

REPORT ON THE AESTHETIC IMPACT OF A PROPOSED 500kW PHOTOVOLTAIC SOLAR ARRAY OFF OF UPPER LOVELAND ROAD, NORWICH VT



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SUMMARY

This report will show that a proposed solar array installation off of Upper Loveland Road in Norwich, Vermont is incompatible and out of character with its surroundings, that it unduly adversely impacts and diminishes the scenic and natural beauty of a designated Resource and Ridgeline protection area, and that it is visually offensive, even shocking, to the sensibilities of average people who make use of nearby public spaces and travel public roads on the east side of the town. Furthermore, this report will show that the project violates clearly written community standards, and that mitigating measures regarding aesthetics are insufficient, incomplete, or have not been considered at all. This aesthetic assessment applies the steps of the Quechee Analysis and incorporates a separate report regarding Orderly Development. The Orderly Development report addresses how the project fails to conform to municipal and regional standards. An additional report addresses how the process of obtaining authorizations from the town and region via a Preferred Site Letter was marked by serious flaws and irregularities.

PART I – ADVERSE ANALYSIS

This first part of the Quechee Analysis addresses the issue whether or not the NST project proposal will have an “adverse aesthetic effect.”

WHAT IS THE NATURE OF THE PROJECT SURROUNDINGS?

The site proposed for the Solar Array project off Upper Loveland Road is located within a Rural Residential district designated both as a Resource Protection and a Ridgeline Protection area.

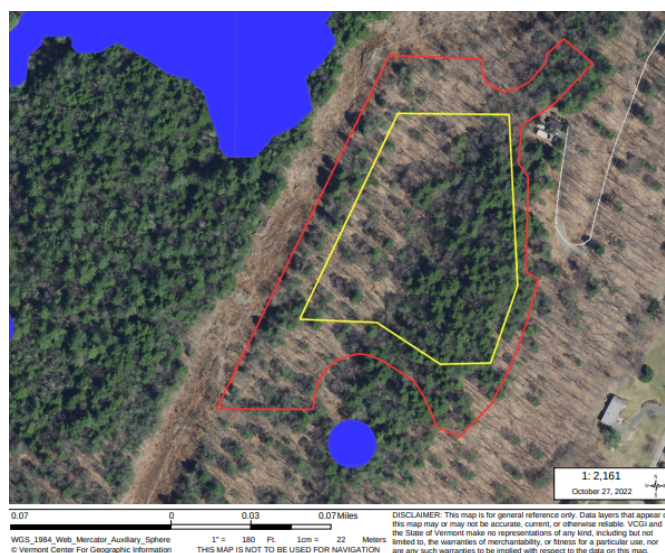


Fig. 1. Aerial view of the proposed Norwich Solar Technologies project area off Upper Loveland Road in Norwich, Vermont. The yellow outline represents the fenceline. The red outline shows the limit of disturbance for the 500 kW photovoltaic solar array. Blue polygons represent locations of wetlands and other known Act 174 constraints. Images created using Vermont Center for Geographic Information (VCGI 2022).

See also Exhibit NN-JK-3 – Aerial Drone Video

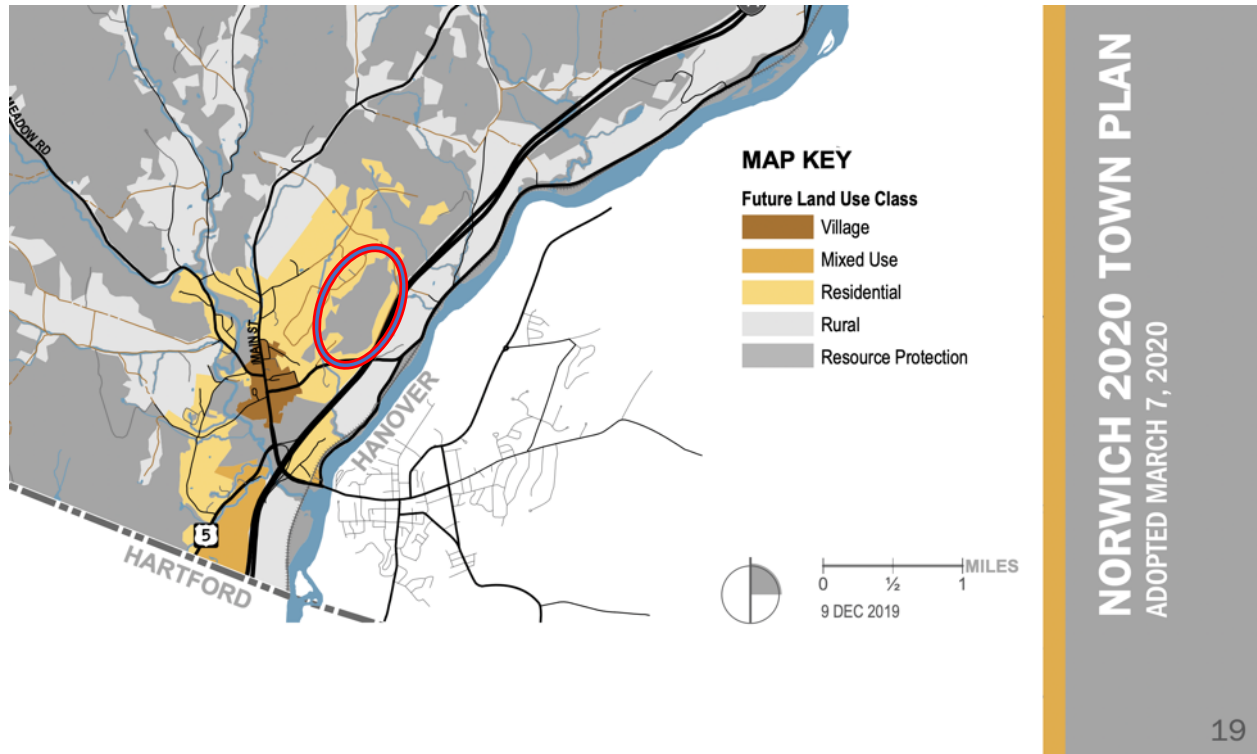


Fig. 2. Resource Protection Area (Exhibit NN-JK-6, Norwich Town Plan, p. 19)

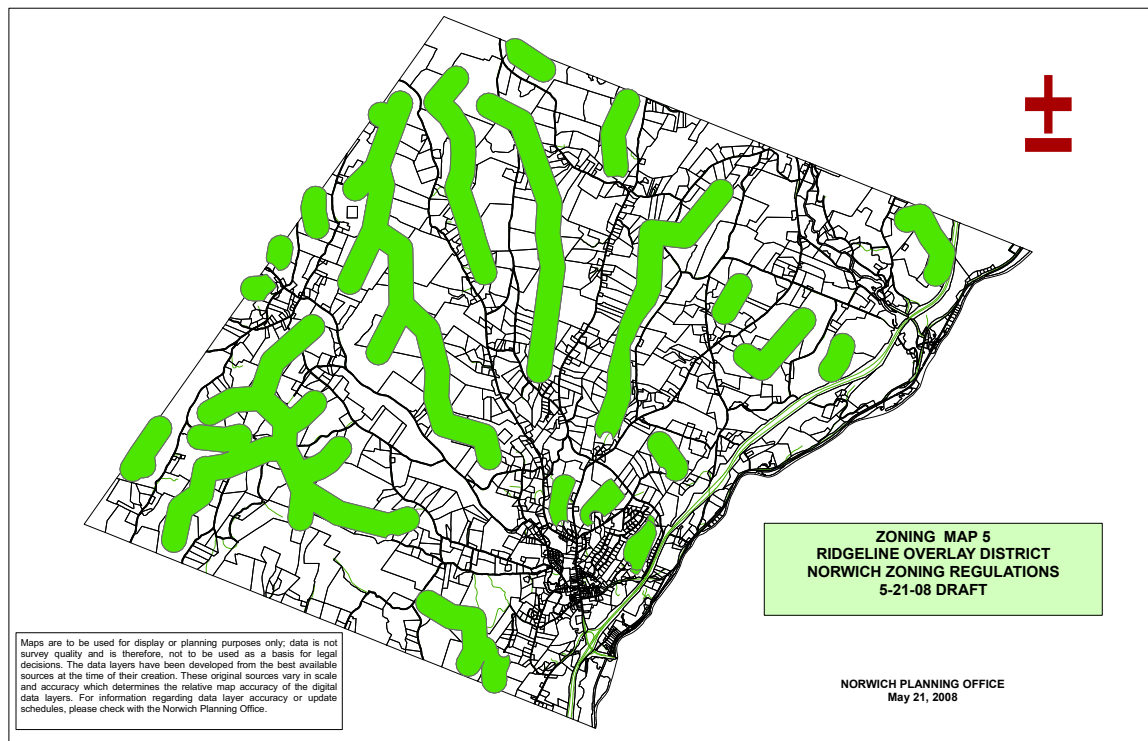


Fig.3. Ridgeline Protection Overlay District Exhibit NN-JK-4
from Norwich Zoning Regulations Exhibit NN-JK-5 incorporated into Town Plan on pp. 22 and 28 Exhibit NN-JK-6

The project surroundings are characterized by a forested basin and two ridgelines. The upper ridgeline, at the western edge of the project site, has an elevation of approximately 720'. A power line runs along the top of this ridge; directly behind it, to the west, is the Norwich Town Forest. The lower ridgeline, along the eastern side of the project area, has an elevation of approximately 680'. In two locations, the elevation on the lower ridgeline reaches 700'.

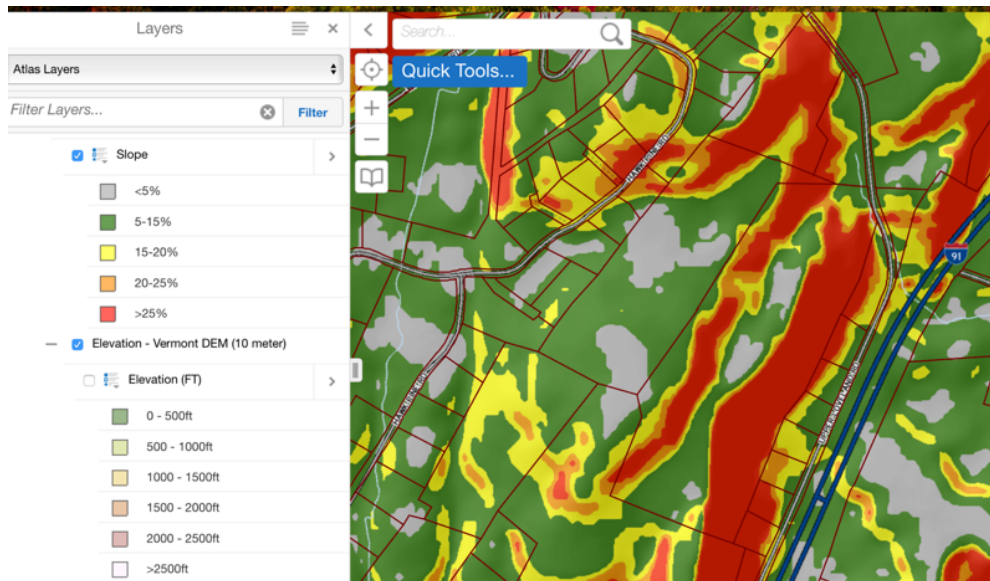


Fig 4. ANR map showing slopes and elevations between Upper Loveland Rd (on the right) and the town forest (center).

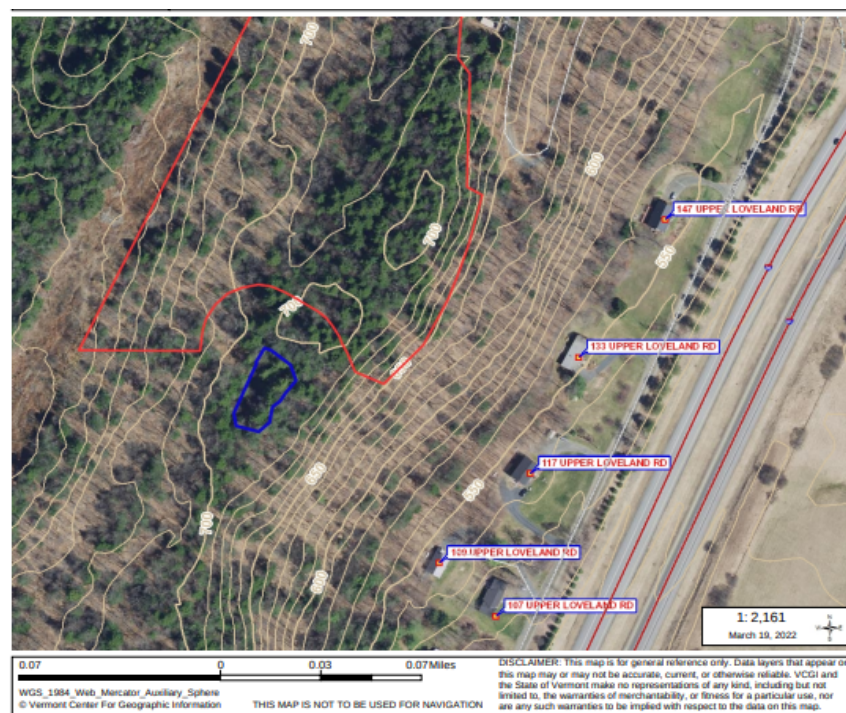


Fig. 5. Elevation decreases from 700 ft in the proposed project area to 560 ft, behind residents' homes on Upper Loveland Road in Norwich, Vermont. The red polygon shows the approximate limit of disturbance for the solar project. Image was created using VCGI (2022).

Hemlocks dominate the lower, eastern ridgeline and provide a harmoniously continuous and uninterrupted skyline with the hemlocks and hardwood trees to the north and south of the project area. A steep slope descends from this ridgeline and consists of an upper half with slopes ranging between 25% and 35% and a lower half, outside the project area, with slopes of up to 60%.



Fig 6. Ridgeline from I 91. Photo: Stephen Gorman



Figs. 7 - 10 . Winter views of ridgeline and slope behind properties at 117, 133, and 147 Upper Loveland Road. The forest of hemlocks (darkest area in background) are clearly visible. Photos: Joy Kenseth

The steep slope, especially its lower half, is characterized by numerous projections of exposed ledge and rock faces.



Fig. 11. Exposed ledge and rock face on the slope and deer making their way up the slope to the ridgeline (one of their preferred routes to the ridgeline and the cover provided by the hemlocks.) Photo: Joy Kenseth



Fig. 12. View of ledge projections and rock face. Photo: Joy Kenseth



Figs. 13. View of ledge projections and rock face. Photo: Joy Kenseth

Many of the trees in this area and in the upper half of the slope range in height from 60' to approximately 90'. The natural and scenic beauty of the neighborhood results almost exclusively from the varied topography and the variety of trees (hemlock, maples, ash, basswood, hickory, birch, beech, and hop-hornbeam) on the ridgelines and slopes: the trees present a variety of shapes and sizes, differing patterns of bark, and changing seasonal colors that provide aesthetically pleasing visual interest not only for residents but also for the many, often daily, visitors from outside the immediate neighborhood who take morning and afternoon strolls, walk their dogs, bike, and run along Upper Loveland Rd.

IS THE PROJECT'S DESIGN COMPATIBLE WITH ITS SURROUNDINGS?

No. The Applicant proposes to install a 500kW solar net-metered project off of Upper Loveland Rd. in Norwich VT. The project consists of two main parts: the solar array design itself, and the clearing (or clear cutting) of forest. The total area of impact, defined by the limit of disturbance or LOD, is approximately 8.2 acres.

The solar array design includes:

- 15 rows of solar panels mounted on a racking system anchored to the ground
- ten string inverters
- underground electrical lines enclosed in conduit connecting the panel rows, string inverters, AC combiner panel and AC disconnect pedestal
- three 167kVA pole-mounted transformers on a GMP distribution pole
- a GMP line extension
- an eight foot high wildlife fence

The elements of this industrial design, especially the solar panels and the racking system, are obviously incompatible with the natural surroundings: in striking contrast to the varied and irregular shapes of the surrounding forest, the parts of the solar array have an unvaried, repetitious, and hard rectilinear geometry. Whereas the colors, contours, and density of forest trees change with the seasons, the solar array panels - monochromatic, flat, and sharp edged - remain the same throughout the year. Arranged artificially in fifteen parallel rows, the solar panels on their racks introduce fixed and immovable objects into an environment where trees and other vegetation continually move and sway in response to changing weather conditions.

Clearing (or clearcut) of the forest

Because the project is unwisely sited in a forested area, approximately 8.2 acres of the forest itself must be cut down to accommodate all its elements. This will entail, for the purpose of “shade management,” cutting down all forest between the project and the transmission corridor to the west, thus opening up a view of the transmission poles and wires, and making all the solar panels and racking system visible from the adjoining Town Forest immediately to the west.



Fig. 14. View of site from town forest. See Also: Video Exhibit NN-JK-7. Photo and Video: Stephen Gorman.

Most alarmingly, this involves the clearing of trees along a protected ridgeline and down a steep slope, also for the purpose of “shade management.”



Figs. 15 - 16 Views of Ridgeline from Upper Loveland Road. Photos Joy Kenseth



Figs. 17 - 18 Views of Ridgeline from Upper Loveland Road. Photos Joy Kenseth

The clearcut will remove the hemlocks along the lower ridge, creating a gap in the forest skyline at least 960' running north to south. In addition, the project requires clearcutting the upper 1/3 of the steep slope descending from the top of the lower ridge to the eastern side of the LOD.¹ This clearcut will create a space shorn of trees -- a space without variety of color, shape, and texture -- that is wholly incompatible with the visual and physical characteristics of the forested slope.

¹ This is an approximation. The applicant provides only one measurement, 65', from the end of a solar panel to the LOD on the east. It should be noted that the widths from most of the other solar panels to the LOD are much greater, i.e. approximately 1/3 of the slope, perhaps more.



Fig. 19. View of ridgeline and steep slope behind 117 and 133 Upper Loveland Rd. Sunlight falls on the deciduous trees on the upper 1/3 of the slope and in front of the hemlocks on the ridge. Solar project would cut down all these trees. Photo: Joy Kenseth



Fig. 20. Similar to view above but farther north, behind 133 Upper Loveland Rd. Photo: Joy Kenseth

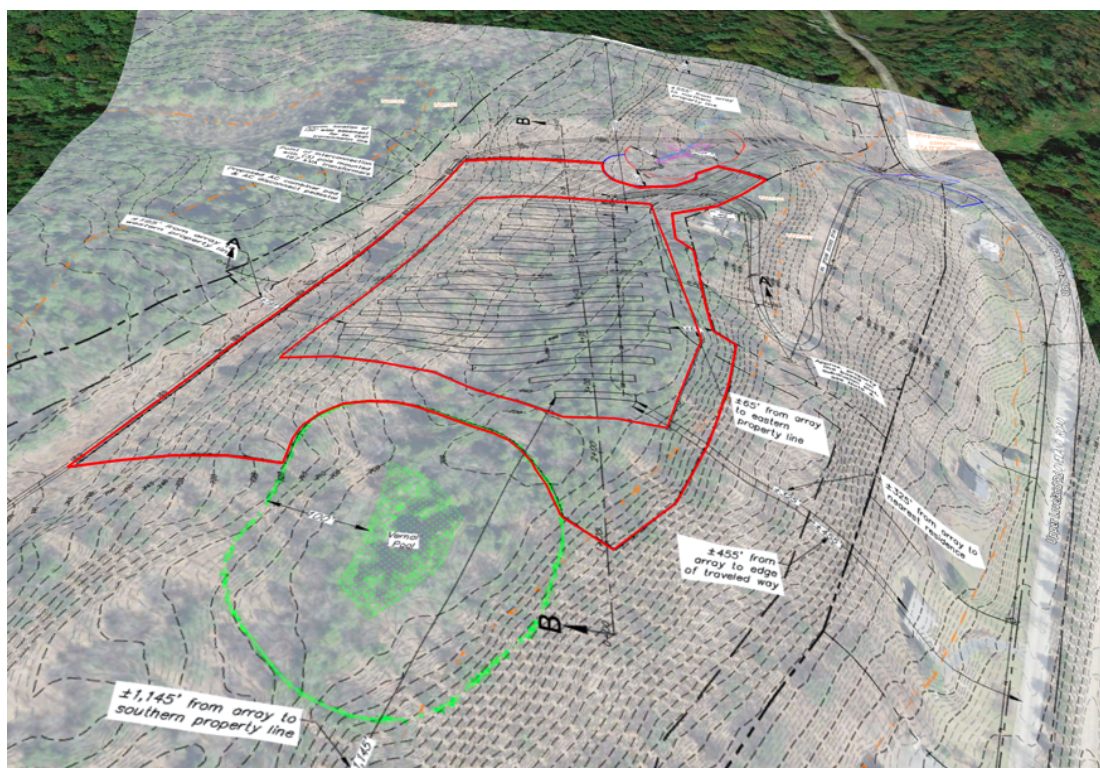


Fig. 21. The area between the solar panels and the LOD

Clearcutting trees along the ridgeline and steep slope raises another serious issue. Forestry experts describe and document how clearcutting results in wind throw, especially along newly created forest edges.² “The edge trees on a clearcut are more prone to be wind thrown due to the change in environmental factors around them.”³ (T.Potter) For example, trees within newly created edges will be subjected to increased winds and wind velocity. The likelihood of such trees succumbing to wind throw is even greater if the trees grow on steep slopes, have shallow root systems, or are diseased. In the case of the Upper Loveland solar project, numerous factors, including those mentioned above, could result in tree throws outside the LOD, thus enlarging the actual area of disturbance. The prevailing winds in this area come from the west and northwest. The hemlocks in the project site, especially those along the lower, eastern ridgeline, serve partly as a screen or buffer against these winds, helping to protect the deciduous trees growing on the adjacent steep slope. The removal of the hemlocks and the deciduous trees on the upper 1/3 of the slope will diminish or eliminate this buffering effect: a

² Zeng, et al., pp. 2247-8, 2255. Hongcheng Zeng, Heli Peltola et.al., “Simulations of the influence of clear-cutting on the risk of wind damage on a regional scale over a 20-year period.” *Canadian Journal of Forest Research*, vol.36, 2006, pp.2247-2258. Other pertinent studies are: Jean-Claude Ruel, “Understanding windthrow: Silvicultural implications.” *The Forestry Chronicle*, July/August 1995, vol.71, no.4, pp.433-445; Emmanuel J.Gabet and Simon M. Mudd, “Bedrock erosion by root fracture and tree throw...,” *Journal of Geophysical Research*, December 2010, vol.115, Issue F4. Available online: <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2009JF001526>

³ E-mail communication 10/10/22 from Tanner Potter, forester/arborist with Chipper Inc. T. Potter and Kaitlyn Creller, forestry technician with New England Forestry Consultants, visited the site Nov. 11/6/22. Both foresters noted the condition of the trees on the steep slope and their potential vulnerability to windthrow.

new forest edge will be created, and trees lower down the steep slope will be subjected to increased winds and wind velocity and possible wind throw.



Fig. 22. Steep slope on the eastern edge of the impact area directly above the Kenseth residence. Once ridgeline trees are cut, the pictured trees will be extremely vulnerable to windthrow.

Photo: Stephen Gorman



Fig. 23 Steep Slope Topography, Eastern Edge of LOD and Solar Array

The ash trees scattered through the lower 2/3 of the steep slope are especially vulnerable. In June 2022 a 90' ash, already infested and weakened by Emerald Ash Borer, succumbed to wind throw, falling from a location about halfway down the steep slope and 20' away from the residence at 133 Upper Loveland Rd.



Fig. 24. Windthrown tree behind the Kenseth residence at 133 Upper Loveland Road, in Norwich.
Photo: Jennifer Goulet, October 14, 2022.



Fig. 25 Ridgeline Protection Overlay District and LOD

In sum, the proposed forest is incompatible with and will have an adverse effect upon the harmoniously continuous contours of the forested ridgeline and on the varied aspects of the steep slope. The negative aesthetic effects resulting from the clearcut will only be increased by the collapse of trees outside the LOD. Moreover, there are no guarantees that treefall resulting from the effects of the clearcut will not endanger the nearby properties or lives of homeowners on Upper Loveland Rd.

ARE THE COLORS AND MATERIALS SELECTED FOR THE PROJECT SUITABLE FOR THE CONTEXT WITHIN WHICH IT IS LOCATED?

Neither the materials nor the colors of the project are suitable for a forested context. While the racking system is composed primarily of aluminum and steel, the solar panels are created from synthetics. Thus a project composed of metals and synthetic materials, with a footprint somewhere between 2.5 to 3.0 acres, will be inserted in a natural landscape that has no material or visual relationship to it.

So far as one can tell from the information provided by the applicant, the primary color of the project is dark bluish grey or dark grey. In either case, the project will be a largely monochromatic industrial assembly occupying an area between 2.5 and 3 acres. As such, it will create an offensive and unwelcome contrast with the changing hues of the surrounding trees and, during winter months, will stand out as a dramatically discordant element in a landscape of snow covered trees.

WHAT IS THE PROJECT'S IMPACT ON OPEN SPACE?

The site chosen for the project is not an open space but a forested area. It will replace a natural area with an open space full of monochromatic industrial materials that are out of character with the area.

WHERE IS THE PROJECT VISIBLE FROM?

The applicant claims that the project will not be visible or will have limited visibility from public roads in Norwich. No mention is made about views from the town forest, a public space that is frequented by hikers, snowshoers, bird watchers and other nature lovers. Due to its close proximity to downtown Norwich and residential areas, the town forest is heavily used by residents. Contrary to the applicant's opinion, not only will the project be visible from Norwich public roads (Upper Loveland Rd., Interstate 91, and Loveland Rd.) it also will be visible from locations within and all along the eastern edge of the town forest as well as from locations in New Hampshire.

See Figs. 6 – 10, p. 5, Views from I-91 and Upper Loveland Road.



Fig. 26. View of Ridgeline from Upper Loveland Road. Photo: Stephen Gorman



Fig. 27. View of ridgeline from Loveland Road. Photo: Stephen Gorman

The photographs submitted by the applicant were taken during the summer and give no indication how the whole project (not just the solar panels but also the area of disturbance) will appear 6½ -7 months of the year. In the 2021-22 calendar year, most of the trees in this area, except for some oaks, had lost their leaves by October 25; they did not come into leaf again until the period between May 11 and May 13. The applicant assumes incorrectly that the project will be screened from view by the remaining trees, i.e. the trees outside the LOD. However, no trees will screen the solar array as viewed from the edge of the town forest. And one cannot count on the remaining trees on the steep slope to camouflage the project: some of these trees already are near collapse, others, such as the ash or very tall trees weakly anchored to bedrock or destabilized by erosion are vulnerable to windthrow. Photographs taken from public roads during late fall and winter demonstrate the clear visibility of the ridgeline and upper 1/3 of the steep slope, both of which will be severely impacted by the clearcut. The wide gap that will be cut into the ridgeline and the bare/treeless space below it on the slope will be dramatically visible from Upper Loveland Rd., Interstate 91, and Loveland Rd. At the same time, the solar array or parts of it will be visible from these public roads, albeit to varying degrees depending on distance from the site. Residents at both low and high elevations in Hanover, New Hampshire will also have views of the solar array and cleared ridgeline.



Fig. 28. View of Ridgeline from Rivercrest Road next to Cold Regions Research and Engineering Lab Hanover, NH. Photo: Stephen Gorman



Fig. 29. View of Ridgeline from Hemlock Road, Hanover, NH. Photo: Stephen Gorman

CONCLUSION

The totality of the NST project (the solar array and the area of disturbance) will have an adverse impact on the aesthetics of the site, a forested ridgeline area that includes very steep slopes and is visible from public and private vantage points. Visually and materially, the project is incompatible with its surroundings: it is an industrial construction that has no relation to and is out of character with the natural forms and colors of the landscape. The poorly sited project requires clearcutting 8.2 acres of forest to accommodate the solar array components and to “manage” shade. The clearcut will create a visually offensive gap in the harmonious contours of the ridgeline and adversely impact a significant part of the steep slope. As a consequence of the clearcut, trees outside the area of disturbance will be subject to windthrow, thus enlarging the LOD and possibly putting nearby homes and homeowners at risk. The project’s area of disturbance and solar array will be visible not just from public roads but also from the town forest where the public goes to enjoy nature, not to gaze upon artificial industrial structures.

As demonstrated in the responses to the preceding questions, the project proposed by NST will have an adverse aesthetic effect.

PART 2 – UNDUE ADVERSE ANALYSIS

Having determined in Step one that the Norwich Solar Technology project will have an adverse aesthetic effect, it is my opinion that that effect will be undue. That is, it will have an inappropriate aesthetic impact that violates community standards, is offensive to the average person and out of character with the area, and the applicant has made insufficient mitigating efforts.

DOES THE PROJECT VIOLATE A CLEAR, WRITTEN COMMUNITY STANDARD INTENDED TO PRESERVE THE AESTHETICS OR SCENIC BEAUTY OF THE AREA?

As observed earlier in this report, the natural scenic beauty of the Upper Loveland Rd neighborhood results almost exclusively from its forested ridgelines and slopes. Norwich, through its Town Plan, gives the highest priority to protecting the natural environment and recognizes that the preservation of its beauty enhances the quality of life of its citizens. Community standards about ridgelines and steep slopes specifically are clearly expressed in the 2020 Town Plan and in related entries from the town's Zoning Regulations. Exhibits NN-JK-5, NN-JK-6.

Norwich Town Plan policies state explicitly that development be guided "away from steep slopes" (Land Use 2.2e) and "away from visually prominent locations on ridgelines and hills as viewed from public vantage points" (Land Use 2.2c). Further, when pointing out that a "key principle of land use planning is to guide development towards land best suited to the purpose and discourage and prevent uses inappropriate to the landscape", the plan says unambiguously "Steep Slopes are poorly suited to development." (2.5 Future Land Use). Zoning regulations, which are incorporated into the Town Plan on pp. 22 and 28 specific to the Ridgeline Protection Overlay District, are equally clear. Article II, Table 2.9 (A) stresses that

"The purpose of the Ridgeline Protection Overlay (RPO) District is to protect Norwich's rural character and scenic landscape by ensuring that development is located and designed in a manner that protects the uninterrupted skyline and minimizes adverse visual impact on designated ridge lines and adjacent slopes as viewed from public roads...within the town."



Fig. 30. The red rectangles approximate the project area location within a) a resource protection area and b) a ridgeline protection area described in the Norwich Town Plan (2020).

When new structures are constructed within the RPO, they require compliance with supplemental district standards, specifically Article II G (1) which concerns the maintenance of forest cover on wooded sites, and Article II G (2) which says in part that the placement of structures “shall not stand in contrast to the surrounding landscape patterns and features.” Finally, regulation 3.13 A (1) f (ii) states clearly that “development in areas to be disturbed with slopes in excess of 25% is not allowed.” The exceptions to this rule do not include solar arrays. The solar array project violates each and every one of the policies and regulations described above. The applicant makes much of the Town Plan’s energy objective 3.2h which says:

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 Applicant states that energy objective 3.2h automatically overrides clearly stated policies adopted by the Norwich community. If that were the case, then any policies set forth in the town plan could also be overridden. Not only would this set a very bad precedent, it makes a

mockery of the Town Plan itself, rendering its policies and objectives utterly meaningless. In fact, the Town Plan (3.1.d) states that while renewable energy production should be increased it ought to be carried out “in a manner that is consistent with the goals, objectives, and policies of this plan (24 VSA §4302 (c) (7) (A).”

To justify their site selection for the solar array, the applicant also refers to the second paragraph of 3.8 (Renewable Energy Project Siting Standards.) It reads: “This plan calls upon the Public Utility Commission to issue Certificates of Public Good for projects between 15kW and 500kW 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.”

Significantly, the applicant failed to mention the immediately preceding paragraph that says: “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: [among other things] ... Preserving the recreational and natural value of those lands identified in the Ridgeline Protection Overlay Area and Shoreline Protection Overlay Area.” **[emphasis added]**

The applicant did not and could not achieve such “balance” because the site plan they presented to the town’s authorizing committees was not the plan now before the PUC or the plan dated June 26, 2021, both of which show significant clearcutting along the ridgeline and steep slopes. Rather, a different site plan, a plan that does not encroach on the ridgelines or steep slopes, was presented to and considered by town officials. Thus any discussion, any deliberation, regarding ridgelines and steep slopes was obviated.

Hereby incorporates by reference all of my testimony and Report on Orderly Development and the Preferred Sites Letter.

See Transcript of Planning Commission Meeting Exhibit NN-JK-8 and Transcript of Select Board Meeting Exhibit NN-JK-9.



Fig. 31. NST site plan presented to the Norwich Planning Commission July 13, 2021 and Norwich Selectboard (August 11, 2021)
The solar project does not encroach on the ridgeline and steep slope.



Fig. 32. NST site plan prepared June 24, 2021 but not presented at the July 13, 2021 PC or August 11, 2021 SB meetings. The project encroaches on the ridgeline and steep slope.
(White dotted line indicates the LOD).

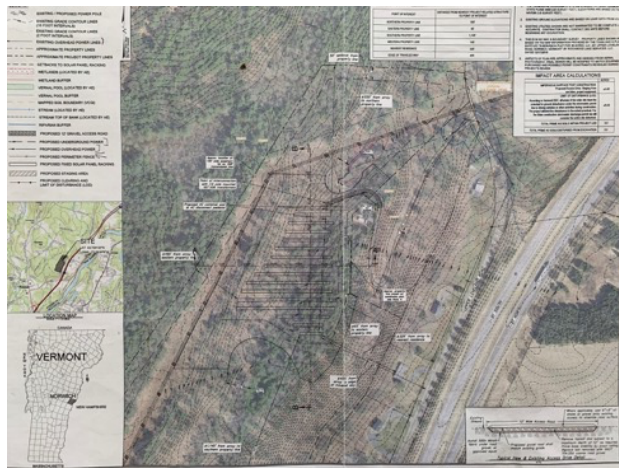


Fig. 33. Final NST site plan. An iteration of the 6/24/21 plan, presently before the PUC.
Encroachment on ridgeline and steep slope extends farther to the east.

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? *Criterion 8 was intended to ensure that as development occurs, reasonable consideration will be given to the visual impacts on neighboring landowners, the local community, and on the special scenic resources of Vermont.*

The proposed project is an aesthetically discordant and disharmonious intrusion into a forested area and as such is offensive to the sensibilities of the average person. It is an industrial construction that is completely out of character with the shapes, colors, and textures of the surrounding forest and it requires significant clearcutting along a ridgeline and steep slope. Taken together, the solar array components and the destructive clearcut will severely diminish the scenic and aesthetically pleasing qualities of the area.

HAS THE APPLICANT FAILED TO TAKE GENERALLY AVAILABLE MITIGATING STEPS WHICH A REASONABLE PERSON WOULD TAKE TO IMPROVE THE HARMONY OF THE PROJECT AND ITS SURROUNDINGS?

Mitigating steps to improve the harmony of the project with its surroundings are either weak or non-existent. The applicant offers none with respect to how the project will appear from the town forest and assumes, incorrectly, that remaining trees, especially on the steep slope, will be sufficient to screen the project. Numerous methods for erosion mitigation are presented in a cut and paste fashion on the reverse side of the site map, but no explanation is offered as to which methods specifically will be used where. Finally, because the applicant did not consider the issue of wind throw, no mitigating steps for its potential consequences are suggested. In this instance, the best mitigating method would be not to cut down the forest at all.