Bluestone Wind Project

Case No. 16-F-0559

1001.15 Exhibit 15

Public Health and Safety

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PUBLIC HEALTH AND SAFETY

The Article 10 regulations require the assessment of potential risks associated with the operation of the Facility, which in the case of wind projects such as the Facility, are generally limited to effects associated with movement of the blades and electrical components within the nacelle. Some of the unlikely risks associated with wind power include ice shedding, tower collapse, blade failure, and fire in the turbines. To the best of the Applicant's knowledge, there are no known instances where a member of the general public was injured at an operating wind farm in the United States. Proper siting, including setbacks from dwellings, roads, and other existing facilities such as those proposed by the Applicant, all but eliminate the potential risks from these types of incidents.

(a) Gaseous, Liquid, and Solid Wastes to be Produced During Construction and Operation

One of the advantages of producing electricity from wind is that it does not produce gaseous wastes, and it generates a minimal amount of liquid waste (oil from wind turbine gearboxes and electrical transformers) and solid wastes (cardboard, packaging material, and general refuse) during operation. With respect to construction, gaseous, liquid and/or solid waste will be primarily limited to standard construction-related wastes and will be handled by the Balance of Plant (BOP) contractor in accordance with all applicable laws and regulations pertaining to such wastes.

During construction, sanitary facilities used by workers will consist of portable toilets, which will be emptied on an as needed basis. During operation of the Facility, the operation and maintenance (O&M) building is anticipated to be served by individual on-site water (i.e., well) and wastewater treatment (i.e., septic systems designed per local and county guidelines (see Exhibits 23, 38, and 39 for details).

Facility construction will generate relatively minor amounts of solid waste, consisting primarily of plastic, wood, cardboard and metal packing/packaging materials, construction scrap and general refuse. This material will be collected from turbine sites and other Facility work areas and disposed of in dumpsters located at the construction staging area(s). A private contractor will empty the dumpsters on an as-needed basis, which is expected to be no less frequent than weekly, and dispose of the refuse at a licensed solid waste disposal facility. Broome County has a landfill in Binghamton. The landfill accepts construction and demolition debris for $45.00 per ton (Broome County, 2014).

Facility construction will be initiated by clearing woody vegetation from all designated areas as indicated on the Final Construction Drawings (to be prepared following issuance of the Certificate). Trees cleared from the work area will be cut into logs and stockpiled on the edge of the work area or removed from the defined work area, while limbs and brush will be chipped and spread in upland areas (safely away from water resources) on-site so as not to interfere with

existing land use practices. Landowners will have the right to any materials, including trees, taken from their property during site preparation, and any trees not claimed by the landowner will be sold to a timber buyer. Any timber buyer will be expected to manage the wood in accordance with best management practices designed to prevent the spread of invasive species such as the emerald ash borer.

(b) Anticipated Volumes of Wastes to be Released to the Environment

No wastes will be released to the environment during construction and operation of the Facility. Soil displaced during construction of the Facility will be managed consistent with a state-issued permit addressing stormwater discharges associated with construction activity that is intended to limit releases of soil/sediment into the environment. See Exhibit 23 for details. The small quantities of liquid and solid wastes generated during construction and operation of the Facility will be managed/disposed of off-Site in accordance with all applicable laws and regulations as discussed in Section (a) above.

(c) Treatment Processes to Minimize Wastes Released to the Environment

As discussed in Section (b) above, no wastes from the Site will be released to the environment; accordingly, no treatment processes are necessary.

(d) Procedures for Collection, Handling, Storage, Transport, and Disposal of Wastes

See Section (a) above for a discussion of waste disposal practices.

(e) Wind Power Facility Impacts

With respect to short-term (construction) and long-term (O&M) worker safety, the Applicant has developed various plans designed to protect the health and safety of workers and the community, including, but not limited to, a comprehensive Preliminary Emergency Action Plan (EAP), Health and Safety Plan (HASP), Operation and Maintenance Plan, and supplied copies of certain plans to local emergency response providers and the New York State Department of Homeland Security in accordance with the consultation requirements set forth in Exhibit 18. To date, comments from the agencies on the plans submitted have not been received.

Exhibits 6 and 31 of the Article 10 Application include a discussion of applicable setbacks as they relate to the protection of public health and safety.

(1) Blade Throw and Tower Collapse

A potential public safety concern with wind power projects is the possibility of a wind turbine tower collapsing or a rotor blade dropping or being thrown from the nacelle. While extremely rare, such incidents have occurred; however, to the best of the Applicant's knowledge, no member of the public has ever been injured as a result of these incidents, and setbacks are generally sufficient to protect area homes and public roads.

The reasons for a turbine collapse or blade throw vary depending on conditions and tower type. The main causes of blade and tower failure are a control system failure leading to an over speed situation, a lightning strike, or a manufacturing defect in the blade (Garrad Hassan America, Inc., 2010). Technological improvements and mandatory safety standards during turbine design, manufacturing, and installation have significantly reduced the instances of blade throw (Garrad Hassan, 2007). The reduction in blade failures coincides with the widespread introduction of wind turbine design certification and type approval. The certification bodies perform both quality control audits of the blade manufacturing facilities and strength testing of construction materials. These audits typically involve a dynamic test that simulates the life loading and stress on the rotor blade (Garrad Hassan America, Inc., 2010).

Modern utility-scale turbines are certified according to international engineering standards. These include ratings for withstanding different levels of hurricane-strength winds and other criteria (ASCE & AWEA, 2011). The wind turbines ultimately used for this Facility will meet all applicable engineering standards and will be equipped with state-of-the-art braking systems, pitch controls, sensors, and speed controls on wind turbines, all of which greatly reduce the risk of blade throw. Among other things, it is anticipated that the wind turbines to be used for the Facility will be equipped with two fully independent braking systems that allow the rotor to be brought to a halt under all foreseeable conditions. In addition, it is anticipated that the turbines will automatically shut down at wind speeds over the manufacturer's threshold. The turbines will also cease operation if significant vibrations or rotor blade stress is sensed by the monitoring systems. For all of these reasons, the risk of catastrophic blade throw is minimal.

Although the risk of blade throw or tower collapse is minimal, the Applicant will have procedures in place in the event of a blade throw or tower collapse incident. These procedures will include emergency shutdown procedures, post-event site security measures, immediate notification of State and local officials, and the implementation of turbine manufacturer-specific blade throw/tower collapse safety procedures, if any. In addition, the Applicant will conduct annual training for operating staff as well as local first responders on the procedures to be implemented in the event of a blade throw or tower collapse incident.

Given the low risk of tower collapse and blade throw and the Facility's current setback distances from permanent residences, adjacent property lines and other features, the potential risk to public safety from tower collapse and blade throw is negligible. See Exhibit 6 for a discussion of setback distances for the Facility.

(2) Audible Frequency and Low Frequency Noise

The frequency range 20 to 20,000 Hertz (Hz) is commonly described as the range of audible noise. The frequency range of low frequency sound is generally from 20 Hz to 200 Hz, and the range below 20 Hz is often described as infrasound.

Although concerns are often raised with respect to low frequency or infrasonic noise emissions from wind turbines, most of the research showing excessively high levels of low frequency sound and infrasound was performed on older wind turbine designs, such as NASA's MOD-0 and MOD-1, which placed the rotor behind the tower. When the rotor passed through the wake of the tower, it would result in an infrasonic and low frequency impulse. Modern pitch-regulated upwind-tower wind turbines of the type proposed for this Facility produce lower levels of infrasound and low frequency sound than these early turbines. Research on modern turbines have shown that at typical receiver distances, infrasound levels are lower than some other environmental noise sources, such as vehicle traffic, and generally well below established hearing thresholds (RSG et al., 2016) and do not have negative health impacts on humans (McCunney et al., 2014; Leventhall, 2013). Although low frequency sound levels from modern turbines are lower than downwind turbines, they are frequently still audible, exceeding the human audibility threshold between 25 and 125 Hz (McCunney et al., 2014; RSG et al., 2016). However, at the sound pressure levels experienced at typical receiver distances, low frequency noise has not been shown to cause adverse health effects (McCunney et al., 2014). The level of infrasound at receiver distances is lower than some other environmental noise sources, such as vehicle traffic.

Several studies of human response to wind turbine sound were conducted in Europe in the early 2000s. Pedersen and Wayne found a dose-response relationship between calculated A-weighted sound levels from wind turbines and noise annoyance. Noise annoyance was related to other subjective factors such as attitude and sensitivity. Attitude towards the visual aspect of wind turbines was strongly correlated to annoyance (Pedersen and Waye, 2004). Another study found that high turbine visibility enhanced a negative response and that people who benefit economically from wind turbines have a significantly decreased risk of annoyance, even at the same sound levels (Bakker et.al., 2012). The same study found that of all sound sources that might disturb sleep in rural areas, 70%

were not disturbed, 12% were disturbed by people/animals, 12% were disturbed by traffic/mechanical sounds, and 6% were disturbed by wind turbines (Bakker et al., 2012).

Potential effects from audible sound include hearing damage and speech interference. The U.S. Environmental Protection Agency (USEPA) and the World Health Organization (WHO) identify sound levels of 70 dBA over a 24-hour period as protective against hearing loss from intermittent sources of environmental noise (USEPA, 1974 and WHO, 1999). According to the WHO guidelines, the threshold for hearing impairment is 110 dBA (Lmax, fast) or 140/140 dBA (peak at the ear) for children and adults (WHO, 1999). The USEPA states that at an outdoor level of 55 dBA (L_{dn}) there is 100% sentence intelligibility indoors and 99% sentence intelligibility at 1 meter outdoors. This includes a 5 dBA margin of safety and is the maximum sound level below which there are no effects on public health and welfare due to interference with speech or other activity. According to the WHO 1999 "Guidelines for Community Noise" document, sound levels at the outside facades of living spaces should not exceed an 8-hour L_{eq} of 45 dBA, so that people may sleep with bedroom windows open.

The Facility will comply with the WHO and USEPA standards discussed above. The highest sound level at a non-participating receptor as a result of Facility operations is 45 dBA, which meets 45 dBA nighttime limit at a non-participating receptor established by the WHO. See Exhibit 19 for additional detail on predicted sound levels as a result of construction and operation of the Facility. Based on discussions with the Towns of Windsor and Sanford, no current land development plans are proposed within the Facility Site or adjacent areas. It is not anticipated that the Facility would have an effect on future uses.

The frequency range of low frequency sound is generally from 20 Hz to 200 Hz, and the range below 20 Hz is often described as "*infrasound*". However, audibility can extend to frequencies below 20 Hz if the energy is high enough. Since there is no sharp change in hearing at 20 Hz, the division between "low-frequency sound" and "infrasound" should only be considered "practical and conventional." The results of Epsilon Associates, Inc.'s research indicate that there is no audible infrasound either outside or inside homes at 1,000 feet from a wind turbine and that sound levels meet the American National Standards Institute (ANSI) standard for low frequency noise in bedrooms, classrooms, and hospitals, meet the ANSI standard for thresholds of annoyance from low frequency noise, and there should be no window rattles or perceptible airborne induced vibration of light-weight walls or ceilings within homes (O'Neal et. al., 2011).

Annex D of the American National Standard ANSI S12.9-2005/Part 4 identifies that low frequency sound annoyance is minimal when the 16, 31.5 and 63 Hz octave band sound pressure levels are each less than 65 dB.

The National Association of Regulatory Utility Commissioners (NARUC) stated in their 2011 report ("Best Practices Guidelines for Assessing Sound Emissions from Proposed Wind Farms and Measuring the Performance of Completed Projects"), "the widespread belief that wind turbines produce elevated or even harmful levels of low frequency and infrasonic sound is utterly untrue as proven repeatedly and independently by numerous investigators" (NARUC, 2011). In light of the above, the Facility is not expected to result in any public health and safety issues due to infrasound and audible low frequency noise.

The predicted low frequency sound levels meet the threshold for annoyance at all non-participating residences at the 31.5 Hz and 63 Hz bands (below 65 dB), and the 16 Hz results are conservative and likely overstate the reality of potential low frequency sound levels. See Exhibit 19 for additional information on predicted sound levels as a result of construction and/or operation of the Facility.

(3) Ice Throw

Ice shedding and ice throw refer to the phenomena that can occur when ice accumulates on rotor blades and subsequently breaks free and falls to the ground. Although a potential safety concern, no serious accidents caused by ice being "thrown" from an operating wind turbine have been reported (Garrad Hassan Canada, Inc., 2007; Baring-Gould et al., 2012; Gipe, 2013). However, in theory, ice shedding and ice throw could occur and could represent a potential safety concern.

Under certain weather conditions, ice may build up on the rotor blades and/or sensors, slowing the rotational speed, and potentially creating an imbalance in the weights of the individual blades. Such effects of ice accumulation can be sensed by the turbine's computer controls and would typically result in the turbine being shut down until the ice melts. Field observations and studies of ice shedding indicate that most ice shedding occurs as air temperatures rise and the ice on the rotor blades begins to thaw. Therefore, the tendency is for ice fragments to drop off the rotors and land near the base of the turbine (Morgan et al., 1998; Ellenbogen, et al., 2012). Ice can potentially be "thrown" when it begins to melt and stationary turbine blades begin to rotate again; if ice falls from a stationary turbine during very high wind conditions that are strong enough to carry the ice some distance; or in the event of a failure of the turbine's control system.

The distance traveled by a piece of ice depends on a number of factors, including the position of the blade when the ice breaks off, the location of the ice on the blade when it breaks off, the rotational speed of the blade, the shape of the ice that is shed (e.g., spherical, flat, smooth), and the prevailing wind speed. The risk of ice landing at a specific location is found to drop dramatically as the distance from the turbine increases. The European Union Wind Energy in Cold Climates research collaborative has studied ice throw at operational wind farms throughout

Europe. The data gathered show that ice fragments typically land within 410 feet (125 meters) of the wind turbine (Seifert et al., 2003). Ice throw observations are also available from a wind turbine near Kincardine, Ontario, where the operator conducted approximately 1,000 inspections between December 1995 and March 2001. Thirteen of these inspections noted ice build-up on the turbine. No ice pieces were found on the ground further than 328 feet from the base of the turbine, with most found within 164 feet (Garrad Hassan Canada, Inc., 2007). Studies conducted in the Swiss Alps found that the maximum throwing distance was 302 feet (Cattin et al., 2008 and 2009). Almost fifty percent of the ice fragments weighed 0.1 pound or less (Cattin et al., 2007) and the heaviest ice fragment weighed nearly four pounds (Cattin et al., 2008 and 2009). While the height of wind turbines is also a factor to be considered in assessing the risks associated with ice throw, the "Wind Turbine Health Impact Study" prepared by an independent expert panel for the Massachusetts Department of Public Health concluded that, "ice is unlikely to land farther from the turbine than its maximum vertical extent" (Ellenbogen et al., 2012).

Public health and safety impacts related to ice shedding are unlikely because any ice is likely to fall within established setbacks. Moreover, the effects of ice accumulation can be sensed by the turbine's computer controls and typically result in the turbine being shut down until the ice melts. As ice builds up on the blades of an operating wind turbine, it can lead to vibration, caused by the mass of the ice or the aerodynamic imbalances. Modern commercial turbines are equipped with vibration monitors, which shut the machine down when vibrations exceed a pre-set level. Most modern wind turbines also monitor the wind speed to power output ratio. If ice accumulates on the blades, this ratio becomes too high and the turbine will stop itself.

In summary, studies/field observations at other wind power projects and other evidence indicate that ice throw does not pose a risk to public health and safety (Garrad Hassan Canada, Inc., 2007; Baring-Gould et al., 2012; Gipe, 2013). Modern turbine technological controls, the implementation of setback limits, and restrictions on public access to turbine sites should adequately protect the public from the risk of falling ice. Recent data collected by the Wind Energy Foundation (2014) indicate that worldwide there were more than 268,000 turbines in operation by the end of 2014, and more have been constructed since. Even with all of these turbines in operation, there has been no reported injury caused by ice being thrown from a turbine. The available evidence thus indicates that the risk from ice throw or shedding to public health and safety is minimal to nonexistent.

(4) Shadow Flicker

With respect to wind turbines, shadow flicker can be defined as an intermittent change in the intensity of light in a given area resulting from the operation of a wind turbine due to its interaction with the sun. While indoors, an observer can experience repeated changes in the brightness of the room as shadows cast from the wind turbine blades briefly pass by windows as the blades rotate. In order for this to occur, the wind turbine must be operating,

the sun must be shining, and the window must be within the shadow region of the wind turbine. Otherwise, there is no shadow flicker. A stationary wind turbine only generates a stationary shadow similar to any other structure.

To date, there are no federal guidelines regarding the maximum radial distance from a wind turbine to which shadow flicker should be analyzed. In the United States, shadow flicker is commonly evaluated out to a distance of ten times the rotor diameter. 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). Defining the shadow flicker calculation area has also been addressed in Europe where the ten times rotor diameter approach has been accepted in multiple European countries (Parsons Brinkerhoff, 2011).

A shadow flicker analysis was conducted by Epsilon Associates for the proposed Facility (see Appendix T). The analysis used *WindPRO 3.1.633* software and its associated Shadow module, which is a widely accepted modeling software package developed specifically for the design and evaluation of wind power projects. The Shadow Flicker Analysis evaluated the impacts of the five turbine models under consideration for the Facility using the turbine with the largest rotor diameter (Vestas V150-4.2) to calculate the ten-rotor diameter study area. Input variables and assumptions used for shadow flicker modeling calculations for the proposed Facility include:

- Latitude and longitude coordinates of 33 proposed wind turbine sites (provided by the Applicant).
- Latitude and longitude coordinates for 392 potential receptors located in the 10-rotor diameter Study Area (1,500 meters) for the largest turbine under consideration for the Facility.
- U.S. Geological Survey (USGS) 1:24,000 topographic mapping and USGS 10-meter resolution digital elevation model (DEM) data.
- The rotor diameter and hub height for the turbine models under consideration for the Facility.
- Annual wind rose data (provided by the Applicant) to determine the approximate directional frequency of rotor orientation throughout the year.
- Monthly sunshine probabilities from a publicly available historical dataset for Binghamton, New York, from the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI).

Shadow-flicker effects on receptors are expressed in terms of predicted frequency (i.e., hours per year). These isolines define the theoretical number of hours per year that shadow flicker would occur at any given location within ten rotor diameters (1,500 meters) for each proposed turbine model. Each modeling point (receptor) was assumed to have a window facing all directions ("greenhouse" mode) which yields conservative results.

There are no federal, state, or local standards for allowable frequency or duration of shadow flicker from wind turbines at the proposed Facility Site. A limit of 30 hours per year has been adopted by multiple jurisdictions in the United States. Connecticut limits the annual duration of shadow flicker to 30 hours at any off-site occupied structure (State of Connecticut, 2014). Internationally, according to the Danish Wind Industry Association (DWIA), a German court has ruled that 30 hours of actual shadow flicker per year was acceptable at a neighbor's property (DWIA, 2003). In the recent proceeding for the siting of the Cassadaga Wind Project, the New York State Board on Electric Generation Siting and the Environment (Siting Board) established a regulatory standard of 30 hours of shadow flicker annually at non-participating residential receptors as a condition to the operation of the facility (Siting Board, 2017). The Applicant has established a design goal of 30 hours per year at non-participating sensitive receptors for purposes of assessing shadow flicker consistent with guidance and regulations developed by various states and countries, and as consistent with the Cassadaga Wind proceeding.

A summary of the projected shadow flicker at each of the 392 receptors located within 1,500 meters of all proposed turbine locations for each turbine model under consideration for the Facility is presented in Table 15-1 below. The receptors studied include residential structures (both participating and non-participating), schools, office buildings, storefronts or known public recreation areas (e.g., campgrounds, trailheads within State forest lands).

Table 15-1. Predicted Shadow Flicker Summary by Turbine Model

Predicted Annual Shadow Flicker	Number of Receptors by Turbine Model				
	General Electric GE 3.8-137	Vestas V150-4.2[1]	Nordex N149/4500	Senvion 4.2 M148	Siemens Gamesa SG4.2-145
0 hours	195	191	192	192	193
<10 hours	117	101	101	100	102
10-30 hours	62	73	74	74	77
>30 hours	18	27	25	26	20

[1]The Vestas V150-4.2 contained the largest rotor dimeter at 150 meters and represents the most conservative analysis.

The Vestas V150-4.2 turbine represents the largest turbine model under consideration and displayed the greatest amount of annual duration of shadow flicker among all of the turbines included in the analysis. The modeling results showed that 27 receptors would be expected to have over 30 hours of shadow flicker per year. Fourteen of those 27 receptors are on participating parcels, which the remaining 13 are on non-participating parcels. The maximum expected annual duration modeled with the Vestas V150-4.2 model was of 62 hours and 1 minute (receptor ID# 408). The details regarding anticipated shadow flicker at all receptors is included in Appendix B of the Shadow Flicker Report (Appendix T to this Application). These results are inherently conservative because

modeling receptors are treated as “greenhouses” (i.e., it is assumed that sunlight can enter the structure from any angle) and the majority of the receptors were modeled without obstacles such as vegetation or structures that could block the shadow flicker effect.

To obtain a more realistic assessment of actual shadow flicker impacts at the 13 non-participating receptors modeled as receiving over 30 hours of shadow flicker per year, the Applicant conducted a more refined model that considered the impact of obstacles such as trees and buildings as well as the actual position of windows at the receptor. Based on the more refined model, two of the 13 non-participating receptors no longer exceeded the 30 hour per year shadow flicker design goal.

Based on the current design and operation of typical modern wind turbines, shadow flicker impacts are generally an annoyance issue and not a health effects concern. Often the public is concerned about the possibility of epileptic seizures being caused by shadow flicker. According to the Epilepsy Foundation, “Generally, flashing lights most likely to trigger seizures are between the frequency of 5 to 30 flashes per second (Hertz)” (Epilepsy Foundation, 2017). Of the proposed wind turbines under consideration for this Facility, the maximum rotational speed of 13.6 revolutions per minute (rpm) corresponds to a frequency of 0.7 Hz. This frequency is well below the frequency identified by the Epilepsy Foundation identified as a potential seizure trigger; therefore, the triggering of epileptic seizures is not a concern with this Facility.

In order to address locations that are currently predicted to exceed the design goal of 30 hours per year, To address shadow flicker impacts, the Applicant intends to conduct additional modeling, if necessary, depending on the final turbine model selected and whether the site layout is modified in a way that affects the results of the shadow flicker assessment. While the Applicant seeks to minimize shadow flicker exposure at the homes in the area as much as possible while also meeting other design constraints, it is not possible to completely eliminate shadow flicker. For those non-participating residences that continue to exceed the 30-hour annual design goal, the Applicant will address shadow flicker complaints through the following process:

- Meet with the homeowner to determine the specifics of their complaint.
- Investigate the cause of the complaint.
- Provide the homeowner with reasonable mitigation alternatives including, as appropriate; shades, blinds, awnings, plantings, or turbine curtailment to significantly reduce the number of hours of shadow flicker inside the home.
- Having the landowner sign a good neighbor agreement and become a Project participant.

- Investigate operational controls at appropriate wind turbines contributing to greater than 30 hours per year of shadow flicker.

(f) Public Health and Safety Maps

See Figure 15-1 for Public Health and Safety maps, which depict publicly available data within a 5-mile radius of the Facility, including:

- Known public water supplies
- Fire/police/EMS stations
- Hospitals and emergency medical facilities
- Emergency services mobile land sites
- USEPA-regulated facilities
- Bridges
- Regulated dams
- Existing known hazard risks (flood hazard zones, storm surge zones, areas of coastal erosion hazard, landslide hazard areas, areas of geologic, geomorphic or hydrologic hazard).
- NYSDEC Remediations Sites

The maps were prepared using data from the NYS GIS Clearinghouse, Federal Emergency Management Agency (FEMA), local municipalities, NYSDEC, New York State Department of Health, and the USGS, as well as local sources for emergency response resources, including the Broome County GIS website.

(g) Significant Impacts on the Environment, Public Health, and Safety

As indicated above in subsections (a) through (d), the Facility is not expected to result in any significant public health or safety concerns associated with gaseous, liquid, or solid wastes. As discussed in subsection (e) above, concerns relating to the operation of wind turbines include blade throw and tower collapse, audible frequency and low frequency noise, ice shedding/ice throw, and shadow flicker. However, as shown above, none of these concerns will result in significant impacts to the environment, public health, or safety.

(h) Unavoidable Adverse Impacts and Appropriate Mitigation/Monitoring Measures

The proposed Facility will result in significant long-term economic benefits to participating landowners, as well as to the Towns of Windsor and Sanford, the local school districts, and Broome County (see Exhibit 27). When fully operational, the Facility will provide up to 124 MW of clean electric power generation. 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 be temporary, and will result from construction activities. Long-term unavoidable impacts associated with operation and maintenance of the Facility includes turbine visibility from some locations within the area. While the presence of the turbines will result in a change in perceived land use from some viewpoints, their overall contrast with the landscape, as determined through evaluation by registered landscape architects, was considered moderate (see Exhibit 24). Facility development will also result in an increased level of sound at some receptor locations (residences) within the study area. However, Facility sound levels are not expected to exceed 45 dBA at any non-participating residences. Other impacts include loss of forest land, minor wetland impacts, wildlife habitat changes, and some level of avian and/or bat mortality associated with bird/bat collisions with the turbines. However, as evaluated through site-specific expert analysis presented in Exhibit 22 of the Application, these impacts are not considered significant, and are outweighed by the benefits of providing a source of clean, renewable energy. See Exhibit 2 for an overview of the relative costs and benefits of the Facility.

Although adverse environmental impacts will occur, they will be minimized through the use of various general avoidance and minimization measures, as well as site-specific mitigation measures. With the implementation of these measures, the Facility is expected to result in positive, long-term impacts that will offset the adverse effects that cannot otherwise be avoided. Should avoidance mitigation measures fail and adverse impacts occur, the Applicant will evaluate the use of operational controls when it is deemed necessary to operate the Facility in a socially responsible manner.

(i) Irreversible and Irretrievable Commitment of Resources

The proposed Facility will require the irreversible and irretrievable commitment of certain human, material, environmental, and financial resources. For the most part, the commitment of these resources will be offset by the benefits that will result from implementation of the Facility. Human and financial resources will be expended by numerous entities including the Applicant, the State of New York (i.e., various State agencies), Broome County, and the Towns of Windsor and Sanford for the planning and review of the Facility. The expenditure of funds and human resources will continue throughout the permitting and construction phases of the Facility (e.g., environmental reviews and certification, environmental compliance monitoring, and construction inspections).

The Facility also represents a commitment of land for the life of the Facility, proposed to be approximately 20-25 years or more. Specifically, the 54 acres of land to be developed for wind turbines, access roads, the O&M building, meteorological towers, collection substation and other ancillary facilities will not be available for alternative purposes for the life of the Facility. As a result of the implementation of the Facility, there will be relatively minor impacts to

environmental resources such as soils, forest and wildlife habitat, wetlands and streams, and agricultural land (see Exhibits 22 and 23 for details). However, because the turbines/towers may be removed, and the land reclaimed for alternative uses upon Facility decommissioning (see Exhibit 29), the commitment of this land to the Facility is neither irreversible nor irretrievable.

Various types of manufacturing and construction materials and building supplies will be committed to the Facility. The use of these materials, such as gravel, concrete, reinforcement steel, cables etc., will represent a long-term commitment of these resources, which will not be available for other projects. However, some of these materials (e.g., steel and other metals, gravel, cables) may be retrievable for recycling/reuse following the operational life of the Facility as part of the decommissioning process (see Exhibit 29).

Energy resources will be irretrievably committed to the Facility during both construction and operation of the Facility. Fuel, lubricants, and electricity will be required during turbine fabrication and activities associated with the manufacture of turbines and components of the electric collection/interconnect system, as well as operation of various types of construction equipment and vehicles on-site, and for the transportation of workers and materials to the Facility area. However, the energy resources utilized to construct and operate the Facility will be minor compared to the energy generated annually by the Facility (up to 124 MW) and made available to the state power grid.

(j) Impact Minimization Measures

General measures to minimize impacts from construction and operation of the Facility include compliance with the conditions of various local, State, and/or federal regulations that will ultimately govern Facility development as well as the commitments made by the Applicant throughout this Application. The Facility has been sited to minimize potential impacts. Adherence to setbacks presented in Exhibit 6 is the chief measure used by the Applicant to minimize potential impacts resulting from the construction and operation of the Facility. For example, while ice shedding, tower collapse, blade failure, and fire in the turbines are all possible (but unlikely) events that could pose a risk to public health and safety, the risk from these types of incidents has been minimized by siting Facility components away from dwellings, roads, and other existing facilities in accordance with setback standards and requirements. Adherence to the setbacks described in Exhibit 6 also minimizes potential impacts resulting from noise and shadow flicker from the proposed Facility. Because the turbines are located on leased private property, the public's access to the Facility is limited.

The Article 10 regulations require public input into the environmental review of proposed large-scale energy development projects so that potential adverse impacts can be identified prior to implementation and avoided, minimized or mitigated to the greatest extent practicable. This Application was prepared in accordance with these

regulations, and provides a primary means by which the potential costs and benefits of the Facility are described and weighed in a public forum. Facility alternatives are evaluated, and potential impacts are identified, avoided, minimized, and mitigated to the greatest extent practicable.

Beyond Article 10, compliance with the other regulations governing the development, design, construction and operation of the proposed Facility also will serve to minimize adverse impacts. For instance, federal permitting required by the U.S. Army Corps of Engineers will serve to protect water resources, along with implementation of a State-approved stormwater permit. Highway permitting at the local, county, and State level will assure that congestion and damage to highways in the area is avoided or minimized and that traffic safety concerns are addressed. For a detailed analysis of impact minimization measures for a given resource, see the appropriate exhibit in this Application (e.g., for impact minimization measures associated with noise see Exhibit 19, for impact minimization measures associated with wetlands see Exhibit 22).

(k) Mitigation Measures

In the Applicant's experience, when a project such as the Facility is properly sited and designed, mitigation measures are generally not necessary because significant impacts to public health and safety typically do not occur. However, in the event that the Facility impacts public health and safety, the facility development and operation will include measures to mitigate the impacts, which generally include the following:

- Adhering to setbacks provided in Exhibit 6.
- Developing and implementing various plans to minimize adverse impacts to air, soil, and water resources (which can directly impact public health), including a dust control plan, a Stormwater Pollution Prevention Plan (SWPPP), and Spill Prevention, Control, and Countermeasures (SPCC) plan.
- Documenting existing road conditions and undertaking public road improvement/repair as required to mitigate impacts to local roadways.
- Developing and implementing the Emergency Action Plan.
- Developing and implementing a Site Security Plan.
- Preparing a compensatory wetland mitigation plan, including the use of payment in lieu fee mitigation, to offset impacts to federal and/or State jurisdictional streams and wetlands as needed.

For a detailed analysis of impact mitigation measures for a given resource, see the appropriate exhibit in this Application (e.g., for impact mitigation measures associated with noise see Exhibit 19, for impact mitigation measures associated with wetlands see Exhibit 22).

In addition, the Applicant will implement a Complaint Resolution Plan (see Appendix R), which will consist of the following:

- Communications protocol and contacts for construction and operation
- Process for registering a complaint
- Process for gathering and analyzing information regarding the complaint
- Complaint response and tracking
- Complaint response follow up
- Documentation

The Complaint Resolution Plan describes each of these steps and identifies all measures proposed by the Applicant to resolve any verified complaints.

(l) Proposed Monitoring

The Applicant is committed to develop and operate the Facility in a safe and environmentally responsible manner. In addition to the mitigation measures described/referenced above, an environmental compliance program will be implemented, and the Applicant will provide funding for an independent, third party environmental monitor to oversee compliance with environmental commitments and permit requirements. The environmental compliance program will include the following components:

1. Planning – Prior to the start of construction, the environmental monitor will review all environmental permits and, based upon the conditions/requirements of the permits, prepare an environmental management document (Environmental Compliance Manual) that will be utilized for the duration of the construction and operation of the Facility (see the Environmental Compliance and Monitoring Program at Appendix Q). This document will distill and clearly present all environmental requirements for construction and restoration included in all Facility permits and approvals, and will be designed to aid in the management of environmental issues and concerns that may arise during construction of the Facility. The Environmental Compliance Manual will include 1) copies of all issued environmental permits and approvals, 2) a compliance matrix that summarizes all relevant permit requirements and identifies the responsible party and time frame (if applicable), and 3) a Facility contact list and organizational chart.

2. Training – The environmental monitor will hold environmental training sessions that will be mandatory for all contractors and subcontractors before they begin working on the Facility Site. The purpose of the training sessions

is to distribute the Environmental Compliance Manual, explain the environmental compliance program in detail prior to the start of construction, and assure that all personnel on site are aware of the permitting requirements for construction of the Facility.

3. Preconstruction Coordination – Prior to construction, the contractor(s) and the environmental monitor will conduct a walkover of areas to be affected by construction activities. The limits of work areas, especially in and adjacent to sensitive resource areas such as wetlands and forest land, will be defined by flagging, staking or fencing prior to construction, as needed. This walkover will identify landowner concerns, sensitive resources, limits of clearing, proposed stream or wetland crossings, and placement of sediment and erosion control features. Specific construction procedures will be discussed amongst the group, and updated to become part of the Facility layout and construction sequence, as needed. The pre-construction site review will serve as a critical means of identifying any required changes in the construction of the Facility early enough in the process to avoid potential delays once construction has begun. Proposed changes to the construction plan will be identified as soon as possible, as changes may require an agency notification period and take time for approval to be received.

4. Construction and Restoration Inspection – The monitoring program will include daily inspection of construction work sites by the environmental monitor. The environmental monitor is the primary individual(s) responsible for overseeing and documenting compliance with environmental permit conditions on the Facility Site. The environmental monitor will conduct inspections of all areas requiring environmental compliance during construction activities, with an emphasis on those activities that are occurring within jurisdictional/sensitive areas, including cultural resource areas, wetland and stream crossings, forested areas, and active agricultural lands. When on site, the environmental monitor's schedule will include participation in a daily Plan of Day (POD) meeting with the contractors to obtain schedule updates, identify in-field monitoring priorities, and address any observed or anticipated compliance issues. During the course of each visit, multiple operations are likely to be occurring throughout the Facility Site, and will need to be monitored by the environmental monitor. Activities with the potential to impact jurisdictional/sensitive resources, or with greater potential for environmental impact, will receive priority attention from the environmental monitor. For instance, installation of an access road across a protected stream would likely receive greater attention than installation of buried electrical collection lines across a successional old field. However, some level of field inspection by the environmental monitor will occur at all earth-disturbing work sites during each site visit. The monitor will keep a log of daily construction activities, and will issue periodic/regular (typically weekly) reporting and compliance audits. Additionally, when construction is nearing completion in certain portions of the Facility Site, the monitor will work with the contractors to create a punch list of areas in need of restoration in accordance with all issued permits.

For monitoring associated with a specific resource, see the appropriate exhibit in this Application (e.g., for monitoring associated with avian/bat resources and agricultural land see Exhibit 22). In addition, standard inspections will examine turbine components such as blades and towers for wear and tear and any issues or red flags that could cause a blade failure. Details regarding the inspection protocol and schedule is provided in the Preliminary O&M plan attached as Appendix G.

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