Cassadaga Wind Project

Case No. 14-F-0490

1001.9 Exhibit 9

Alternatives

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EXHIBIT 9 ALTERNATIVES

(a) Description of Reasonable Alternative Location Sites

In order 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, the Applicant proposes to take advantage of the available wind resource and bulk power transmission system in Chautauqua County, New York. As described in the System Reliability Impact Study prepared on behalf of the New York State Independent System Operators (NYISO), the existing transmission system near the Facility can accommodate up to 126 megawatts (MW) of additional power generation, with appropriate upgrades. Therefore, the Applicant's goal is to construct a facility that can produce up to 126 MW of renewable energy. Total net generation delivered to National Grid's existing 115 kilovolt (kV) line is expected to be approximately 397 gigawatt-hours (GWh), or enough electricity to meet the average annual consumption of between 36,422 and 55,915 households, based on the average annual electric consumption of 10.9 megawatt-hours (MWh) for the U.S. and 7.1 MWh for New York State, respectively (USEIA, 2015).

Please also note that the Applicant, as a private facility applicant, does not have and does not anticipate having, eminent domain authority. Therefore, the identification and description of reasonable and available alternate site locations to be addressed in this Application will be limited to sites owned by or under contract/option to the Applicant. Irrespective to this, it is worth noting that the preliminary selection of wind turbine locations on a regional or statewide basis is constrained by several factors that are essential for the Facility to operate in a technically and economically viable manner. These factors include the following:

- adequate wind resource (Class II or above)
- 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 land lease participants and host communities
- limited population/residential development
- avoiding areas of high statewide significance and/or environmental sensitivity (e.g., Adirondack Park, Great Lakes shoreline)

The location selected for the Facility is suitable for commercial scale wind energy production. Across New York State, the wind resource varies based upon a number of factors (and the interaction of these factors) including topography, prevailing wind direction, and location. Commercial scale wind power projects can only be sited in certain locations within the state that are conducive to wind energy production. The higher the wind speed at a particular site, the more desirable that site is, since the energy produced by a given turbine is a function of the cube of the wind speed. Although New York has a modest wind resource, this renewable resource is not evenly distributed throughout the state. Rather, the wind resource is limited to certain unique areas in the state, which generally include coastal areas, ridgelines, elevated plateaus, and mountain peaks. Further, the Facility Site's proximity to an existing transmission line also makes this location unique and desirable.

The Applicant selected the proposed site for the Facility because of the presence of the wind resource, the presence of available land and willing landowners, the relative ease of access to the site, and the proximity and relative ease of connecting to the existing electric transmission grid. These factors combined to make the proposed site desirable from the standpoint of commercial-scale wind power development.

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

Given the unique nature and constraints associated with the siting of wind-powered electric generation facilities (i.e. adequate wind resource, willing land lease participants and host communities, and adequate access to the bulk power transmission system), the Applicant is not providing an evaluation of comparative advantages and disadvantages of alternate locations. It is simply not practicable to procure land contracts, perform environmental and engineering studies, enter into and progress through multiple interconnection permit processes, and conduct community outreach for alternative locations. However, this section provides information regarding the general criteria used to evaluate the suitability of the site for the Facility.

(1) Environmental Setting

The Facility Site consists of all parcels that are hosting Facility components. The Facility Site is located within the Allegheny Plateau physiographic province of New York State. Elevations in the area range from between 1,200 feet above mean sea level (AMSL) in eastern Chautauqua County to 1,900 feet AMSL in the western portion of the county. The topography is strongly influenced by the underlying bedrock, which is nearly level bedded (Puglia, 1994). Bedrock in this region is typified by stratified beds of shale, sandstone, limestone, and dolostone that gently tilt towards the southwest. See Exhibit 21 of this Application for more detailed information on geology and soils of the Facility Site.

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

The Applicant has identified several recreational facilities in the area including, but not limited to, state and local parks, trails (e.g., hiking, biking, water, snowmobile, equestrian), forests, wildlife management areas, fishing access points, and resorts. See Exhibit 24 of this Application for more detailed information on recreational facilities in the vicinity of the Facility Site.

A Phase 1A Historic Architectural Resources Survey & Work Plan and a Phase 1A Archeological Survey Report & Work Plan were prepared during development of the Preliminary Scoping Statement (PSS) that included information and recommendations intended to assist the Department of Public Service (DPS) and the New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP) in their review of the proposed Facility. In letters dated August 10, 2015 and September 17, 2015, respectively, NYSOPRHP indicated concurrence with the proposed scopes of work for the Historic Architectural Resources Survey and Phase 1B Archaeological Survey. These site-specific field studies have been completed, and additional detail on these studies is provided in Exhibit 20. No direct physical impacts to historic-architectural resources will occur as a result of the Facility. The Facility's potential effect on historic resources would be a change (resulting from the introduction of wind turbines) in the visual setting associated with a given historic resource. Archaeological sites identified within the Facility Site will be avoided during construction. See Exhibit 20 of this Application for more detailed information on cultural resources at the Facility Site.

The proposed Facility is located in a rural portion of Chautauqua County, which is characterized by a mix of agricultural and forested land. Land use at the Facility Site is currently dominated by dispersed residential development and vacant land. While both temporary and permanent impacts to land use will occur, these changes will affect a tiny percentage of leased lands, and the Facility will be compatible with the existing land uses that dominate the Facility Site and surrounding area. Only very minor changes in land use are anticipated within the Facility Site as a result of Facility operation, and no changes are predicted outside the Facility Site. Aside from occasional maintenance and repair activities, Facility operation will not interfere with on-going land use (i.e., farming or forestry activities). See Exhibit 4 of this Application for more detailed information on land use at the Facility Site.

(3) Engineering Feasibility

A Preliminary Geotechnical Assessment was conducted that included literature review of publicly available information and data pertaining to surface and subsurface soil, bedrock, and groundwater conditions in the vicinity of the proposed Facility, as well as preliminary geotechnical investigations at select locations within the Facility Site to obtain additional information pertaining to 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 (GZA, 2015). The literature review and preliminary borings suggest that foundations for the proposed turbines can be constructed on shallow mat foundations, and will not require deep foundation elements (e.g., caissons, piles, etc.). Due to the apparent depth of bedrock and its low rock quality, it does not appear that blasting will be required for 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. For additional information about the Geotechnical Assessment and the engineering feasibility of the site, please see Exhibit 21 of this Application.

The Applicant has conducted a rigorous wind resource analysis for this Facility, the intent of which is to optimize the turbine layout to maximize energy production within the context of the existing, site-specific constraints. The detailed results of these analyses are proprietary and are typically retained as trade secrets. Therefore, a copy of the wind meteorological analysis is not attached to this Application, but rather will be provided to DPS under separate cover. The Applicant is seeking the requisite trade secret protection for this information pursuant to NY Public Officer's Law Section 87(2)(d) and 16 NYCRR 6-1.4. See Exhibit 6 of this Application for additional information about the wind resource at the Facility Site.

With respect to interconnections, please see (b)(4) below.

(4) Reliability and Electric System Effects

A System Reliability Impact Study (SRIS) was conducted in January 2015 to evaluate the impact of the Facility on the reliability of the New York State Transmission System and to evaluate alternatives to eliminate adverse reliability impacts, if any, resulting from the Facility. The SRIS, which is discussed in more detail in Exhibit 5, evaluated a number of power flow base cases, as determined by the NYISO, including 2018 summer peak, winter peak, and light load. The SRIS also included stability analyses for the system summer peak and light load conditions, both with and without the Facility. The Facility is not expected to result in adverse impacts to the transmission system. See Exhibit 5 for more detailed information on reliability and electric system effects.

(5) Environmental Impacts

Despite the positive effects anticipated as a result of the Facility, its construction and operation will necessarily result in certain unavoidable impacts to the environment. The majority of these environmental impacts will result from construction activities and will be temporary in nature. Long-term unavoidable impacts associated with operation and maintenance of the Facility are anticipated to be relatively limited, but will include turbine visibility, wildlife habitat changes, and minor impacts to streams and wetlands.

The presence (i.e., visibility) of the turbines will likely result in a change in perceived land use from some viewpoints. Evaluation by registered landscape architects indicates that the Facility's overall contrast with the visual/aesthetic character of the area will generally be minimal to moderate. However, based on the contrast rating scores and comments, greater levels of contrast can be anticipated where foreground or near-midground views of turbines (i.e., under 1.5 mile) are available from residences or areas of relatively higher overall scenic quality. Conversely, contrast is reduced when turbines are partially screened, viewed at greater distances, seen in the context of a working agricultural landscape, or viewed in a setting with existing visual clutter. Based on experience with currently operating wind power projects elsewhere, public reaction to the Facility is likely to be generally positive, but highly variable based on proximity to the turbines, the affected landscape, and personal attitude of the viewer regarding wind power. See Exhibit 24 of this Application for more detailed information on turbine visibility and visual impacts in the vicinity of the Facility Site.

The Facility layout was designed, in part, through an iterative process of identifying wetland locations and siting Facility components to avoid and minimize impacts to surface waters and wetlands wherever possible. Despite avoiding and minimizing wetland impacts where practicable, some wetland impacts are unavoidable. Where avoidance was not practicable, narrow and/or previously disturbed portions of the wetlands were chosen for crossing locations. The Applicant will implement compensatory mitigation that will be determined in consultation with the New York State Department of Environmental Conservation (NYSDEC) and United States Army Corps of Engineers (USACE). This mitigation will ensure "no net loss" of wetlands, and may include the purchase of credits from an approved in-lieu-fee program, creation of an on-site compensatory mitigation area, restoration or enhancement of wetlands in the impacted watershed, or some combination of these options. See Exhibit 22 of this Application for more detailed information on impacts to wetlands at the Facility Site.

Facility components have been sited so as to minimize impact to undisturbed wildlife habitat. Many of the proposed turbines are sited in or adjacent to agricultural land, which generally provides 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. Approximately 509.5 acres of wildlife habitat will be temporarily disturbed during construction, while permanent loss through conversion of natural habitat to built facilities will total 81.2 acres. On a landscape scale, there is abundant availability of habitats within the nearby landscape similar to those at the Facility Site. See Exhibit 22 of this Application for more detailed information on impacts to wildlife habitat within the Facility Site.

The proposed Facility will not contribute to global temperature increases. On the contrary, the Facility is anticipated to have long-term beneficial effects on the use and conservation of energy resources. The operating Facility will generate up to 126 MW of electricity without consuming cooling water, and without emitting pollutants or heat-trapping greenhouse gases. Electricity generated from zero-emission wind energy facilities can displace the electricity generated from conventional power plants, thereby reducing the emissions of conventional air pollutants, such as mercury; sulfur and nitrogen oxides (acid rain precursors); and carbon dioxide (linked to global climate change). This conclusion is supported by a 2008 U.S. Department of Energy, National Renewable Energy Laboratory report that states, "Wind 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, which have higher operating and fuel costs." On a long-term basis, wind generated power also reduces the need to construct and operate new fossil fueled power plants (Jacobsen & High, 2008). Please also see section (f) below for additional information on the benefits of wind power.

According to an extrapolation of 2012 data released in 2015 by the U.S. Environmental Protection Agency *Emissions and Generation Resource Integrated Database* (eGRID2012), the Facility is expected to displace approximately 244,086.4 tons of carbon dioxide (CO2) emissions from conventional power plants on an annual basis (USEPA, 2015a), which represents approximately 0.7% of CO2 produced by the electricity generation sector in New York State (USEPA, 2105b). See Exhibit 8 for additional information, including an explanation of how these displacements were calculated.

(6) Economic Considerations

The purpose of the Facility 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. To fulfil these goals, adequate wind resource and access to the existing transmission system are some of the most important economic considerations is selecting a Facility Site. The Facility Site has ample wind resource for the proposed Facility, and is located in close proximity to the existing bulk power transmission system. See Exhibit 6 of this Application for additional information about the wind resource at the Facility Site, and Exhibit 34 for 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 typically 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 NY Public Officer's Law Section 87(2)(d) and 16 NYCRR 6-1.4.

The proposed Facility will have a positive impact on the local economy. Construction will employ a total work force of approximately 75 on-site employees. Of these, 70 of the jobs will occur in Construction Labor, while five of the jobs includes the disciplines of engineers and other professional services. Operations and maintenance of the proposed Facility will generate seven full full-time jobs with combined estimated annual earnings of approximately $600,000. In addition to the jobs created and the wages paid to the work force, the Facility will have a direct economic benefit from the first round of buying/selling, which includes the purchase of goods from local sources (such as fuel), the spending of income earned by workers, annual labor revenues, and the income effect of taxes. These direct effects will result in additional induced economic benefits in other sectors.

The Project operation will result in payment to local landowners in association with the lease agreements executed to host Project components, which will be in addition to any income generated from the existing land use (e.g. agricultural production). Based on the specifics of the lease and easement agreements, the Applicant estimates that these payments will total approximately $1.2 million during the first year (construction), and approximately $950,000 on an annual basis each year the Facility is in operation. These lease payments will have a positive impact on the region, to the extent that landowners will spend their revenue locally.

The proposed Facility will have a significant positive impact on the local tax base, including local school districts and other taxing districts that service the area where the proposed wind farm is to be located. Taxing districts within the Project Area include Chautauqua County, the Town of Cherry Creek, the Town of Charlotte, the Town of Arkwright, the Town of Stockton, Cassadaga Valley Central School District, and Pine Valley Central School District. It is important to note that the proposed Facility will make few, if any, demands on local government services. Therefore, 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 as a whole, the Applicant has developed, and will implement plans for site security, worker safety, and emergency action, which are described in Exhibit 18 of this Application.

The Applicant has developed a Preliminary Emergency Action Plan (EAP), which is summarized in detail in Exhibit 18. The information contained in the EAP has been developed in conjunction with local emergency service providers, and outlines the procedures to follow in the event of an emergency. The EAP will be made available to the employees of the Applicant and any visiting guests or workers at the Facility. A discussion of the various elements contained within the EAP is provided in Exhibit 18 of this Application.

(9) Public Health

The Facility is not expected to result in any public health concerns. Claims of health impacts related to sound and shadow flicker have been considered, but all significant, scientifically reviewed studies on the subject have found those claims to be largely unfounded. The design of the Facility adequately considered any reasonable standards and is not expected to result in any public health concerns. See Exhibit 19. See Exhibit 15 of this Application for additional information about public health.

(10) Vulnerability to Seismic Disturbances and Climate Change Impacts

Based on the 2014 New York State Seismic Hazard Map (USGS, 2014), the Facility Site is located in an area of relatively low seismic hazard, with a 2% or less chance that peak ground acceleration in a 50 year window is between 4% and 8% of standard gravity. An earthquake occurred in Attica, New York (about 75 miles northeast of the Facility Site) in 1966 with a Richter scale magnitude of 4.7 (USGS, 2015). There are several faults mapped in Chautauqua County (Jacobi, 2002). The Mayville fault, Charlotte Center fault, and an unnamed fault are located within the vicinity of the Facility Site. However, these faults are not associated with any historic 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. See Exhibit 21 of this Application for a more detailed discussion of the Facility's potential vulnerability to seismology.

With respect to climate change, New York State is increasingly faced with a changing climate that is beyond the range of past experiences. Statewide annual temperatures have increased by approximately 0.6ºF per decade since 1970. This increase is most pronounced during the winter, when warming has exceeded 1.1ºF per decade. Overall, there has been no discernable trend in annual precipitation since the start of the 20th century, although intense precipitation events have increased in recent decades (NYSERDA, 2011). Increasing greenhouse gas concentrations are projected to lead to continual steady temperature increases, as well as significant increases in the frequency, intensity, and duration of extreme heat events and coastal flooding. Intense precipitation events are also projected to become increasingly frequent, while cold air outbreaks are projected to gradually become less frequent (NYSERDA, 2014).

The Facility Site is located along upland ridges in western New York, far from coastal areas. As a result, the site is not expected to be vulnerable to rising sea levels. More frequent intense precipitation events could lead to more frequent flooding in low-lying areas. Review of Federal Emergency Management Agency (FEMA) flood insurance rate maps indicate that 100-year floodplains are mapped in several stream valleys within the Facility Site, including along portions of Mill Creek and unnamed tributaries of Cassadaga Creek. However, the wind turbines are located in upland areas, well away from these floodplains. The crossing of Mill Creek by a co-located section of transmission line and collection line are the only Facility components proposed to be located within a floodplain. The transmission line poles will be located outside the floodplain to the extent practicable.

Temperature increases will drive many changes in species composition and ecosystem structure across the state (NYSERDA, 2011). For example, forest composition is expected to slowly change, with oak-hickory forests becoming dominant in many areas currently occupied by maple-beech forests (Iverson et al., 2008). However, the 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 EverPower Wind Holdings, Inc. ("EverPower"). Headquartered in Pittsburgh, Pennsylvania with offices in New York and Ohio, EverPower is a developer of utility grade wind projects. Since its founding in 2002, EverPower has used a unique approach to wind power development by partnering with landowners and communities to establish itself as a premier developer, owner, and operator of wind energy facilities in the U.S. To date, EverPower currently has seven operational wind facilities with a nameplate capacity of approximately 752 MW, including the Howard Wind Project in Steuben County, New York. The Howard Wind Project has a total generating capacity of 55.35 MWs and uses 27 Repower MM92 turbines. The first 25 turbines became commercial operational in 2011, and the two-turbine second phase became operational in 2012.

The objective of the proposed Facility is to create an economically viable wind-powered electrical-generating facility that will provide a source of renewable energy to the New York power grid to:

- Satisfy regional energy needs in an efficient and environmentally sound manner;
- Supplement and offset fossil-fuel electricity generation in the region, with emission-free, wind-generated energy;
- Reduce the amount of electricity imported to New York State;
- Realize the full potential of the wind resource at the Facility Site;
- Provide energy that is not susceptible to fluctuations in 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;
- Provide good-paying job opportunities in rural areas; 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.

(12) Wind Meteorological Analysis

Wind resource analyses were performed in order to optimize the turbine layout for maximum energy production within the context of the existing, site-specific constraints. These analyses are described in in greater detail in Exhibit 6 of this Application. The detailed results of these analyses are proprietary and are typically retained as trade secrets. Therefore, a copy of the wind meteorological analysis is not being provided with this Application, but rather will be provided to DPS under separate cover. The Applicant is seeking the requisite trade secret protection for this information pursuant to NY Public Officer's Law Section 87(2)(d) and 16 NYCRR 6-1.4.

Publicly available wind resource maps suggest a suitable wind resource along ridgetops at the Facility Site (AWS Truewind, 2007; NREL & AWS Truepower, 2010). The Cassadaga Wind Project will have a nameplate capacity of up to 126 MW, and is expected to operate at an annual net capacity factor of approximately 36%. This means that over the course of a full calendar year the Project would produce up to 397,353 megawatt hours (MWh) of energy (i.e., 126 MW x 24 hrs/day x 365 days x 36%). This is enough electricity to meet the average annual consumption of between approximately 36,422 and 55,915 households, based on the average annual electric consumption of 10.9 MWh for the U.S. and 7.1 MWh for New York State, respectively (USEIA, 2015).

(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 facilities in any area or on any parcel of land. Facilities can only be sited on private property where the landowner has agreed to allow such construction, and is further constrained by the factors described in (c)(4) below.

(1) General Arrangement and Design

The general arrangement and design of the Facility is influenced by a number of factors, as discussed in detail in (c)(4) below.

(2) Technology

Private landowner agreements strictly limit the use of land to a wind power project, and as such, do not allow for the siting of other alternative energy production facilities (e.g., solar, hydro, biomass, or fossil fuel). Accordingly, other power generation technologies are not reasonable alternatives, and do not warrant consideration in this Article 10 Application.

The turbines proposed for the Facility will utilize the latest in wind power generation technology to enhance 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) to the top of the tower, 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. This also has the benefit of reducing visibility from ground vantage points, by making them difficult to see against 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. These lights are anticipated to be flashing red strobes (L-864) that operate only at night. 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 68 meters (223 feet) in length, with a maximum rotor diameter of up to 136 meters (446 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, which enables the turbine to operate efficiently at varying wind speeds. The rotor can spin at varying speeds to operate more efficiently. Depending on the turbine model selected, the wind turbines will begin generating energy at wind speeds as low as 3 meters per second (m/s) [6.7 miles per hour (mph)], and cut out at maximum wind speeds of 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. However, turbine models that have been determined to be suitable for this site include the Gamesa G114 (2.1 MW), Gamesa G114 (2.625 MW), Gamesa G126 (2.5 MW), General Electric (GE) 2.3-117 (2.3 MW), GE 2.75-120 (2.75 MW), GE 3.2-130 (3.2 MW), Nordex N117 (3.0 MW), Siemens SWT-2.3-120 (2.3 MW), Siemens SWT-3.3-130 (3.3 MW), Vestas V112 (3.0 MW), Vestas V117 (3.3 MW), Vestas V126 (3.3 MW), and Vestas V136 (3.45 MW). Table 9-1 presents the dimensions for each of the alternative turbine models.

Table 9-1. Approximate Turbine Dimensions by Model

Turbine Model	Rated Power	Hub Height	Rotor Diameter	Total Height
Gamesa G114	2.1 MW	93 meters (305 feet)	114 meters (374 feet)	150 meters (492 feet)
Gamesa G114	2.625 MW	93 meters (305 feet)	114 meters (374 feet)	150 meters (492 feet)
Gamesa G126	2.5 MW	84 meters (276 feet)	126 meters (413 feet)	147 meters (482 feet)
GE 2.3-117	2.3 MW	94 meters (308 feet)	116 meters (381 feet)	152 meters (499 feet)
GE 2.75-120	2.75 MW	85 meters (279 feet)	120 meters (394 feet)	145 meters (476 feet)
GE 3.2-130	3.2 MW	85 meters (279 feet)	130 meters (427 feet)	150 meters (492 feet)
Nordex N117	3.0 MW	91 meters (299 feet)	117 meters (384 feet)	150 meters (492 feet)
Siemens SWT-2.3-120	2.3 MW	92 meters (302 feet)	120 meters (394 feet)	152 meters (499 feet)
Siemens SWT-3.3-130	3.3 MW	85 meters (279 feet)	130 meters (427 feet)	150 meters (492 feet)
Vestas V112	3.0 MW	96 meters (315 feet)	112 meters (367 feet)	152 meters (499 feet)
Vestas V117	3.3 MW	92 meters (302 feet)	117 meters (384 feet)	150 meters (492 feet)
Vestas V126	3.3 MW	87 meters (285 feet)	126 meters (413 feet)	150 meters (492 feet)
Vestas V136	3.45 MW	82 meters (269 feet)	136 meters (446 feet)	150 meters (492 feet)

These turbine models represent suitable turbines under consideration for the Facility at the time of this Application. The final turbine selected for the Facility may be one of these, or may be another turbine model. If a different turbine model is selected, it will not have a greater total height, rotor swept area, or sound power level output that those analyzed in this Application. Please see Appendix K of this Application for turbine brochures containing additional information about wind turbine technology.

(3) Scale or Magnitude

As mentioned previously, various siting constraints dictate the size and layout of a wind power project. These constraints make a significantly larger number of turbines than what is proposed within the Facility Site highly unlikely. The Applicant is doing business in a wholesale electric market that is highly competitive and extremely price-sensitive. Given the economies of scale involved in the development and construction of a wind energy facility, all other things being equal, a larger scale project will produce lower cost energy. Since the Cassadaga Wind Project has a 126 MW interconnection request with the NYISO, the preferred alternative is to construct a facility that has the ability to produce up to 126 MW. A facility with significantly smaller production capacity would pose challenges to the technical and/or economic feasibility of the Facility, and would not meet the stated objectives of the Facility.

If the proposed generating capacity were significantly reduced, the maximum benefit of the available wind resource would not be realized. Furthermore, construction cost economics of scale are realized for a larger generating capacity due to fixed costs to mobilize expensive equipment such as erection cranes to the Facility. As with most land disturbance based environmental impacts, economic benefits would also be reduced proportionately with a smaller project. PILOT payments to local taxing jurisdictions (which are typically developed per MW or per turbine) would be greatly reduced, as would construction expenditures and landowner lease payments.

Although the Facility presented herein includes up to 58 turbine sites, the number of turbines actually constructed may be significantly lower, depending on the turbine model selected, in order to achieve the 126 MW interconnection. For example, if a turbine with a 3.0 MW nameplate capacity is selected, such as the Nordex N117 or Vestas V112, it is expected that 42 turbines will be constructed. If the proposed number of turbines were significantly increased above 58 sites evaluated in this Application, the Applicant would need to obtain more leased land area to operate efficiently and to meet the criteria for siting. The Applicant does not currently have the additional land control to increase the Facility Site. Furthermore, as previously indicated, the maximum generating capacity for this interconnection is 126 MW.

(4) Alternative Turbine Layouts

The proposed location and spacing of the wind turbines are directly related to a number of factors, including landowner participation, a wind resource assessment, environmental resource factors, and review of the Facility Site's zoning constraints. Factors considered during the layout design process include the following:

- *Wind Resource Assessment*. Through the use of on-site meteorological data, topographic and surface roughness data, wind flow modeling, and wind plant design software, the wind turbines will be sited to optimize exposure to wind from all directions, with emphasis on exposure to the prevailing southwest wind direction at the Facility Site.

- *Topography*. Elevation is a key component of maximizing the capture of wind energy, and higher elevations typically correspond to higher wind resource. In addition, turbine manufacturers require certain elevation and topography criteria be met (i.e., not locating a turbine on too steep of a slope or on too narrow a ridge), or else they will not certify the turbine location as suitable and the turbine cannot be constructed. To ensure turbines were placed in suitable locations, all potential turbine sites were evaluated to meet elevation and topography criteria.
- *Sufficient Turbine Spacing*. Siting turbines too close to one another can result in decreased electricity production and excessive turbine wear, due to the creation of wind turbulence between and among the turbines. Each operating wind turbine creates downwind turbulence in its wake. As the flow proceeds downwind, there is a spreading of the wake and recovery to free-stream wind conditions. The Facility turbines will be located with enough space between them to minimize wake losses and maximize the capture of wind energy.
- *Local Zoning*. The Towns of Arkwright, Charlotte, and Cherry Creek have adopted Wind Energy Regulations as amendments to the Town's Zoning Ordinances (as noted previously in Exhibit 6 there are no turbines proposed for the Town of Stockton and therefore local zoning in this town was not considered in relation to turbine siting). These regulations specify criteria under which applications for commercial wind energy conversion systems will be evaluated. The Facility will be consistent with all Town Zoning Ordinance and Wind Energy Regulations, except as discussed in Exhibit 31 (i.e., construction hours and maximum turbine height in Cherry Creek).
- *Wetlands and Waterbodies.* Facility components will avoid and/or minimize impacts to wetlands/streams to the greatest extent practicable.
- *Communication Interference*. Turbines will be sited outside of known microwave pathways or Fresnel zones to minimize the effect that they may have on existing communications.
- *Cultural Resources*. Facility construction will be conducted in such a way that does not cause any significant impact to prehistoric or historic archeological resources.

As previously mentioned, the Facility evaluated in this Article 10 Application consists of 58 proposed wind turbine sites. Table 9-2 identifies the position of all proposed turbine sites. See also Figure 2-2.

Table 9-2. Turbine Coordinates, Proposed Facility

Turbine ID	Latitude	Longitude	Turbine ID	Latitude	Longitude
1	42.27067	-79.12278	30	42.32825	-79.15194
2	42.27339	-79.12430	31	42.30455	-79.14367
3	42.34555	-79.24141	32	42.31280	-79.15907

Turbine ID	Latitude	Longitude	Turbine ID	Latitude	Longitude
4	42.33916	-79.19559	33	42.29435	-79.26207
5	42.31592	-79.11949	34	42.30895	-79.15478
6	42.27648	-79.13754	35	42.33184	-79.21742
7	42.35070	-79.24588	36	42.32810	-79.22780
8	42.34321	-79.15753	37	42.28342	-79.14213
9	42.27640	-79.12718	38	42.30061	-79.26787
10	42.32566	-79.14925	39	42.28086	-79.27103
11	42.34859	-79.24320	40	42.30721	-79.15180
12	42.28367	-79.13532	41	42.30828	-79.20275
13	42.32879	-79.13141	42	42.32421	-79.14531
14	42.31751	-79.12294	43	42.29740	-79.26454
15	42.31592	-79.16579	44	42.28695	-79.26920
16	42.33453	-79.15590	45	42.29025	-79.27680
17	42.32020	-79.12483	46	42.28880	-79.27306
18	42.28109	-79.13308	47	42.33788	-79.14997
19	42.33398	-79.22975	48	42.32781	-79.20447
20	42.33709	-79.23059	49	42.32985	-79.13948
21	42.33096	-79.22879	50	42.29608	-79.21594
22	42.27099	-79.13029	51	42.33465	-79.14553
23	42.32390	-79.12464	52	42.29984	-79.21669
24	42.27409	-79.13397	53	42.33276	-79.20439
25	42.33181	-79.15409	54	42.31364	-79.19272
26	42.31059	-79.15751	55	42.33252	-79.14194
27	42.27819	-79.13183	56	42.33667	-79.21610
28	42.29021	-79.26313	57	42.33733	-79.22333
29	42.34032	-79.15379	58	42.31620	-79.19435

The Facility's turbine layout is also a function of the turbine model that will ultimately be used at the site. The actual number of turbines constructed will depend on the capacity of the turbine model selected, in order to reach a total generating capacity of up to 126 MW. For example, if a turbine with a 2.1 MW nameplate capacity is selected, such as the 2.1 MW Gamesa G114, it is expected that up to 58 turbines will be constructed; if a turbine with a 2.3 MW nameplate capacity is selected, such as the GE 2.3-117 or Siemens SWT-2.3-120 is selected, it is expected that up to 54 turbines will be constructed; if a turbine with 3.45 MW nameplate capacity is selected, such as the 3.45 MW Siemens V136, it is expected that up to 36 turbines will be constructed.

The turbine model ultimately selected for this Facility will be based on numerous factors, such as site suitability, availability, and price. If all 58 turbine sites are not needed because a 2.3 MW or larger turbine is selected, the turbine locations to be utilized will be chosen from among the 58 specific locations identified above in Table 9-2. This determination will be made based on the wind resource, and other siting factors such as distance to the collection substation, construction costs, environmental impacts that could be avoided or minimized, etc. However, even though fewer than 58 turbines may be built, this Application assesses the potential impacts associated with all 58 turbine locations, in order to assure a worst-case analysis.

The Towns of Arkwright, Charlotte, and Cherry Creek each have local wind laws. These laws include height restrictions for wind turbines, specifying that the maximum total turbine height shall be 420 feet in the Town of Cherry Creek, and 500 feet in the Towns of Charlotte and Arkwright. See Exhibit 31 of this Application for additional information on local laws and ordinances. As shown above in Table 9-1, the total height of these turbine models ranges from 476 to 499 feet and the turbine ultimately selected for the Facility will be of similar height and dimension.

For illustrative purposed, two alternative layouts to the proposed Facility will be discussed in greater detail herein: (1) the use of taller turbines at the same 58 locations as the proposed layout, and (2) an alternate 75-turbine layout. See Figure 3-1.

<u>Taller Turbine Alternative</u>

This alternative explores the option of utilizing one of the largest onshore wind turbine models available, the 7.58 MW Enercon E-126. With a hub height of 135 meters (443) and a rotor diameter of 127 meters (417 feet), the Enercon E-126 has a total height of 198 meters (650 feet). This turbine model would begin generating energy at wind speeds as low as 3 meters per second (m/s) [6.7 miles per hour (mph)], and has storm control features that allow it to continue generating power at high wind speeds, cutting out at wind speeds of 28-34 m/s (62.6-76.1 mph).

Setbacks are among the many constraints evaluated when identifying proposed turbine sites. The local wind laws adopted in the Towns of Arkwright, Charlotte, and Cherry Creek contain requirements for various distances that turbines must be setback from residences, non-participating parcels, public roads, and other infrastructure. Many of the setbacks are based on turbine height. See Exhibit 6 for more information about the setbacks prescribed by local law. The Facility was designed so that the turbine sites meet or exceed the setback requirements set forth in the Towns of Arkwright, Charlotte, and Cherry Creek zoning regulations. Given the range of turbine models under consideration (476 to 499 feet), setback distances were calculated for the proposed Facility assuming a total turbine height of 500 feet. Table 9-3 compares the setback distances derived from the Applicant's setback standards for the proposed Facility with those for the Taller Turbine Alternative, calculated assuming a total turbine height of 650 feet.

Table 9-3. Comparison of Height-Based Setback Distances for 500-foot vs. 650-foot Turbines

Applicant's Setback		Setback Distance	
		500-foot Turbines	650-foot Turbines
Substation	1.5x total turbine height	750 feet	975 feet
Transmission Line[1]	1.5x total turbine height	750 feet	975 feet
Gas Well	Total turbine height	500 feet	650 feet
Public Road	1.1x total turbine height	550 feet	715 feet
State Land	1.1x total turbine height	550 feet	715 feet
Non-Residential Structure[2]	1.1x total turbine height	550 feet	715 feet
Non-Participating Residence	3x total turbine height	1,500 feet	1,950 feet
Participating Residence	2x total turbine height	1,000 feet	1,300 feet
Non-Participating Parcel	1.1x total turbine height	550 feet	715 feet

[1]This setback applies to larger transmission lines (i.e., 115 kV and greater) and is to be measured from the edge of the right-of-way.
[2]The Town of Arkwright requires a setback of 1.5x total turbine height to existing non-wind turbine structures, which would 750 feet for a 500-foot turbine and 975 feet for a 650-foot turbine. For each of the three alternatives, there is only one proposed turbine site in the Town of Arkwright. The closest non-residential structure is approximately 1,730 feet from turbine site T7 (part of the proposed Facility and the Taller Turbine Alternative) and approximately 1,670 feet from turbine site T39 (part of the 75-Turbine Alternative). In other words, all three alternatives comply with the 1.5x setback to non-residential structures in the Town of Arkwright.

All 58 proposed turbine sites that are the subject of this Application meet the Applicant's setback standards for each of the turbine models under consideration. However, because many of the setbacks are based on turbine height, the use of a taller turbines would result in greater setback distances for the Taller Turbine Alternative. The first six setbacks listed above in Table 9-3 are strictly resource-based (i.e., substation, transmission line, gas well, public road, State land, and non-residential structures). The setback distances for these features are calculated based on a simple distance offsets from the given resource, and are not dependent on the lease status of the landowner. The distances for the remaining setbacks, to residences and parcel boundaries, are status-based. The setback distances for these features are based on the lease status of the landowner (participating vs. non-participating).

Twenty-one (21) of the 58 proposed turbine sites would not be in compliance with at least one of the Applicant's resource-based setbacks assuming use of the 650-foot Enercon E-126 turbine model. Specifically, with the use of taller turbines, seven turbine sites would not comply with the gas well setback (T11, T22, T23, T32, T41, T49, T58); six turbine sites would not comply with the public road setback (T4, T26, T34, T40, T44, T50); four turbine sites would not comply with the State land setback (T4, T15, T54, T58); and seven turbine sites would not comply with the non-residential structure setback (T14, T17, T28, T37, T45, T46, T49). All 58 proposed turbine sites would still be in compliance with the setbacks for substations and transmission lines with the use of taller turbines.

With regard to status-based setbacks, one way to illustrate the differences between the alternatives is to compare the number of leases that must be signed. In order to comply with the Applicant's setbacks, the landowners of any parcel within 1.1x total turbine height of a proposed turbine site must be project participants (i.e., they must have signed a landowner agreement, easement, setback waiver, or Good Neighbor Agreement). As shown above in Table 9-3, this means the landowners of all parcels located within 550 feet of a proposed Facility turbine or within 715 feet of a Taller Turbine Alternative turbine must be project participants. In order to comply with the setback to non-participating parcels for the proposed Facility, the Applicant will sign landowner agreements allowing the use of 71 parcels. For the Taller Turbine Alternative, the Applicant would need to sign landowner agreements allowing use of 100 parcels, an increase of more than 40%.

To comply with the setback to non-participating residence, the owners of any residential structure within 3x total turbine height of a turbine site must be project participants (i.e., they must have signed a landowner agreement, easement, setback waiver, or Good Neighbor Agreement). As shown above in Table 9-3, this means the owners of all residential structures located within 1,500 feet of a proposed Facility turbine or within 1,950 feet of a Taller Turbine Alternative turbine must be project participants. In order to comply with the setback to non-participating residences for the proposed Facility, the Applicant will sign agreements with the owners of the 25 residences within 1,500 feet of a turbine site (making them project participants). For the Taller Turbine Alternative, the Applicant would need to sign landowner agreements with the owners of 118 residences within 1,950 feet of a turbine site, an increase of more than 320%.

There is also a setback to participating residences of 2x total turbine height. As shown above in Table 9-3, this means that regardless of whether or not the owners are project participants, no turbine site can be located within 1,000 feet of a residential structure according to the Applicant's setback standards, and no Taller Turbine Alternative turbine site can be located within 1,300 feet of a residential structure when considering this alternative. There are no residential structures within 1,000 feet of a proposed Facility turbine site. Fifteen (15) of the 58 Taller Turbine Alternative turbines are within 1,300 feet of at least one residential structure. With the use of the 650-foot Enercon E-126 turbine model, turbine sites T3, T13, T20, T28, T31, T32, T38, T39, T40, T41, T44, T49, T52, T54, and T56 would not comply with the participating residence setback.

The environmental impacts of constructing Enercon E-126 turbines would be similar to the impacts from constructing the proposed Facility, because turbines, access roads, and collection lines would be sited in the same locations. Wetland and stream impacts would be very similar, because turbine sites have been selected to avoid impacts to such resources. However, permanent soil, vegetation, land use, and agricultural impacts would be somewhat greater, because the Enercon E-126 turbine has a larger tower diameter at the base and requires a larger foundation.

The Taller Turbine Alternative is not preferred because the greater height results in proportionally larger setbacks, which would make it extremely difficult to reach a total generating capacity of 126 MW. The 650-foot height would also violate the maximum total turbine height restrictions in all of the host Towns.

75-Turbine Alternative

This alternative explores the option of utilizing 75 proposed turbine sites instead of 58, using the same range of turbine models under consideration for the proposed Facility. Some of the turbine sites in the 75-Turbine Alternative are located in the same general areas as proposed Facility turbine sites (due to the availability of wind resources), while others are located along completely different ridgelines. Table 9-4 identifies the position of the 75-Turbine Alternative turbine sites. See also Figure 3-1.

Table 9-4. Turbine Coordinates, 75-Turbine Alternative

Turbine ID	Latitude	Longitude	Turbine ID	Latitude	Longitude
1	42.27067	-79.12278	39	42.35067	-79.24488
2	42.31619	-79.11782	40	42.31939	-79.16897
3	42.27339	-79.12457	41	42.33516	-79.23063
4	42.32304	-79.12687	42	42.34106	-79.19686
5	42.32522	-79.14899	43	42.26578	-79.18813
6	42.26250	-79.17387	44	42.30543	-79.14969
7	42.28163	-79.26977	45	42.28281	-79.14220
8	42.26073	-79.17027	46	42.30894	-79.15565
9	42.27648	-79.13754	47	42.32938	-79.22738
10	42.32741	-79.17786	48	42.33827	-79.14972
11	42.31885	-79.12043	49	42.31618	-79.16571
12	42.29096	-79.26318	50	42.29400	-79.18559
13	42.27606	-79.12747	51	42.30718	-79.15273
14	42.32101	-79.12365	52	42.33008	-79.13899

Turbine ID	Latitude	Longitude	Turbine ID	Latitude	Longitude
15	42.34540	-79.24243	53	42.27438	-79.20235
16	42.29768	-79.16784	54	42.31048	-79.20601
17	42.27137	-79.13092	55	42.30031	-79.21574
18	42.28940	-79.27315	56	42.29809	-79.18750
19	42.26368	-79.18453	57	42.27004	-79.19537
20	42.32556	-79.17387	58	42.33339	-79.21723
21	42.33412	-79.15683	59	42.26356	-79.19530
22	42.29464	-79.26256	60	42.26850	-79.20281
23	42.27383	-79.13415	61	42.33510	-79.14461
24	42.31048	-79.15881	62	42.26783	-79.19150
25	42.33092	-79.15450	63	42.29407	-79.21385
26	42.33811	-79.23258	64	42.26558	-79.19968
27	42.30030	-79.17138	65	42.27258	-79.19822
28	42.28695	-79.26920	66	42.30794	-79.20327
29	42.28053	-79.13364	67	42.33252	-79.14194
30	42.26433	-79.17737	68	42.27894	-79.14011
31	42.29774	-79.26490	69	42.27730	-79.20569
32	42.33224	-79.22912	70	42.31545	-79.19518
33	42.28356	-79.13571	71	42.32782	-79.20430
34	42.33844	-79.19375	72	42.33588	-79.22002
35	42.32801	-79.15179	73	42.33280	-79.20416
36	42.34798	-79.24401	74	42.31275	-79.19217
37	42.27821	-79.13097	75	42.33855	-79.22327
38	42.31316	-79.17100			

Because the setbacks are height-based, the same setback distances presented above in Table 9-3 for the proposed Facility also apply to the 75-Turbine Alternative.

Nineteen (19) of the 75 sites would not be in compliance with at least one of the resource-based setbacks with the use of the same turbine models under consideration for the proposed Facility. Specifically, with the 75-Turbine Alternative, nine turbine sites would violate the public road setback (T24, T34, T38, T42, T44, T45, T46, T51, T56); seven turbine sites would violate the State land setback (T10, T34, T38, T40, T42, T50, T74); and eight turbine sites would violate the non-residential structure setback (T11, T12, T14, T18, T29, T44, T45, T64). By comparison, all 58 proposed Facility turbine sites will meet or exceed these setbacks. All 75 alternative turbine sites would be in compliance with the setbacks for substations, transmission lines, and gas wells.

In order to comply with the setback to non-participating parcels for the 75-Turbine Alternative, the owners of all parcels located within 550 feet of a turbine must be project participants. To achieve this, the Applicant would need to sign agreements/waivers/easements allowing the use of 119 parcels. This represents an increase of more than 67% when compared to the 71 landowner agreements required to comply with the setback to non-participating parcels for the proposed Facility.

In order to comply with the setback to non-participating residences for the 75-Turbine Alternative, the owners of all residential structures located within 1,500 feet of a turbine must be project participants. To achieve this, the Applicant would need to sign landowner agreements with the owners of 82 residences. This represents an increase of more than 192% when compared to the 28 landowner agreements required to comply with the setback to non-participating residences for the proposed Facility.

In order to comply with the setback to participating residences for the 75-Turbine Alternative, no turbine sites can be located within 1,000 feet of a residential structure. A total of seven 75-Turbine Alternative turbine sites would not comply with the participating residence setback: T6, T8, T16, T26, T44, T56, and T74. By comparison, there are no residential structures within 1,000 feet of a proposed Facility turbine site.

Field reconnaissance conducted on the 75-turbine layout in April 2015 determined that stream and wetland impacts would be significantly greater under this scenario, more so than would be expected proportionally based on the increase to 75 turbine sites (an increase of 29 percent compared to the 58 turbine sites for the proposed Facility). Approximately 4.77 acres of wetlands and 604 linear feet of streams would be permanently impacted by the 75-Turbine Alternative, increases of 208 and 77 percent, respectively, when compared to the proposed Facility. See Exhibit 22 of this Application for more detailed information on impacts to wetlands and streams from the proposed Facility. It also appears that impacts to archaeological resources could not be entirely avoided with the 75-Turbine Alternative. This is because when siting a larger number of turbines, there is less opportunity for avoiding impacts to sensitive resources (e.g., wetlands, cultural resources) without creating wake effects between turbines or impacting other sensitive resources. Visual, sound, and shadow flicker impacts also could not be minimized in the 75-Turbine Alternative to the extent that they have in the proposed Facility layout.

The 75-Turbine Alternative is not preferred because the impacts from this layout are so much greater. The smaller layout associated with the proposed Facility allows greater flexibility in minimizing impacts to nearby residents, as well as to sensitive resources such as wetlands, streams, and cultural resources.

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

Siemens Power Technologies International prepared a System Reliability Impact Study (SRIS) for the Project on behalf of the New York Independent System Operator (NYISO) in 2015. The SRIS is Appendix E to this Application, but will be filed under confidential cover, as NYISO requires the SRIS to remain confidential due to Critical Energy Infrastructure Information (CEII) Regulations.

The SRIS evaluated a number of power flow base cases, as provided by the NYISO, including 2018 summer peak, winter peak, and light load. In base case normal operating conditions, the power flow steady state analyses indicate that the Project will cause no thermal violations for summer peak and winter peak case loadings. Under contingency operating conditions with the Project, the summer peak case shows some overloads on the 230 kV and 115 kV lines under several contingencies. The addition of the Project reduced the overload on these lines, thus causing a positive impact on the system. The addition of the Project increased the 34.5 kV post-contingency voltage by as much as 2% and exceeded its 105% limit. Post-contingency load tap changes in the 115/34.5 kV transformers reduced the 34.5 kV voltages to acceptable levels.

For the winter peak case, the Project caused an adverse impact of about 11% on the Hartfield 115/34.5 kV transformer following the double circuit contingency. However, this overload can be mitigated by the construction of a new sub-T station ‘West Asheville’ (115-34.5kV 25 MVA), located at the junction of Dunkirk-Falconer Line 160 and Sherman-Ashville Line 863, a reliability project approved by National Grid. Hence, the Project does not require any additional network upgrades for interconnection. Voltage violations at some buses near the point of interconnection also occurred under several contingencies with the addition of the Project, but as with the summer peak case, load tap changes in the 115/34.5 kV transformers reduced most of the 34.5 kV voltage to acceptable levels (Siemens PTI, 2015).

Based upon the findings in the SRIS, this Facility is not anticipated to have any adverse effects on the New York State Power Grid. Please see Exhibit 5 of this Application for additional information.

(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 above with the public health benefits of wind energy generation. Air pollution has both short-term and long-term adverse effects on public health. Electricity generated from zero-emission wind energy facilities like the proposed Facility can displace the electricity generated from conventional power plants, thereby reducing the emissions of conventional air pollutants, such as mercury; sulfur and nitrogen oxides; and carbon dioxide. Less fossil fuel combustion will improve public health and welfare. Commercial scale wind power projects can only be sited in certain locations that are conducive to wind energy production. The Applicant selected the proposed site for the Facility because of the presence of the wind resource, the presence of available land and willing landowners, the relative ease of access to the site, and the proximity and relative ease of connecting to the existing electric transmission grid. These factors combined to make the proposed site best suited for wind power development and the associated beneficial impacts to air quality.

(e) Why the Proposed Technology, Scale, and Timing Best Promote Public Health and Welfare

The benefits of the Facility are anticipated to include positive impacts on socioeconomics (e.g., increased employment, increased revenues to local municipalities and lease revenues to participating landowners and neighbors), air quality (through reduction of emissions from fossil-fuel-burning power plants), and climate (reduction of greenhouse gases that contribute to global warming). By eliminating pollutants and greenhouse gases, the Facility will also benefit ecological and water resources 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 such as 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, thereby reducing economic and public health benefits. If the proposed number of turbines were significantly increased above the 58 sites evaluated in this Application, the Applicant would need more land area to meet the siting criteria, which is not feasible because the Applicant does not have additional land under lease option.

Regarding timing, the State Energy Plan calls for achieving a 40% reduction in GHG emissions from 1990 levels and 50% of generation of electricity from renewable energy sources by 2030 (NYSEPB, 2015). These are aggressive targets that will require significant new sources of renewable energy 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 intense precipitation events, more extreme summer heat waves, and more widespread vector-borne infections and diseases. However, according to the NYSDEC (2016c), it's not too late: "If we reduce emissions in the near future, future risk from climate change will be lower. Failure to reduce emissions now will compound future change, making impacts even more disruptive and costly." 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 nor adversely affect current land use, ambient noise conditions, traffic or public road conditions, television/communication systems, and would maintain the area's current community character, socioeconomic, and energy-generating conditions as they currently exist.

The No Action Alternative is not best suited to promote public health, because it would deprive the state and the region with a source of clean, pollutant-free electricity. The operating Facility will generate up to 126 MW of electricity without emitting pollutants or heat-trapping greenhouse gases. Air pollution is generated by many human activities, including manufacturing, vehicle exhaust, and energy facilities that burn coal, gas, or oil. Air pollution has both short-term and long-term adverse effects on public health. Short-term exposure to air pollution caused by fossil-fueled electricity generation may result in headaches, nausea, allergic reactions, asthma exacerbation, and irritation to the eyes, nose and throat. Long-term exposures can lead to cancer, as well as a variety of adverse reproductive, development, respiratory, and cardiovascular effects (NYSDEC, 2016a).

According to the NYSDEC (2016b), "*For a sustainable future, we need an efficient energy system that taps clean sources to let us enjoy energy's benefits, but use less and pay less. Solar and wind energy, geothermal heat and other renewable resources can power our lives with no cost for fuel and no harmful emissions. An efficient system with reliable and affordable clean energy already is demonstrating its potential to support an abundant and sustainable New York:*

- *Energy efficiency improvements and renewable sources are cutting consumers' carbon footprints, making communities cleaner and healthier, and supporting local economies.*
- *Electricity from renewable sources is helping to create a more resilient and flexible power grid with less reliance on expensive peaking power.*
- *New York businesses that provide clean energy products and services are responding to growing markets with expanded offerings and good jobs.*"

As indicated above, electricity generated from zero-emission wind energy facilities like the proposed Facility can displace the electricity generated from conventional power plants, thereby reducing the emissions of conventional air pollutants, such as mercury; sulfur and nitrogen oxides (acid rain precursors); and carbon dioxide (linked to global climate change). 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 & High, 2008).

Furthermore, 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) Strategy, 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 greenhouse gas (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 New Yorkers. 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). The REV Order recognizes that large-scale renewables (LSR), such as the proposed Facility, will be critically important to meeting greenhouse gas 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.

(g) Energy Supply Source Alternatives

Because different energy supplies do not meet the objectives or capabilities of the Applicant, no alternative energy supply sources have been identified. Therefore, alternative energy supply sources will not be evaluated in this Application.

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

Because source and demand-reducing alternatives do not meet the objectives or capabilities of the Applicant, no alternatives have been identified. Therefore, source and demand – reducing alternatives will not be evaluated in this Application.

(i) Why the Proposed Facility 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; landowner considerations; stream, wetland, and cultural resources impact avoidance/minimization; noise and shadow flicker minimization; and protection of agricultural lands. Each of these issues are discussed in detail in this Application (e.g., see Exhibits 19, 22, 23, and 24). Alternative layouts at the same Facility Site were evaluated above, and the Facility, as proposed, is the best suited to promote public health and welfare.

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