Bluestone Wind Project

Case No. 16-F-0559

1001.9 Exhibit 9

Alternatives

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EXHIBIT 9 ALTERNATIVES

(a) Description of Reasonable Alternative Sites

The preliminary selection of wind turbine locations on a regional or statewide basis is constrained by several factors that are essential for a wind energy generating facility to operate in a manner that is viable both technically and economically. These factors include:

- An adequate wind resource;[1]
- Adequate access to the bulk power transmission system from the standpoints of proximity and ability of the system to accommodate the interconnection and accept and transmit the power from the facility;
- Contiguous areas of available land;
- Compatible land use;
- Willing landowner participants and host communities; and
- Limited population/residential development.

The Facility Site presented in this Application has been extensively refined to carefully meet the conditions outlined above and minimize the impact on sensitive environmental receptors. The wind resource within the Facility Site is adequate for the wind turbine generator models selected and included in this Application. The transmission system that will receive electricity from the Facility[2] can accommodate the Applicant's proposed up to 124 megawatts (MW) of electric power generation (see Exhibit 5) and the point of interconnection is close enough that an extended overhead transmission line will not be necessary.[3] This reduces costs and adverse environmental impacts associated with overhead transmission lines (e.g., visual and environmental impacts). No other interconnections are proposed at the point of interconnection (POI) substation. The Applicant, as a private facility applicant, does not have eminent domain authority; however, landowners and municipalities within the Facility Site are willing to work with the Applicant, land within the Facility Site is available to site components, and existing land uses are compatible. Access to the site for component delivery and Facility operation is acceptable. No areas of statewide significance or high environmental sensitivity area located within the Facility.

[1] Across New York State, the wind resource varies based on topography, prevailing wind direction, and location. Large-scale wind power projects can only be built in certain areas that are conducive to wind energy production. The higher the wind speed at a site, the more desirable a site is, as the energy produced by a given turbine is a function of the cube of the wind speed. Winds adequate to support a commercial wind-powered generating facility are generally limited to coastal areas, ridgelines, elevated plateaus, and mountain peaks.

[2] The Afton to Stilesville 115 kV transmission line is owned and maintained by NYSEG.

[3] An approximately 250-foot span of overhead transmission line is proposed between the collection and point of interconnection substations.

Therefore, the preferred alternative is to construct a facility that can produce up to 124 MW of renewable energy within the Facility Site identified in this Application. Considering that the Applicant is a private facility applicant, the identification and description of reasonably available alternative site locations in this Application need only include sites owned by or under contract/option to the Applicant (i.e., site locations within the Facility Site). The layout of Facility components within the Facility Site, as proposed in this Application, was designed through an iterative process where the technical and economic requirements of the Facility were weighed against impacts to recreation, cultural resources, the environment, and public safety, health, and environmental justice. The proposed Facility layout is the most reasonable layout possible, given the constraints of the Facility Site. A description of the Facility layout selection process, including specific examples of the design evolution and resource impact avoidance and minimization, is described in Section (b) and a discussion of alternative turbine layouts is provided in Section (c)(4).

(b) Comparison of Advantages and Disadvantages of Proposed and Alternative Locations

Given the unique nature and constraints associated with siting wind-powered electric generation facilities, this Application does not include a fully developed evaluation of the comparative advantages and disadvantages of alternate locations. It is not practicable to procure land contracts, perform environmental and engineering studies, enter and progress through multiple interconnection permit processes, and conduct community outreach for alternative locations. Therefore, this Application provides information regarding the site selection process and the information and analyses utilized in developing the proposed Facility layout, as summarized below.

(1) Environmental Setting

The Facility Site consists of parcels that are under contract to the Applicant. The Facility Site is located within the glaciated Appalachian Plateau physiographic province of New York State. The Appalachian Plateau in Broome County is characterized by well-rounded streams and rolling hills formed by millions of years of glacial erosion during the Pleistocene era. Elevations range from 1100 feet above mean sea level (AMSL) along Oquaga Creek to 2,100 feet AMSL in the hills east of Marsh Pond State Forest. The Facility Site is characterized by a high relative elevation and is located on the boundary between the Upper Delaware and Susquehanna river watersheds. Exhibits 21, 22, and 23 provide a full description of the geology, soils, terrestrial and aquatic ecology, wetlands, and water resources found within the Facility Site. A summary of these resources is presented below.

Most of the Broome County population is found near Binghamton, in the western half of the county. The eastern half of the county, where the proposed Facility is located, is sparsely populated. Within the Facility Site,

anthropogenic disturbance is largely limited to the valleys where the soil is fertile, while the ridges and upper slopes are relatively undisturbed.

Glacial-drift deposits dating back to the Pleistocene age blanket most of Broome County (USDA, 1971). This glacial drift is broadly divided into two main deposits: valley fill deposits and glacial till. In general, approximately 95 percent of the surficial soil encountered on the Facility Site consists of loamy till derived from sedimentary bedrock, which may be classified in accordance with the Unified Soil Classification (UCS) as Silty Sand or Silt (ML) with gravel. Bedrock in the study area likely consists of clastic sedimentary rock of Upper Devonian age. Bedrock is anticipated to be encountered at a depth less than 4 to 8 feet under most of the wind turbines.

The geology, pedology, and topography of the Facility Site is generally not supportive of wetlands. National Wetland Inventory (NWI) has mapped 20 wetland communities totaling 85 acres within the wetland study area[4]; the New York State Department of Environmental Conservation (NYSDEC) has no designated wetlands within the Facility Site. The Applicant delineated a total of 64 wetlands within the wetland study area. These wetlands were identified based on the presence of hydrophytic vegetation, hydric soils, and wetland hydrology, and total approximately 29 acres. The Applicant also delineated 28 streams within 200 feet of the Facility. The delineated streams included intermittent, perennial and ephemeral channels, totaling approximately 9,133 linear feet (1.72 miles). See Exhibit 22 for a further discussion of terrestrial ecology and wetlands and potential Facility impacts. See Exhibit 23 for a further discussion of stream impacts.

A description of the siting process (e.g., avoiding permanent impacts to water resources, avoiding flood prone areas, etc.) is outlined in Section (b)(5).

(2) Recreational, Cultural, and Other Concurrent Uses of the Site

The Applicant has identified several recreational facilities in the area around the Facility Site, including, but not limited to, trails (i.e., hiking, snowmobile, biking, etc.), and two state forests (see Figure 4-8). Land use at the Facility Site consists of agricultural fields, scattered residential development along area roadways, and large tracts of undeveloped second-growth forest. The Facility generally will be compatible with these land uses and will have primarily temporary impacts associated with construction. See Exhibit 4 of this Application for more detailed discussion of land use in the area around the Facility.

[4] For purposes of impacts avoidance and assessing alternative, this exhibit is referencing the wetland study area outlined in the Wetland Delineation Report (Appendix VV) which includes areas within a 200-foot wide corridor centered on linear Facility components (e.g., access roads, buried electrical interconnect, overhead transmission line), and within a 265-foot radius of turbines and other components such as permanent meteorological towers, O&M building, staging areas, and the collection substation

As discussed in Exhibit 20, a Phase 1A Historic Architectural Resources Survey and Work Plan was prepared during the development of the Preliminary Scoping Statement (PSS). In a letter dated March 29, 2018, NYSOPRHP provided a response to the Phase 1A Archaeological Survey Report and Phase 1B Fieldwork Plan, which concurred with the conclusions and recommendations of the Phase IA Survey and Phase 1B Fieldwork Plan. Further, the Applicant has coordinated with local and regional Native American Nations, including with staff from the Oneida Indian Nation. Information from these on-going discussions regarding potential "stone landscape" and impact avoidance/mitigation measures are provided in the NYSOPRHP-approved Cultural Work Plan(s). See Exhibits 20 and 24 of this Application for more detailed information on the recreational, cultural, and other uses of the Facility Site.

The site selection process relative to recreational, cultural, historic, and other concurrent uses was largely centered on avoidance. Early in the planning process, the preliminary Facility Site was progressively updated to avoid impacts to known recreational, cultural, and historic resources. The number of turbines was significantly reduced to avoid impacts to known resources (see Section (c)(4) for a full discussion of this effort). As the Facility Site solidified and the preliminary locations of Facility components became known, these locations were compared to field data collected as part of the Article 10 Application process. Where conflicts were detected, Facility components were often moved to avoid impacts. For example, turbines T7 and T37 were both shifted to avoid impacts to stone landscapes (see Table 9-1). Where impacts were unavoidable, mitigation measures are being considered.

(3) Engineering Feasibility

A Report of Expected Geotechnical Conditions was conducted that included a literature review of publicly available information and data pertaining to surface and subsurface soil, bedrock, and groundwater conditions near the proposed Facility, as well as preliminary field investigations at select locations within the Facility Site to obtain additional information pertaining to the subsurface soil and bedrock features to assess the general constructability of the proposed Facility. The Assessment concluded that the Facility Site is generally suitable for the proposed Facility (see Appendix JJ). The literature review and preliminary borings suggest that the proposed turbines can be constructed on spread footing or rock anchors foundations depending on each turbine foundation location. Due to the overall shallow depth to bedrock in many turbine sites, blasting will likely be required for the construction of the turbine foundations. It is expected that the excavations for the construction of the proposed Facility will be completed using conventional construction equipment including bulldozers, track hoes, and possibly pan excavators. Additional information regarding the geotechnical assessment and the engineering feasibility of the

Facility Site are presented in Exhibit 21 of this Application. With respect to interconnections, a System Reliability Impact Study (SRIS) was conducted that found the 115 kV Afton to Stilesville transmission line can accommodate the interconnection and accept and transmit the power from the facility. See Appendix D and Section (b)(4) below.

The Applicant has conducted a rigorous wind resource analysis for this Facility to assess the quality of the wind resource and optimize the turbine layout to maximize energy production within the context of the existing site-specific constraints. This analysis informed every change made to the layout of Facility turbines during the design phase. For example, if a turbine needed to be moved to avoid or minimize impacts on a resource, the potential alternative locations for that turbine were limited to the small number of sites that would maintain engineering feasibility and not introduce additional environmental, social, cultural, or economic conflicts.

As discussed in Exhibit 6, the detailed results of the wind resource analysis are proprietary and are retained as trade secrets; a copy of the wind meteorological analysis will be provided to the New York State Department of Public Service (DPS) under separate confidential cover. The Applicant will seek the requisite trade secret protection for this information pursuant to New York Public Officer's Law § 87(2)(d) and 16 NYCRR § 6-1.3. See Exhibit 6 of this Application for additional information about the wind resource at the Facility Site.

(4) Reliability and Electric System Effects

A System Reliability Impact Study (SRIS) was completed in 2018 to evaluate the impact of the Facility on the reliability of the New York State Transmission System and to identify alternatives to eliminate adverse reliability impacts, if any, resulting from the Facility. The Facility is not expected to result in adverse impacts to the transmission system based on the results of the SRIS. See Exhibit 5 of this Application for a more detailed description of Facility effects on the reliability of the regional transmission system.

(5) Environmental Impacts, Including Assessment of Climate Change Impacts

The proposed Facility will have long-term beneficial environmental impacts. The Facility will generate up to 124 MW of clean, renewable energy without emitting any conventional air pollutants or greenhouse gases (GHGs), or consuming cooling water or generating wastewater.

Electricity generated from zero-emission wind energy facilities can displace the electricity generated from conventional power plants, thereby reducing the emissions of air pollutants. This conclusion is supported by a 2008 U.S. Department of Energy, National Renewable Energy Laboratory report, which states, "[w]ind energy is a preferred power source on an economic basis, because the operating costs to run the turbines are very low and

there are no fuel costs. Thus, when the wind turbines produce power, this power source will displace generation at fossil fueled plants..." On a long-term basis, wind generated power also reduces the need to construct and operate new fossil fueled power plants (Jacobsen and High, 2008, pp. 9-10). See Section (f) below for additional information on the benefits of wind power.

The Facility is expected to displace approximately 72,829 short tons of carbon dioxide (CO_2) emissions from conventional power plants on an annual basis. This represents approximately 0.26% of all CO_2 emissions estimated to be produced by New York State in 2021. See Exhibits 8 and 17 for a further discussion of air emissions.

Although the overall impact of the Facility will be positive, the construction and operation of the Facility will result in certain unavoidable impacts to the environment. Most environmental impacts will be temporary and associated with construction. Long-term unavoidable impacts associated with the operation and maintenance of the Facility are anticipated to be relatively limited, but will include aesthetic visual impacts, direct mortality to avian and bat species, and impacts to streams and wetlands.

As described in the introduction to this exhibit, the process for designing the Facility layout involved balancing technical and economic constraints against impacts to sensitive resources. Ultimately, the Facility Site and individual Facility components were sited to avoid and minimize impacts wherever practicable.

General measures the Applicant initially took to avoid and minimize impacts to sensitive resources in the site selection/refinement process included: relocating Facility components, collocating Facility components (e.g., access roads and collection lines), routing Facility components along previous disturbance corridors (e.g., farm roads and adjacent to pipeline rights-of-way), reducing the size of the Facility Site (see Section (c)(4) for a full discussion of alternative Facility layouts), designing access roads to work with the native topography (e.g., avoiding steep slopes), precluding construction in flood-prone areas where possible, and committing to the strategic use of horizontal directional drill (HDD) technology when installing buried interconnects.[5]

For wetlands, where avoidance was not practicable, impacts were minimized by selecting narrow and/or previously disturbed portions of the wetlands for crossing locations. Impacts to undisturbed wildlife habitat have been minimized by siting access roads and collection lines in or adjacent to agricultural land, which generally provides

[5] Specifically, HDD installation will be used where buried interconnection lines cross forested wetlands and NYSDEC-protected streams, and the buried line is the only component crossing such features.

habitat for only a limited number of wildlife species. In addition, these areas are already subject to regular periodic disturbance in the form of mowing, plowing, harvesting, etc.

As the Facility Site and the layout of Facility components solidified, more specific measures were taken by the Applicant to avoid and minimize impacts to environmental resources. These measures are summarized in Table 9-1.

Table 9-1. Measures Implemented by the Applicant to Avoid Impacts to Wetlands, Public Health, and Recreational, Cultural, and Other Resources.

Facility Component	Resource(s)	Measures to Avoid Impacts
Access Roads	Wetlands I, K, L, U, Y, DD, EE, FF, XX, AAA, BBB, FFF, and 4A	Rerouted in 13 locations to avoid and minimize direct impacts.
	Wetlands approximated in winter of 2017/2018	Access roads to T5 and T6 were completely rerouted to avoid impacts to approximated wetlands.
	Stone Landscape	Rerouted in two locations to stay 50 feet away from identified potential stone landscapes.
Collection Lines	Wetlands I, K, L, U, Y, PP, OO, XX, 4B, 4C, and 4F	Rerouted in 11 locations to avoid direct impacts.
	Wetlands approximated in winter of 2017/2018	Collection lines to T5 and T6 were completely rerouted to avoid impacts to approximated wetlands.
POI and Collection Substations	Wetlands A, B, C, D, E, F, and G	Substation boundaries, collection lines, and access roads shifted multiple times to avoid and minimize direct impacts.
Turbines		
(Preliminary) T41	Wetland Q and Public Health	The preliminary turbine T41 and its associated collection line were removed to avoid impacts to wetlands and multiple sensitive receptors.
(Preliminary) T25	Wetland U	The preliminary turbine T25 was removed to avoid impacts to wetlands.
T7	Stone Landscape	Shifted to stay over 50' away from identified potential stone landscape.
T11	Wetland VV	The work area/crane pad for this turbine was shifted to avoid direct impacts.
T32	Stone Landscape	Shifted to stay over 50' away from identified potential stone landscape.

As stated above, the Facility may result in short-term and long-term impacts to several environmental resources. Based on final impact calculations to wetlands and streams, the Applicant will implement compensatory mitigation to satisfy the requirements of the NYSDEC and U.S. Army Corps of Engineers (USACE) (see Exhibit 22).

Approximately 375 acres (7% of the approximately 5,657-acre Facility Site) will be temporarily disturbed during construction, while permanent loss of habitat through conversion of natural habitat to built facilities will total 53.6 acres (1% of the approximately 5,657-acre Facility Site). However, these impacts will not result in any landscape-scale habitat fragmentation effects as the nearby landscape has abundant available habitat with wildlife value like that found in the Facility Site. See Exhibit 22 and 23 of this Application for more detailed information on impacts to wetlands, streams, and wildlife habitat at the Facility Site, along with specific proposed mitigation measures.

To minimize visual impacts, the Applicant has greatly reduced both the number of turbines and the size of the Facility Site (see Section (c)(4) for a full discussion of this topic). Even considering this reduction in the size of the Facility, the presence (i.e., visibility) of Facility turbines will likely result in a change in perceived land use from some viewpoints. The Visual Impact Analysis (VIA) (see Appendix ZZ) indicates that the Facility's overall contrast with the visual/aesthetic character of the area will generally be moderate. The public reaction to the aesthetic qualities of the proposed Facility is difficult to gauge but will likely vary depending on turbine proximity, the affected landscape, and viewer attitude towards wind power. See Exhibit 24 of this Application for more detailed information on turbine visibility and visual impacts near the Facility Site.

(6) Economic Considerations

The Applicant's intent is to create an economically viable wind-powered electrical-generating facility that will provide a significant source of renewable energy to the New York power grid. Properly siting the Facility and individual Facility components is a key part of this process. As discussed previously, the Facility Site has the wind resource necessary to produce a profitable amount of energy, while the proximity of the Facility Site to the Afton to Stilesville 115 kV transmission line reduces grid connectivity costs. Furthermore, individual turbine locations have been progressively refined to maximize capture of the wind resource, while minimizing environmental and economic costs associated with constructing and maintaining access roads, collection lines, and other Facility infrastructure, i.e., turbines have been sited in the densest configuration that does not result in turbulence or wake effects. See Exhibit 6 of this Application for additional information about the wind resource at the Facility Site and see Exhibit 34 for additional information about the electric interconnection.

This Application provides an estimate of the total capital costs of the Facility in Exhibit 14. However, because capital cost information is considered proprietary and is retained as a trade secret, this data has been provided in the form of an internal work paper that also describes the assumptions in estimating the total capital costs. The Applicant is seeking the requisite trade secret protection for this information pursuant to New York Public Officer's Law § 87(2)(d) and 16 NYCRR § 6-1.3.

The proposed Facility is anticipated to have local, regional, and statewide economic benefits. Wind power development, like other commercial development projects, can expand the local, regional, and statewide economies through both direct and indirect means. Income generated from direct employment during the construction and operation phases of a wind energy generating facility is used to purchase local goods and services, creating a ripple effect throughout the state.

The Facility will create approximately 255 full-time equivalent jobs (FTE) during the construction phase. Of these, 242 will be construction and interconnection labor, while 13 will be in construction-related services (e.g., engineering and other professional services). Operation and maintenance of the proposed Facility will generate approximately seven long-term full-time jobs. When turbine, local revenue, and supply chain impacts, and induced impacts are factored in, the Facility will create 634 FTE jobs during the construction phase and 23 FTE jobs during the operation phase. These workers will receive $46.6 million in payroll during construction and $2.1 million annually for the life of the Facility during operation.

In addition, the Facility will result in direct payments to landowners having agreements with the Applicant. These payments will provide a source of funds that will supplement any income generated from the existing land use (e.g., mining, timber harvesting, agricultural production). Taxing districts within the Facility Site include Broome County, the Towns of Sanford and Windsor, and the Windsor and Deposit Central School Districts. These taxing districts will receive substantial payments through a Payment in Lieu of Taxes (PILOT) Agreement and Host Community Agreements. The proposed Facility will make few, if any, demands on local government services. Therefore, the payments made to local taxing jurisdictions will be net positive gains and represent an important economic benefit to the local area. See Exhibit 27 of this Application for more detailed information on the socioeconomic effects of the proposed Facility.

(7) Environmental Justice

No environmental justice areas occur within the Facility Site, and the Facility is not expected to impact any environmental justice areas. See Exhibit 28 for additional information about the closest environmental justice areas to the Facility Site.

(8) Security, Public Safety, and Emergency Planning

Overall safety and security risks associated with the Facility are anticipated to be minimal. To ensure the safety of construction and operations personnel, as well as the security of the Facility overall, the Applicant has developed,

and will implement a Site Security Plan, a Health and Safety Plan, and an Emergency Action Plan (EAP). These plans are described in Exhibit 18 of this Application. The information contained in the EAP has been developed in coordination with local emergency service providers and will be made available to the employees of the Applicant and any visitors or workers to the Facility Site. This plan outlines the procedures to follow in the event of an emergency.

Risks to the community posed by wind energy generating projects such as the Facility are minimal because the turbines themselves are generally safe. Further, most wind energy generating projects are sited in rural landscapes, away from population centers. Risks theoretically posed by wind power—ice shedding, tower collapse, blade failure, and fire in the turbines—are readily addressed through the proposed setbacks. See Exhibit 6 for details regarding Facility setbacks and Exhibit 15 for details about public safety.

(9) Public Health

The Facility is not expected to impact public health. Claims of health impacts related to noise and shadow flicker have been considered, but the consensus of the scientific literature on the topic is that public health claims are largely inapplicable to modern wind energy generating facilities that follow appropriate setback and design standards (see Exhibit 15). Consistent with that finding, the Facility has been designed to follow appropriate design and setback standards and thus is not expected to impact public health. Regardless, the Applicant has worked with landowners and the local community to make changes to the Facility layout to avoid and reduce impacts. Some of those changes are summarized in Table 9-1 above. Public health and noise are discussed in full in Exhibit's 15 and 19 of this Application, respectively.

(10) Vulnerability to Seismic Disturbances and Climate Change Impacts

Based on the 2014 New York State Hazard Map (USGS, 2014), the proposed Facility is in an area of very low seismic hazard, with a 10% probability that peak ground acceleration in a 50-year window will exceed 3% of standard gravity.[6] Broome County has no recorded earthquakes (USGS, 2015). Furthermore, the USGS Earthquake Hazards Program does not list any young faults, or faults that have had displacement in the Holocene epoch, within the vicinity of the Facility Site. Exhibit 21 of this Application provides a more detailed description of the Facility's potential vulnerability to seismic disturbance.

[6] Peak acceleration is the largest increase in velocity recorded by a station during an earthquake.

In New York State, climate change is predicted to result in rising sea levels, more frequent intense precipitation events, and higher average temperatures. Although the Facility Site will not be affected by rising seas, changes in precipitation intensity could lead to more frequent flooding in low-lying areas. Federal Emergency Management Agency (FEMA) flood insurance rate maps indicate that sections of Oquaga Creek within the Facility Site contain a 100-year floodplain; however, no turbines or other Facility buildings will be built near this floodplain. A collection line will cross the Oquaga Creek floodplain; however, the collection line will be underground, and trenchless technologies (i.e., HDD) will be utilized to avoid impacts to wetland or floodplain resources. Temperature increases linked to climate change may drive broad shifts in ecosystems across New York State (NYSERDA, 2011). Ecological communities most vulnerable to climate change (e.g., boreal spruce-fir forests, high elevation alpine tundra communities, etc.) do not occur at the Facility Site.

(11) Objectives and Capabilities of the Applicant

With respect to capabilities, the Applicant is a wholly owned subsidiary of Calpine Corporation (Calpine), which is headquartered in Houston, Texas. Calpine specializes in developing, constructing, owning and operating generation assets that use advanced technologies to produce power in a low-carbon and environmentally responsible manner. In early 2015, Calpine launched a new development group with the goal of being a long-term owner and operator of wind energy projects throughout the United States.

Given the Applicant's capabilities, the proposed Facility best advances company objectives, as well as the State Energy Plan, Clean Energy Standard, and Reforming the Energy Vision initiative.

The Towns of Windsor and Sanford have been selected as the location of the proposed Facility because the Applicant has determined that the area meets the company's objective of creating an economically viable wind-powered electrical-generating facility that will:

- Satisfy regional energy needs in an efficient and environmentally sound manner;
- Supplement and offset fossil-fuel energy generation in the region;
- Reduce the amount of electricity imported to New York State;
- Realize the potential of the Broome County wind resource;
- Provide energy not coupled to commodity prices;
- Produce electricity without the generation of carbon dioxide or other greenhouse gases that contribute to climate change;
- Promote the long-term economic viability of rural areas in New York; and

- Assist New York State in meeting its proposed Renewable Portfolio Standard and State Energy Plan goals for the consumption of renewable energy in the State and the reduction of greenhouse gas emissions.

(c) Description of Reasonable Alternatives to the Proposed Facility at the Proposed Location

Unlike state or municipal entities, private developers do not have the power of condemnation or eminent domain. Consequently, the Applicant does not have the unfettered ability to locate projects in any area or on any parcel of land but must site Facility components on private property where landowners have agreed to allow such construction. The agreements the Applicant has developed with landowners within the Facility Site strictly limit the use of land to a wind energy generating facility, and as such, do not allow the Applicant to site other alternative energy production facilities (e.g., solar). These and other constraints sharply limit the alternatives that can be reasonably considered (see Section (c)(4) for a further discussion of this topic).

(1) General Arrangement and Design

As discussed above, the arrangement and design of the Facility is constrained by several factors. These factors are discussed in Section (c)(4). The Facility Site is 5,657 acres in size and roughly oblong, extending west from the Afton to Stilesville 115 kV transmission line approximately 6 miles to the hills above Deer Lake. Turbines are arranged to follow the network of ridgelines that provide the best access to the wind resource. See Exhibit 3 and Exhibit 11 for a full description of the arrangement and design of Facility components.

(2) Technology

It is the Applicant's intent and objective to develop a wind power project that harnesses the existing wind resource in Broome County to the greatest extent possible while minimizing impacts to the environment.

The turbines proposed for the Facility will utilize the latest in wind power generation technology to enhance energy production and project efficiency and safety. Each wind turbine consists of three major components: the tower, the nacelle, and the rotor. The nacelle sits atop the tower, and the rotor hub is mounted to the front of the nacelle. "Hub height" is the height of the center of the rotor, as measured from the base of the tower (excluding the subsurface foundation), while total turbine height is the height of the entire turbine, as measured from the tower base to the tip of the highest blade when rotated to the highest position. Descriptions of each of the turbine components are provided below.

Tower: The tubular towers used for megawatt-scale turbines are tubular conical steel structures manufactured in multiple sections. Each tower will have an access door in the base section and internal lighting, along with an internal ladder and/or mechanical lifts to access the nacelle. The towers will be painted white or off-white in accordance with Federal Aviation Administration (FAA) regulations designed to make the structures more visible to aircraft when viewed from above, as light colors contrast sharply against the dark-colored ground. The color also has the benefit of reducing visibility from ground vantage points by reducing contrast with the pale background of the sky.

Nacelle: The main mechanical components of the wind turbine are housed in the nacelle. These components include the drive train, gearbox, and generator. The nacelle is housed in a steel reinforced fiberglass shell that protects internal machinery from the environment and dampens noise emissions. The housing is designed to allow for adequate ventilation to cool internal machinery. The nacelle is equipped with an external anemometer and a wind vane that signals wind speed and direction information to an electronic controller. Attached to the top of some of the nacelles, per specifications of the FAA, will be a single, medium intensity aviation warning light. The nacelle is mounted on a yaw ring bearing that allows it to rotate ("yaw") into the wind to maximize wind capture and energy production.

Rotor: A rotor assembly is mounted to the nacelle to operate upwind of the tower. Each rotor consists of three (3) composite blades that will be up to 74 meters (242 feet) in length, with a maximum rotor diameter of up to 150 meters (492 feet). The rotor attaches to the drive train at the front of the nacelle. Hydraulic motors within the rotor hub feather each blade according to wind conditions, enabling the turbine to operate efficiently at varying wind speeds. Depending on the turbine model selected, the wind turbines will cut in (i.e., begin generating energy) at wind speeds of 3 meters per second (m/s) [6.7 miles per hour (mph)] and will cut out at 25 m/s (55.9 mph).

Due to market factors such as availability and cost, a specific turbine model has not yet been selected for the Facility. Table 9-2 presents the dimensions for each of the alternative turbine models under consideration for the Facility.

Table 9-2. Approximate Turbine Dimensions by Model

Turbine Model	Rated Power	Hub Height	Rotor Diameter	Total Height
GE 3.8-137	3.8 MW	131 meters (430 feet)	137 meters (449 feet)	199.5 meters (655 feet)
Nordex N149/4.0-4.5	4.0-4.5 MW	125 meters (410 feet)	149 meters (489 feet)	199.5 meters (655 feet)
Senvion M148-4.2	4.2 MW	130 meters (427 feet)	148 meters (485 feet)	204 meters (669 feet)
Siemens Gamesa SG4.2-145	4.2 MW	127.5 meters (418 feet)	145 meters (476 feet)	200 meters (656 feet)
Vestas V150-4.2	4.2 MW	130 meters (427 feet)	150 meters (492 feet)	205 meters (673 feet)

The turbine model selected for the Facility may be one of these models or another equivalent model. If a different turbine model is selected, it will not have a greater total height, rotor swept area, or sound power level output than those analyzed in this Application. See Section (c)(4) for a full discussion of an alternative layout that employs less productive (i.e., smaller) turbine models. See Appendix I of this Application for turbine brochures containing additional information about wind turbine technology.

(3) Scale or Magnitude

As mentioned previously, numerous siting constraints dictate the size and layout of a wind energy generating facility, as do the practical constraints inherent in the limited number of available turbine models and technologies available to the Applicant. These constraints reduce the feasibility of constructing a facility with electric power generation capabilities above 124 MW within the proposed the Facility Site. Considering the Applicant is a private facility applicant, expanding the physical size of the Facility Site is not an option.

Constructing a facility with a reduced generating capacity would not be economically advantageous. The Applicant is doing business in a highly competitive, price sensitive wholesale electric market. Given the economies of scale involved in the development and construction of a wind project, all other things being equal, a larger scale project produces lower cost energy. Since the Facility has a 124 MW interconnection request with NYSEG, the preferred alternative is to construct a facility that can produce up to 124 MW. A facility with significantly smaller production capacity would pose challenges to the economic feasibility of the Facility and would not meet its stated objectives.

In particular, if the proposed generating capacity were significantly reduced: (1) the maximum benefit of the available wind resource would not be realized; (2) the Facility would not as readily address the significant State policy considerations relating to reducing greenhouse gas emissions, increasing renewable energy generation, and de-carbonizing the electric system; (3) economies of scale related to construction costs would not be realized

while fixed costs related to constructing the Facility would remain the same (e.g., mobilization costs for expensive equipment such as erection cranes); and (4) the cost of environmental monitoring and mitigation would be proportionately higher

With respect to the economic benefits to the community, reducing the sale/magnitude of the Facility would also reduce PILOT and Host Community Agreement contributions to local taxing jurisdictions, which are typically developed per MW or per turbine. In addition, if the physical extent of the Facility Site was reduced, revenues related to landowner agreements would also be reduced. Finally, the smaller the Facility, the smaller the direct and indirect economic benefits associated with its construction and operation. The ramifications of utilizing smaller turbines over a larger area are discussed in Section (c)(4).

(4) Alternative Turbine Layouts

(i) Factors Considered During Layout Design

The proposed location and spacing of wind turbines are directly related to several factors, including landowner participation, the wind resource assessment, the location of existing access roads, environmental factors, constructability issues, and the consideration of adjacent land uses or any potential zoning constraints. Factors considered during layout design include the following:

- *Wind Resource Assessment* – Using on-site meteorological data, topographic and surface roughness data, wind flow modeling, and wind plant design software, wind turbines will be sited to optimize exposure to wind from all directions, with an emphasis on exposure to the southwest winds that prevail in the Facility Site.
- *Topograph*y – Higher elevations typically correspond with a greater wind resource. In addition, turbine manufacturers require that certain elevation and topography criteria be met (e.g., not siting turbines on steep slopes or narrow ridgelines), or else they will not certify the turbine location as suitable, precluding construction. All proposed turbine locations were sited to meet specific elevation and topography criteria and satisfy turbine manufacturer requirements.
- *Sufficient Turbine Spacing* – Each operating wind turbine creates downwind turbulence in its wake; wind speeds are greatly reduced in this wake. As the flow proceeds downwind, there is a spreading of the wake and recovery to free-stream wind conditions. Electricity production can be greatly reduced and wear on mechanical turbine components can increase when turbines are sited too close

to one another. Turbines in the proposed Facility will be sited to minimize wake losses and maximize the capture of wind energy.

- *Local Zoning* – The Town of Sanford has adopted regulations pertaining to renewable energy systems.[7] These regulations specify criteria under which applications for commercial wind energy conversion systems will be evaluated, including setback requirements. The Facility will meet the requirements contained in these and other regulations that govern the construction and operation of wind energy projects in the Town. The Facility also will meet all applicable laws adopted by the Town of Windsor. Potential impacts to town roads will be addressed in Road Use Agreements with the Towns of Sanford and Windsor agreed to separately or as a part of larger Host Community Agreements.
- *Wetlands, Waterbodies, and Other Sensitive Habitats* – Facility components will avoid and/or minimize impacts to wetlands, waterbodies, and other sensitive habitats to the greatest extent practicable.
- *Communication Interference* – Turbines have been sited outside of known microwave pathways, and far enough from land mobile and emergency service communication towers and AM/FM radio stations to minimize any effect that they would have on existing communications.
- *Recreational Resources* – Turbines have been sited to avoid any material adverse effects to the Towns' or County's existing or proposed trails, trail facilities, and recreation areas.
- *Cultural Resources* – Facility construction will be conducted in such a way that does not cause any significant direct or indirect impacts to prehistoric or historic archeological resources.

Layout is also a function of the turbine model that is ultimately used. As discussed previously, the number of turbines constructed as part of the proposed Facility will depend on the capacity of the turbine model selected. For example, if the Vestas V150-4.2 is selected, then up to 29 turbines will be constructed. By comparison, if the GE 3.8-137 is selected, then up to 32 turbines will be constructed. Turbine models are selected based upon numerous factors, such as site suitability, availability and price. For the proposed Facility, turbine locations will ultimately be chosen from among the specific locations identified in the Application and will be based on the wind resource and other siting factors. However, to assure a worst-case evaluation, the Application has assessed the impacts associated with up to 33 turbine locations, even though fewer turbines may be built. Figure 3-1 identifies the position of all proposed wind turbine sites for the layout proposed in this Application.

[7] The Town of Sanford's Local Law #1-1992, entitled "Land Use Management Local Law," was amended by Local Law #1-2017 to add Article XIV: Renewable Energy Systems. See Exhibit 31 for details regarding local laws.

(ii) 53-Turbine Alternative Layout

Introduction

A 53-turbine alternative layout ("alternative layout") was developed by the Applicant early in project development. Early conversations with landowners and desktop environmental and constructability analyses indicated that the alternative layout could be viable. The alternative layout contemplated using a greater number of smaller turbines to generate 124 MW. The layout of this alternative was similar to the 33-turbine layout proposed in this Application (the "proposed layout") but included an additional 20 turbines that extended west towards the Town of Windsor and south of Interstate 86 (see Figure 9-1). The GE 2.3-116 turbine or an equivalent model would likely have been used if the alternative layout had been selected. This model is rated for 2.3 MW and has a total height of 152 meters (499 feet).

In the course of project development, environmental, economic, visual, landowner participation, and health and safety constraints prompted the Applicant to reduce the Facility to the proposed 33-turbine layout. The analysis below details the potential impacts of the 53-turbine alternative layout and makes comparisons to the potential impacts of 33-turbine proposed layout.

Assumptions and Limitations

When the Facility was initially being developed and this 53-turbine layout was being considered, a full project layout was not generated (i.e., access roads, collection lines, etc., were not engineered). Accordingly, impact comparisons described below between the alternative layout and the proposed layout are based on available quantitative information, and quantitative and qualitative information that could reasonably be extrapolated or interpolated. Numbers and figures relative to the proposed layout presented in the comparative analysis (e.g., Table 9-4) may not exactly match those found elsewhere in this Application as many of these analyses were simplified or based on basic assumptions to allow direct comparison with the alternative layout.

Table 5 of the Bluestone Wind Project Preliminary Scoping Statement (PSS) presents a list of assumptions to be used in calculating temporary and permanent impacts to plant communities and soils. This table has been brought forward and is summarized in Table 9-3 below.

Table 9-3. Impact Assumptions Presented in the Bluestone Wind Project PSS.

Facility Components	Typical Area of Vegetation Clearing	Typical Area of Soil Disturbance (Temporary and Permanent)	Typical Area of Permanent Impacts (i.e., Built Facilities)
Wind Turbines and Workspaces	Up to 265' radius per turbine	Up to 265' radius per turbine	0.20 acre per turbine (pedestal plus crane pad)
Access Roads	100' wide per foot of road	80' wide per foot of road	40' wide per foot of road
Buried Electrical Collection Lines	75' wide per linear foot of line per collection line circuit	15' wide per linear foot of line per collection line circuit	None
Meteorological Towers	1.5 acres per tower	0.10 acres per tower	0.05 acres per tower
O&M Building	5 acres	5 acres	5 acres
Staging Areas	5 acres per staging area	5 acres per staging area	None
Collection substation	5 acres	5 acres	5 acres

The assumptions detailed in Table 9-3 were developed assuming the use of 673-foot turbines and were applied to the proposed 33-turbine layout in the comparative analysis completed for this exhibit. The Table 9-3 assumptions were also applied to the 53-turbine alternative, with one exception—the typical areas of vegetation clearing and soil disturbance for wind turbines and their workspaces were reduced from 265 feet to 200 feet for the alternative layout.[8] A 200-foot radius area is conservative and limits the potential for overestimating the impacts of the alternative layout; it is also consistent with impact radii applied in designing other wind energy generating projects with approximately 500-foot turbines. The typical area of permanent impacts was not altered as the pedestal and crane pad footprint would not be substantively smaller for the 499-foot turbine used in the alternative layout analysis.

Impacts associated with access roads and collection lines for the alternative layout were extrapolated from data developed for the proposed layout using a linear relationship between the number of turbines and the acres of disturbance. Note that it is possible that the relationship between the number of turbines and the acres of disturbance associated with access roads and collections lines is not linear;[9] however, impact calculation assumptions were equalized between the proposed and alternative layouts in this case and wherever reasonable to simplify the analysis and avoid overestimating the impacts of the alternative layout.

The alternative layout visual impact data presented in this section were developed utilizing the same inputs, methods, and assumptions explained in the Visual Impact Assessment (VIA) (Appendix ZZ) and presented in Exhibit 24, except that turbine size and location were modified to reflect the metrics of the alternative layout.

[8] Assumptions not directly related to the wind turbines and their workspaces would not likely be affected by the smaller turbine size used in the alternative layout analysis.

[9] The alternative layout is less compact than the proposed layout (see Figure 9-1). Further, the 20 additional turbines in the alternative layout are in a less developed area in the Town of Windsor where opportunities to collocate access roads with farm, mining, and utility (i.e., gas pipeline) roads are limited compared with those available to the proposed layout.

Sensitive site comparisons between the alternative and proposed layout were made using the 5-mile study area for each respective layout. The alternative layout 5-mile study area was created using the same methods applied in creating the 5-mile study area for the proposed layout detailed in Exhibit 24.

Vegetation Clearing and Soil Disturbance

Based on the impact assumptions presented above, temporary and permanent impacts to plant communities and soils were calculated for the proposed 33-turbine alternative and the 53-turbine alternative. These calculations are summarized in Table 9-4 below. Note that this table does not detail impacts related to meteorological towers, the O&M building, staging areas, and collection substation as these impacts would likely be similar between the proposed and alternative layouts.

Table 9-4. Impact Comparisons Between the 33-Turbine Proposed Layout and the 53-Turbine Alternative Layout.

Facility Components	Vegetation Clearing (acres)		Soil Disturbance (acres)		Permanent Impacts (acres)	
	Proposed Layout	Alternative Layout	Proposed Layout	Alternative Layout	Proposed Layout	Alternative Layout
Wind Turbines and Workspaces	167	153	167	153	7	11
Access Roads	223	358	178	286	89	143
Buried Electrical Collection Lines	244	391	71	114	None	None
Total	634	902	416	553	95	153

Overall, it is estimated that the alternative layout would likely have resulted in a 42% increase in vegetation clearing, a 33% increase in soil disturbance (temporary and permanent), and a 61% increase in permanent impacts (i.e., built facilities) as compared to the proposed layout. These increased impacts are largely due to the additional miles of access roads and collections lines found in the alternative layout.

Wetland Impacts

Considering the substantially greater plant community and soil impacts estimated for the alternative layout in Table 9-4, it is likely that—even utilizing the avoidance and minimization measures outlined in Section (b)(5)—the construction and operation of the alternative layout would likely result in greater impacts to wetlands, as

compared to the proposed layout. Fully quantifying the difference in wetland impacts between the proposed and alternative layouts is not possible, as wetland data for the 20 additional turbines in the alternative layout are limited to data at the turbines and their workspaces that is publicly available,[10] (i.e., National Wetland Inventory (NWI) and NYSDEC wetland data). These data do not accurately reflect conditions on the ground and their application in this analysis is limited. Further, there are no National Wetland Inventory or NYSDEC-designated wetlands at the turbine workspaces of the proposed or alternative layouts.

Within the proposed layout, delineated wetlands are found primarily associated with access roads and collection lines. Considering the similarities between the layouts, it is likely that wetlands would also have been found primarily associated with access roads and collection lines in the alternative layout. In Table 9-4, permanent impacts associated with access roads and collection lines were estimated to be 61% greater under the alternative layout as compared to the proposed layout. It is reasonable to conclude that impacts to wetlands would exhibit a proportionally similar increase under the alternative layout, i.e., that wetland impacts would have been 61% greater under the alternative layout when compared to the proposed layout. See Section (b)(5) and Exhibit 22 of this Application for more detailed information on how the proposed Facility has avoided and minimized impacts to wetlands.

Forest Cover Impacts

The alternative layout would likely result in greater impacts to forest resources and wildlife habitat. The area that will be disturbed by the proposed layout (see Table 9-4) is approximately 87% forested, based on 2011 National Land Cover Database (NLCD) data (Homer et al., 2015). Although extracting NLCD data for all components of the alternative layout is not possible, as locations for access roads and collection lines were never developed, land cover at the turbine workspaces can be compared. The turbine workspaces of the proposed and alternative layouts are 98.8% forested and 98.7% forested, respectively. Considering how similar these turbine workspaces are with respect to forest cover, it is reasonable to assume that access roads and collection lines for both layouts would likewise have similar proportions of forest cover. A review of aerial imagery in the vicinity of the turbine workspaces for both layouts supports this assumption.

Considering the information above, it is reasonable to conclude that the alternative layout would result in additional forest impacts proportional to the vegetation clearing increase detailed in Table 9-4, i.e., the alternative layout could result in an approximately 42% increase in forest cover impacts as compared to the proposed layout.

[10] Completing field-based wetland delineations for the turbine sites and supporting components (i.e., access roads and collection lines) unique to the alternative layout is outside the scope of this alternatives analysis.

See Section (b)(5) and Exhibit 22 of this Application for more detailed information on how the proposed Facility has avoided and minimized impacts to forest resources and wildlife habitat.

Visual Impacts

Visual impacts would likely differ greatly between the proposed and alternative layouts. Within a 5-mile study area,[11] the alternative layout would potentially have a larger viewshed and would be visible from a greater number of visually sensitive resources[12] when compared to the proposed layout (see Tables 9-5 and 9-6).

Table 9-5. Viewshed Visibility Comparisons Between the 33-Turbine Proposed Layout and the 53-Turbine Alternative Layout.

Number of Turbines Potentially Visible	Viewshed Visibility[1]			
	Proposed Layout[2]		Alternative Layout[3]	
	Square Miles	%	Square Miles	%
0	152.6	82.6	172.9	80.1
1-8	22.5	12.2	30.9	14.3
9-16	7.0	3.8	8.9	4.1
17-24	1.8	1.0	1.8	0.8
25-33	0.9	0.5	0.8	0.3
34-43	-	-	0.4	0.2
44-53	-	-	0.2	0.1
Total Visibility	32.2	17.4	43.0	19.8

[1]This viewshed analysis is based on the maximum blade tip height for each layout and considers screening provided by topography, vegetation, and structures, as captured in the 2007 FEMA lidar data for the Susquehanna Basin and Delaware County.

[2]The proposed layout consists of 33 turbines with a maximum blade tip height of 205 meters. The 5-mile study area for this layout totals 184.8 square miles in size.

[3]The alternative layout consists of 53 turbines with a maximum blade tip height of 152 meters. The 5-mile study area for this layout totals 215.9 square miles in size.

Table 9-6. Visually Sensitive Resource Comparisons Between the 33-Turbine Proposed Layout and the 53-Turbine Alternative Layout Within the 5-Mile Study Area.

Name	Maximum Number of Wind Turbines Potentially Visible		Approximate Percentage of Resource with Potential Turbine Visibility	
	Proposed Layout	Alternative Layout	Proposed Layout	Alternative Layout
NRHP-Listed Resource				
Hotchkiss, Jedediah, House	0	2	0.0	36.2
Ouaquaga Lenticular Truss Bridge	0	0	0.0	0.0
State Theater	1	1	3.2	0.7
Windsor Village Historic District	3	13	1.4	32.6

[11] i.e., an area with a radius of five miles around each turbine.

[12] Visually sensitive resources were identified in accordance with the NYSDEC Program Policy DEP-00-2, Assessing and Mitigating Visual Impacts (NYSDEC, 2000), which defines specific types of properties as visually sensitive resources of statewide significance. See the VIA for a full discussion of how sensitives sites were developed.

State Park				
Oquaga Creek State Park	33	37	6.0	4.5
Heritage Area				
Susquehanna State Heritage Area	33	53	19.4	22.3
Trails				
Finger Lakes Trail	14	13	0.3	0.3
State Bike Route 17	22	21	27.5	45.0

As detailed in Table 9-5, the alternative layout would likely be visible over a 34% greater area within the 5-mile study area when compared to the proposed layout. Perhaps more importantly, it is estimated that overall impacts to visually sensitive resources would be greater in the alternative layout when compared to the proposed layout: more turbines would be visible, and these turbines would be visible within a greater proportion of visually sensitive resource areas. The greatest potential impacts to visually sensitive resources would be at the Jedediah Hotchkiss House and the Windsor Village Historic District. Up to 13 turbines from the alternative layout would be visible from within approximately one-third of the land area within these resources, both of which are National Register of Historic Places (NRHP) properties; by comparison, the proposed layout would be largely not visible from these resources.

It is also important to note that these visual impact analyses likely underestimate the impacts of the alternative layout. Tree clearing activities generally lead to viewshed increases in a specific area. The viewshed analysis conducted for the alternative layout did not incorporate access road and collection line tree clearing as these facility components were not developed for the alternative layout, thereby underestimating the visibility of the alternative layout.

Public Health and Safety Impacts

The alternative layout would likely have increased noise impacts compared to the proposed layout. There are approximately 222 additional receptors within one mile of turbines in the alternative layout compared to the proposed layout, based on preliminary receptor data.[13] This constitutes a 91% increase in receptors. The maximum sound power of the turbines contemplated for the proposed layout average approximately 106 dBA (see Appendix X). Although the turbines in the alternative layout have a lower nameplate capacity, they are not necessarily quieter. Maximum sound power levels for the GE 2.3-116 are not publicly available; however, similar

[13] Note that this preliminary receptor data was used early in project development to vet the 53-turbine alternative layout. This receptor data is more expansive and less refined than the data presented elsewhere in this Application but is suitable for comparison purposes. The receptor data used elsewhere in this Application (e.g., in Exhibit 19) does not include some areas within the alternative layout and therefore could not be used in this comparative analysis.

models produced by GE's competitors have maximum sound power levels ranging from 105 dBA to 110.5 dBA.[14] Even if the sound power level of the GE 2.3-116 is equal to the lowest of its competitors, turbines in the alternative layout would only have a slightly reduced sound power level compared to the proposed layout. This small sound power decrease would not likely compensate for the significant increase in the number of potentially affected receptors within one mile of turbines in the alternative layout. See Exhibit 19, the Noise Impact Assessment (Appendix X), and the Sound Monitoring and Compliance Protocol (Appendix Y) for a more detailed discussion of how the proposed Facility has avoided noise impacts.

Shadow flicker impacts would likely be greater for the alternative layout compared to the proposed layout. In the United States, shadow flicker is commonly evaluated through modeling the area around each wind turbine out to a distance of ten times the rotor diameter.[15] Although shadow flicker modeling is outside the scope of this alternatives analysis, the total number of sensitive receptors within the shadow flicker evaluation area was compared between the layouts. The alternative layout has approximately 52 additional receptors within the shadow flicker evaluation area compared to the proposed layout,[16] a 23% increase. Based on this comparison, it is possible that shadow flicker impacts would have been 23% greater in the alternative layout. See Exhibit 15 and the Shadow Flicker Report (Appendix T) for a detailed discussion of how the proposed Facility has minimized and avoided shadow flicker impacts.

Transportation Impacts

The location of wind turbines south of Interstate 86 in the alternative layout could potentially result in greater health and safety risks and transportation impacts when compared to the proposed layout. Collection lines would have to cross I-86, which could require a new overhead crossing or an extensive sub-surface boring. Either of these options could result in an increased potential for environmental impacts (i.e., visual impacts from overhead structures, or impacts associated with new bore pits). In addition, transportation impacts to I-86 and other local roads would be increased during both the construction and operation phases as construction and operation vehicles would need to utilize this highway and other local roads to access the entirety of the project site in the course of their work.

[14] The Vestas V120-2.2 and the Nordex N117/2400 have maximum sound power levels of 110.5 and 105, respectively, based on publicly available information from these manufacturers.

[15] According to the Massachusetts Model Bylaw for wind energy facilities, shadow flicker impacts are minimal at and beyond a distance of ten rotor diameters (Massachusetts Department of Energy Resources, 2009).

[16] This analysis is based on the preliminary receptor data used in the noise comparison analysis above.

Conclusion

The 53-turbine alternative layout initially developed by the Applicant would likely have resulted in greater vegetation clearing and soil disturbance, and greater impacts to wetlands, forest cover, visual resources, public health and safety, and transportation. In certain cases, these impacts would likely have been substantial. For example, permanent impacts (i.e., built facilities) were estimated to be 61% greater under the alternative layout compared to the proposed layout, and the number of sensitive sound receptors within one mile of turbines would likely have been 91% greater under the alternative layout as compared to the proposed layout. As part of its comprehensive effort to avoid and minimize impacts, the Applicant refined the 53-turbine layout it initially developed into the final 33-turbine layout discussed in this Application.

As previously noted, having elected to implement the 33-turbine layout, the Applicant has attempted to avoid and minimize impacts wherever possible, while maintaining the feasibility of the Project. For example, after completing the initial turbine layout and completing the wetland delineation process, the Applicant reviewed the impact of access roads and other Facility components on wetlands made several locational adjustments that reduced permanent wetland impacts from 1.82 acres to 0.77 acres and temporary wetland impacts from 3.9 acres to 2.0 acres. See Section (b)(5), Table 9-1 for further details on how the Applicant has avoided impacts.

(5) Timing of In-service Date in Relation to Other Capacity Changes to the Electric System

The Facility is not anticipated to have any adverse effects on the New York State power grid. See Exhibit 5 for a more detailed discussion of electrical system effects.

(d) Why the Proposed Location Best Promotes Public Health and Welfare

The proposed location is best suited to promote public health and welfare because it properly balances the siting constraints discussed in Section (a) and will provide the public health benefits associated with wind energy generation. Electricity generated from zero-emission wind energy facilities like the proposed Facility can displace the electricity generated from conventional power plants, reducing emissions of conventional air pollutants, such as mercury and sulfur and nitrogen oxides, and GHGs (e.g., carbon dioxide).

(e) Why the Proposed Facility Best Promotes Public Health and Welfare

The proposed Facility will promote public health and welfare by positively impacting socioeconomics (through increased employment, increased revenues to local municipalities, and revenues to participating landowners), air quality

improvements, and climate (through a reduction of GHGs that contribute to climate change). The proposed Facility also generates electricity without using water—a valuable resource—and without requiring the extraction of fossil fuels. Also, operation of the proposed Facility will not generate any residuals—such as waste byproducts—that require management and disposal. In facilitating an overall reduction in pollutants and GHGs, the Facility will benefit sensitive environmental resources (e.g., water quality) and human health.

The proposed technology, scale, and timing of the Facility are best suited to promote public health and welfare. The turbines proposed for the Facility will utilize the latest in wind power generation technology to enhance project efficiency and safety and minimize impacts (e.g., noise). If the scale of the proposed Facility (i.e., generating capacity) were significantly reduced, the maximum benefit of the available wind resource would not be realized, reducing economic and public health benefits, and potentially rendering the project non-viable. As discussed above, increasing the number of turbines above the 33 sites evaluated in this Application, without increasing the generating capacity of the Facility, would increase impacts to agricultural and forested land and wildlife habitat, and would likely result in greater visual, shadow flicker, and noise impacts, including impacts to certain recreational and cultural resources, without any added energy generation benefit.

Regarding timing, the State Energy Plan calls for reducing GHG emissions 40% from 1990 levels and generating 50% of electricity from renewable energy sources by 2030 (NYSEPB, 2015). These aggressive targets require significant new sources of renewable energy to be brought online as soon as possible. Furthermore, New York State is already experiencing adverse impacts from climate change, including rising temperatures and sea levels, decreased winter snow cover, more widespread vector-borne infections and diseases, and more extreme precipitation events and summer heat waves. Therefore, the timing of the Facility best promotes public health and welfare.

(f) No Action Alternative

The no action alternative assumes that the Facility Site would continue to exist as is. This no action alternative would not beneficially or adversely affect current land use, ambient noise conditions, traffic or public road conditions, television/communication systems, and would maintain the area's community character, socioeconomic, and energy-generating conditions as they currently exist.

The No Action Alternative is not best suited to promote public health and welfare because it would deprive the State and the region of a major source of clean, renewable electricity. As discussed above, electricity generated from wind energy facilities can displace electricity generated from conventional power plants, reducing emissions of both conventional and GHG pollutants. On a long-term basis, increasing the production of wind generated power will reduce the need to construct and operate new fossil fueled power plants (Jacobsen and High, 2008).

The No Action Alternative is not best suited to promote public welfare because it would deprive the State of a new source of renewable energy that would help achieve the objectives of the State Energy Plan, the Governor's Reforming the Energy Vision (REV) initiative, and the Clean Energy Standard (CES). The 2015 State Energy Plan contains a series of policy objectives to increase the use of energy systems that enable the State to significantly reduce GHG emissions while stabilizing energy costs. The State Energy Plan commits to achieving a 40% reduction in GHG emissions from 1990 levels by 2030 and reducing total carbon emissions 80% by 2050. In addition, the State Energy Plan calls for 50% of generation of electricity from renewable energy sources by 2030 (NYSEPB, 2015). The No Action Alternative would not help advance the objectives of the State Energy Plan (i.e., it would not contribute toward reducing GHG emissions or assist the State in achieving the 50% renewable energy generation objective).

REV is a strategy to build a clean, resilient, and affordable energy system for all of New York. The Public Service Commission (PSC) issued their *Order Adopting Regulatory Policy Framework and Implementation Plan* on February 26, 2015 that outlines issues and tasks to resolve the technical, marketplace, and regulatory challenges necessary to achieve the REV plan and goals. As stated by the PSC in the REV Order, "A significant increase in the penetration of renewable resources is essential to meeting our objectives, state goals and proposed federal requirements" (PSC, 2015, p. 82). The REV Order recognizes that large-scale renewables (LSR), such as the proposed Facility, will be critically important to meeting GHG emissions reduction goals. On December 2, 2015, Governor Andrew Cuomo directed the Department of Public Service to develop a CES, which would change the targets identified in the State Energy Plan to required mandates. The No Action Alternative would not contribute to State policy objectives, because it would not provide additional electrical capacity produced by renewable energy.

The No Action Alternative also would not contribute to the State's goal of increasing energy storage capacity. The Clean Energy Standard (CES) Order declares that "[s]torage is a critically important component of the energy system that is both distributed and increasingly reliant on intermittent resources. Unlike other resources, the load shifting and fast response capabilities of various forms of storage resources allow them to provide simultaneous value as an energy and reliability resource" (PSC, 2016, pp. 103-104).The Bluestone Wind Facility is the first large-scale wind energy project in the State to include an energy storage component, making it a particularly valuable addition to New York's energy market and a potential model for other facilities.

(g) Energy Supply Source Alternatives

In considering alternative energy supply sources, the objectives and capabilities of the sponsor need to be considered. The objective of the Bluestone Wind Project is to add a significant source of renewable energy to the State's electric system that will qualify for participation in the New York State Clean Energy Standard program. This objective excludes

consideration of non-renewable facilities and impounded hydroelectric facilities, the only hydroelectric technology that could generate the quantity of energy the Bluestone Wind Project will produce. Solar is a potential alternative energy supply source; however, the development of a solar energy generating facility is outside the current capabilities of the Applicant. Further, considering the largely forested condition of the Facility Site, solar energy development—which has a much larger footprint than wind energy development—would likely result in substantially greater environmental and cultural impacts in this case. Overall, available alternative power generation technologies do not meet the objectives or capabilities of the Applicant.

Although not an alternative, the Applicant has incorporated battery storage into the design of the Facility. This demand-reducing technology will increase the utility of the energy generated by the Facility, helping the system manage peak demand by storing excess supply and deploying it during periods of greater demand.

(h) Comparison of Advantages and Disadvantages of Proposed and Alternative Energy Sources

Energy supply source and demand-reducing alternatives do not meet the objectives or capabilities of the Applicant. Therefore, energy supply source and demand-reducing alternatives are not evaluated in this Application.

(i) Why the Proposed Project Best Promotes Public Health and Welfare

The Applicant has designed the Facility layout to optimize the balance between energy generation and the protection of agricultural, environmental, and aesthetic resources, as well as public health and welfare. The design of the Facility has evolved through an iterative process that incorporates various siting constraints, including: wind resource availability; landowner considerations; site accessibility; stream, wetland, cultural, and visual impact avoidance/minimization; noise and shadow flicker minimization; and agricultural land protection. Each of these issues are discussed in detail in this Application. As the analysis of the alternative turbine layout in Section (c)(4) shows, the proposed Facility is best suited to promote public health and welfare.

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