

Article 10 Application

Canisteo Wind Farm

Case 16-F-0205

Steuben County, New York

1001.24 Exhibit 24

Visual Impacts

Revision 23

Invenergy

Exhibit 24 Visual Impacts

Appendix 24a is the visual impact assessment (VIA) required by Section 1001.24. The VIA was prepared by Environmental Design & Research (EDR) for CWE in compliance with subsections (a)-(c) of § 1001.24 and presents the information required therein. Appendix 24b is an analysis of the shadow-flicker impacts associated with the proposed Facility. The VIA and shadow flicker analysis are summarized below.

The impacts described in the VIA and shadow-flicker analysis must be considered worst case because they assume 117 WTGs will be built using GE3.6-137 turbines on towers with a tip height of 592 feet. This is the tallest turbine presently under consideration for the Facility and represents the greatest potential visual impact.

24.a Visual Impact Assessment

24.a.1 Character of the Existing Landscape

The Study Area is comprised primarily of agricultural and forested land in Steuben County. Higher density residential areas within the proximity of the Facility Site include the Villages of Canisteo, Andover and the City of Hornell. Additional turbines from other wind farms in the area are visible from the Study Area. The VIA provides further description of the character and visual quality of the existing landscape.

24.a.2 Visibility of the Facility

The proposed wind turbines will be visible throughout many parts of the Study Area. Viewshed maps in the VIA show areas where the Facility will be visible, and areas where screening of topography or vegetation will block visibility. Section 24b discusses the assumptions and methods used for preparing the viewshed maps included in the VIA.

24.a.3 Visibility of Above-Ground Interconnections and Roadways

Interconnection Line and POI Switchyard Visibility

Other than wind turbines, the next most visible aspect would be the overhead electrical transmission line that is proposed to run between the proposed collection substation and the POI substation. Due to the voltage and length of the transmission line it will be addressed under Article VII of the Public Service Law and will be subject to a separate visual impact assessment, not addressed in this application. However, clearing of land for the transmission line ROW have been considered in the viewshed analysis included with the VIA.

The visual impact of the POI Switchyard will be addressed in the VIA prepared for the Article VII application.

Electrical Collection System Visibility

Collection lines between Facility components will be buried throughout the Facility Site and will not be visible overhead. The vegetation clearing that will occur along the collection line ROW is addressed in the VIA.

The VIA contains a discussion of visibility of the proposed Collection Substation. Additionally, Appendix G of the VIA shows a photo of a typical collection substation like the one CWE proposes to construct.

Access Road Visibility

Facility access roads will require upgrades to existing farm lanes and logging roads, and temporary widening for large construction vehicles to access turbine locations. Access roads are not expected to have long-term visual impacts and are addressed further in the VIA. However, vegetation clearing that may occur is addressed in the VIA.

24.a.4 Appearance of the Facility

The O&M building would be visible to travelers driving past the building. Appendix G of the VIA, on sheet 7, is a photo of a typical O&M building like the one CWE will install. Final finishes and dimensions may vary from what is shown.

24.a.5 Lighting

Exhibit 18, Section 18b discusses FAA-required lighting. The VIA includes a viewshed map showing the portions of the Study Area where FAA turbine lights are expected to be visible. Exhibit 11, Section 11e discusses other Facility lighting.

24.a.6 Representative Views of the Facility

The VIA contains photographic overlays simulating views of the Facility once built.

24.a.7 Nature and Degree of Visual Change from Project Construction

The WTGs will be the Facility's largest visual elements, and this will be the case during the final stages of construction. During most phases of construction, construction activities will be visible, including excavation areas where roads, WTGs, cables, the collection substation, and the O&M building are being installed, as well as the construction laydown yard. Appendix G of the VIA shows a typical construction laydown yard for a wind farm being constructed in New York.

24.a.8 Nature and Degree of Visual Change from Operation of the Facility

The VIA contains tables with the following information for each of the visually-sensitive resources in the Study Area:

- General description of the resource,
- Potential number of visible turbines,
- Landscape similarity zone,
- Viewer groups (e.g., residents, workers, travelers), and,
- Distance to nearest turbine.

24.a.9 Analysis of Operational Effects Including Shadow Flicker

The Facility wind turbines will cast shadows, which, depending on weather conditions, could include moving shadows cast by rotating WTG blades. Appendix 24b is a report documenting an analysis of when and where potential WTG shadows could be cast on sensitive receptors.

Shadow Analysis Assumptions

Appendix 24b discusses the assumptions used to conduct the shadow analysis. These include WTG locations, dimensions, receptor locations, and sunshine probability.

Shadow-Sensitive Receptors

All structures and locations analyzed in the noise study described in Exhibit 19 and within ten times the rotor diameter of any proposed wind turbine were included in the shadow analysis (the Shadow-Sensitive Receptors or SSRs):

Shadow Analysis Results

The shadow analysis memorandum lists the annual average shadows expected to occur at every SSR. Annual average shadow hours are the number of hours, including partial hours that are expected to occur in a typical year with sunshine and cloud levels equal to those in a typical year. The updated analysis evaluated the use of the GE 158 wind turbine at all 117 locations since it is the unit with the largest rotor diameter of those under consideration, although not all locations would be built with this turbine model. This analysis does not account for the location and orientation of windows and screening effects from site-specific conditions such as trees and vegetation.

Appendix 24b lists those receptors with 30 or more annual average shadow hours. This list shows:

- 81 year-round residences have 30 hours or more of expected annual average shadows, ~~41-47~~ of these are owned by participating landowners and ~~40-34~~ are owned by non-participating landowners.
- 44 category 2 residences would be expected to have 30 hours of annual shadows but will likely not be occupied at all times.
- Six residences that are identified as category 4 or not occupied would be expected to have 30 hours or more of expected annual average shadows.
- Nine non-residential structures (an institution, a commercial structure, and an outdoor public space) were expected to have 30 or more hours of annual average shadows, but these locations are unlikely to be occupied at all times.

Shadow Impacts

None of the Facility Site towns, the host county, or New York State have published regulations or guidelines establishing an acceptable amount of shadow-flicker impact on a potential receptor. However, many European countries and Victoria, Australia have identified 30 hours of shadow-flicker as an allowable threshold and suggested anything above this level would be considered a nuisance and require mitigation.¹ The National Association of Regulatory Utility Commissioners (NARUC) identifies a reasonable standard of 30 hours of shadow flicker per year or 30 minutes of shadow flicker per day at any occupied building as a reasonable standard². Towns and wind companies have employed this 30-hour

¹ Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria. The State of Victoria, Department of Environment, Land, Water, and Planning, January 2016.

² National Association of Regulatory Utility Commissioners (NARUC). 2012. Wind Energy & Wind Park Siting and Zoning Best Practices and Guidance for States. A report for the Minnesota Public Utilities Commission Funded by the U.S. Department of Energy. January 2012.

threshold in studying many of the wind projects built in New York and elsewhere in the United States and CWE proposes using it here.

Shadow Flicker Avoidance and Mitigation Measures

Shadow impacts could be reduced by relocating or not installing select turbines, but these measures could result in other adverse impacts (e.g., higher noise levels, greater wetland or farm land impacts, reduced energy generation, higher cost of energy).

To mitigate potential annoyance from shadow flicker, CWE will rely on operational monitoring to determine if the 30-hour threshold is being exceeded and the complaint handling program provided as Appendix 19m. CWE will investigate complaints related to the Facility, including those related to shadow flicker. When CWE confirms shadows are occurring at a residence where the expected annual shadow hours exceed 30 hours, CWE will fund installation of mitigations such as window blinds or new plantings to block the shadows from landing on windows.

24.a.10 Mitigation

Wind turbine visibility cannot be completely avoided. CWE will use the following measures to minimize and/or mitigate the Facility's visual impacts:

- Wind turbines will be painted with a nonreflective paint to minimize reflected glare.
- Wind turbines will be painted a neutral off-white or light gray color. This color will minimize visual contrast with the background sky.
- To minimize visual complexity, all the Facility turbines will use tubular towers, be a uniform color, and will have the same number of blades (3) which will rotate in the same direction.
- Wind turbines will be setback several hundred feet from roads, which will increase the likelihood of vegetation between the road and turbine blocking travelers' views of the turbine bases.
- As discussed in Exhibit 11, Section 11e, the wind turbines, Collection Substation, and O&M building will be designed with the minimum necessary exterior lighting.
- CWE will use non-reflective chain link fencing for the Collection Substation and O&M building storage yard.
- To minimize impact of the FAA lights to viewers at ground level, CWE will install FAA obstruction lights with the lowest intensity permitted by the FAA. Other potential measures to minimize impacts from the FAA lights are discussed in Exhibit 18, Section 18b.4.

24.a.11 Visual Resources that Would be Affected by the Facility

The VIA lists and maps visually-sensitive resources in the Study Area and the potential visual impact of the Facility on each resource. The list includes, but not limited to, the following:

- Many town, county, and state roads (a wide range of visibility predicted),
- Snowmobile club trails throughout the Facility Site (a wide range of visibility predicted),
- The Hamlets of Jasper and Troupsburg,

- TripEnd Brewery in the Town of Troupsburg,
- Locally identified resources,
- The Harley Mayo County Park in the Town of Cameron

24.b Viewshed Analysis

24.b.1 Viewshed Maps

The daytime viewshed maps contain multiple color shadings to indicate the number of turbines expected to be visible from any given point. The VIA includes the following viewshed maps depicting the expected visibility of the Facility wind turbines in the Study Area:

- A “bare earth” viewshed map that assumes no vegetation. In this map, topography is the only source of screening to screen views of wind turbines. This shows maximum visibility that might exist in the winter, if the screening effects of evergreens and trunks and branches of deciduous trees were ignored.
- A “vegetated” viewshed map that includes the screening effects of both topography and vegetation. This shows the visibility that might exist in summer months.
- An FAA light viewshed map that shows where FAA obstruction lights on the wind turbine nacelles are expected to be visible considering the screening effects of topography and screening. This map assumes turbines are lit at the locations discussed in Exhibit 18, Section 18b.

24.b.2 Viewshed Methodology

The VIA describes the details of how the viewshed maps were produced. Key assumptions used are:

- Wind turbine tip heights of 592 feet;
- Topography per USGS Digital Elevation Mapping (DEM) data files;
- For the vegetated viewshed analysis, forested areas are assumed to block views to a height of 40 feet.

24.b.3 Use of Viewsheds to Determine Sensitive Viewing Areas

To assist reviewers assessing potential visual impacts, the VIA presents the daytime viewshed maps with the following overlays:

- State and county roads;
- Locations of visually-sensitive sites, cultural and historic resources, locations for photo-simulations, and public vantage points;
- Locations of properties listed, or eligible for listing, on the National Register of Historic Places;
- Residences, businesses, and recreational areas.

24.b.4 Conferences with Municipal and Agency Officials on Selection of Viewpoints

CWE conducted a systematic program of public outreach to assist in the identification of visually sensitive resources. Copies of the correspondence sent by CWE and its visual consultant as part of this process, as well as responses received from stakeholders, are included as Appendix C of the VIA.

CWE selected locations for visual simulations to represent the range of landscape similarity zones and distances from which the Facility will be seen and to simulate views from points of community interest. To identify locations of community interest, CWE consulted with local residences, town officials, county officials, and state officials who identified recreation areas, businesses, important views from local roads and residential areas, that they consider visually-sensitive.

24.b.5 Photo-simulations of the Facility

Photo-simulations of the Facility wind turbines, and where visible, other Facility components such as met towers and access roads are presented in the VIA. For each simulation, the VIA shows both existing and proposed conditions. Methods and assumptions used to prepare the simulations are described in the VIA.

24.b.6 Photo-simulations for Locations Where Physical Mitigation is Proposed

Due to the large nature of the Facility wind turbines, physical screening is not an effective mitigation for visual impacts. As such, no photo-simulations are provided to show the effects of mitigation screening.

24.b.7 Impact Ratings

CWE's visual consultant used a modified version of the Bureau of Land Management (BLM) contrast rating methodology to rate the visual impacts shown by the photo-simulations. The resultant ratings are presented and described in the VIA.

24.b.8 Assessment of Operational Characteristics of the Facility

Once operational, the Facility's wind turbines will cast moving shadows that could result in shadow flicker in nearby buildings. Analysis of the Facility's potential shadow flicker impacts is discussed in Section 24a.9.

24.c Additional Information

Long Distance Visibility

In addition to the viewshed maps of the Study Area, the VIA also provides two photo-simulations of locations further than 5 miles from the outermost wind turbines:

- Veteran's Memorial Park (8.4 miles north-northwest of the nearest wind turbine), and
- a point on County Route 22, where an Allegany County Federation of Snowmobilers Club Trail crosses (7.2 miles west of the nearest wind turbine).