High Bridge Wind Project

Case No. 18-F-0262

1001.15 Exhibit 15

Public Health and Safety

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EXHIBIT 15 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 has been 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 generate gaseous wastes. Also, wind power generates only 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.

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. The Chenango County Pharsalia Sanitary Landfill is located approximately 20 miles from the Facility Site and accepts construction and demolition debris for approximately $58 per ton (Source: Chenango County Dept. of Public Works, 607-337-1710. March 26, 2019).

Facility construction will be initiated by clearing woody vegetation from all designated areas as indicated on the Final Construction Drawings. 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 of the Facility Site (safely away from water resources) 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. All timber products will be managed in accordance with best management practices designed to prevent the spread of invasive species such as the emerald ash borer (see Appendix 22-B).

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 will be served by an individual wastewater treatment (i.e., septic) system designed per local and county guidelines (see Exhibits 23 and 39 for details concerning wastewater management).

(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 storm water discharges associated with construction activity and the accompanying Stormwater Pollution Prevention Plan (SWPPP). See Exhibit 21, 23, and Appendix 21-D for details concerning erosion and sediment control measures at the Facility. 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 Exhibit 15(a).

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

As discussed in Exhibit 15(b), no wastes from the Facility 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 Exhibit 15(a) 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 (HSP), and operation and maintenance (O&M) 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 this 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. A literature review of peer reviewed articles, technical journals and papers prepared by government agencies indicates that, 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 and other Facility security measures are sufficient to protect area homes and public roads. Moreover, as set forth below, improvements in wind turbine technology have reduced the potential for such incidents.

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; Macqueen et al., 1983). 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, 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 these reasons, the risk of catastrophic blade throw is minimal.

Although the risk of blade throw or tower collapse is minimal (CMOH, 2010), 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.

Audible Sound

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.[1]

[1] See the Preconstruction Noise Impact Assessment (PNIA) includes a full review of these and other studies, standards, and guidelines specific to the Facility's potential noise impacts.

The Facility will comply with the WHO and USEPA standards discussed above. The highest sound level at a non-participating receptor (i.e., residence) as a result of Facility operations is 45 dBA, which meets 45 dBA nighttime limit at a non-participating receptor established by the WHO. A discussion of the results of the potential sound impacts on sensitive receptors is found in Chapter 13 of the Preconstruction Noise Impact Assessment (PNIA) included as Appendix 19-A. Noise contour maps showing potential short-term and long-term sound impacts are found in Chapter 9 of the PNIA. 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 Town of Guilford, no current land development plans are proposed within the Facility Site or adjacent areas. It is not anticipated that the Facility would affect future uses.

Several studies of human response to wind turbine sound were conducted in Europe in the early 2000s. Pedersen and Waye 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).

In 2015, the U.S. Department of Energy funded Lawrence Berkeley National Laboratory (LBNL) to lead a 4-year project collecting data from a broad-based and representative sample of individuals living near U.S. wind power projects. The aim was to broaden the understanding of how U.S. communities are reacting to the deployment of wind turbines and provide insights to those communities considering wind projects. Survey data were collected from 1,705 residents across 24 states who were living within 5 miles of 250 U.S. wind energy generating facilities. A 50-question multi-mode (phone, mail, and internet) survey was distributed to each homeowner in the sample, eliciting information on attitudes, stress reactions, perceived fairness of the process, relationship to the project, attitudes, and demographic information. Regarding attitude toward the wind project, 8% responded either very negative or negative, while the remaining 92% were neutral or positive. For just those respondents residing within 0.5 miles of a turbine, 25% were very negative or negative, and 75% were neutral or positive. Regarding annoyance, 5.6% of all respondents reported being somewhat, moderately, or very annoyed by the wind project. For those respondents residing within 0.5 miles of a wind turbine, 30% reported being somewhat, moderately, or very annoyed by the wind project (Hoen et al., 2018).

Another portion of the LBNL study included modeled sound levels at more than 500 respondent's homes near 15 existing wind projects. The results found that modeled sound levels alone are not a good predictor of annoyance. Prediction of annoyance was improved by including other variables in the model such as visibility of wind turbines, support or opposition to the project, compensation from the project, and when they moved into the area. Higher background sound levels appear to mask turbine sound and thus produce less annoyance.

Low Frequency and 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.

Low frequency sound levels produced by modern turbines exceed 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). Annex D of the American National Standard Institute (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 dBA.

Research on modern turbines have shown that, at typical receiver distances, infrasound levels are lower than other common environmental noise sources (e.g., vehicle traffic), are generally below established hearing thresholds (RSG et al., 2016), and do not have negative health impacts on humans (McCunney et al., 2014; Leventhall, 2013). O'Neal et al. (2011) found no audible infrasound either outside or inside homes that were more than 1,000 feet from a wind turbine, and that sound levels that meet the ANSI standard for low frequency noise in bedrooms, classrooms, and hospitals, meet the ANSI standard for thresholds of annoyance from low frequency noise (O'Neal et. al., 2011).

In 2011, the National Association of Regulatory Utility Commissioners (NARUC) stated that "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).

Predicted low frequency sound levels are below the 65-dB threshold for annoyance at all non-participating residences at the 63 Hz octave band, and at all non-participating receptors except one (66 dB) at the 31.5 Hz octave band. The 16 Hz results are conservative and likely overstate the reality of potential low frequency sound levels. The Facility is not expected to result in any public health and safety issues due to infrasound and audible low frequency noise. 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, slowing the turbine's rotational speed, and potentially creating an imbalance in the weights of the individual blades. The 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. In this situation, ice fragments may 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" if: the ice begins to melt and stationary turbine blades begin to rotate again; 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); the heaviest ice fragment weighed just under 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", i.e., a turbine's maximum tip height (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 wind energy generating facilities 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 Global Wind Energy Council (2018) indicate that worldwide there were approximately 568,409 onshore wind turbines in operation by the end of 2018, and more have been constructed since. Even with all these turbines in operation, there have been no reported injuries 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. 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, just like any other structure.

There are no federal laws or guidelines regarding the distance from a wind turbine that shadow flicker should be studied (i.e., the study area). In the United States, shadow flicker is commonly evaluated within a 10-rotor-diameter radius of proposed turbine locations. According to the Massachusetts Model Bylaw for wind energy facilities, shadow flicker impacts are minimal at and beyond ten rotor diameters (Massachusetts Department of Energy Resources, 2009); this approach has also been accepted in multiple European countries (Parsons Brinkerhoff, 2011). In New York, the New York State Board on Electric Generation Siting and the Environment (Siting Board) accepted the 10-rotor-diameter radius as the study area in conjunction with the Cassadaga Wind Project (Case No. 14-F-0490).

A shadow flicker analysis was conducted by Epsilon Associates for the proposed Facility (see Appendix 15-A). The analysis used *WindPRO 3.2.737* 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 Applicant used ten times the rotor diameter of each wind turbine to calculate the Shadow Flicker Study Area. Input variables and assumptions used for shadow flicker modeling calculations for the proposed Facility include:

- Latitude and longitude coordinates of 25 proposed wind turbine sites.
- Latitude and longitude coordinates for potential receptors located in the Shadow Flicker Study Area (the area within a 10-rotor-diameter radius of proposed turbine locations).
- 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).

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 non-participating 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 non-participating property (DWIA, 2003). In the recent proceeding for the siting of the Cassadaga Wind Project, the Siting Board established a standard of 30 hours of shadow flicker annually at non-participating sensitive receptors

as a condition to the operation of the facility (Siting Board, 2017). Consistent with these examples, the Applicant has established a design goal of 30 hours per year at non-participating sensitive receptors for the purposes of assessing shadow flicker.

Shadow-flicker effects on receptors are expressed in terms of predicted frequency (i.e., hours per year), which is reflective of the theoretical number of hours per year that shadow flicker would occur at any given location within the Shadow Flicker Study Area. Each receptor (i.e., modeling point) was assumed to have windows facing all directions ("greenhouse" mode) which yields conservative results.

A summary of the projected shadow flicker at each of the 818 receptors located within the Shadow Flicker Study Area for each turbine model under consideration 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[2]			
	General Electric GE158-5.x[1]	Siemens Gamesa SG145-4.x	Nordex N149/4.0-4.8	Vestas V150-5.6
0 hours	492	562	533	524
<10 hours	202	156	179	188
10-30 hours	110	89	95	94
>30 hours	14	11	11	12

[1]The GE 158-5.x contained the largest rotor dimeter at 158 meters and represents the most conservative analysis.
[2]Results presented in this table reflect the highest anticipated hub height for each turbine model considered (see Table 6-1 in Exhibit 6).

The General Electric GE158-5.x turbine represents the largest turbine model under consideration and was predicted to cause the greatest amount of shadow flicker. The modeling results showed that 14 receptors would be expected to have over 30 hours of shadow flicker per year; seven of these receptors are on participating parcels, seven are on non-participating parcels. The details regarding anticipated shadow flicker at all receptors is included in Appendix B of the Shadow Flicker Report (see Appendix 15-A). As previously noted, 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 all receptors were modeled without obstacles such as vegetation or structures that could block the shadow flicker effect.

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. In the past, members of the public have voiced concerns about the possibility of shadow flicker causing epileptic seizures. 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 is 13.6 revolutions per minute (rpm), which 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, the Applicant intends to conduct additional modeling, if necessary, depending on the final turbine model selected and site layout. While the Applicant seeks to minimize shadow flicker exposure at the homes in the area as much as possible within appropriate design constraints, it is not possible to 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 (see also Appendix 15-A):

- Meeting with the homeowner to determine the specifics of their complaint.
- Investigating the cause of the complaint.
- Providing the homeowner with reasonable mitigation alternatives including, as appropriate, shades, blinds, awnings, or plantings to significantly reduce the number of hours of shadow flicker inside the home.
- Having the landowner sign a good neighbor agreement and become a Facility participant.
- Investigating 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 communications facilities
- USEPA-regulated facilities
- Bridges

- Regulated dams
- Existing known hazard risks (flood hazard zones, storm surge zones, areas of coastal erosion hazard, landslide hazard areas, and areas of geologic, geomorphic or hydrologic hazard).
- NYSDEC Remediation 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.

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

As indicated in Exhibit 15(a)-(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 Exhibit 15(e), 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 Town of Guilford, local school districts, and Chenango County (see Exhibit 27). When fully operational, the Facility will provide up to 100.8 MW of clean energy. 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. Most 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 include turbine visibility, sound, loss of forest cover, minor wetland impacts, wildlife habitat changes, and some level of avian and/or bat mortality associated with bird/bat collisions with the turbines. These impacts are addressed in detail elsewhere in this Application.

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, is considered minimal to moderate (see Exhibit 24). Facility development will also result in an increased level of sound at some receptor locations (residences). However, Facility sound levels are not expected to exceed 45 dBA at any non-participating residences. The environmental impacts associated with terrestrial ecology and wetlands addressed in Exhibit 22 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 using various general and site-specific avoidance, minimization, and 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, minimization, and mitigation measures not meet expectations and adverse impacts occur, the Applicant will evaluate the use of operational controls.

(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), Chenango County, and the Town of Guilford 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 25 years or more. Specifically, the land 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, although the remaining land comprising the Facility Site can continue to be used for forestry, farming and other similar uses after the Facility is built. 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) are 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 100.8 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 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, further reducing the potential for adverse public health and safety impacts.

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 Town, 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, if the Facility impacts public health and safety, 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 12-B), 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 (see Appendix 22-C).

In addition, the Article 10 regulations specifically require monitoring to assess the impacts on a particular type of resource. 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).

As discussed in Exhibit 18, an extensive quality assurance/quality protocol will be implemented to monitor construction of the Facility and ensure that the materials and equipment meet all applicable standards. See Appendix 12-A for the preliminary Quality Assurance/Quality Control Plan. Once the Facility has been constructed, periodic inspections will be conducted as part of the Facility's O&M program. Among other things, the 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, tower collapse or other potential health and safety problem. Details regarding the inspection protocol and schedule is provided in the Preliminary O&M plan attached as Appendix 05-D.

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