

plantings along the eastern edge of the access. The exact placement of these plantings should be field verified for additional screening effectiveness. Species such as white cedar (thuja occidentalis), given the likely wetter soils allows them to be effective for screening. SE Group recommends installing the plantings at a height of around 5 to 6 feet, assuring that they are mature enough to establish well along with the existing vegetation. The location of these plantings are shown on the Project site Plan (Exhibit MS-2).

Conclusions Regarding Aesthetic Impact

Overall, SE Group concludes that the Project **does not create an adverse impact** with respect to aesthetics or the scenic beauty of the area. Furthermore, even if the project did adversely impact the surrounding viewshed, this impact would not be **unduly adverse** under the Quechee Analysis. The Project site is well-chosen and effectively screened from offsite public views.

Orderly Development of the Region

30 V.S.A. § 248(b)(1) requires that a project not unduly interfere with the orderly development of the region, with due consideration to the recommendations of the town and regional planning commissions, town selectboards, and town land conservation measures. This criterion "relates to the orderly development of the region, not to a particular municipality within the region." *In re Petition of Rutland Renewable Energy, LLC. for Certificate of Public Good Pursuant to 30 V.S.A. § 248*, 2016 Vt. 50, ¶ 9.

In addition, Section 248(b)(1)(C) provides that where an enhanced energy plan has been adopted by a regional commission or municipality, substantial deference be given to the land conservation measures and specific policies in such plans. As noted above, the Project is consistent with the TRORC energy plan.

The Project does not unduly interfere with the orderly development of the region: Specifically,

- The Project does not compromise regional and local land conservation objectives and measures. The Project site has not been identified as conservation land nor has the local plan defined any policy, goal, or purpose related to its conservation. The Brookmead Conservation area extends to the south, west, and north of the Project site. Still, the Project is not within the conservation area, nor does it impede access to or directly affect it.

- The Project's small footprint and intermittent offsite visibility diminish the potential for regional or local land use or aesthetic impact. The scale of the Project fits within this setting.

- The Regional Plan's classification of the Project area as part of the "Rural Area" is

consistent with the policy objectives of the town. The town supports appropriately scaled solar facilities throughout the community.

- The Regional Plan considers typical natural resources (wetlands, habitats), sensitive soils, steep slopes, established conservation parcels, as sub-areas for "conservation" policies at the regional scale. As described in the testimony of Martha Staskus and Dori Barton, the Project site does not unduly impact those resources.

- Both the local municipality and the regional planning commission have qualified the site for preferred siting status. This is indicative that the Project, as proposed and planned, is considerate of the regional and local land use objectives and supportive of its renewable energy goals.

SE Group's review of the Project results in the conclusion that the Project will not unduly interfere with the orderly development of the region. The Project's siting does not conflict with established regional or municipal land-use policies or objectives. The town and the regional planning commission have qualified the Project as a preferred site. And the nature of the Project makes it inherently low-impact and removable with negligible long-term impacts to the site or surroundings.

Above-Ground Historic Resources

In the ordinary course of our evaluation for potential aesthetic impacts, it is routine to review the subject property for any visible evidence of above-ground structures, including those either historic or potentially historic.

The Applicant has reviewed above-ground historic properties within the immediate area and has submitted materials to the Division for Historic Preservation Project Review. There are no above-ground historic structures on or near the Project Site.

Given the distance from the Norwich Village Center and the overall limited visibility of the project, SE Group concludes that the Project does not have an indirect (i.e., aesthetic) impact on the historic structures that might exist within the broader region. The Project cannot be viewed in context with any historic structure or site and does not diminish or alter any public views of historical districts, sites, or structures.

FIGURES

Location	Latitude	Longitude	Distance to Project (ft.)
1	43.747849 N	-72.326762 W	945
2	43.745762 N	-72.325139 W	355
3	43.745129 N	-72.324549 W	125
4	43.745512 N	-72.324828 W	115
5	43.744834 N	-72.324190 W	300
6	43.743927 N	-72.323278 W	590

Legend

- 1 Photo Location
- Project Site
- 1 mile radius

SCALE (ft)

0 750 1500 2250 3000

N

Date: 06/02/2020

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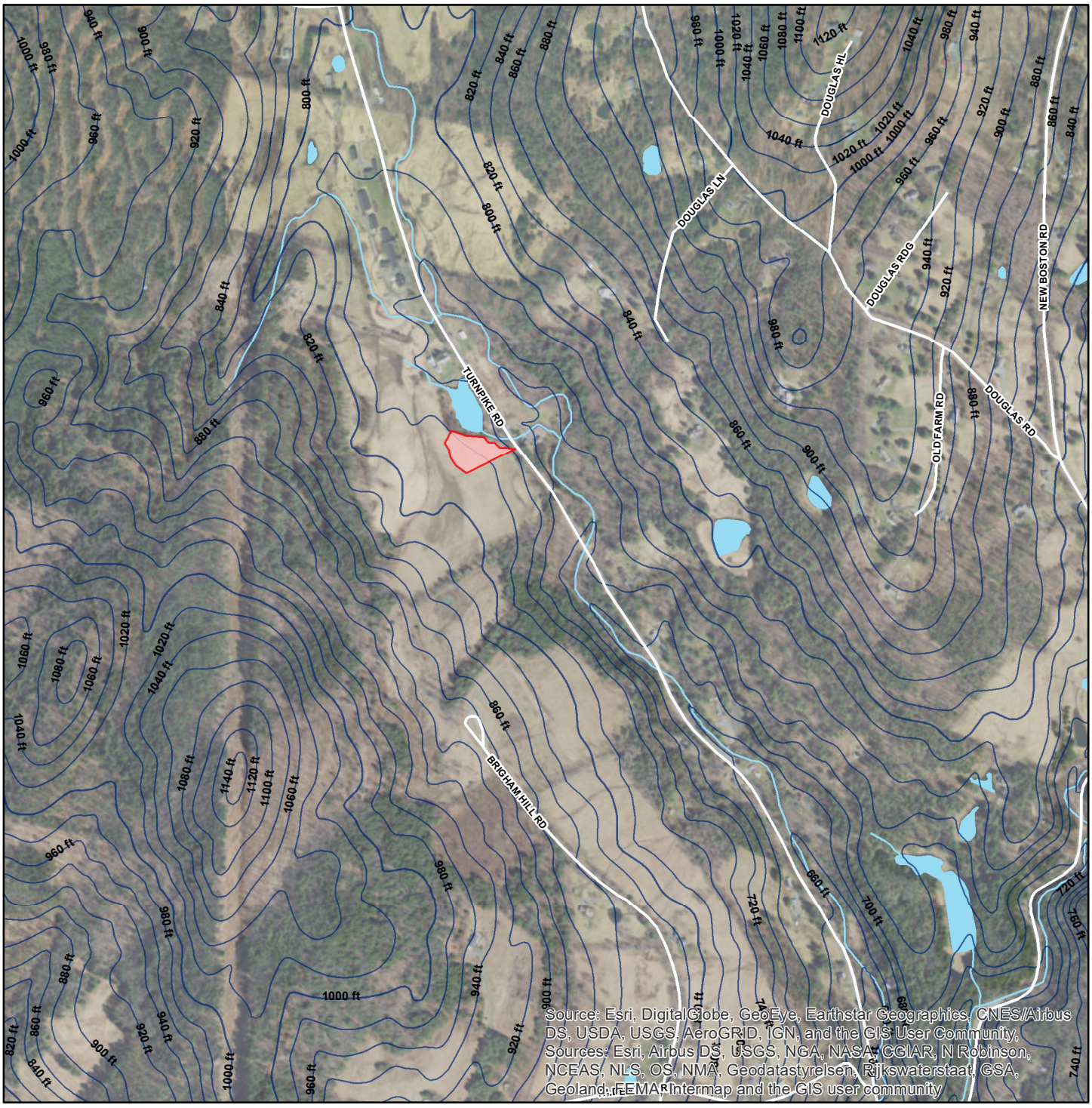
FIGURE 1 : SITE CONTEXT
NORWICH TURNPIKE ROAD SOLAR



Legend

Project Site

SCALE (ft)

0 500 1000 1500 2000

N

Date: 06/02/2020

SE GROUP

FIGURE 2 : TOPOGRAPHY
NORWICH TURNPIKE ROAD SOLAR

1

View looking southeast from Turnpike Road. Roadside vegetation filters direct views of the Project site even during leaf-off conditions.

2

View looking southeast from Turnpike Road. Roadside vegetation becomes more extensive with a mix of scrub/shrub and deciduous trees. Roadside powerlines are visible from this location. A pond near the Project is just to the right, outside of the view of the image. In leaf-off conditions, travelers may have brief and filtered views of the Project as they approach from the north

3

Looking directly at Project site from Turnpike Road. Roadside vegetation thins somewhat within this very narrow portion of the frontage. Strategically placed shrubs are proposed beyond the existing roadside vegetation and before the array.

Note: Photographs take by SE Group on April 29, 2020 around 10am using a Nikon Digital Rebel SLR Camera with a 50mm focal length

Date: 06/02/2020

SE GROUP

FIGURE 3 : SITE PHOTOGRAPHS
NORWICH TURNPIKE ROAD SOLAR

4

View looking southeast towards the proposed access point into the Project site and shows the increasing roadside vegetation. The curb cut to the most proximate residential neighbor is observed on the left side of the image.

5

View looking northwest towards the Project Site. The Project site is generally out of view due to foreground vegetation, including mature trees.

6

View looking northwest towards the Project Site. Views are precluded due to intervening terrain and vegetation features.

Note: Photographs take by SE Group on April 29, 2020 around 10am using a Nikon Digital Rebel SLR Camera with a 50mm focal length

Date: 06/02/2020

SE GROUP

FIGURE 4 : SITE PHOTOGRAPHS
NORWICH TURNPIKE ROAD SOLAR

ATTACHMENT
Relevant Local and Regional Plan Excerpts

norwich town plan

ADOPTED MARCH 7 2020

Norwich Planning Commission

Jaci Allen, Chair
Susan Brink
Ernie Ciccotelli
Jeff Goodrich
Melissa Horwitz
Brian Loeb
Jeff Lubell
Leah Romano
Steve Thoms

Figures

3 | ENERGY

3.1 Objectives

3-1.a Reduce greenhouse gas emissions from Norwich municipal operations, businesses and residents (24 VSA §4302 (c) (7)).

3-1.b Reduce overall energy use in Norwich (24 VSA §4302 (c) (7)).

3-1.c Shift energy use in Norwich from non-renewable to renewable sources (24 VSA §4302 (c) (7) (A)).

3-1.d Increase the amount of renewable energy being produced in Norwich in a manner that is consistent with the goals, objectives and policies of this plan (24 VSA §4302 (c) (7) (A)).

3-1.e Pursue strategies identifies in the State Energy Plan (30 VSA §§202, 202b).

3.2 Policies

3-2.a Establish a mechanism to collect and appropriate funds to support projects that further the objectives of this Energy Plan.

3-2.b Ensure that the review of the Norwich Zoning and Subdivision Regulations is informed by the link between changing land use patterns and reducing fossil fuel use, including, but not limited to, consideration of increasing density adjacent to the existing village district, and the creation of new zoning districts.

3-2.c Promote bike and pedestrian as non-vehicular transport modes using best practices for traffic engineering such as sidewalks, bike lanes and dedicated trails.

3-2.d Consider lifecycle costs when planning to construct or upgrade municipal facilities.

3-2.e Develop programs that assist low-income households with weatherizing and improving the efficiency of existing dwelling units.

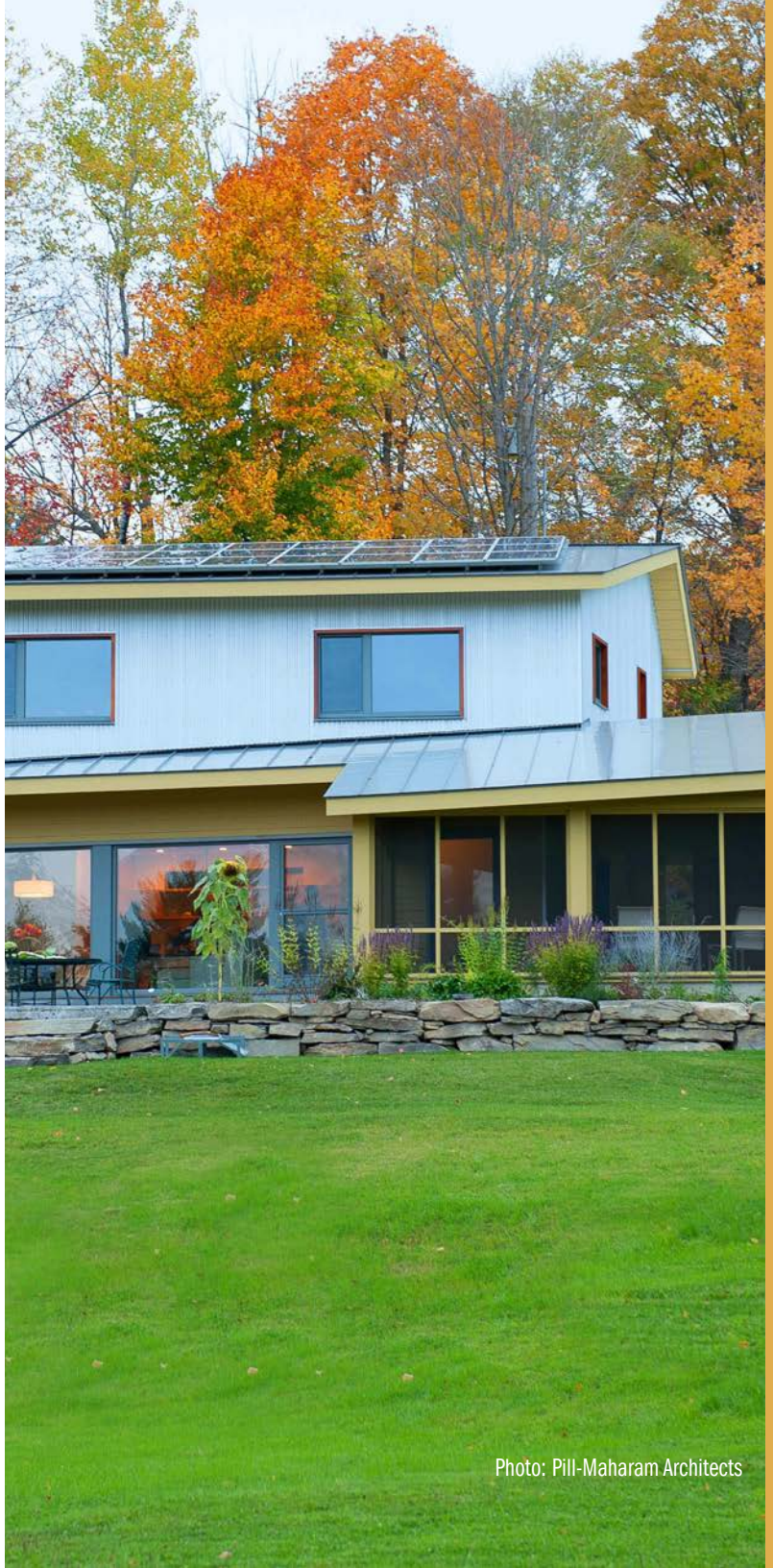


Photo: Pill-Maharam Architects

3-2.f Expand the authority of the Zoning Administrator to require the issuance of a Certificate of Compliance on all new construction over 800-sq ft ensuring that such work meets the VT Residential Building Standards (VT-RBES).

3-2.g Require large-scale commercial and institutional development to install solar panels on roofs and over any parking lots where feasible.

3-2.h For solar generation projects sized from 15kW to 500kW the presumption is that all of Norwich meets the Public Utility Commission definition of 'preferred site', notwithstanding the existing areas of local concern including the Ridgeline Protection Overlay Area, Shoreline Protection Overlay Area and the historic village district as identified in the Norwich Land Use Regulations.

3-2.i Support Advanced Transit in providing a range of commuter services to Norwich, providing connections with locations where residents attend school, work and shop.

3.3 Actions

3-3.a Advocate before VTrans on behalf of non-vehicular road users for improved accommodations on state highways.

3-3.b Review hybrid and electric options for any municipal vehicle purchase or replacement.

3-3.c Consider how to address barriers to development related to limitations on wastewater capacity, including a review of the findings of the 2005 study conducted by the Norwich Sewer Committee in light of current challenges and changes in wastewater management.

3-3.d Encourage development projects to install solar collectors on rooftops and parking lots.

3-3.e Participate in the Section 248 process before the Public Utility Commission to make decisions that further the goals, objectives, and policies of this plan.

3-3.f Implement to the best of our abilities the (non-binding) Article 36 from the Town of Norwich 2019 ballot, which was passed by voters:

> *Shall the voters of Norwich direct all Town officials to take immediate and sustained efforts to gradually and continually reduce the Town's direct use of fossil fuels, beginning at a rate of no less than 5 percent per year starting in the 2019-20 fiscal year and continuing until they are eliminated entirely, and shall the Town Manager be charged with monitoring such efforts and reporting on them each year in the annual Town Report, and no capital expenditures shall be made that contradict or undermine this direction, absent a majority vote of the Selectboard?*

3-3.g Ensure that the Zoning Administrator or their designee has the training and resources to both enforce state Residential Building Energy Standards and issue Certificates of Compliance on development projects greater than 800-sf.

3-3.h Provide residents with information on:

i. cold-climate heat pumps, and other non-fossil fuel heat sources in new construction and in existing homes and buildings;

ii. replacing fossil fuels powered vehicles with electric vehicles;

iii. managing forest land for long-term, sustainable harvesting of wood.

3-3.i Raise climate crisis and energy awareness.

3-3.j Work with community groups and others to support non-vehicular transportation options in Norwich.

3.4 Overview

We have understood for at least fifty years that human dependence on fossil fuels is not sustainable. Only now are we beginning to grapple with the climate crisis resulting from burning fossil fuels. We also need to develop community resiliency to better withstand the disruptions caused by the changing climate. There is an active grassroots effort in Vermont and around the world to act locally in addressing the climate crisis and in building resiliency.

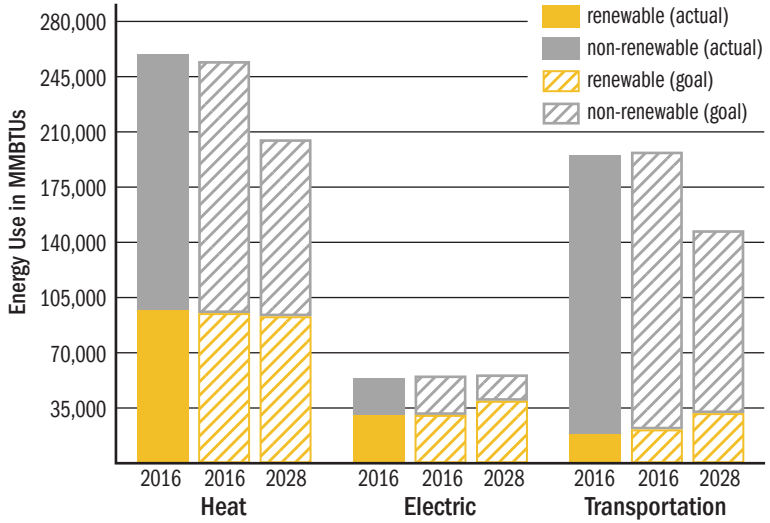
This chapter details an energy plan for Norwich residents, businesses, and town government in the context of Vermont's "90 percent renewable by 2050" energy goal. Policies and objectives focus on those decisions directly within the control of the town, assuming the current regulatory scope and commitment of resources. Opportunities for promoting changes in residential energy consumption with existing town volunteer resources are also identified. Assumptions made in the Vermont 2016 Comprehensive Energy Plan (CEP) and the shortcomings in available data are noted to encourage more rigorous planning at the state level, where the vast majority of decisions regarding energy markets (fossil fuel and renewable) are made.

3.5 Current Energy Use

According to the 2018 Progress Report by the Energy Action Network, Vermont greenhouse gas emissions have been increasing despite significant reduction commitments. Transportation and thermal energy (heating and cooling) are the largest contributors to the state's greenhouse gas emissions. This plan assumes that this state-level analysis applies to Norwich as well.

The accepted estimate of the total amount of energy being used in Norwich is from the Energy Action Network Community (EAN Energy Dashboard). This source suggests that in 2016 (the latest year actual use figures are available) Norwich consumed 508,115 MMBTUs (million BTUs) for electricity, thermal, and transportation (see Figure 11). Energy use in Norwich reflects the settlement pattern, which is dominated by low density residential lots, and little or no industrial or commercial activity.

Figure 11. **Energy Use and Goals by Sector**



Source: Brighter Vermont Community Energy Dashboard

In developing this chapter, the town relied upon:

- 2017 Two Rivers Ottauquechee Regional Commission (TRORC) regional energy planning
- The EAN Energy Dashboard which tracks the progress of each Vermont community towards the state's goal of meeting 90 percent of local energy needs through efficiency and renewable energy by 2050.
- The Act174 Supplement prepared for Norwich by TRORC is incorporated into this plan and included in Appendix B.

Data on electricity consumption is specific to Norwich and up-to-date because Green Mountain Power (GMP) as a

utility regulated by the VT Public Utilities Commission (PUC) provides detailed statistics about electricity generation and use as part of their license to operate. Approximately 60 percent of the GMP portfolio is made up of renewable energy, predominantly hydro-electric from Quebec. Current commercial transportation energy use and future trends were not assessed by TRORC as part of their Act 174 energy planning. The published figures for thermal and transportation energy are rough estimates, based on statewide averages and Census data. More reliable and accurate data is needed for town energy planning to be meaningful and effective.

3.6 Renewable Energy Resources

Vermont's Renewable Energy Goals

Greenhouse gas (GHG) emissions caused from human activities are driving the global climate crisis. In 2011 Vermont adopted a goal to obtain 90 percent of the total energy used in the state (primarily electricity, thermal, and transportation) from renewable sources by 2050. Advisory 2050 targets have been set for each Vermont municipality. The energy and conservation targets for Norwich are shown in Figure 12. Specific targets for renewable energy generation are included in Appendix B, Energy Targets and Conservation Goals.

Figure 12. **Norwich Energy Targets**

Year	Renewable	Nonrenewable	Efficiency	Total
2014 (baseline)	144.3	380.1	0	524.4
2016 (actual)	145.4	362.7	8.7	508.1
2025 (target)	160.1	273.8	47.9	434.0
2035 (target)	174.5	177.2	91.5	351.7
2050 (target)	196.1	32.3	156.8	228.4

All values expressed in thousand MMBTUs.
Source: Energy Action Network 2050 Energy Pathway Analysis

Town-level efforts to meet the State's '90 by 50' goal will focus on redirecting energy demand to renewable electric sources. These efforts will be challenged by the limited authority of municipalities to affect energy use outcomes. Energy products (including efficiency and renewables) are allocated via markets which are regulated by State and US governments. Municipalities are best understood as institutional consumers who have no jurisdiction over the structure and operation of energy markets. In the case of Norwich, the town is a very small consumer, even compared to local school districts and larger regional employers.

Municipalities do have the authority to regulate land use (an authority granted to municipalities by state statute and case law). Because land use patterns in Norwich have been consistent for many decades, and the rate of development is exceedingly slow, changing land use patterns will not play a major role in achieving the targets within the timeframes identified by the VT CEP. Nevertheless, Norwich will use this opportunity to review the zoning and subdivision regulations to encourage future development patterns that reduce energy use and preserve forest and agricultural lands for

ecosystem services. These concerns are addressed in more detail in the Land Use, Housing and Transportation chapters.

Fifty seven percent of the electricity consumed in Norwich is from renewable sources (based on the GMP renewable portfolio and local generation), 0.5 percent below the 2016 EAN Dashboard target. Converting current electricity use to renewable sources has been relatively straightforward in response to state policies such as the Renewable Energy Standard, which required utilities to procure 55 percent of their electricity from renewable sources in 2017. That figure will increase incrementally to 75 percent by 2032. Conversion of transportation and thermal energy (most of the energy used in Norwich) to renewable sources are beyond the regulatory scope of the municipality, and thus the Town can only influence the outcome at the margins.

In summary, it is important to acknowledge that the town's ability to meet the ambitious and necessary state energy goals is limited. It falls primarily in 1) land use regulation, 2) modeling the adoption of energy conservation and renewable energy in Town facilities and equipment, and 3) ensuring local regulations are not a barrier to necessary change. Norwich is, nevertheless, determined to take concerted action to make progress.

Renewable Energy Generation Potential

Act 174 Maps. As required by the state under Act 174, TRORC has mapped areas of Norwich that have potential for renewable energy generation (see Appendix B).

The maps for solar potential rely heavily on analyzing aspect (south-facing landforms are most suitable for solar generation). The maps do not correct for features that will limit uptake of solar projects including: current land use and lot boundaries, extent of forest cover, proximity to roads, and distance to electric distribution (particularly 3-phase power and transmission infrastructure). Each of these factors presents serious limitations to utility scale (>500 kW) solar energy development.

At present, the most salient factors for determining where non-residential renewable energy projects may feasibly be located is proximity to the existing power grid (3-phase power and transmission lines) and the capacity of the grid to accommodate additional load. As of 2019, the GMP Solar Map 2.0 indicated that there were system limitations on the circuit along the Thetford-Norwich border and to the far west of Norwich near the Sharon town-line. Norwich operates on circuit 71G1 of the Wilder substation, which the utility lists as having 72 percent of its capacity remaining (approximately 10.2 MW). Therefore, installation of numerous 150 kW solar arrays is feasible. Three-phase power lines currently run along Main Street as far as Willey Hill Road, Route 5 South, and Route 5 North (to just south of Farrell Farm Road). Beyond these areas infrastructure upgrades would be required for larger projects.

SOLAR POWER. The EAN Dashboard identifies 190 small PV sites in Norwich, with a total capacity of almost 1,800 kW (approximately 11 percent of the generation goal). The Norwich Energy Committee tracks solar installations, including households that have purchased shares of solar

projects located in other towns. This count tallies 283 residences, businesses, or churches that have "gone solar" — more projects of this scale and type are likely. The EAN Dashboard ranks Norwich 12th out of 250 towns in Vermont for the number of solar electric sites.

While large scale development of solar energy will require proximity to a substation and three phase power, the utility grid in Norwich is well-suited for projects of about 150kW or smaller. Using the Act 174 mapping methodology 6,341 acres out of a total 28, 620 acres in Norwich has solar potential (southern facing slopes). But, 22,116 acres (or 77 percent) of Norwich is forested. About 67 percent of the area identified as having solar potential is currently under forest. Aside from the economic cost of clearing, the release of carbon from cleared lands would diminish the climate benefits of solar development on these sites. The mapping of solar potential also includes the Right-of-Way (ROW) for interstate 1-91 and other lands not available for development.

About 16 MW of installed solar would be needed for Norwich to meet its renewable energy generation target of about 20,000 MWh per year (Appendix B, table 1Q). This is the town share of projected statewide energy demand in 2050, in proportion to its population. Based on current solar technology. 16 MW of solar generation would require about 160 acres total, or about 0.5 percent of the towns total land area. Assuming that solar panels continue to increase in efficiency, the area needed to meet Norwich energy demand will decrease as a result. Today 150 kW solar arrays typically require about of a third of an acre. To the extent that homes and businesses take up roof and parking lot installations the need for larger ground-based solar arrays will be reduced.

BIOMASS. It is not known how much wood is harvested for fuel in Norwich on an annual basis. Wood is a renewable source of thermal energy and technological improvements have greatly increased the efficiency and reduced the pollution associated with burning wood. A large percentage of homes in Norwich use wood as either a primary or secondary heating source. The State of Vermont is encouraging schools and municipal facilities to install high efficiency wood pellet or woodchip heating systems. More recently Dartmouth College (in neighboring Hanover, NH) is reconsidering a proposal for a biomass plant to replace existing fossil fuel fired heat system, due to concerns about the risk of increasing greenhouse gas emissions (including the impact of trucking woodchips) and local air quality effects. While the climate benefits of burning wood for heat are being reassessed Norwich will promote the clear path of solar electricity and switching to electric heat and transportation.

GEOTHERMAL. There is one ground source heat pump installed at a residential property in Norwich, according to the EAN Dashboard. The feasibility of installing geothermal systems needs to be assessed on a site-by-site basis. As of 2019, the town is considering geothermal heat pumps for three town buildings (Tracy Hall, the Fire Department apparatus bay, and the Town Garage).

HYDRO POWER. There are no hydropower facilities currently located in Norwich according to the Energy Dashboard. Small, run-of-the-river generators would be the only likely future hydro generation, given current state and federal regulations regarding the damming of waterways. However, just over 60 percent of GMP electricity is provided by contracts with Hydro-Quebec, a public utility.

WIND POWER. According to the Energy Dashboard there are no wind energy projects installed in Norwich as of 2018. There is no meaningful potential for utility- or community-scale wind generation in Norwich given current turbine technology, which generally requires an average wind speed of at least 6 meters per second. Only two locations in Norwich are identified through the Act 174 mapping process with wind speeds at 6 meters per second or above (accessed via turbines set between 50 and 70 meters high). Both are off Chapel Hill Rd along the Sharon town-line. These sites are not currently accessible from roads suitable for this scale of development, nor to a power transmission line.

3.7 Energy Conservation and Efficiency

STRUCTURES. The scenario for meeting the state's renewable energy goal presented on the EAN Dashboard shows that by 2050 Norwich will need to use a total of 296 MMBTUs of energy less than it did in the baseline year of 2014. Under the US and Vermont constitutions, the town has no role in shaping or regulating the market provision of energy conservation or efficiency products and services. In addition, the annual rate of new construction, or even substantial improvement, is very low. Nevertheless, the town can still play a role by encouraging energy code compliance, modeling energy-efficiency in municipal facilities, supporting outreach and information-sharing with residents, and investigating how it could take on inspection and enforcement.

TRANSPORTATION. Of note here is the assumption that the town's total energy use for transportation will go from 205,793 MMBTUs in the baseline year of 2014 to 56,348 MMBTUs in 2050 (see EAN Dashboard, regional energy planning). That is, the town's transportation energy use in 2050 will be 27 percent of what it was in 2014. It is also expected that fully 90 percent of the 2050 transportation energy budget will be provided from renewable sources. This is a major change from the town's current modes of transportation and entirely outside the control of (existing) municipal decision-making. Land-use policy, a clear area of town authority, will play an important role, as will town support for regional public transit and town infrastructure for walking, biking, and electric vehicles. Land use policy can help support reductions in the number and length of car trips — and thus greenhouse gas emissions — by encouraging future development to be located close to job and retail centers and public transit lines, and creating walkable neighborhoods.

3.8 Future Generation, Use and Conservation

Energy Targets

Future targets for energy generation, use and conservation have been set for all Vermont municipalities as part of the state's enhanced energy planning under Act 174 (see Figure 12). The planning scenario presented on the EAN Dashboard envisions that total energy consumption of Norwich will decrease from the 2014 baseline consumption of 524,4000 MMBTUs to 228,400 MMBTUs in 2050. A reduction to 44 percent of 2014 levels. Moreover, only 32,300 MMBTUs (or 14 percent of the total) will be from non-renewable sources. This reduction will primarily rely on the efficiencies of weatherization and electric transportation.

This plan's land use, housing and transportation objectives and policies call for new housing and economic development to be focused in and adjacent to the village and mixed use areas. This is where people can live close to employment, shopping and services. Such proximity allows walking, biking and public transit, all of which reduce transportation energy use. Encouraging such a development pattern through the Town's land use regulations and public infrastructure are the most effective and direct measures Norwich government can take to move towards meeting the state's energy goals.

The 2017 TRORC Energy Plan recognizes that Norwich is currently generating 2.2 GWh/year of electricity from solar and sets a target for a total of 20GWh/year of renewable energy generation by 2050. This is based on Norwich's fraction of the regional population. The portfolio of renewable energy generating sources includes both rooftop and ground-mounted solar, wind, and hydropower. The TRORC energy plan suggests that there is 81 times more 'suitable land' than is needed to host such renewable energy projects (primarily for solar) in Norwich.

Renewable Energy Project Siting Standards

This plan supports renewable energy production in Norwich. For this policy to continue with broad community support it must be balanced with this plan's policies related to:

- Protecting natural resources, environmental quality, scenic resources and rural character
- Maintaining viable farms and the working lands needed to sustain them
- Focusing development in those areas of town already served by existing public infrastructure
- Preserving cultural resources within Norwich village
- Preserving the recreational and natural value of those lands identified in the Ridgeline Protection Overlay Area and Shoreline Protection Overlay Area
- Increasing the supply, diversity and affordability of housing in Norwich

This plan calls upon the Public Utility Commission to issue Certificates of Public Good for projects between 15 kW and 500 kW based on the presumption that lands in Norwich meet the so-called 'preferred site criteria', except in areas already mapped as Ridgeline Protection Overlay Area, the Shoreline Protection Overlay Area, and the designated

village center. Renewable energy projects in Norwich are further conditioned on the following standards:

- For individual or group net metered renewable energy projects, the property owner must take reasonable measures to site and/or screen the installations to minimize any visual or noise impacts beyond the property line, particularly on sites where there are neighboring homes in close proximity.
- Projects larger than 150 kW must meet existing standards for setbacks, site design (landscaping, screening, lighting, stormwater, etc.) as laid out in the Norwich Zoning and Subdivision Regulations.
- Projects larger than 500 kW must have a management and decommissioning plan that will ensure the land will be returned to its prior condition when no longer actively used for renewable energy generation. Wherever feasible, the energy generation use must be combined with continued agricultural use of the land or habitat management, such that soil health and fertility is maintained.
- Projects larger than 500 kW must not clear land within a mapped forest block (see Figure 8) unless there is a management and decommissioning plan that will ensure the land will be re-forested and managed in accordance with a forest management plan, when no longer actively used for renewable energy generation.

Two Rivers-Ottauquechee
REGIONAL COMMISSION

Regional Plan
2017

TWO RIVERS-OTTAUQUECHEE REGIONAL PLAN

TRORC STAFF (2017)

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TRORC
Two Rivers-Ottauquechee
REGIONAL COMMISSION

ADOPTED – JULY 26, 2017
EFFECTIVE – AUGUST 31, 2017

D. Scenic Resources

Background and Goals

The landscape of the region is an economic asset. It represents some of the finest examples of townscapes and rural scenic character in the world. It has tangible economic value. Tourists spend money in the region because they are attracted to the scenery, values, and quality of rural life. Tourism is a significant industry in Vermont's economy.

In Vermont, the economic value of scenic resources to tourism cannot be lightly brushed aside. The public's commitment to conservation of our visual resources can be traced to the late 1960s with the passage of Vermont's anti-billboard legislation. This legislation was strongly endorsed by the Vermont Hotel and Motel Association which recognized the direct economic relationship between land conservation and a growing tourism sector. A past Governor's Commission on the Economic Future of Vermont summarized: "we consider Vermont's environment to be the goose that lays golden eggs". All municipal plans prepared and adopted by member towns in the region consistently stress the goal of coordinating economic development with maintenance of rural character. TRORC believes it is appropriate public policy to recommend standards which, if reasonably followed, will minimize or mitigate any adverse effects of development on recognized scenic resources.

Patterns for Development - A Community Standard

The inherent beauty of the region is tied to the visual relationship between buildings, the working landscape, and its mountains and river valleys. Over the past thirty years, development patterns have emerged which propagate highway strip development. Such a land use pattern will serve, amongst other factors, to destroy the transition between town village centers and the countryside. It is not in the public interest to promote or endorse such a sprawling pattern of development in this region. Continued emphasis and restructuring of municipal planning and zoning administration, that addresses the delicate balance of the landscape elements mentioned above, can effectively preserve the landscape heritage in many areas of the region. Act 250 is not the answer. It is

Red Barn, Quechee: An illustration of "rural scenic character." *| Source: ©Jericho Hills Photography*

not intended to ensure a specific pattern of development, but only to evaluate projects on an incremental case-by-case basis.

The region's landscape is also changing due to a gradual reforestation and loss of fields and meadows due to a reduction in agriculture. The resultant land use pattern is a product of economic forces which can permanently alter or pressure that landscape. TRORC supports a land use planning concept which encourages a pattern of development that complements the traditional settlement pattern clearly recognized and existing in the region.

View from the Beidler Family Farm in Randolph Center: An illustration of diversity, harmony, focal dominance, and intactness.
| Source: ©J. Colby, 2006

Determining scenic significance and evaluating the probable impacts of land development or subdivision on the resource and the recommended measures that may be desirable to mitigate visual impacts is a complex matter. Projects which are planned in areas of scenic significance are more likely to impact the resource. It is appropriate that municipalities, TRORC and other entities employ a process for evaluating impacts and to recommend design characteristics to be considered by those involved in the review and preparation of development proposals.

Prominent Landscapes

The following areas are likely to be affected by projects and should be reviewed. Such areas are generally accepted as areas of scenic significance:

1. Shorelands immediate to public lakes, rivers, or ponds;
2. Areas immediately adjacent to scenic corridors;
3. Prominent ridgelines, mountain tops, or excessively steep slopes that can be readily viewed from public corridors;
4. Exceptional agricultural and historic areas, recognized as outstanding resource values;
5. Areas within or immediately adjacent to natural areas (i.e. wetlands) designated by the State; and
6. Areas of high scenic quality which are publicly recognized as exceptionally unique or are

noted examples of the dominant characteristics of an area in the region.

There are several kinds of scenic landscapes ranging from villages, urban centers to distant mountain views. Their relative importance is dependent on the several characteristics which make some landscapes more scenic than others. These characteristics are:

1. ***Landscape diversity*** - a combination of scenic elements which increases the effect, including:
    a. topographic variation;
    b. mixture of open meadows and woodlands;
    c. water;
    d. distant views; and
    e. mixture of vegetative types.

2. ***Extent of Order or Harmony in the Manmade Landscape*** – Landscapes that contain a sense of order or logic, such that a clear sequence of villages and surrounding rural countryside exist. The cultural landscape that is represented by sprawl becomes indistinguishable and often chaotic. Order is heavily influenced by the following:
    a. scale of building;
    b. pattern of buildings; and
    c. architectural similarities in form, size, or other factors.

3. ***Focal Dominance*** - Natural or man-made landscapes that are clear and dramatic focal points are more sensitive to scenic disruption; and

4. ***Intactness/Uniqueness*** - Landscapes that have retained traditional patterns or forms or have absorbed modern development with minimal disruption are unique and are more likely to contribute to the scenic quality of an area.

Prominent Ridgelines or Mountain Tops

Where land development or subdivision is proposed on a prominent ridgeline or mountain top and visible from a scenic corridor, design plans should work toward the goal of retaining its prominent natural appearance. To accomplish this, structures or buildings are encouraged to locate away from the highly visible ridgeline to a lower backdrop on the hillside and structures should be partially hidden within existing wooded hillsides, where possible, and avoid excessive use of reflective glass.

Highly Scenic Areas with Distant Views

Where land development or subdivision is proposed in the foreground of a highly scenic location with distant views, design plans should work toward the goal of retaining or enhancing the view. New buildings or structures should be as unobtrusive as reasonable. To accomplish this, structures or buildings are encouraged to be designed so as to be compatible with the traditional pattern, scale, size, form, etc., and not unnecessarily block distant views from highways noted as especially scenic. Buildings or structures are encouraged to be sited in less visible areas such as at the edges of or within wooded areas rather in open meadows.

Overall goals, policies and recommendations continued or

Clustering of buildings or structures is encouraged to leave vistas open on the site. Design of structures which is not excessive and do not unduly compete with the existing natural or cultural focal point is encouraged.

Scenic Agricultural Land

Where land development or subdivision is proposed on highly scenic agricultural land within a scenic context, design plans should work toward the goal of retaining the overall quality of the scenic area and of minimizing loss of the agricultural potential of the land. To accomplish this, structures or buildings are encouraged not to be sprawled over the entire site, leaving areas that are unusable for agriculture. In the alternative, development or subdivisions should be planned so that structures are clustered or located in a manner that remaining land is made available for practical use as open land, cropland, or hay-land. Common access drives to properties are encouraged. Location of utilities and common access drives is encouraged on the site away from productive agricultural land and in a manner to minimize visual impact on the scenic resource.

Scenic Areas Highly Visible from a Public Corridor

Where land development or subdivision is proposed in scenic areas highly visible from a public corridor, design plans should work toward the goal of minimizing the adverse visual impacts often associated with large-scale box-like buildings and/or large lot parking areas. To accomplish this, structures, buildings and other site improvements should be planned so that building form, massing, and other features are compatible with dominant patterns of the area or site and in ways that reduce the apparent scale of the project on the site. Design planners are requested to break large parking areas into smaller lots with ample landscaping or screening from off-site views, and to locate the project on the less scenic areas of the site. Prominent grade changes that starkly contrast with existing or surrounding contours are discouraged.

Built Environment with Scenic Value

Where land development or subdivision is proposed within or adjacent to a built environment noted for its exceptional scenic value, including historic sites or areas recognized by the State of Vermont or municipalities, design plans should work toward the goal of minimizing contrast with the exceptional resource and to enhance visual quality. To accomplish this, project planners are encouraged to site buildings and structures that are compatible with the scale, massing, texture, or otherwise respect the pattern of nearby structures. Plans that promote large box-like structures which sharply contrast with existing scenic resource values are not recommended, particularly where the composition of the overall project is highly visible from public viewpoints.

Industrial or Commercial Development in Areas of Scenic Value

Where single purpose developments such as industrial or office parks, or

shopping centers are proposed in areas of exceptional scenic value, design plans should work toward a goal which reflects the traditional settlement pattern and characteristics of the area. To accomplish this, project planners must design the site so the development does not appear to be grossly out of scale with its surroundings. It must not extend or enlarge existing patterns of development that are deemed unacceptable (e.g. strip development).

Design solutions should respect location and design of the project to minimize visual intrusion on the most valuable scenic attributes of the site. They should respect the natural contours of the land, utilize, where necessary, landscaping which harmonizes with existing vegetation to create project buffers and screening of buildings, and to encourage pedestrian access and internal circulation.

Policies: **Scenic Resources**

Policies

1. Where development is proposed in areas of scenic value - because they possess scenic views, contain land with historic or scenic significance, or are highly visible within a scenic context, design plans must:
    a. Maintain the prominent natural feature of the developed area;
    b. Work toward enhancing or retaining views;
    c. Minimize adverse impact on views and areas of historic significance;
    d. Minimize contrasts with areas of historic significance;
    e. Reflect traditional settlement patterns.
2. Certain areas immediately adjacent to major highways are examples of development sprawl. They adversely affect scenic resource values of the traveler. Generally referred to as strip development, buildings, parking lots, and signage are oriented to the automobile rather than the pedestrian. Because strip development lacks focus or orientation, it is generally considered confusing and inhospitable. Such forms of development are generally considered contrary to the preferred development pattern of this region.
    a. In spite of the general policy that strip developments are to be discouraged and contrary to the spirit of this Plan, it is recognized that certain areas have been or will be developed or redeveloped principally for commercial or industrial uses.
    b. To the extent feasible, project planners are encouraged to minimize the adverse effects of strip development on existing visual resources by consideration of the following design principles:
        - Provide pedestrian and vehicular links between projects;
        - Reduce impacts of parking areas by breaking the lots into small groups with integrated landscaping;
        - Encourage compact and densely developed projects which utilize land efficiently;

Policies continued on next page

Policies continued on next page

Policies: **Scenic Resources**

Policies (continued)

- Preservation of open space, if appropriate, be of a distinct area of visual or functional importance rather than useless bits of greenery between buildings, etc.;
- Placement of street trees which act as buffers between traffic arteries and internal drives;
- Use of signage and other structures that effectively communicate the desired message or use of the site without being garish;
- Layout of the project site to allow for coordinated future use of the entire parcel;
- Reduction of apparent scale of excessively large buildings by varying the pattern, number, size, and location of structures within the site;
- Employ screening plans for visually objectionable features on the site, including dumps, refuse disposal sites, and building equipment; and
- Minimize access roads or curb cuts onto public highways and use of common access drives.

3. An integral scenic element of the rural countryside is the extensive network of roads which comprise town and state highway systems. These roads are often characterized by relatively narrow roadways of diverse and contrasting features in close proximity. These characteristics combined provide a unique visual experience and awareness of the landscape. With some exception for principal arterials, it is in the public interest to retain these special features. Given their unique visual experience, roads exhibiting exceptionally high scenic and cultural values, and determined to be of local or state significance should be constructed or improved with due concern for the special scenic qualities inherent to the roadway and roadway fringe. Substantial modifications or off-alignment options which unnecessarily destroy the special characteristics of such roadways are not consistent with this Plan. Use of appropriate design standards is encouraged and should be related to highway functional classification.

E. Scenic Values and Telecommunications Facilities

Background

TRORC recognizes that transmission towers are necessary telecommunications facilities, but as land uses, these towers have emerged as planning concerns. To ensure adequate transmission of signals in mountainous areas such as this region, towers and related facilities need to be confined to hilltops or high elevation points. Thus, due to their higher visibility from multiple vantage points, conflict with scenic landscapes has become an issue.

Over the years, the District Environmental Commission III, in its administration

of Act 250, and some municipalities as part of their zoning review, have had to evaluate these uses. Some cases have been contentious, resulting in delays and expensive appeals. Most local plans and bylaws lack definitive policies, standards of review, or key information necessary to enable a fair and comprehensive evaluation of the impacts posed by these issues.

TRORC is aware of the potential problems and opportunities associated with these uses and have devised land use policies and standards to assist in mitigating conflicts and to give constructive guidance to the industry and affected municipalities. As a result, municipalities have begun adopting telecommunications tower language in Town Plans and have adopted zoning provisions.

The Federal Communications Commission (FCC) retains jurisdiction over public airwaves and the telecommunications industry in general. Additionally, the Federal Aviation Administration (FAA) exercises control over the location and height of towers and similar structures to prevent interference with airport operations. Under Vermont law (24 VSA Chapter 117), municipalities may require that certain standards be met prior to the erection of telecommunication facilities. Local bylaws may regulate the use, dimension, location, and density of towers, however, FCC rules are preemptive of local and state law where conflicts exist. Current practice within the FCC is not to specifically regulate the location, height, or design of individual owners. However, FCC uses the "central point doctrine" that provides for the location of transmission antenna to be at the "most central point at the highest elevation available". Given, this rule and others promulgated by the FCC, municipalities and the State may not be overly restrictive of or prohibit these types of facilities. In sum, the extent of local and state regulation is limited, must be reasonable, and serve the public interest.

TRORC has devised land use policies and standards to assist in mitigating conflicts and to give constructive guidance to the industry and affected municipalities.

In late 1994, the Cellular Telecommunications Industry Association requested the FCC to push state and local governments out of the siting process entirely. Additionally, bills were introduced in Congress to limit local and state authority over telecommunications. Most of these actions have been opposed by state and municipal organizations, and are viewed as unnecessary invasions of state and local control. TRORC does not favor preemption and supports cooperative efforts between the industry, the State, and municipalities to plan and regulate the future build-out of the telecommunications system affecting the region. The 1996 Telecommunications Act ensures a local voice in siting decisions.

Goals and Policies: **Scenic Values and Telecommunications Facilitates**

Goals

1. To improve telecommunication coverage in the region.
2. To support the enhancement of telecommunications network when such facilities do not have significant adverse environmental, health, or aesthetic impacts.

Policies

1. In order to minimize tower proliferation, it is the policy of TRORC to encourage applicants to exhaust all reasonable options for sharing space on existing towers or tower sites prior to proposing new towers sites and related facilities. The principle of co-location is the favored alternative. In making such a determination on the feasibility of co-location, proposers should evaluate space available on existing towers, the tower owners ability to lease space, geographic service area requirements, mechanical or electrical incompatibilities, the comparative costs of co-location and new construction, and regulatory limitations.
2. One of the region's principal scenic qualities are its ridgelines and mountainsides. These areas are significant contributors to the rural character of the region. The ridges are predominately undeveloped and provide an unbroken skyline viewed from the valley floor. The use of the region's ridges for telecommunication towers and related facilities needs to be undertaken in a manner that will not unduly detract nor adversely affect these scenic values. Protection of these areas from insensitive developments are matters of public good. To minimize conflict with scenic values, co-location is the first choice, followed by an analysis that provides the least impact for the desired coverage. Facility design and construction should employ the following principles:
    a. Use the minimal height necessary, and where feasible, be sited in areas not highly visible to the traveling public, or from residential areas, historic districts, and public use areas or outdoor recreation areas such as hiking trails and beaches;
    b. Be located in forested areas or be sufficiently landscaped to screen the lower sections of towers and related ground fixtures from public vantage points, such as trails, roads, or water bodies;
    c. Utilize materials, architectural styles, color schemes, lighting fixtures, mass and other design elements to promote aesthetic compatibility with surrounding uses and to avoid adverse visual impacts;
    d. Where prominent views of a site exist, be located downgrade of the ridge so as not to exceed the elevation of the immediate ridge;
    e. Where construction of access roads, power or phone lines are involved, minimize their visibility by constructing them along the contour of the land and avoiding any open fields or meadows. This is also intended to reduce their ability to encourage secondary development;
    f. Avoid peaks and ridges which function as regional focal points.

Goals and policies continued next page

Goals and Policies: **Scenic Values and Telecommunications Facilitates**

Policies (continued)

3. In planning for telecommunication facilities, consideration should be given to the environmental limitations of any given site. Impacts of the use on wildlife habitats, soil erosion, forestry and agricultural lands, and similar resources should be carefully addressed. Projects which materially impact these resources are discouraged.
4. For telecommunication projects situated on lands owned by the State, design plans should be compatible with current Management Plans for Public Lands adopted by the Agency of Natural Resources.
5. Towers, antennae, and related fixtures that fall into disuse, or are discontinued should be removed to retain the values set forth above. Local and state land use permits should incorporate such as an approval condition.
6. When facilities and tower configurations are dependent upon others being constructed along a corridor, then the entire string of facilities should be considered as a whole so that piece-meal permits to not preclude more amenable options.
7. The clearing of land associated with site development for tower and facility construction should not negatively impact the scenic views present.
8. Towers or facilities that are designed to resemble trees or natural features should not be placed conspicuously higher than the tree line.

F. Outdoor Lighting Design and Management

Issues and Opportunities

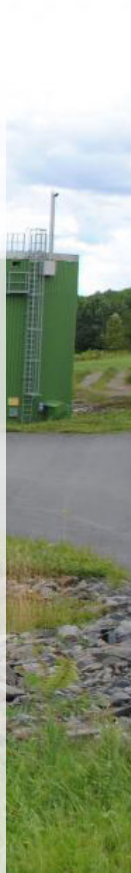
Increased development in the region in recent decades has brought about a corresponding increase in the use of outdoor lighting. These include new parking lots, brighter street lighting in our towns and villages, floodlights on commercial and industrial complexes, and lighted gas station canopies at our interchanges and along our major roads. While increased lighting can be seen as an inevitable result of growth, there is a concern that excessive and unplanned lighting results in unwise and uneconomic energy use, contributes to "light pollution," affects our ability to view the night landscape as well as creating an adverse impact on the character of our historic villages.

With the advent and increased use of new lighting technologies since the 1950s, commercial enterprises, industry, towns, and others have new tools to shape the nighttime environment. Many of these new lighting installations are well-designed, provide good night vision at reasonable levels and fit well into their immediate surroundings. Others do not. Problems of glare, over-lighting, light escalation, sky-glow, and energy waste have become more common.

Regional Energy Implementation Plan

A Pathway to Achieving Vermont's Energy Goals

Adopted
July 26, 2017



TRORC
Two Rivers-Ottauquechee
REGIONAL COMMISSION

RENEWABLE ELECTRICAL ENERGY GENERATION 5

A. Background

The State's goal of 90% renewable energy by 2050 represents a substantial shift from our energy portfolio. Renewable portfolio standards are state or local level policies that mandate all or certain types of electricity producers to supply a minimum share of their electricity from designated renewable resources.

Sixty percent of Vermont's electricity currently comes from renewable sources, a majority of which is hydropower generated by Hydro Quebec. To reach the state's renewable energy generation targets, more generation will need to be developed (with RECs retired in state).

The growth of the renewable energy generation industry in Vermont over the last five years has been remarkable. As a measure of current growth of commercial solar development in Vermont for example, it took Green Mountain Power (GMP) from 2008-2014 to hit a net metering cap of 4% of peak load, and less than two years to reach the increased cap of 15%.[29] The proliferation of commercial wind energy generation in Vermont has been decidedly slower, primarily due to the costs of development and the complicated permitting requirements. Hydro development has dropped off significantly since the early 1990s, due to a number of factors including the loss of economic incentives and stricter permitting requirements."[30]

Renewable Electrical Energy Generation

The TRORC Region currently produces 88,588 MWh of renewable electric energy generation. All existing or permitted generation capacity as of 2015 was factored into the LEAP modeling used as part of the RPC Energy Project. All goals in this plan are in **addition** to that capacity.

Based on the Two Rivers regional share of the overall state population, and the current renewable energy generation, the regions target generation is 349,307 MWh of electric energy. To reach this goal all towns have a responsibility to contribute to producing renewable energy generation in the state. In-state production will minimize the loss of electricity during transmission, reduce the cost of long distance infrastructure, and set the state to be more financially resilient. We cannot rely solely on generation that is produced elsewhere.

Town level targets are allocated based on each municipality's share of the region's population. Within the region the targets range from around 1,800 MWh to 62,000 MWh. Two-thirds of the towns in the region have a generation target of under

MW vs MWh

Capacity is the maximum power that a power plant can produced and is expressed in (MW). While the total electricity they actually generate over a period of time is expressed in megawatt hours (MWh). For example, a solar farm rated at a power level of 10 MW capacity can potentially generate 10 MWh of electrical energy over an hour in optimal conditions. Over 6 hours in optimal sunny conditions the 10 MW solar PV farm could generate 60 MWh of energy.

~ Climate Council

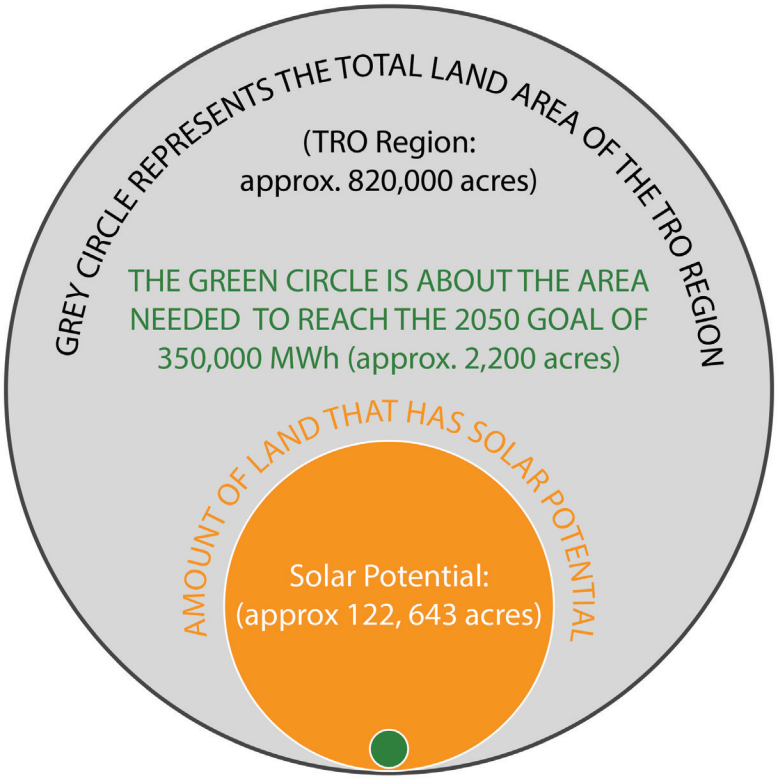


Figure 12: All Solar Scenario Diagram

10,000 MWH which requires 60 acres of land in an all-solar approach. It is important to recognize that the model developed and utilized in this Energy Implementation Plan is full of various assumptions and is one path to reach the state's energy goals. The model helps us create a target using data which gives us a sense of the magnitude of the amount of energy towns need to plan for in the next 30 years. These targets should be used by communities as they formulate their own plans and policies with regard to renewable energy generation, particularly those communities seeking to meet the Enhanced Energy Planning standards of Act 174.

The Two Rivers region includes adequate amounts of land that is suitable for solar and wind systems. Using data from the regional energy maps , the region could produce about 900,000 MWh of prime solar electrical energy generation that has no constraints, within one mile of three phase power, and not within forested land which would utilize approximately 5,500 acres of land. The prime wind potential in the region can produce between 35,000 MWh- 480,000 MWh depending on various factors. In the lower MWh wind potential, that includes land that is not forested, has no constraints, is within one mile of three phase power and has a hub height of 70 feet. The higher MWh potential analyzes the result of wind energy production in forested land.

While there are regional and local targets for renewable electrical energy generation, there is no mandate on the approach that is taken to produce that electricity. Based on the capacity factors of various renewable resources, we have provided three hypothetical scenarios(all solar, mix of solar and wind, and a mix of solar, wind, and hydro) to show how the region could reach the targets and how using a mixed portfolio of electrical energy generation sources can reduce the land and number of generation structures needed.

Scenario 1: All New Solar

To reach the regional target through the approach of using only solar electrical energy generation, the region would need to produce a generating capacity of 285 MW which would require approximately 2,200 acres of land.(See figure 12)

Scenario 2: New Solar and Wind Mix

If the region were to build a mix of wind and solar facilities the amount of land needed to reach the target would be reduced. In this scenario, wind was

allocated for 10% of the regional energy production and the remaining 90% was produced for solar. The generation capacity total would be reduced to 269 MW which would utilize about 2,100 acres of land.

Scenario 3: New Solar, Wind, and Hydro Mix

In the last scenario, if a new hydro facility were to be constructed or existing hydro facilities significantly upgraded, in the region as well as some wind turbines the amount of solar needed to reach the target would significantly decrease. This scenario was broken down into 10% wind, 25% hydro and 65% solar. This mix of renewable resources would require a capacity of 222 MW and would need about 1500 acres of land

Solar

Solar is the most viable source of new renewable electric energy generation in the TRORC region due to the nature of our topography and land cover. Based on GIS mapping analysis, there are roughly 123,000 acres of land in our region that have the raw potential* of producing solar energy, which is about 9% of the region's total land area. Not all land that has the potential to generate solar energy is appropriate for this use, however. Many areas have conditions that may make them unsuitable, such as hydric soils, wetlands or flood plains. Other suitable locations may be better used for other purposes, such as locations with prime agricultural soils or as forests.

Roof-top solar (or solar facilities on existing structures) is often considered a viable alternative to commercial-scale production. However, as indicated by the infographic on the previous page, even using extremely optimistic projections, roof-top solar might account for only 51,849 MWh of electrical generation (15% of the projected solar production needed by 2050). As such, even when encouraging extensive development for rooftop solar, a majority of the new renewable solar power generated in the TRORC region will be

WHAT ABOUT ROOFTOP SOLAR?

Rooftop solar will be a piece of the renewable energy genration puzzle, but commercial scale generation will still be the primary generator. Using the perfect (but unlikely) scenario described below, rooftop solar could generate 51,849MWh of electrical generation.

There are roughly 4000 residential structures within the areas that have been identified as having solar potential.
If 100% of those structures are properly oriented and structurally compatible, and each one chooses to install systems at an average of 4905 kWh of electrical energy generation, it could account for...
19,620 MWh

There are roughly 414 small commercial structures (<40K sq ft) within the areas that have been identified as having solar potential.
If 100% of those structures are properly oriented and structurally compatible, and each one chooses to install systems at an average of 24,528 kWh of electrical energy generation, it could account for...
10,154 MWh

There are roughly 90 large commercial structures (>40K sq ft) within the areas that have been identified as having solar potential.
If 100% of those structures are properly oriented and structurally compatible, and each one chooses to install systems at an average of 1,752,000 kWh of electrical energy generation, it could account for...
22,075 MWh

Figure 13: TRO Region Rooftop Solar Capacity Potential

NOT ALL GENERATION IS EQUAL

In some communities, there may be a preference for one kind of renewable energy generation vs. another. It is possible (but not simple) to "swap" one generation type for another (for example, a town could decrease the amount of solar in a community in favor of more wind).

It is important to recognize the different types of renewable energy are not equal, and each have a different "capacity factor" (actual output over time). For example, a solar system with a capacity of 100 megawatts, won't produce energy at that level all the time because the sun is not available 24 hours a day, 365 days a year. Solar in Vermont is generally considered to have a capacity factor of 15%. Wind generation in VT, on the other hand, has a capacity factor of roughly 25-30%, because winds are more constant.

** Solar potential is determined using GIS analysis of topography based on slope and direction (azimuth) for ground mounted solar. Additional factors in analysis included the removal of "known level 1 constraints." See Chapter 6 for more information.*

Town	Type	Utility	Capacity kW	Annual kWh	Owner	Stream/River
Bethel	GNM	GMP	330	12000000	Bethel Mills	Third Branch, White River
Newbury	GRD	GMP	970	33000000	Boltonville Hydro	Wells River
Newbury	GRD	GMP	270	1096000	GMP	Wells River
Newbury	GRD	GMP	5	23000	Sardnar Thanhuser	Halls Brook
Bradford	GRD	GMP	1500	4335000	GMP	Waits River
Hartford	GRD	GMP	37400	148850000	TransCanada	Connecticut River
Hartford	GRD	GMP	3790	6904000	GMP	Ottauquechee River
Hartford	GRD	GMP	645	2780000	Simon Pearce Glass	Ottauquechee River
Hartland	GRD	GMP	4000	12100000	North Hartland, LLC	Ottauquechee River
Hartland	GRD	GMP	2180	5834000	GMP	Ottauquechee River
Hartland	GRD	GMP	250	800000	Jay Boeri	Lulls Brook
Woodstock	GRD	GMP	500	1429000	GMP	Ottauquechee River

Table 1: Existing Hydro Generation Facilities, TRORC Region 2015
GNM= Group Net Metered, GRD= Grid, GMP= Green Mountain Power

commercial scale. Existing and proposed commercial solar facilities in our region have ranged from small (1.5kW) to large (20MW). The amount of land needed for a facility depends entirely on the scale. It takes roughly 9 acres for 1MW of solar generation.*

Wind

Wind energy generation has several advantages over solar. Wind turbines have a more significant amount of "up-time" in terms of generated energy because they have the potential to operate 24 hours a day. Additionally, they are able to produce energy during the winter, when sunlight is less available for solar production. But, because of the need for constant wind speed, commercial scale wind energy generation facilities generally require areas with elevated topography (where wind speeds are generally higher). Only 20% of the TRORC region has topography that can offer potential for wind speeds that make commercial-scale wind energy generation+ cost-effective. On average, out of the 30 towns in the TRORC region, only about 16% of the land in each community is elevated enough to offer significant potential for commercial-scale wind. There are potential large wind areas that may be suited for industrial scale power generation in Brookfield, Stockbridge, Tunbridge, Chelsea, Topsham, and Vershire based on a limited analysis that included wind potential, lack of natural resource constraints and access to phase 3 lines. This analysis doesn't take into account the considerable impacts on landowners. These site- specific issues may rule out many of these areas but towns should consider the significant property tax relief that a large project could provide to its residents as well as the important contribution the project is making to the New England renewable energy market. Towns also may benefit from infrastructure upgrades to their road system and electrical grid to build the project. It is

** Based on analysis of existing and proposed facilities in the TRORC region. CEP estimates the amount of acres per MW at 7.*

+ Digitally modeled wind speed (based on topography) analyzed at 3 hub heights.

possible to generate energy in areas with lower wind speed. These are more practical on the residential scale, rather than commercial scale.

While the benefits of wind power are substantial, the location of utility scaled wind energy turbines and associated facilities can adversely interfere with scenic, natural and historic resources. Past versions of the TRORC Regional Plan have focused primarily on the aesthetic impact of these facilities, but it is fair to say that in order to encourage the development of renewable energy, we must accept a reasonable amount of impact to the scenic quality of the region. Our primary concern with these facilities is the impact on our region's natural environment. Because much of the area where even small utility-scale wind systems would be built is currently undeveloped, careful consideration to the impact on natural and wildlife communities must be taken into consideration. Wind generation facilities need to be carefully sited so they don't destroy or significantly imperil necessary wildlife habitat blocks, migratory bird patterns, or wildlife corridors. Wind turbines, associated power lines, access roads, and other components of a generating system have been known to disrupt the physical and ecological relationships of habitats. Approvals or permits for this use should not be awarded unless evidence clearly establishes that habitats will not experience an undue adverse impact.

As with solar, not all land that has the potential to generate wind energy is appropriate for that use. The areas suitable for wind development can be challenging to access and difficult to permit, making them less profitable for the developer.

Anaerobic Digester, Vermont Technical College

Town	Name	Primary Use of Facility
Randolph	Vermont Tech Community Anaerobic Digester	Anaerobic Digester
Newbury	Blue Mountain Union School	Heat
Hartford	Hartford High School	Heat
Randolph	Randolph Union High School	Heat
Topsham	Limlaw Chipping	Heat
Vershire	Mountain School of Milton Academy	Heat
Hartford	White River Junction VA Medical Center	Heat
Sharon	Sharon Elementary	Heat

Table 2: Biomass Facilities in the TRORC Region, 2015

Commercial scale wind may be less desirable than solar, due to the reasons mentioned above.

Hydro

Hydroelectric energy generation has the highest capacity factor of renewable sources. Hydro is one of the lowest-priced, steady power producers available to the TRORC region. There are currently twelve hydroelectric facilities in operation in the TRORC region, which account for 51,840 kW of existing capacity.

There are two main forms of hydropower: run-of-river which uses the natural flow of water to generate power, and facilities that

store water behind an impoundment. Run-of-river systems rely on seasonal rainfall and runoff to produce power, resulting in periods of low production. Impounding water behind a dam allows for control of the water flow, resulting in consistent electric production.

Recognizing that the development of new, commercial-scale hydroelectric facilities is unlikely, gains in hydroelectric energy generation will be made by upgrading and improving existing infrastructure including dams that are not currently outfitted for hydro. There are 35 existing dams in the TRORC Region that have the potential to generate hydroelectric power.[32]* However, these facilities only have the estimated capacity of 2,700 kW. It is hoped that through advanced operational controls, more efficient equipment and/or conservation flow turbines, additional energy can be generated at existing facilities within our region.

Hydroelectric development necessitates balancing priorities. While the benefits of generating electricity from local renewable resources are evident, they are not without associated costs. The power output from a hydroelectric facility on a given stream must be moderated by environmental considerations. A minimum stream flow that is adequate to support aquatic life forms, needs to be maintained and impoundments need to be designed with water quality, land use, and recreation considerations in mind.

BIOMASS DEFINED

Biomass, in its simplest form, is defined as organic matter renewable over time. Woody biomass is the accumulated mass, above and below ground, of the roots, wood, bark, needles, and leaves of living and dead woody shrubs and trees.

Biomass also includes manure and herbaceous crops such as switchgrass, miscanthus and reed canarygrass.

Biomass

Biomass generally consists of woody and non-woody solid biomass, and is most commonly used in heating, although it can be used to produce electricity and transportation fuel as well. An estimated 37% of Vermont households heat at least in part with firewood or wood pellets.[41] Larger facilities use wood chips or pellets for heating as well, including schools and institutional facilities. The TRORC Region is home to only one biomass related electricity generator, the Vermont Technical College Community Anaerobic Digester. Using manure and food wastes, the facility harnesses biogasses through anaerobic digestion to fuel a generator that generates power. The system has a capacity of 375 kW of electrical generation, and excess heat is used to supplement the college's heating system. In addition to VTC's digester, six other facilities use large-scale biomass for heating. In addition to heating their own facilities, Limlaw Chipping in Topsham, produces wood chips used for heating of several significant entities including the National Life building, where a number of state offices are located, and Norwich University.

Vermont, with 78% of the state forested, has the potential to increase the use of this renewable resource, and consequently

** Data used includes existing dams with low-to high hazard risk. Existing structures identified as having "significant hazard potential" were not included.*

reduce its dependency on fossil fuels and mitigate climate change.[33] In the TRORC Region, there are 685,000 acres of forestland (84% of our region), which annually produce roughly 91,000 green tons[34] of Net Available Low-grade Growth (NALG) wood—wood that would be appropriate for use as biomass fuel above and beyond current levels of harvesting.

Proper forest management is essential to sustainable woody biomass production. Much of the land enrolled in the Current Use Value Appraisal (UVA) program in the TRORC Region is forested, and as such a forest management plan is required. Most forest management plans are designed to encourage the growth of higher quality wood which will yield a higher harvested value for the landowner. As a result, the bulk of what loggers harvest out of these areas is lower quality wood. 75- 80% of the volume of harvested wood by loggers is typically low grade fiber (pulp, firewood or whole tree chips).

While in many instances, the thicker trunks of the trees not suitable for sawing into boards can be chipped and used for boiler fuel, whole-tree chips that include the tops and branches of the trees are utilized primarily in electricity generation plants such as the power stations in Ryegate and Burlington. The challenge is that these two facilities, the only biomass electricity generation plants in Vermont, cannot utilize all of the low-quality product harvested out of our forests.

Attempts to develop new biomass energy generation facilities have taken place in the TRORC region, the most recent of which was considered in Randolph. However, due to significant local resistance to these facilities, none have been built. The efficiency of large-scale biomass electricity generation facilities remains a barrier as well. A highly efficient gasification biomass system emits roughly 60% of its potential as thermal energy, generating only 40% as electricity. Siting these projects in areas that can receive truck traffic without interfering with residential neighborhoods and also in proximity to large consumers of thermal energy is ideal.

With the closing of pulpwood and biomass consuming facilities in Maine, (a loss of nearly 30-40 % of the market for low grade timber in the northeast), the local market for low-grade wood has been significantly impacted. By supporting and encouraging the development of sustainable biomass systems in the region, TRORC can add another component of energy production in the Region and support the sustainable forestry economy.

Other types of biomass, such as perennial grasses, are now being used nationally as a solid fuel in some power plants as well as targeted as a choice feedstock for such advanced biofuels as cellulosic ethanol. Grass-based biomass can also be pressed into pellets, briquettes, and cubes and used as a heating fuel to replace or complement fuels made from wood fibers. Including a thermal component in the use of solid biomass for energy increases a combustion system's efficiency more than threefold.[35] However, in Vermont, woody biomass remains the most immediately viable and largest potential source of biomass.

There are no specific targets for additional biomass production in the pathway developed with the LEAP model and so in the tables and charts this energy source is likely underestimated. Biomass was left out in part due to a need to further

investigate how its production for energy and heating would interact with Vermont's strong policy of forest protection. It is also because investigations into the sustainable production of grass-based biomass are in their early phases. Initial studies indicate that it is possible for Vermont to produce grass-based biomass for energy generation only at a small scale in part due to the lack of available farmland.

Despite the lack of specific targets for the development of biomass, this Plan recognizes that utilization of woody biomass, particularly for heating, will need to be a significant part of the pathway to achieving the state's energy goals.

Certificate of Public Good (CPG)

Any new renewable electrical energy generation facility that is connected to the grid, must apply for a certificate of public good (CPG, also known as Section 248 Permit). As part of this process, the Public Service Board must find that:

- The Project must 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.
- The Project must meet a need for present and future demand for services. The Project will not have an adverse impact on system stability and reliability.
- The Project will not have an undue adverse impact on aesthetics, historic sites, air and water purity, the natural environment, the use of natural resources, and public health and safety, with due consideration having been given to the criteria specified in 10 V.S.A. §14724a(d) and 6086(a)(1) through (8) and (9)(K) and greenhouse impacts.

State agencies, municipalities and the regional planning commissions are considered parties by right, in a Section 248 proceeding. Although the CPG process includes elements of review that are similar to Act 250, it is a very different process. Any facility that applies for a CPG is exempt from consideration under a municipality's zoning regulations. However with the ratification of Act 174 in 2016, Regional Commissions and communities that are granted a determination of energy compliance for enhanced energy planning will have their respective municipal plans receive " substantial deference" instead of mere"due consideration" in the CPG process

For many communities, the process of intervening in a CPG can be expensive, difficult and time consuming.[36] The highly technical and legal nature of the CPG process can make it challenging for municipal officials to understand how to actively and effectively participate in the process. In the case of smaller solar energy generation facilities (<15kW) which are subject to an expedited CPG process, municipalities have no voice at all.