High Bridge Wind Project

Case No. 18-F-0262

1001.24 Exhibit 24

Visual Impacts

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EXHIBIT 24 VISUAL IMPACTS

(a) Visual Impact Assessment

A Visual Impact Assessment (VIA) prepared by Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C. (EDR), included as Appendix 24-A to this Article 10 Application, was conducted to determine the extent, and assess the significance, of the Facility's visual impacts. The VIA methodology and content are consistent with the policies, procedures, and guidelines contained in 1001.24 and established visual impact assessment methodologies (See Literature Cited/References Section of VIA in Appendix 24-A). The components of the VIA include characterization of the existing landscape, identification of visually sensitive resources, viewshed mapping, confirmatory visual assessment fieldwork, visual simulations (photographic overlays), cumulative visual impact analysis, and proposed visual impact mitigation.

(1) Character and Visual Quality of the Existing Landscape

To establish an inclusive visual study area based on the turbine technology options proposed in Exhibit 6 of this Application, visual impacts were studied in the area within a 10-mile radius of Facility components (the "visual study area"; see Figure 3.1-1 of the VIA). The visual study area was utilized for the various visual analyses presented in the VIA (e.g., visual fieldwork, viewshed analysis, and simulations).

The visual study area lies within the Northern Allegheny Plateau physiographic region of New York State (Bryce et al., 2010). This region is glacially smoothed with flattened hilltops and wide stream valleys. The landform can generally be characterized by rolling hills, open valleys, and low mountains covered by glacial till and dissected by stream valleys. The dissection by both water and ice erosion has given the upland a somewhat rugged relief. The low, rolling hills in this region are divided by valleys and troughs, some containing lakes and rivers, such as Guilford Lake, North Pond, and the Susquehanna, Chenango, and Unadilla Rivers, while others contain smaller ponds, streams, or wetlands. While the valleys are relatively flat, the valley walls can be rather steep (NYSDOT, 2013). Within the visual study area, two of the major valleys generally run north to south while one is oriented east to west. The Unadilla River and Chenango River are located east and west, respectively, of the proposed turbine array and the Susquehanna River is south of the array, traversing the southeastern portion of the visual study area.

Vegetation throughout the visual study area is dominated by a mosaic of cropland, pastureland, and woodland. Forestland is prevalent throughout the more elevated portions of the visual study area and on steeper slopes. Forestland can also be found in woodlots, hedgerows, and wooded wetlands abutting the more agricultural portions of the visual study area. Forests in the visual study area are primarily deciduous, consisting of beech/maple mesic forests and mixed hemlock/northern hardwood forests. Open fields occur primarily on some level hilltops and within the major valleys associated with rivers and transportation corridors. Agricultural/open fields are primarily associated with relatively small farmsteads, which typically include a single-family residence and associated farm structures.

Per the requirements set forth in 16 NYCRR § 1000.24(a)(1), Landscape Similarity Zones (LSZs) were defined within the visual study area along with other indicators of potential visual impact on viewshed maps. Definition of discrete landscape types within a given study area provide a useful framework for the analysis of the Facility's potential visual effects. The LSZs are defined based on the similarity of various landscape characteristics including landform, vegetation, water, and/or land use patterns, in accordance with established visual assessment methodologies. The approximate location of these zones is illustrated in VIA Figure 3.3-1. LSZs within the visual study area are described in more detail in the VIA and include the following:

- Forest
- Rural Residential/Agricultural
- Open Water
- Village
- Transportation Corridor

Distance zones are typically defined in visual studies to divide the visual study area into distinct classifications based on the various levels of landscape detail available to the viewer. Four distinct distance zones were developed for this purpose, and include the following:

- *Near-Foreground*: 0 to 0.5 mile,
- *Foreground*: 0.5 to 1.5 miles,
- *Middle ground*: 1.5 to 4.0 miles, and
- *Background*: Over 4.0 miles.

A description of these zones can be found in Section 3.4 of the VIA.

User groups define the mostly likely users within the visual study area. Three categories of viewer/user groups were identified within the visual study area. These are:

- Local Residents

- Through-Travelers/Commuters
- Tourists/Recreational Users

Each of these users may have variable sensitivities to changes in the landscape. These are discussed in more detail in the VIA.

(2) Visibility of the Facility

The VIA includes an analysis of potential visibility and identifies locations within the visual study area where it may be possible to view the proposed wind turbines, meteorological (met) towers, substations, and operations and maintenance facility (O&M facility) This analysis includes identifying potentially visible areas on viewshed maps and verifying Facility visibility in the field. Two viewshed studies were completed in order to determine the potential geographic extent of visibility. The first analysis considered the screening effects of topography only, and the second considered the screening effects of topography, vegetation, and structures. The methodology for these analyses is described in Section (b)(2), below and Section 4.1.1 of the VIA.

EDR personnel conducted visual field review within the visual study area on April 18, 2019. During the site visit, EDR staff members drove public roads and visited public vantage points within the visual study area to document Facility visibility and confirm the results of the viewshed analysis. This determination was made based on the visibility of the distinctive ridges/landforms, as well as existing tall structures (such as silos and temporary meteorological towers) on the Facility Site, which served as locational and scale references. These site visits resulted in photographs from 85 representative viewpoints within the visual study area. The viewpoints document potential visibility of the Facility from the various LSZs, distance zones, directions, visually sensitive resources, and areas of high public use throughout the visual study area. During the field visit, weather conditions consisted of partly cloudy to clear skies which were generally favorable conditions for long distance viewing.

During the site visit, photographs were taken using digital SLR cameras with a minimum resolution of 24 megapixels. All cameras utilized a focal length between 28 and 35 mm (equivalent to between 45 and 55 mm on a 35mm sensor). This focal length is the standard used in visual impact assessment because it most closely approximates normal human perception of spatial relationships and scale in the landscape (CEIWEP, 2007). To assist with viewer orientation and potential Facility visibility in the field, global positioning system (GPS) units were combined with a live mapping unit in ESRI Collector® (Collector). The data contained in the Collector unit included the viewshed analysis results, visually sensitive resources, a topographic and aerial base map, and the current user location. At each of the viewpoints, the GPS was used to document the camera location, direction of view, time, and notes for each photo position. Viewpoints photographed during field review generally represented the most open, unobstructed available views toward the Facility. A representative photograph documenting the general view towards the Facility Site from each viewpoint is included in Appendix B of the VIA. Viewpoint locations are depicted in VIA Figure 5.1-3.

A detailed description of potential Facility visibility as observed during the field review is also provided in the VIA.

(3) Visibility of Overhead Transmission and Collection Lines

As described in Exhibit 34, all collection lines proposed in this Application with be installed underground and will not be visible. The Applicant is proposing an approximately 200-foot span of overhead transmission line to connect to the collection and point of interconnection (POI) substations. This short span of transmission line, along with the POI, are accounted for in the visual simulations provided in the VIA (Appendix 24-A).

(4) Appearance of the Facility Upon Completion

To show anticipated visual changes associated with the proposed Facility, three-dimensional (3D) software was used to create realistic photographic simulations of the proposed Facility from each of the 15 selected viewpoints. The photographic simulations were developed by using Autodesk 3ds Max Design® to create a simulated perspective (camera view) to match the location, bearing, and focal length of each existing conditions photograph. Existing elements in the view were modeled using detailed lidar data representing existing landscape elements such as roads, buildings, and topography. At this point, minor adjustments were made to camera and target location, focal length, and camera roll to align all modeled elements with the corresponding elements in the photograph. This assures that any elements introduced to the model space (i.e., the proposed turbines) will be shown in proportion, perspective, and proper relation to the existing landscape elements in the view. Consequently, the alignment, elevations, dimensions and locations of the proposed Facility structures will be accurate and true in their relationship to other landscape elements in the photograph.

A computer model of the proposed turbine layout was prepared based on specifications and data provided by the Applicant (see Exhibit 6, and VIA Section 2.2.1 for turbine dimensions). All turbine rotors were modeled facing into the prevailing wind (i.e., oriented to the southwest). Using the camera view as guidance, the visible portions of the modeled turbines were imported to the landscape model space described above and set at the proper coordinates. Coordinates for proposed turbines were provided to EDR by the Applicant.

Once the proposed Facility was accurately aligned within the camera view, a lighting system was created based on the actual time, date, and location of the photograph in order to accurately represent light reflection, highlights, color casting, and shadows. The rendered Facility was then superimposed over the photograph in Adobe Photoshop® and portions of the turbines that fall behind vegetation, structures or topography were masked out. Photoshop was also used to take out any existing structures or vegetation proposed to be removed as part of the Facility. Once the turbines were added to the photograph, any shadows cast on the ground by the proposed structures were also included by rendering a separate "shadow pass" over the DEM model in 3ds Max ® and then overlaying the shadows on the simulated view with the proper fall-off and transparency using Photoshop. A graphic illustration of the simulation process is included in VIA Figure 4.2-1.

"Wireframe" Renderings

In addition, for some views, "wireframe renderings" were prepared to illustrate the potential screening effect of landscape features within the photograph. In these wireframe renderings, the portions of the proposed turbines that will be screened by a landscape feature (vegetation, topography or structures) are shown in a bright green color (for illustrative purposes). In some instances, these wireframe renderings were prepared for visual simulations in which the Facility was difficult to see as a result of substantial screening from intervening landscape features. The wireframe renderings produced for this report are included in Appendix D of the VIA.

(5) Lighting

The potential visibility of FAA warning lights for the proposed turbines is described in Section 5.2.3 of the VIA and Exhibit 24(b)(1). VIA Figure 5.1-1, Sheet 2 illustrates FAA warning light visibility within the 10-mile extended study area. Nighttime photos from the Fenner Wind Power Facility, which is in Madison County, New York, and has been in operation since 2001, are included in Appendix I of the VIA to illustrate the type of nighttime visual impact that could occur at certain viewpoints. The contrast of the aviation warning lights with the night sky could be appreciable in dark, rural settings, and their presence suggests a more commercial/industrial land use. Viewer attention is drawn by the flashing of the lights, and any positive reaction that wind turbines engender (due to their graceful form, association with clean energy, etc.) is lost at night. While generally not an issue from roads and public resources visited almost exclusively during the day (parks, trails, historic sites, etc.), turbine lighting could be perceived negatively by area residents who may be able to view these lights from their homes and yards in dark, rural settings. However, this impact will be limited along major roadways and in areas of more concentrated human settlement, where nearby ridgelines will generally screen views of turbines clusters and existing light sources will limit the visibility and contrast of the aviation warning lights.

It should be noted that the size and brightness of the lights depicted in the representative photos of the Fenner Wind Power Facility (see Appendix I of the VIA) are due to the use of a long exposure during photography to ensure that the lights were visible in the photographs. As a result, the photographs are not representative of what would be seen with the naked eye. It should also be noted that the Fenner example has one light per turbine where the proposed Facility will have two lights per current FAA requirements. Depending on angle of view, distance and direction the turbine is facing, the lights will appear as one. See Appendix I of the VIA for representative nighttime photos.

Lighting at the substations and O&M building will be kept to a minimum and turned on only as needed, either by switch or motion detector. Final exterior lighting at Facility components will be described in the Facility Exterior Lighting Plan.

(6) Photographic Overlays

To show anticipated visual changes associated with the proposed Facility, high-resolution computer-enhanced image processing was used to create realistic photographic simulations of the proposed Facility from each of 15 viewpoints selected following outreach to stakeholders. See Exhibit 24(a)(4) for discussion of the methodology and specific software packages that were used for creating the simulations. The VIA (Appendix 24-A) discusses each of the visual simulations for the Facility in Section 5.0 and the simulations are attached as Appendix D of the VIA.

(7) Nature and Degree of Visual Change from Construction

Visual impacts during construction are anticipated to be relatively minor and temporary in nature. Representative photographs of construction activities are included in Section 5.3.5 of the VIA. As shown on these photographs, anticipated visual effects during construction include the following:

- During construction, there will be a temporary increase in truck traffic on area roadways served by the Facility. Construction vehicles for the Facility will include conventional construction trucks, crane transporters, concrete trucks, and oversized semi-trailers. The transportation of turbine components and associated construction material involves numerous conventional and specialized transportation vehicles. For instance, wind turbine blades are transported on trailers with one blade per vehicle. Blades typically control the length of the vehicle. Tower sections and/or nacelles are typically transported in three to four sections depending on the supplier (one section per truck). Towers generally control the height and width of the transportation vehicle.

Inset 5.3-31. Transportation of Turbine Components

- As described in Exhibit 25 of the Article 10 Application, it is anticipated that temporary widening of the pavement surface with an aggregate roadway surface will be required to accommodate the turning movements of delivery vehicles in some locations, including some road intersections. These will generally be removed at the completion of construction. After completion of construction activities, there may be permanent road improvements needed to address any damage caused by the heavy construction vehicle traffic (especially on any roads that had temporary repairs made during construction activities).
- As described in Exhibits 21 and 22 of the Article 10 Application, construction and operation of the Facility will result in impacts to soils and on-site plant communities. These impacts include vegetation clearing and disturbance from construction, as well as permanent loss of vegetated habitats by conversion to built facilities. Permanent built facilities include turbine foundations and pads, access roads, the O&M facility, meteorological tower foundations, and substations.
- The construction laydown yard will be developed by stripping the topsoil, grading as necessary, and installing a level gravel-surfaced working area. Electric and communication lines will be brought in from existing distribution poles to allow connection with construction trailers. During Facility construction, the yard will be occupied by vehicles, construction trailers and stockpiled materials.

Inset 5.3-32. Construction staging and laydown area

- Facility construction will be initiated by clearing woody vegetation from all turbine sites, access roads, and electrical collection line routes. Trees cleared from the work area will be removed and disposed of off-site. It is generally assumed that a radius of up to 265 feet will be cleared around each turbine, a 75-foot wide corridor will be cleared along access roads, and a 30-foot-wide corridor per collection line circuit will be cleared along underground electric collection lines that are not adjacent to access roads.

- Wherever feasible, existing roads and farm drives will be upgraded for use as Facility access roads in order to minimize impacts to active agricultural areas, forest, and wetland/stream areas. Road construction will involve topsoil stripping and grubbing of stumps, as necessary. Stripped topsoil will be stockpiled along the road corridor for use in site restoration. Following removal of topsoil, subsoil will be graded, compacted, and surfaced with approximately 12 inches of gravel or crushed stone. During construction, access roads with a travel surface of up to 60 feet wide will be required to accommodate large cranes and oversized construction vehicles. This road width will be narrowed to 20 feet following completion of construction.

- Once the roads are complete for a particular group of turbine sites, turbine foundation construction will commence on that completed access road section. Initial activity at each tower site will typically involve tree clearing (as needed) around each tower location. Topsoil will be stripped from the excavation area and stockpiled for future site restoration. Following topsoil removal, tracked excavators will be used to excavate the foundation hole. Subsoil and rock will be segregated from topsoil and stockpiled for reuse as backfill. Once the foundation concrete is sufficiently cured, the excavation area around and over it is backfilled with the excavated on-site material. The base of each tower will be surrounded by a 6-foot wide gravel skirt, and an area approximately 100 feet by 60 feet will remain as a permanent gravel crane pad.

- Whenever possible, underground collection lines will be installed by direct burial, which involves the installation of bundled cable (electrical and fiber optic bundles) directly into a narrow cut or "rip" in the ground. The rip disturbs an area approximately 24 inches wide with bundled cable installed to a minimum depth of 36 inches. Where direct burial is not possible, an open trench will be excavated. Using this installation technique, topsoil and subsoil are excavated, segregated, and stockpiled adjacent to the trench. Following cable installation, the trench is backfilled with suitable fill material and any additional spoils are spread out or otherwise properly disposed of. Following installation of the buried collection line, areas will be returned to pre-construction grades.
- Turbine assembly and erection involves mainly the use of large track mounted cranes, smaller rough terrain cranes, boom trucks, and rough terrain fork-lifts for loading and off-loading materials. The tower sections, rotor components, and nacelle for each turbine will be delivered to each site by flatbed trucks and unloaded by crane. A large erection crane will set the tower segments on the foundation, place the nacelle on top of the tower, and install the rotor either by individual blade installation or, following ground assembly, place the rotor onto the nacelle. The visibility of these cranes will be comparable to the visibility of the proposed turbines (in terms of height). However, use of crane equipment at each turbine site will be on a temporary basis sufficient to complete construction activities.
- Vegetation removal will be minimized primarily through careful site planning. Large areas of forest and wetland are being avoided to the extent practicable. Facility access roads will be sited on existing farm lanes and forest roads wherever possible, and areas of disturbance will be confined to the smallest area possible. In addition, a comprehensive sediment and erosion control plan will be developed and implemented prior to Facility construction to protect adjacent undisturbed vegetation and aquatic resources. In addition to protecting natural resources, these measures will minimize the visual impact associated with landscape clearing and disturbance during construction of the Facility.
- Following construction activities, temporarily disturbed areas will be restored to original grades (where feasible) and seeded (and stabilized with mulch and/or straw if necessary) to reestablish vegetative cover in these areas. Other than in active agricultural fields, native species will be allowed to revegetate these areas. This will avoid long term visual impacts associated with soil and vegetation disturbance during construction.

(8) Nature and Degree of Visual Change from Operation

To evaluate anticipated visual change from Facility operation, the photographic simulations of the completed Facility were compared to photos of existing conditions from each of the selected viewpoints. These "before" and "after" photographs, identical in every respect except for the Facility components to be shown in the simulated views, were provided as 11 x 17-inch color prints to five professionals with experience in the visual/aesthetics field (three in-house and two independent), who were then asked to determine the effect of the proposed Facility in terms of its contrast with existing elements of the landscape. The methodology utilized in this evaluation was developed by EDR in 1999 for use on wind power projects (and subsequently updated). It involves using a short evaluation form and a simple numerical rating process. Along with having proven to be accurate in predicting public reaction to wind power facilities, this methodology 1) documents the basis for conclusions regarding visual impact, 2) allows for independent review and replication of the evaluation, and 3) allows a large number of viewpoints to be evaluated in a reasonable amount of time. Landscape, viewer, and facility-related factors considered by the landscape architects in their evaluation included the following:

- *Landscape Composition:* The arrangement of objects and voids in the landscape that can be categorized by their spatial arrangement. Basic landscape components include vegetation, landform, water and sky. Some landscape compositions, especially those that are distinctly focal, enclosed, detailed, or feature-oriented, are more vulnerable to modification than panoramic, canopied, or ephemeral landscapes.

- *Form, Line, Color, and Texture*: These are the four major compositional elements that define the perceived visual character of a landscape, as well as a facility. Form refers to the shape of an object that appears unified; often defined by edge, outline, and surrounding space. Line refers to the path the eye follows when perceiving abrupt changes in form, color, or texture; usually evident as the edges of shapes or masses in the landscape. Color refers to the perceived hue of elements within the landscape. Texture in this context refers to the visual surface characteristics of an object. Texture in this context refers to the visual surface characteristics of an object. The extent to which form, line, color, and texture of a facility are similar to, or contrast with, these same elements in the existing landscape is a primary determinant of visual impact.

- *Focal Point*: Certain natural or man-made landscape features stand out and are particularly noticeable because of their physical characteristics. Focal points often contrast with their surroundings in color, form, scale or texture and therefore tend to draw a viewer's attention. Examples include prominent trees, mountains and water features. Cultural features, such as a distinctive barn or steeple, can also be focal points. If possible, a proposed facility should not be sited so as to obscure or compete with important existing focal points in the landscape.

- *Order*: Natural landscapes have an underlying order determined by natural processes. Cultural landscapes exhibit order by displaying traditional or logical patterns of land use/development. Elements in the landscape that are inconsistent with this natural order may detract from scenic quality. When a new facility is introduced to the landscape, intactness and order are maintained through the repetition of the forms, lines, colors, and textures existing in the surrounding built or natural environment.

- *Scenic or Recreational Value*: Designation as a scenic or recreational resource is an indication that there is broad public consensus on the value of that particular resource. The particular characteristics of the resource that contribute to its scenic or recreational value provide guidance in evaluating a facility's visual impact on that resource.

- *Duration of View*: Some views are seen as quick glimpses while driving along a roadway or hiking a trail, while others are seen for a more prolonged period of time. Longer duration views of a facility, especially from significant aesthetic resources, have the greatest potential for visual impact.

- *Atmospheric Conditions*: Clouds, precipitation, haze, and other ambient air related conditions affect the visibility of an object or objects. These conditions can greatly impact the visibility and contrast of landscape and facility components, and the design elements of form, line, color, texture, and scale.

- *Lighting Direction*: Backlighting refers to a viewing situation in which sunlight is coming toward the observer from behind a feature or elements in a scene. Front lighting refers to a situation where the light source is coming from behind the observer and falling directly upon the area being viewed. Side lighting refers to a viewing situation in which sunlight is coming from the side of the observer to a feature or elements in a scene. Lighting direction can have a significant effect on the visibility and contrast of landscape and facility elements.

- *Scale*: The apparent size of a proposed facility in relation to its surroundings can define the compatibility of its scale within the existing landscaping. Perception of facility scale is likely to vary depending on the distance from which it is seen and other contextual factors.

- *Spatial Dominance*: The degree to which an object or landscape element occupies space in a landscape, and thus dominates landscape composition from a particular viewpoint.

- *Visual Clutter*: Numerous unrelated built elements occurring within a view can create visual clutter, which adversely impacts scenic quality.

- *Movement*: Moving facility components can make them more noticeable, but in the case of wind turbines, have also been shown to make them appear more functional and visually appealing. Numerous studies have documented that viewers prefer to see wind turbines in motion. The following quote and citations are taken from an on-line summary of perceptional studies of wind farms conducted by the Macaulay Land Research Institute (MLURI, 2010):

> "Motion has also been indicated as a powerful predictor of preference (Gipe, 1993; Thayer & Freeman, 1987). This is a unique feature of wind turbines in comparison with other forms of static structures. People find wind farms that appear to be working by relating this with moving rotors as more attractive than those that do not. Motion is equated with lower perceived visual impact (Gipe, 1993). They are likely to find wind farms visually interesting because of their motion. In this mode, the turbines are perceived as abstract sculptures, arousing interest with their novel, unfamiliar forms and animation (Thayer & Hansen, 1988)."

Copies of the completed rating forms are included in Appendix F of the VIA, and the results of the evaluation process are summarized in VIA Table 8. A summary of the results is contained in Exhibit 24(b)(7) below.

(9) Operational Effects of the Facility (i.e., Shadow Flicker)

To determine operational effects of the Facility, Epsilon Associates, Inc. (2019) conducted a shadow flicker analysis using WindPRO software. The analysis looked at the potential shadow flicker occurrence on nearby potential receptors, identifying the number of potential receptors and predicted annual hours of shadow flicker at each receptor within the Shadow Flicker Study Area.[1] Potential receptors include any known residential structures (both participating and non-participating), schools, office buildings, storefronts, or known public recreation areas (e.g., campgrounds, trailheads within State Forest land) within or adjacent to the Facility Site. Shadow flicker was previously discussed in Exhibit 15(e)(4) and the Shadow Flicker Report is provided as Appendix 15-A to this Application. Below is a summary of the shadow flicker analysis.

Chenango County and the Town of Guilford do not have any shadow flicker regulations applicable to wind turbine operations. Although the State has not adopted shadow flicker limits, in a previous proceeding for the siting of a wind project, the Siting Board established a threshold of 30 hours annually at non-participating residential receptors as a condition to the operation of the facility (see Application of Cassadaga Wind LLC, Order Granting Certificate of Environmental Compatibility and Public Need, With Conditions, Case No. 14-F-0490, dated January 17, 2018; Condition 30). In addition, various states and countries also have adopted a 30 hour annual shadow flicker

[1]The area within a 10-rotor-diameter (i.e., 1580-meter or 5183-foot) radius of proposed turbine locations. Note, the turbine with the largest rotor diameter (General Electric GE158-5.x) was used in calculating the Shadow Flicker Study Area.

threshold. For example, Connecticut Regulation Section 16-50j-95(c) limits the annual duration of shadow flicker to 30 hours at any off-site occupied structure in Connecticut. Likewise, a German court has ruled that 30 hours of actual shadow flicker per year was acceptable at a neighbor's property in Germany (Epsilon, 2019). Consistent with these examples, a design goal of 30 hours per year at non-participating sensitive receptors has been established for the Facility.

The shadow flicker analysis for the proposed Facility used *WindPRO 3.1.633* software and the associated Shadow module, which is a widely accepted modeling software package developed specifically for the design and evaluation of wind power projects. Shadow flicker impacts were analyzed for all four wind turbine models under consideration by the Applicant (see Exhibit 6(a)). Input variables and assumptions used for shadow flicker modeling calculations for the proposed Facility include:

- Latitude and longitude coordinates of the 25 proposed wind turbine sites (provided by the Applicant).
- Latitude and longitude coordinates for all 818 potential receptors located within and adjacent to the Shadow Flicker Study Area. The receptors include residential structures (both participating and non-participating), schools, office buildings, storefronts, and known public recreation areas (e.g., campgrounds, trailheads within State Forest land). The location of each receptor is mapped on Figures 6-2 and 6-3 in the Shadow Flicker Report (Appendix 15-A).
- USGS 1:24,000 topographic mapping and USGS 10-meter resolution DEM data.
- The rotor diameter and hub height for the turbine models under consideration for the Facility.
- Annual wind rose data (provided by the Applicant) to determine the approximate directional frequency of rotor orientation throughout the year.
- Monthly sunshine probabilities from a publicly available historical dataset for Binghamton, New York, from the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information.

A summary of the projected shadow flicker at each of the receptors located within or adjacent to the Shadow Flicker Study Area is presented in Table 24-1, which groups anticipated shadow flicker exposure into ranges grouped by hours per year. See the full Shadow Flicker Report in Appendix 15-A for more specific results by receptor, including Appendix B of the Shadow Flicker Report which presents anticipated shadow flicker exposure in hours per year, and Appendix D of the Shadow Flicker Report which presents anticipated shadow flicker exposure in number of days per year and maximum minutes per day.

Table 24-1. Predicted Shadow Flicker Summary by Turbine Model

Predicted Annual Shadow Flicker	Number of Receptors by Turbine Model[2]			
	General Electric GE158-5.x[1]	Siemens Gamesa SG145-4.x	Nordex N149/4.0-4.8	Vestas V150-5.6
0 hours	492	562	533	524
<10 hours	202	156	179	188
10-30 hours	110	89	95	94
>30 hours	14	11	11	12

[1]The GE 158-5.x contained the largest rotor dimeter at 158 meters and represents the most conservative analysis.

The General Electric GE158-5.x turbine represents the largest turbine model under consideration and would result in the greatest amount of annual duration of shadow flicker among all of the turbines included in the analysis. The preliminary modeling results showed that 14 receptors would be expected to have over 30 hours of shadow flicker per year. Eight of the 14 receptors exceeding 30 hours of shadow flicker per year are on participating parcels, the remaining six are on non-participating parcels. The maximum expected annual duration of shadow flicker at a receptor on a non-participating parcel is 58 hours 7 minutes.

This analysis is conservative in several respects. First, modeling locations were treated as “greenhouses” (i.e., did not consider the actual location and orientation of windows) and the model did not consider the screening effects associated with existing obstacles such as barns and vegetation. In addition, many of the modeled shadow flicker hours are expected to be low in intensity. They would occur during the early morning or late afternoon hours when the sun is low in the sky. As the sun sinks below the horizon, more of its light is scattered by the atmosphere, which has the effect of dampening its brightness and therefore reducing its ability to cast dark shadows (EMD, 2013).

More generally, as discussed in the Shadow Flicker Report, shadow flicker impacts are generally an annoyance issue and not a health concern. According to the Epilepsy Foundation, “Generally, flashing lights most likely to trigger seizures are between the frequency of 5 to 30 flashes per second (Hertz)” (Epilepsy Foundation, 2017). Of the proposed wind turbines under consideration for this Facility, the maximum rotational speed of 13.6 revolutions per minute (rpm) corresponds to a frequency of 0.7 Hz, which is well below the frequency identified by the Epilepsy Foundation as a potential concern.

[2] Results presented in this table reflect the highest anticipated hub height for each turbine model considered.

In summary, significant adverse shadow flicker impacts are not anticipated. Of the 818 receptors initially studied, only 14 receptors were predicted to exceed the 30-hour threshold, six of which are non-participating receptors. While the Applicant seeks to minimize shadow flicker exposure at the homes in the area as much as possible, it is not possible to eliminate shadow flicker and still meet all other design constraints. A discussion of mitigation options is provided in Exhibit 15 and the Shadow Flicker Report (Appendix 15-A).

(10) Measures to Mitigate for Visual Impacts

Mitigation options are limited given the nature of the Facility and its siting criteria (very tall structures typically located in open fields and/or at the highest locally available elevations). However, in accordance with NYSDEC Program Policy: Assessing and Mitigating Visual Impacts, DEP-00-2 (NYSDEC, 2000) (hereinafter “NYSDEC Visual Policy”), various mitigation measures were considered. These include the following:

A. Professional Design. All turbines will have uniform design, speed, color, height and rotor diameter. Turbines will be mounted on conical steel towers that minimize visual clutter. The placement of any advertising devices (including commercial advertising, conspicuous lettering, or logos identifying the Facility owner or turbine manufacturer) on the turbines will be prohibited, although certain small mandatory warning and related signs will be located on or adjacent to the turbines at ground level.

B. Screening. Due to the height of individual turbines and the geographic extent of the proposed Facility, screening of individual turbines with earthen berms, fences, or planted vegetation will generally not be effective in reducing Facility visibility or visual impact. Additionally, based on site-specific field investigation both the POI and collection substation are not anticipated to have significant visual effect on nearby sensitive receptors. Therefore, visual screening is not anticipated to be necessary.

C. Relocation. Because of the limited number of suitable locations for turbines within the Facility Site, and the variety of viewpoints from which the Facility can be seen, turbine relocation will generally not significantly alter visual impact. Moving individual turbines to less windy sites would not necessarily reduce impacts but could affect the productivity and viability of the Facility. Where visible from sensitive resources within the visual study area, views of the Facility are highly variable and include different turbines location from different vantage points. Therefore, turbine relocation would generally not be effective in mitigating visual impacts. Additionally, the Facility layout has been designed to accommodate various setbacks from roads and residences. Options for relocation of individual Facility components are constrained by compliance with these setbacks.

D. Camouflage. The white/off white color of wind turbines (as mandated by the FAA to avoid daytime lighting) generally minimizes contrast with the sky under most conditions. This is demonstrated by simulations prepared under a variety of sky conditions. Consequently, it is recommended that this color be utilized on the High Bridge Wind Project. The size and movement of the turbines prevents more extensive camouflage from being a viable mitigation alternative (i.e., the turbines cannot be made to look like anything else). Nielsen (1996) notes that efforts to camouflage or hide wind farms generally fail, while Stanton (1996) feels that such efforts are inappropriate. She believes that wind turbine siting "*is about honestly portraying a form in direct relation to its function and our culture; by compromising this relationship, a negative image of attempted camouflage can occur*." Other components of the Facility will be designed to minimize contrast with the existing character in the Facility Site. For instance, new road construction will be minimized by utilizing existing farm or other lanes wherever possible.

E. Low Profile. A significant reduction in turbine height is not possible without significantly decreasing power generation. Less generating capacity (resulting from smaller turbines) could threaten the Facility's economic feasibility. To avoid generation losses, use of smaller turbines would require that additional turbines be constructed. Several studies have concluded that people tend to prefer fewer larger turbines to a greater number of smaller ones (Thayer and Freeman, 1987; van de Wardt and Staats, 1988). There will be minimal visual impact from the electrical collection system because the collection system will be installed underground. If overhead collection line sections are necessary, the poles will be relatively low profile and would likely have limited visibility within the visual study area. However, depending on the location of potential overhead sections and the sensitivity of proximate resources, additional visual analysis may be warranted.

F. Downsizing. Reducing the number of turbines could reduce visual impact from certain viewpoints, but from most locations within the visual study area where more than one turbine is visible, the visual impact of the Facility would change only marginally. Additionally, the elimination of turbines could significantly reduce the socioeconomic benefits of the Facility and reduce the Facility's ability to assist the State in meeting its energy policy objectives and goals.

G. Alternate Technologies. Alternate technologies for comparable power generation, such as gas-fired or solar-powered facilities, would have different, and perhaps more significant, visual and other impacts than wind power. Viable alternative wind power technologies (e.g., vertical axis turbines) that could reduce visual impacts do not currently exist in a form that could be used on a commercial/utility-scale project.

H. Non-specular Materials. Non-specular conductors will be considered for use on the proposed generator lead line, and the overhead portions of the electrical collection lines, if any. Non-reflective paints and finishes will be used on the wind turbines to minimize reflected glare.

I. Lighting. Medium intensity red strobes will be used at night, rather than white strobes or steady burning red lights. Fixtures with a narrow beam path will be utilized as a means of minimizing the visibility/intensity of FAA warning lights at ground-level vantage points. Lighting at the substations and O&M facility will be kept to a minimum and turned on only as needed, either by switch or motion detector.

J. Maintenance. The turbines and turbine sites will be maintained to ensure that they are clean, attractive, and operating efficiently. Research and anecdotal reports indicate that viewers find wind turbines more appealing when the rotors are turning (Pasqualetti et al., 2002; Stanton, 1996). In addition, the Facility developer will establish a decommissioning fund to ensure that if the Facility goes out of service and is not repowered/redeveloped, all visible above-ground components will be removed.

K. Offsets. Correction of an existing aesthetic problem within the viewshed is a viable mitigation strategy for wind power projects that result in significant adverse visual impact. Historic structure restoration/maintenance activities could be undertaken to offset potential visual impacts on cultural resources.

(11) Description of Visually Sensitive Resources to be Affected

Visually Sensitive Resources (VSRs) within the visual study area were identified in accordance with the NYSDEC Visual Policy and the requirements of Article 10, as described in 16 NYCRR § 1001.24(b)(4). In addition, EDR identified other resources that could be considered visually sensitive based on the type or intensity of use they receive. The categories of VSRs that would be typically required for consideration in VIAs include the following:

- Properties of Historic Significance
- Designated Scenic Resources
- Public Lands and Recreational Resources
- High Use Public Areas
- Locally Identified Resources.

To identify VSRs within the visual study area, EDR consulted a variety of data sources including geospatial resources provided by State, County, Town, and Village entities, and stakeholders. A complete documentation of resources used in the identification of VSRs is included in the Literature Cited section of the VIA.

In addition, per the requirements set forth in 16 NYCRR § 1001.24(b)(4) as well as the Public Scoping Statement (PSS) for the Facility, the Applicant conducted a systematic program of public outreach to assist in the identification of visually sensitive resources. Copies of the correspondence sent to 75 state, county, town, city, and village stakeholders, and the responses received, are included as Appendix F of the VIA.

(b) Viewshed Analysis

The VIA (Appendix 24-A) includes identification of locations within the visual study area where it may be possible to view the proposed wind turbines and other proposed above-ground facilities from ground-level vantage points. This analysis includes identifying potentially visible areas on viewshed maps. The methodology employed is described below.

(1) Viewshed Maps

Viewshed maps define the maximum area from which any turbine within the completed Facility could potentially be seen within the visual study area during both daytime and nighttime hours based on a direct line of sight and ignoring the screening effects of existing vegetation and structures. Separate maps were prepared showing both the results of the viewshed analysis based on the screening effect of topography alone, and the combined screening effect of mapped forest vegetation, topography, and structures. The viewshed analyses were based on maximum blade tip height and FAA warning light height. These maps are presented on ArcGIS® World Topographic mapping (VIA Figure 5.1-1). Additionally, results of the viewshed analysis are also shown on maps that depict visually sensitive sites, viewpoint locations, near-foreground, foreground, midground and background distances, and LSZs (Appendix A of the VIA).

With respect to line of sight profiles, note that the computer model program defines the viewshed (when evaluating topography only) by reading every cell of the DEM data and assigning a value based upon the existence of a direct, unobstructed line of sight to turbine location/elevation coordinates from observation points throughout the entire visual study area. Therefore, for the purposes of the Article 10 Application, the viewshed analyses also serves to document the line of sight profiles for resources of statewide concern.

Potential wind turbine visibility, as indicated by the viewshed analyses, is illustrated in VIA Figure 5.1-1 and summarized in Table 24-2, below. Based only on the screening provided by topography, the blade tip viewshed analysis indicates some portion of the proposed turbine array could potentially be visible from approximately 55% of the visual study area. This "worst case" assessment of potential visibility indicates the area where any portion of any turbine could potentially be seen, without considering the screening effect of existing vegetation and structures. Areas where there is no possibility of seeing the Facility include large portions of the river valleys associated with the southern portions of the Chenango and Susquehanna Rivers, much of Interstate 88 where it intersects the visual study area, and valleys associated with smaller creeks in the visual study area, such as Thompson Creek, Indian Creek, and Sand Hill Creek. Based solely on the results of topographic viewshed analysis, visibility of the Facility is most concentrated within the Facility Site and along the ridgetops throughout the visual study area. Additionally, where the river valleys are aligned with the Facility, outward views become available. This is particularly the case in the northern reaches of the Chenango River valley, in and around the City of Norwich. As indicated in VIA Appendix C, 202 of the 246 identified VSRs within the visual study area theoretically could have views of some portion of the Facility (based on maximum blade tip height and screening provided by topography alone).

Areas of potential nighttime visibility, as indicated by the FAA topographic viewshed analysis (VIA Figure 5.1-1, Sheet 2; and Table 24-2, below) include approximately 47.8% of the visual study area. This analysis indicates that the potential visibility of FAA warning lights at a height of 418 feet will generally be concentrated in the same areas where daytime blade-tip height visibility was indicated. As stated above, this topographic analysis presents a "worst case" assessment of potential nighttime visibility that does not consider the screening effect of existing vegetation and structures.

Factoring vegetation and structures into the viewshed analysis significantly reduces potential Facility visibility throughout the visual study area (VIA Figure 5.1-1, Sheets 3 and 4). The screening provided by structures and vegetation, in combination with topography, will serve to block daytime views of the Facility from approximately 90.5% of the visual study area (i.e., the Facility would likely be visible from 9.5% of the visual study area). Areas of potential nighttime visibility, as indicated by FAA DSM viewshed analysis, are limited to approximately 7.4% of the visual study area. Based on the results of the DSM viewshed analysis, visibility occurs along the Unadilla River and within the foreground distance zone (1.5 miles) of the turbines. Minor visibility is also indicated in the City of Norwich and the Villages of Gilbertsville, Oxford, Sidney, and the outskirts of Bainbridge. Views from these population centers are primarily concentrated within higher elevation areas and areas of rising topography, and along street corridors that provide open views toward the Facility. However, areas of actual visibility are anticipated to be more limited than indicated by the DSM viewshed analysis, due to the slender profile of the turbines, the effects of distance, and the intermittent nature of the views within these population centers. As indicated in Appendix C of the VIA, 166 of the 246 identified VSRs within the visual study area theoretically could have views of some portion of the Facility (based on maximum blade tip height and screening provided by vegetation, topography and structures).

Table 24-2. Summary of Turbine Viewshed Results for the Visual Study Area

Number of Turbines Visible	Visual Study Area[1] Viewshed Results							
	Blade Tip Topography Only		Blade Tip Topography, Vegetation, and Structures		FAA/Nacelle Topography Only		FAA/Nacelle Topography, Vegetation, and Structures	
	Square Miles	% of Study Area	Square Miles	% of Study Area	Square Miles	% of Study Area	Square Miles	% of Study Area
0	210.8	45.0	423.9	90.5	244.7	52.2	433.7	92.6
1-5	47.3	10.1	21.7	4.6	54.8	11.7	20.4	4.4
6-10	48.8	10.4	11.4	2.4	51.7	11.0	8.5	1.8
11-15	42.3	9.0	6.2	1.3	41.9	9.0	3.8	0.8
16-20	35.3	7.5	3.2	0.7	32.3	6.9	1.3	0.3
21-25	83.7	17.9	1.9	0.4	42.9	9.2	0.5	0.1
Total Visible	**257.5**	**55.0**	**44.3**	**9.5**	**223.6**	**47.7**	**34.5**	**7.4**

[1]The visual study area includes approximately 468.3 square miles, or approximately 299,697 acres.

The VIA contains further detail regarding potential visibility from within the individual LSZs in Section 5.1.1.

(2) Viewshed Methodology

Wind Turbine Viewshed Analysis

Topographic viewshed maps for the proposed turbines were prepared using 2-meter lidar digital elevation model (DEM) data for the visual study area, the location and height of all proposed turbines (VIA Figure 2.2-1), an assumed viewer height of 5.6 feet above ground level (AGL), and ESRI ArcGIS® software with the Spatial Analyst extension. Two topographic viewsheds were mapped, one to illustrate “worst case” daytime visibility (based on a maximum blade tip height of 671 feet AGL, and the other to illustrate potential visibility of FAA obstruction warning lights at night. The FAA warning light viewshed was based on a height of 418 feet AGL, and the assumption that all turbines would be equipped with the lights as required by the FAA for turbines exceeding 499 feet AGL.

As previously noted, the ArcGIS program defines the viewshed by reading every cell of the DEM data and assigning a value based upon the existence of a direct, unobstructed line of sight to the proposed turbine locations from observation points throughout the visual study area. The resulting viewshed maps define the maximum area from which any portion of any turbine in the completed Facility could potentially be seen within the visual study area during both daytime and nighttime hours based on a direct line of sight and ignoring the screening effects of existing vegetation and structures. A turbine count analysis was also performed to determine how many wind turbines are potentially visible from any given point within the study area. The results of this analysis were then grouped by number of turbines potentially visible and presented on a viewshed map.

Because the screening provided by vegetation and structures is not considered in this analysis, the topographic viewshed represents a true "worst case" assessment of potential Facility visibility. Topographic viewshed maps assume that no trees or structures exist and therefore are very accurate in predicting where visibility will *not* occur due to topographic interference. However, they are less accurate in identifying areas from which the Facility could actually be visible. Trees and buildings can limit or eliminate visibility in areas indicated as having potential Facility visibility in the topographic viewshed analysis.

In order to more accurately identify areas with potential Facility visibility, a second-level analysis was conducted to incorporate the screening effect of structures and vegetation by utilizing the Federal Emergency Management Agency (FEMA) lidar data for the Susquehanna Basin (2007), NYS GPO Madison Otsego 2015, and Delaware County (2007). Lidar is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth to generate precise, three-dimensional information about the shape of the Earth and its surface characteristics (National Oceanic and Atmospheric Administration [NOAA], 2018). A digital surface model (DSM) of the visual study area was created from these lidar data, which includes the elevations of buildings, trees, and other objects large enough to be resolved by lidar technology. Henceforth, this type of viewshed analysis will be referred to as a DSM viewshed analysis, which considers the screening effects of topography, vegetation, and structures.

To account for clearing of forest vegetation that would be required for Facility construction, the DSM was modified to reflect the bare-earth elevation within an approximated limit of clearing around proposed Facility components. This was based on generalized assumptions that areas within 265 feet of turbines, as well as areas within a 100-foot wide corridor along access roads, and a 70-foot wide corridor along collection lines, would be cleared of forest vegetation and maintained in an open condition. Additionally, to account for features such as local distribution lines (the DSM would project these lines to ground level, creating screening features), thin hedgerows, and other minor screening features, a corridor of 70 feet along all public roads was cleared to conservatively eliminate these elements. The modified DSM was then used as a base layer for the second-level viewshed analysis. Once the viewshed analysis was complete, a conditional statement was used to set Facility visibility to zero in locations where the DSM elevation exceeded the bare earth elevation by six feet or more. This was done for two reasons:

1) because in locations where trees or structures are present in the DSM, the viewshed would reflect visibility from a vantage point on the tree tops or building roofs, which is not the intent of this analysis and 2) to reflect the fact that ground-level vantage points within buildings or areas of vegetation exceeding six feet in height will generally be screened from views of the Facility.

As with the topographic viewshed analysis previously described, this second-level DSM viewshed analysis was conducted for the proposed wind turbines twice, once to illustrate daytime visibility based on the maximum height of 671 feet above existing grade and once to illustrate potential visibility of FAA warning lights based on an approximate FAA warning light height of 418 feet above existing grade.

A DSM viewshed analysis was also conducted to further evaluate potential visibility of the proposed collection and POI substations based on a maximum structure height of 55 feet.

Because it accounts for the screening provided by structures and vegetation, this second-level analysis is a more accurate representation of potential Facility visibility. However, it is worth noting that because certain characteristics of the turbines and substation that may influence visibility (color, narrow profile, distance from viewer, etc.) are not taken into consideration in the viewshed analyses, being located within the DSM viewshed does not necessarily equate to actual Facility visibility.

(3) Sensitive Viewing Areas

In accordance with standard visual impact assessment practice in New York State, visually sensitive resources were identified in accordance with NYSDEC Visual Policy, which defines specific types of properties as visually sensitive resources of statewide significance. The types of resources identified in the NYSDEC Visual Policy are consistent with the types of resources identified in 16 NYCRR § 1000.24(b)(4). These include: landmark landscapes; designated wild, scenic or recreational rivers; forest preserve lands, designated scenic vistas, conservation easement lands, scenic byways designated by the federal or state governments; designated scenic districts and scenic roads; designated Scenic Areas of Statewide Significance; state parks or historic sites; State/National Register of Historic Places (S/NRHP) sites; areas covered by scenic easements, public parks or recreation areas; locally designated historic or scenic districts and scenic overlooks; and high-use public areas.

To identify visually sensitive resources within the visual study area, EDR consulted a variety of data sources, including: digital geospatial data (shapefiles) obtained primarily through the NYS GIS Clearinghouse or the ESRI ArcGIS® software databases; numerous national, state, county, and local agency websites as well as websites specific to identified resources; the DeLorme Atlas and Gazetteer for New York State; USGS 7.5-minute topographical maps; and web mapping services such as Google Maps. Aesthetic resources of national and statewide significance were identified within a 10-mile radius of the Facility Site. S/NRHP-eligible sites, as well as locally significant aesthetic resources and areas of intensive land use were identified within a 5-mile radius of the Facility Site. The complete inventory of visually sensitive resources is presented in Appendix C of the VIA. Their locations are shown in Appendix A of the VIA.

In addition, per the requirements set forth in 16 NYCRR § 1001.24(b)(4) as well as the PSS for the Facility, the Applicant conducted a systematic program of public outreach to assist in the identification of visually sensitive resources. Copies of the correspondence sent by the Applicant to 75 state, county, town, city and village stake holders as part of this process, as well as the responses received, are included as Appendix F of the VIA. This outreach included the following:

- The Applicant distributed a request on February 19, 2019 for information on possible VSRs to municipal planning representatives, town and village historians, local and regional chambers of commerce, along with multiple local environmental groups. For a full distribution list of the 75 identified contacts please see Appendix F of the VIA.
- The Applicant received three responses to this outreach and added an additional 14 locally identified VSRs to be included in the VIA inventory and analysis. The additional resources identified through the consultation process are included in Table 3.6-1.
- The Applicant has initiated consultation with the New York State Office of Parks, Recreation, and Historic Preservation (NYSOPRHP) in order to evaluate the Facility's potential effect on historic resources listed or eligible for listing in the S/NRHP (EDR, 2019). This analysis is on-going at the time of this Application and if additional resources are identified through the process, NYSOPRHP can request further analysis at such a time.

As a result of the database review and outreach effort described above, VSRs of national, regional and statewide significance, as well as locally significant aesthetic resources, were identified within the visual study area. The mapped locations of inventoried VSRs are shown in VIA Figure 5.2-1 and in the composite overlay map included in Appendix A of the VIA. Table 3.6-1 includes a summary of the identified VSRs within the visual study area.

All the visually sensitive sites that were identified as a result of the research, stakeholder outreach, and subsequent consultation described above are included in Appendix C of the VIA and summarized in Table 24-3, below.

Table 24-3. Total Visually Sensitive Resources Identified in the Visual Study Area

Visually Sensitive Resources	Total Number of Resources within the Visual Study Area [3]
Properties of Historic Significance [6 NYCRR 617.4 (b)(9)]	**Total 106**
National Historic Landmarks (NHL)	0
Properties Listed on National or State Registers of Historic Places (S/NRHP)	35
Properties Eligible for Listing on NRHP or SRHP	71
National/State Historic Sites	0
Designated Scenic Resources	**Total 0**
Rivers Designated as National or State Wild, Scenic or Recreational	0
Adirondack Park Scenic Vistas [Adirondack Park Land Use and Development Map]	0
Sites, Areas, Lakes, Reservoirs or Highways Designated or Eligible for Designation as Scenic [ECL Article 49 Title 1 or equivalent]	0
Scenic Areas of Statewide Significance Article 42 of Executive Law]	0
Other Designated Scenic Resources (Easements, Roads, Districts, and Overlooks)	0
Public Lands and Recreational Resources	**Total 67**
National Parks, Recreation Areas, Seashores, and/or Forests [16 U.S.C. 1c]	0
National Natural Landmarks [36 CFR Part 62]	0
National Wildlife Refuges [16 U.S.C. 668dd]	0
Heritage Areas [Parks, Recreation and Historic Preservation Law Section 35.15]	0
State Parks [Parks, Recreation and Historic Preservation Law Section 3.09]	1
State Nature and Historic Preserve Areas [Section 4 of Article XIV of the State Constitution]	0
State Forest Preserves [NYS Constitution Article XIV]	0
Other State Lands	0
Wildlife Management Areas & Game Refuges	0
State Forests	16
State Boat Launches/Waterway Access Sites	8
Designated Trails	6
Palisades Park [Palisades Interstate Park Commission]	0
Local Parks and Recreation Areas	15
Publicly Accessible Conservation Lands/Easements	2
Rivers and Streams with Public Fishing Rights Easements	3
Named Lakes, Ponds, and Reservoirs	16
High-Use Public Areas	**Total 69**
State, US, and Interstate Highways	10
Cities, Villages, Hamlets	37
Schools	22
Other Resources Identified by Stakeholders	**Total 4**
Total Number of Visually Sensitive Resources in the Visual Study Area	**246**

[3] Five VSRs identified by stakeholders occur outside the visual study area and, therefore, are not included in this table or the determination of Facility visibility. However, they are inventoried in Appendix C of the VIA.

(4) Viewpoint Selection

16 NYCRR § 1001.24(b)(4) includes the requirement that "the applicant shall confer with municipal planning representatives, DPS, DEC, OPRHP, and where appropriate, APA in its selection of important or representative viewpoints." Building on the consultation with municipal representatives and stakeholders to identify visually sensitive sites (as described above and in Section 3.6 of the VIA), EDR conducted additional outreach to agency staff and stakeholder groups to determine an appropriate set of viewpoints for the development of visual simulations. Copies of the correspondence sent by EDR as part of this process, as well as responses received from stakeholders, is included as Appendix F of the VIA. This outreach included:

On May 14, 2019, in accordance with 16 NYCRR § 1001.24(b)(4), EDR distributed a memorandum entitled "High Bridge Wind LLC (DPS Case 18-F-0262) Recommended Viewpoints - Official Request for Information" to 75 state, county, town, city, and village representatives and stakeholders (see Appendix F of the VIA). This memo included: a summary of research and consultation undertaken as part of the VIA to date; description of the field review/photography for the Facility; a rationale for viewpoint selection; and, recommendations for 15 viewpoints to be considered for the preparation of visual simulations. The rationale provided for viewpoint selection included the following factors:

- Providing representative views from the locally identified LSZs within the visual study area
- Providing representative views from the designated Distance Zones within the visual study area. Because of the forested nature of the visual study area, obtaining near foreground views was a challenge. Field photography was focused on obtaining foreground and middle ground views which included multiple turbines.
- The locations of VSRs within the visual study area, including areas/sites recommended by the DPS and other stakeholders during review of the Facility's PSS.
- Locations that are predicted to have visibility of a large number of turbines based on viewshed analysis.
- The availability of open views towards the proposed Facility as determined by field reconnaissance.

In response to the May 14, 2019 request for public input (described above) EDR was contacted by the City of Norwich Planning and Community Development Department. The City of Norwich determined that the viewpoint selection was adequate and did not recommend any views beyond those recommended in the viewpoint selection outreach letter. On July 2, EDR received an email from NYSDPS stating that it had not identified any additional locations to add to the inventory. No other responses to the May 14, 2019 outreach letter were received.

Based on the outcome of stakeholder and agency consultation, 15 viewpoints were selected for the development of visual simulations. These viewpoints were selected based upon the following criteria:

- They provide open views of proposed turbines or provide representative views of the screening effects of vegetation, topography, or structures from selected areas;
- They illustrate Facility visibility from VSRs;
- They illustrate typical views from LSZs;
- They illustrate typical views of the proposed Facility that will be available to representative viewer/user groups;
- They illustrate typical views of different numbers of turbines, from a variety of viewer distances, and under different lighting/sky conditions, to illustrate the range of visual change that will occur with the Facility in place; and
- The photos obtained from the viewpoints display appropriate composition, lighting, and exposure.

Locational details and the criteria for selection of each simulation viewpoint are summarized in Table 24-4 below:

Table 24-4. Viewpoints Selected for the Production of Simulations

Viewpoint Number	Location and/or Visually Sensitive Resource	LSZ Represented	Viewer Group Represented	Viewing Distance[1]	View Orientation[2]
1	Interstate Route 88	Transportation Corridor	Through-Travelers/Commuters	11.8[4]	N
5	Sidney Historic District/Sidney Veterans Memorial Park	Rural Residential/Agricultural	Local Residents, Tourists/Recreational Users	6.0	NNW
29	Furnace Hill Road	Rural Residential/Agricultural	Local Residents	1.7	N
30	High Bridge Road	Rural Residential/Agricultural	Local Residents	1.3	NE
33	NYS Route 51	City/Village	Local Residents, Through-Travelers/Commuters	1.3	WSW
34	Furnace Hill Road	Rural Residential/Agricultural, Open Water	Local Residents, Tourists/Recreational Users	1.0	NNE to ENE
35	County Road 37	Rural Residential/Agricultural	Local Residents	2.8	ESE
41	North Pond Road (County Road 37)	Rural Residential/Agricultural, Open Water	Local Residents, Tourists/Recreational Users	1.0	NE
42	County Road 36	Rural Residential/Agricultural	Local Residents	0.8	NNW
58	NYS Route 12	Rural Residential/Agricultural	Local Residents, Through-Travelers/Commuters	3.9	ESE
66	Gibbon Road	Rural Residential/Agricultural	Local Residents	3.2	SSE
70	East Side Road	Rural Residential/Agricultural	Local Residents	9.8	SW
74	NYS Route 23	City/Village	Local Residents, Through-Travelers/Commuters	5.2	SSW
80	St. Paul Cemetery	City/Village	Local Residents, Tourists/Recreational Users	7.5	SSE
81	NYS Route 8	Rural Residential/Agricultural	Local Residents, Through-Travelers/Commuters	7.6	SSW

[1]Distance from viewpoint to nearest visible turbine (in miles)
[2]N = North, S = South, E = East, W = West

(5) Photographic Simulations

To show anticipated visual change associated with the proposed Facility, high-resolution computer-enhanced image processing was used to create realistic photographic simulations of the proposed turbines, met towers, substations, O&M facility and associated clearing from each of the 15 selected viewpoints. The photographic simulations are presented in Appendix D of the VIA.

[4] The nearest visible turbine from this location is not the nearest geographic turbine position relative to the viewer.

Due do the typical height of individual turbines and the geographic extent of a given wind power project, mitigation measures such as screening of individual turbines with earthen berms, fences, or planted vegetation will generally not be effective in reducing visibility. Therefore, additional simulations specific to mitigation were not prepared.

(6) Simulation Rating and Assessment of Visual Impact

As discussed in Exhibit 24(a)(8) above, five professionals with experience in the visual/aesthetics field (three in-house and two independent) evaluated the visual impact of the proposed Facility. Utilizing 11 x 17-inch printed and digital color prints of the 15 visual simulations described above, the landscape architects (LAs) reviewed the existing and proposed views, evaluated the contrast/compatibility of the Facility with various components of the landscape (landform, vegetation, land use, water, sky, and viewer activity), and assigned quantitative visual contrast ratings on a scale of 0 (insignificant) to 4 (strong). The composite contrast score assigned by each LA was calculated for each viewpoint, and an average score for each viewpoint was determined. Copies of the completed rating forms are included in Appendix F of the VIA. The methodology for the rating panel exercise is described in detail in Exhibit 24(a)(8).

The average score of the landscape components evaluated by each landscape architect was calculated for each viewpoint. The results of this process are summarized below in Table 24-5.

Table 24-5. Summary of Results of Contrast Rating Panel Review of Simulations

Viewpoint Number	Distance to Nearest Visible Turbine (mi)	Distance Zone	Landscape Similarity Zone	Viewer Groups			Contrast Rating Scores[2]						
				Local Residents	Through Travelers/ Commuter	Tourists/ Recreation	#1	#2	#3	#4	#5	Average	Contrast Rating Result
1	11.8	Background	Transportation Corridor		●		0.0	0.0	0.0	0.0	0.0	0.0	Insignificant
5	6.0	Background	Rural Residential / Agricultural	●		●	0.0	0.0	0.0	0.0	0.3	0.1	Insignificant
29	1.7	Middle Ground	Rural Residential / Agricultural / Forest	●			2.7	1.3	2.7	2.1	2.4	2.2	Moderate
30	1.3	Foreground	Rural Residential / Agricultural	●			2.8	1.8	2.7	2.3	3.4	2.6	Moderate / Appreciable
33	1.3	Foreground	City / Village / Forest	●	●		2.2	1.5	2.2	1.8	2.2	2.0	Moderate
34	1.0	Foreground	Rural Residential/ Agricultural, Open Water	●		●	3.1	1.9	2.9	3.6	3.3	3.0	Appreciable
35	2.8	Middle Ground	Rural Residential / Agricultural	●			2.4	0.8	2.0	1.4	2.6	1.8	Moderate
41	1.0	Foreground	Rural Residential / Agricultural, Open Water	●		●	3.3	1.8	3.7	2.2	4.0	3.0	Appreciable
42	0.8	Foreground	Rural Residential / Agricultural	●			2.8	1.6	3.4	3.1	2.8	2.7	Moderate / Appreciable
58	3.9	Middle Ground	Rural Residential / Agricultural	●	●		1.8	0.9	2.4	1.7	2.2	1.8	Moderate
66	3.2	Middle Ground	Rural Residential / Agricultural	●			2.2	1.1	2.0	2.0	2.0	1.9	Moderate
70	9.8	Background	Rural Residential / Agricultural / Forest	●		●	0.0	0.0	0.5	0.0	0.0	0.1	Insignificant
74	5.2	Background	City / Village	●	●		0.4	0.1	2.0	1.5	0.4	0.9	Minimal
80	7.5	Background	City / Village	●		●	1.2	0.0	1.7	1.3	1.0	1.0	Minimal
81	7.6	Background	Rural Residential / Agricultural	●	●		0.3	0.0	1.9	1.9	0.0	0.8	Minimal
Total Average Contrast Rating Scores							1.7	0.9	2.0	1.7	1.8	1.6	Minimal / Moderate

[2]Contrast Rating Scale: 0.0 - 0.4 (Insignificant), 0.5 – 0.9 (Insignificant/Minimal), 1 – 1.4 (Minimal), 1.5 – 1.9 (Minimal/Moderate), 2 - 2.4 (Moderate), 2.5 – 2.9 (Moderate/Appreciable), 3 – 3.4 (Appreciable) 3.5 – 3.9 Appreciable/Strong), 4 (Strong).

As Table 24-5 indicates, the average overall composite contrast ratings for the 15 visual simulations (Appendix D of the VIA) ranged from 0.0 (Insignificant) to 3.0 (Moderate/Appreciable). The results of this evaluation are summarized as follows.

Rural Residential/Agricultural LSZ (Viewpoints 5, 29, 30, 34, 35, 41, 42, 58, 66, 70, & 81)

Simulations of the Facility from viewpoints located within the Rural Residential/Agricultural LSZ received average contrast rating scores that ranged from 0 for Viewpoint 5, to 3.0 for Viewpoint 34. Simulations within the Rural Residential/Agricultural LSZ received an overall average contrast rating of 1.7, which indicates a minimal to moderate level of impact can be expected throughout this LSZ. The low average contrast rating for Viewpoint 5 is largely attributable to the distance of the viewer from the Facility as well as the screening provided by intervening topography and vegetation, which will conceal views of the proposed turbines even during leaf-off/winter conditions. Comments from the rating panel indicated that the turbines were indiscernible from this location and would not be noticed by the viewer unless being actively searched for. Viewpoint 34 and 41 received highest average contrast rating of 3.0 due largely to the proximity of the turbines to the viewer, the number of turbines visible, and the turbines' line, form, and scale contrast with existing features. Under these conditions the turbines become the dominant features of the landscape and focal points in the view.

City/Village LSZ (Viewpoint 33, 74, & 80)

Views of the proposed Facility will be extremely limited from the City/Village LSZ due to the distance of the turbines from population centers, and/or the abundance of man-made features and surrounding vegetation and hills that effectively in screen views from these areas. Simulations from viewpoints located within the City/Village LSZ received ratings from individual panel members that ranged from 0.0 to 2.2, and average contrast rating scores that ranged from 0.9 at Viewpoint 74 to 2.0 at Viewpoint 33. Simulations within the City/Village LSZ received an overall average contrast rating of 1.3, which indicates a minimal to moderate level of impact can generally be expected in this LSZ within the APE. The low contrast rating received by Viewpoint 74 can largely be attributed to the distance of the viewpoint from the proposed Facility as well as the dominance of man-made elements in the foreground that typify City/Village areas. Viewpoint 33 received a higher average contrast rating of 2.0 due largely to the proximity of the viewpoint to the Facility and the contrast in scale and form of the turbines with existing landscape elements in the view. However, in most cases viewshed analysis and field review indicates that open views from this LSZ will be very limited, and will usually feature the Facility in the background, where it will be less noticeable to the viewer and less likely to dominate the view. The presence of existing manmade and utility infrastructure within this LSZ further mitigates the contrast presented by the Facility.

Open Water LSZ (Viewpoints 34 & 41)

Unscreened views of the Facility from shorelines adjacent to open water are very rare due to lack of public access and/or screening provided by trees and hills that typically surround waterbodies within the study area. Simulations from viewpoints that include prominent waterbodies (also within the Rural Residential/Agricultural LSZ) received average contrast rating scores of 3.0 at Viewpoints 34 and 41, which indicates an appreciable level of impact can be expected in portions of this LSZ with foreground views of the Facility. The high contrast ratings received by the viewpoints within this LSZ can be attributed to the proximity of the viewpoints to the Facility, the number of turbines visible, and the high degree of scale contrast between the turbines and the existing landscape features. In both instances the presence of the waterbody did not enhance Facility visibility but may have increased overall scenic quality and Facility contrast.

Transportation Corridor LSZ (Viewpoint 1)

The viewpoint located within the Transportation Corridor LSZ (Viewpoint 1) is a representative example of the limited views toward the Facility that will be available from Interstate Route 88. Viewpoint 1 is one of the few open views along this transportation corridor that will have views of the Facility, and received an overall contrast rating score of 0, which indicates an insignificant level of impact can be expected throughout this LSZ. The low contrast rating received by Viewpoint 1 can be attributed to the distance of the viewpoint from the Facility, the fleeting nature of the view, variation in the surrounding landscape types that border the corridor, and the degree of visual clutter in the existing view. In general, views within this LSZ are characterized by the dominance of roadside infrastructure in the foreground and high-speed travel, which distracts from potential views of turbines that may be available in the background. While the turbines may be noticeable to the viewer from some locations within this LSZ, these views will generally be distant and partially screened by the existing landform and vegetation that surrounds this LSZ.

Forest LSZ (Viewpoints 29,33 & 70)

As discussed in Sections 3.3.1 and 5.1.3 the Forest LSZ provides minimal opportunities for views toward the Facility due to the presence of dense vegetation and lack of available long distance views. Generally, only the outer perimeter of forested areas, where they border other LSZs, provide opportunities for views toward the

Facility. Viewpoints 29, 33, and 70, while not in the Forest LSZ, provide examples in which the forest is a significant compositional element in the view. These viewpoints received average contrast rating scores of 2.2 at Viewpoint 29, 2.0 at Viewpoint 33, and 0.1 at Viewpoint 70, resulting in an overall average contrast rating of 1.4. These scores indicate that a variable, but generally minimal to moderate level of impact can be expected in portions of the APE adjacent to this LSZ. The average ratings for each of these views are largely a function of distance from the Facility and screening provided by vegetation. Viewpoints 29 and 33 occur in the middle ground (1.7 miles) and foreground zones (1.3 mile), respectively and have relatively unobstructed visibility of several WTG's. Viewpoint 70 occurs in the background zone (9.8 miles) and has partial visibility of the distant turbines. These results are not what would be expected within the Forest LSZ where views are typically fully or substantially screened. However, this range of contrast can be expected throughout the Forest LSZ within the APE.

As indicated by the contrast ratings/summary in Table 24-5 (see also Appendix E in the VIA), the rating scores provided by the five rating panel members were generally consistent, with a few outliers or conflicting scores. Although moderate to appreciable contrast was noted for some viewpoints, the overall contrast presented by the Facility is considered minimal to moderate. Rating panel results indicate that the distance from the Facility, the degree of scale contrast, and discordant land uses were the primary sources of visual contrast with the existing landscape. The greatest perceived visual impact typically occurs at viewpoints where multiple turbines are visible at close distances and/or when the turbines appear out of place with the existing land use. These conditions tend to heighten the Facility's contrast with existing elements of the landscape in terms of line, form, and especially scale. With respect to the Facility under review, factors mitigating visual impact within the visual study area include 1) the rolling topography that reduces opportunities for long-distance views in many locations, 2) the relatively few viewers present on the elevated plateaus and ridgetops where views of numerous turbines and near foreground views will be available, 3) the substantial screening provided by existing foreground landscape features in forested areas and areas of concentrated human settlement, and 4) the working agricultural character of much of the landscape in which the Facility would be viewed.

As the rating panel results demonstrate, visual impacts to resources greater than 5.0 miles from the turbines generally resulted in insignificant to minimal contrast with the existing landscape element. This is particularly relevant in locations where only a few of the 25 turbines are visible through other competing landscape elements. In fact, it is expected that in many cases the turbines will go unnoticed to a casual observer at these distances.

Although at times offering strong contrast with existing elements of the landscape, the proposed Facility will not necessarily be perceived by viewers as having an adverse visual impact. Wind turbines are unlike most other energy/infrastructure facilities, such as transmission lines or conventional power plants, which are almost universally viewed as aesthetic liabilities. In EDR's experience, operating wind power projects in New York State have generally received a positive public reaction following their construction. This observation is supported by several surveys conducted by Jefferson County Community College in Lewis County, New York (location of the 195-turbine Maple Ridge Farm Project in operation since 2006), which revealed strong community support for wind power (JCCC, 2008, 2010, 2011, 2012). A significant majority (approximately 90%) of Lewis County residents who participated in these surveys expressed support for the development of additional wind energy projects (JCCC, 2010, 2011, 2012). Approximately 70% of respondents have consistently indicated that wind farms have had a positive impact on Lewis County (JCCC, 2008, 2010, 2011, 2012). The 2008 survey indicated that 77% of individuals that were able to see and/or hear turbines from their homes indicated that the wind farms have had a positive impact on Lewis County. Additionally, only 7.5% of participants who live within 1 mile of the nearest wind turbine felt that wind farms have had a negative impact (JCCC, 2008).

Motion has also been indicated as a powerful predictor of preference (Gipe, 1993; Thayer and Freeman, 1987). This is a unique feature of wind turbines in comparison with other forms of structures. People find wind farms that appear to be working more attractive than those that do not. Motion is equated with lower perceived visual impact (Gipe, 1993). They are likely to find wind farms visually interesting because of their motion. In this mode, the turbines are perceived as abstract sculptures, arousing interest with their novel, unfamiliar forms and animation (Thayer and Hansen, 1988).

This finding is consistent with a number of broader studies that have found increased local support for wind projects once they are constructed and become operational. Public support often follows a "U" pattern, in which acceptance is initially high, drops during the planning and construction, and then rebounds after the wind farm commences operation, and impacts are found to be less detrimental than feared (Firestone et al., 2009).

Similar results have also been documented in public opinion/acceptance surveys regarding constructed wind power projects in other locations. The National Survey of Attitudes of Wind Power Project Neighbors is the largest survey its kind regarding neighbors' attitudes toward wind power projects. This survey included 1,705 homeowners living within 5 miles of one of 250 wind farms throughout the United States. Results from this study suggest that overall attitudes regarding wind turbines are generally positive, even amongst individuals living as close as 0.5 mile from turbines. Only about 8% of the respondents had negative attitudes toward wind turbines within 5 miles of their home (Firestone et al. 2017).

Based on the variability in the rating panel results and analysis provided in the VIA, it is expected that the built Facility will generally result in minimal impacts to the enjoyment of public and private resources, with some minor individual variability.

(7) Visible Effects Created by the Facility

As previously mentioned, part of the visual impact analysis included a study of potential shadow flicker impacts on nearby receptors. Details of this study are enumerated in Exhibit 24(a)(9), and Exhibit 15 of this Application. See Appendix 15-A for the Shadow Flicker Report.

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