Baron Winds Project

Case No. 15-F-0122

1001.15 Exhibit 15

Public Health and Safety

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EXHIBIT 15 PUBLIC HEALTH AND SAFETY

Wind generated power is in many ways safer and healthier than other forms of electricity generation. Unlike conventional power plants, wind farms produce energy without emitting pollutants that degrade air quality. In addition, unlike certain other sources of power generation, wind farms produce energy without impacts to surface and ground water quality. These benefits to air and water resources are a major public health benefit and the negative effects of air and water pollution and climate change are well understood.

New York State's 2015 State Energy Plan calls for reducing GHG emissions from the energy sector to protect the health and welfare of New Yorkers. Clean air is essential to New Yorkers' health and quality of life. Although New York's energy system provides many benefits for New Yorkers, it is also the cause of significant impacts on the State's natural resources and public health, principally because pollutants from certain energy generation sources find their way into the State's air and water. Of particular note, air pollutants emitted when carbon-based fuels are burned are associated with serious health conditions and contribute to the climate change that threatens New York's residents and natural resources. The kinds of health risks associated with the combustion of carbon-based fuels are not associated with wind, solar energy and hydroelectric power. While the use of these means of producing electric power is not risk-free, increasing the fraction of New York's electricity needs met by wind, solar, and water will, in general, decrease health risks associated with electricity production. The recognition of the benefits of renewable energy underpins New York's nation-leading commitment to renewable energy development through the Clean Energy Standard and is a key reason for the commitment in the New York State Energy Plan to produce 50% of electricity from renewable sources by 2030.

The Article 10 regulations require the assessment of potential risks associated with the operation of electric generating facilities, which, in the case of wind projects such as the Facility, are generally limited to effects associated with movement of the blades and the 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. Regardless, 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 generating electricity from wind is that it produces no gaseous wastes during operation, and only a minimal amount of liquid (oil from wind turbine gearboxes and electrical transformers) and solid wastes (cardboard, packaging material, and general refuse). With respect to construction, the generation of gaseous, liquid and/or solid waste generated is primarily limited to standard operation of construction equipment 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, if the operation and maintenance (O&M) building is newly constructed at the identified site near the laydown yard, it will served by individual water and septic systems. If an existing building is used as the O&M facility, the Applicant will have the existing systems inspected and implement any needed upgrades identified (see Exhibits 33, 38 and 39 for details).

Facility construction will generate relatively minor amounts of solid waste, primarily 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. It is anticipated that there will be one or two 30-cubic yard dumpsters located centrally at one of the two laydown yards. 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. Neither the Towns of Cohocton, Dansville, Fremont, and Wayland nor Steuben County provide a waste collection service for the Facility Site, but residents can hire private waste removal companies. Steuben County has a landfill in Bath as well as three transfer stations. The closest transfer stations to the Facility are in the Towns of Hornell and Wayland. These stations accept recyclables at no charge, as well as bulk garbage loads at $59.00 per ton. The Bath Landfill accepts recyclables at no charge, as well as bulk garbage loads at $44.00 per ton and construction debris at $30.00 per ton (Steuben County, 2017).

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.

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

This item is not applicable to the Facility. See Section (a) above and (e) below.

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

This item is not applicable to the Facility. See Section (a) above and (e) below.

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

For responsive information, see Section (a) above and (e) below.

(e) Wind Power Facility Impacts

(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 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. 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 engineering standards of the wind turbines ultimately used for this Facility will meet all applicable engineering standards. State of the art braking systems, pitch controls, sensors, and speed controls on wind turbines have greatly reduced the risk of blade throw. 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. As described above, 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, the potential impact to public health and safety is negligible. The Facility's current setback distances from permanent residences, adjacent property lines and other features will adequately protect the public from tower collapse and blade throw. See Exhibit 6 for a discussion of setback distances for the Facility.

(2) Audible Frequency and Low Frequency Noise

The 2015 Final Generic Environmental Impact Statement (FGEIS) for New York State's Reforming the Energy Vision (REV) initiative and Clean Energy Fund (CEF) recognized data from multiple studies indicating that the sound levels created by wind turbines are not sufficient to damage hearing or cause other adverse health effects (Industrial Economics, Incorporated and Optimal Energy, Incorporated, 2015). The 2016 Supplemental Final Generic Environmental Statement for REV/CEF further recognized that those who felt more positively toward wind turbines were less likely to be annoyed by the noise (Industrial Economics, Incorporated and Optimal Energy, Incorporated, 2016).

Infrasound is sound pressure fluctuations at frequencies below about 20 Hz. Sound below this frequency is only audible at very high magnitudes. Low frequency sound is in the audible range of human hearing, that is, above 20 Hz, but below 100 to 200 Hz depending on the definition.

Although concerns are often raised with respect to low frequency or infrasonic noise emissions from wind turbines, most of the research quoted 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 receiver distances, infrasound levels are well below established hearing thresholds (RSG et al., 2016) and research has not shown that inaudible infrasound has negative health impacts on humans (Leventhall, 2013; McCunney et al., 2014). 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.

Human response to audio frequency wind turbine noise has been assessed by several studies (Pedersen et al., 2008; Michaud, 2015; Yano et al., 2013). These studies compared noise annoyance to modeled or measured wind turbine sound pressure levels. In all cases, a correlation was found between wind turbine sound and noise annoyance, with the percentage of residents highly annoyed less than 15 percent at equivalent sound pressure levels of 45 dBA or less. The World Health Organization's guidelines to prevent nighttime sleep disturbance are 45 dBA. L_{Night} (the sound pressure level averaged over the night). As discussed in Exhibit 19, the Facility will comply with a sound limit of 45 dBA $L_{8\,hr}$ at night at non-participating residences.

The Facility is not expected to result in any public health and safety issues due to infrasound and audible frequency noise. See Exhibit 19 for additional information on noise issues.

(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, 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 pounds 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 Global Wind Energy Council (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 at or near the Facility Site.

(4) Shadow Flicker

Shadow flicker refers to the moving shadows that an operating wind turbine casts over an identified receptor (i.e., non-participating residence) at times of the day when the turbine rotor is between the sun and a receptor's position. Shadow flicker is most pronounced in northern latitudes during winter months because of the lower angle of the sun in the winter sky. However, it is possible to encounter shadow flicker anywhere for brief periods before sunset and after sunrise (U.S. Department of the Interior, 2005). During intervals of sunshine, wind turbine generators will cast a shadow on surrounding areas as the rotor blades pass in front of the sun, causing a flickering effect while the rotor is in motion. Shadow flicker does not occur when fog or clouds obscure the sun, or when turbines are not operating.

The distance between a wind turbine and a potential shadow-flicker receptor affects the intensity of the shadows cast by the blades, and therefore the intensity of flickering. Shadows cast close to a turbine will be more intense, distinct, and focused. This is because a greater proportion of the sun's disc is intermittently blocked by the turbine (BERR, 2009). Obstacles such as terrain, vegetation, and/or buildings occurring between receptors and wind turbines may significantly reduce or eliminate shadow-flicker effects. At distances beyond roughly 10 rotor diameters (approximately 1,400 meters based on the Senvion MM140 turbine model used in this case) shadow-flicker effects are generally considered negligible (BERR, 2009; DECC, 2011; Massachusetts DOER, 2011).

A Shadow Flicker analysis was conducted by EDR (2017) for the proposed Facility (see Appendix U). The analysis used *WindPRO 2.9.285* software and associated Shadow module, which is a widely accepted modeling software package developed specifically for the design and evaluation of wind power projects. Input variables and assumptions used for shadow flicker modeling calculations for the proposed Facility include:

- Latitude and longitude coordinates of 76 proposed wind turbine sites (provided by the Applicant).
- Latitude and longitude coordinates for 435 potential receptors located in the 10-rotor diameter (1,400 meters) Study Area (provided by the Applicant).

- USGS 1:24,000 topographic mapping and USGS 10-meter resolution digital elevation model (DEM) data.
- The rotor diameter (140 meters) and hub height (80 meters) for the Senvion 3.6 MW MM140
- Annual wind rose data (provided by the Applicant), which is depicted in Appendix U Table A1 of Attachment A (to determine the approximate directional frequency of rotor orientation throughout the year).
- To account for the occurrence of cloudy conditions, the average monthly percent of available sunshine for the nearest NOAA weather station in Binghamton, New York was used. Data was obtained from NOAA's "Comparative Climatic Data for the United States through 2015" (see Appendix U, Table A2 of Attachment A) (http://www.ncdc.noaa.gov).
- No allowance was made for wind being below or above generation speeds. Blades are assumed to be moving during all daylight hours when the sun's elevation is more than 3 degrees above the horizon. Shadow flicker is generally considered imperceptible when the sun is less than 3 degrees above the horizon (due to the scattering effect of the atmosphere on low angle sunlight) (States Committee for Pollution Control, 2002).
- The possible screening effect of all existing trees and buildings adjacent to the receptors was not taken into consideration in the modeling. In addition, the number and/or orientation of windows in residential structures were not considered in the analysis.

Shadow-flicker effects on receptors are expressed in terms of predicted frequency (hours per year). These isolines define the theoretical number of hours per year that shadow flicker would occur at any given location within 10 rotor diameters (1,400 meters) of all proposed turbines. The model calculations include the cumulative sum of shadow hours for all Facility turbines. This omni-directional approach reports total shadow flicker results at a receptor regardless of the presence or orientation of windows at that particular residence (i.e., it assumes shadows from all directions can be perceived at a residence, which may or may not be true). A receptor in the model will be defined as a one square meter area located one meter above ground; consistent with industry standards, actual house dimensions are not taken into consideration.

No consistent national, state, county, or local standards exist for allowable frequency or duration of shadow flicker from wind turbines at the proposed Facility Site. The Wisconsin Administrative Code (WAC) specifies a limit of 30 hours per year at any non-participating residence or occupied community building (Wisconsin Public Service Commission, 2012). The Ohio Power Siting Board uses 30 annual hours of shadow flicker as a threshold of acceptability in reviewing commercial wind power projects (OPSB, 2011a, 2011b, 2012, 2013, 2014). The New York State Department of Public Service has suggested "operations shall be limited to a maximum of 30 hours annually at any non-participating residential receptor" (NYSDPS, 2017). Additionally, international guidelines from Europe and Australia have suggested 30 hours of shadow flicker per year as the threshold of significant impact, or the point at which shadow flicker is commonly perceived as an annoyance (NRC, 2007; DECC, 2011; DPCD, 2012). Accordingly, a threshold of 30 shadow flicker hours per year was applied to the analysis of the proposed Facility to identify any potentially significant impacts on identified non-participating receptors.

A summary of the projected shadow flicker at each of the 435 receptors located within a 10-rotor diameter radius of all proposed turbine locations is presented below. Because the shadow flicker analysis conducted for the proposed Facility was based on the conservative assumptions that 1) all 76 turbines will be built, 2) the turbines are in continuous operation during daylight hours, and 3) that shadow flicker can be perceived at a receptor structure regardless of the presence or orientation of windows or the screening effects of surrounding trees and buildings, the analysis presented herein is a conservative projection of the shadow-flicker effects at ground level.

- 101 (23%) of the receptors are not expected to experience any shadow flicker,
- 3 (1%) of the receptors may be affected 0-1 hour/year,
- 113 (26%) of the receptors may be affected 1-10 hours/year,
- 120 (28%) of the receptors may be affected 10-20 hours/year,
- 43 (10%) of the receptors may be affected 20-30 hours/year,
- 55 (13%) of the receptors may be affected for more than 30 hours/year.

Results of the shadow flicker analysis for the Baron Winds Facility indicate that up to 55 receptors could exceed the 30-hour threshold. However, nine of these receptors (16%) are located on properties owned by Facility participants. An additional three receptors (5%) are identified as cabins. Because these structures are generally occupied periodically throughout the year, the occupants will not be present during all shadow flicker events. Finally, three receptors (5%) are identified as "unknown structures" that most likely consist of agricultural and maintenance buildings and so are not occupied. As these structures are only periodically occupied, these six structures (three cabins, three unknown) are considered non-participating receptors, but are not considered non-participating residences. With respect to the remaining structures—which are classified as non-participating residential—it is possible that some of the structures are seasonal residences that are not occupied year-round, limiting potential exposure to shadow flicker by occupants. However, for the shadow flicker analysis, these receptors were assumed to be participating residences. Therefore, only 40 non-participating residences could potentially exceed the 30-hour per year threshold. The details regarding anticipated shadow flicker at all structures predicted to receive in excess of 30 hours are summarized below in Table 15-2.

Table 15-2. Receptors Predicted to Exceed 30 Hours of Shadow Flicker

Receptor ID	Receptor Type[1]	Project Status	Predicted Annual Shadow Flicker (hh:mm)	Predicted Max Daily Shadow Flicker (hh:mm)	Predicted Shadow Flicker (days/year)
589	Residential	Non-Participating	30:25:00	1:12	159
811	Residential	Non-Participating	30:51:00	0:59	165
561	Residential	Non-Participating	31:09:00	0:52	203
4506	Residential	Non-Participating	32:04:00	0:55	125
912	Residential	Non-Participating	32:54:00	1:11	165
584	Residential	Non-Participating	33:56:00	0:48	196
768	Residential	Non-Participating	34:00:00	0:53	114
3670	Residential	Non-Participating	34:01:00	1:23	134
427	Residential	Non-Participating	34:26:00	0:47	160
585	Residential	Non-Participating	34:29:00	0:41	204
2620	Residential	Non-Participating	34:36:00	1:04	196
592	Unknown[2]	Non-Participating	34:58:00	1:06	163
687	Residential	Non-Participating	35:17:00	0:49	132
966	Residential	Non-Participating	36:11:00	0:55	203
604	Residential	Non-Participating	36:14:00	0:57	165
4084	Residential	Non-Participating	36:34:00	1:21	177
2629	Residential	Non-Participating	36:53:00	1:26	183
2807	Unknown[2]	Non-Participating	37:12:00	0:57	168
2627	Residential	Non-Participating	37:40:00	1:21	191
650	Residential	Non-Participating	38:12:00	1:15	170
570	Unknown[2]	Non-Participating	38:41:00	1:11	93
806	Residential	Non-Participating	39:47:00	0:40	243
4449	Cabin	Non-Participating	39:49:00	1:01	195
544	Residential	Non-Participating	39:53:00	1:09	159
807	Residential	Non-Participating	40:34:00	0:41	242
4058	Residential	Non-Participating	40:37:00	1:08	208
991	Residential	Non-Participating	40:41:00	1:44	133
648	Residential	Non-Participating	42:15:00	1:19	148
4085	Residential	Non-Participating	44:07:00	1:11	177
968	Residential	Non-Participating	44:44:00	1:03	225
547	Residential	Non-Participating	45:05:00	0:53	223
564	Residential	Non-Participating	46:00:00	0:59	253
967	Residential	Non-Participating	46:49:00	1:03	234

Receptor ID	Receptor Type[1]	Project Status	Predicted Annual Shadow Flicker (hh:mm)	Predicted Max Daily Shadow Flicker (hh:mm)	Predicted Shadow Flicker (days/year)
576	Residential	Non-Participating	47:12:00	1:09	246
574	Residential	Non-Participating	49:32:00	0:53	190
770	Residential	Non-Participating	52:35:00	1:03	148
769	Residential	Non-Participating	56:17:00	1:08	150
542	Residential	Non-Participating	57:30:00	1:10	244
851	Residential	Non-Participating	62:09:00	1:26	236
977	Residential	Non-Participating	64:00:00	1:14	215
2801	Cabin	Non-Participating	64:13:00	1:45	265
4468	Residential	Non-Participating	65:30:00	1:02	288
425	Residential	Non-Participating	67:38:00	1:28	264
4470	Cabin	Non-Participating	68:00:00	1:34	213
4448	Residential	Non-Participating	69:18:00	1:23	225
837	Residential	Non-Participating	98:56:00	1:40	195
979	Residential	Participating	37:54:00	1:42	178
2616	Residential	Participating	38:27:00	1:47	184
578	Residential	Participating	39:18:00	0:50	238
2651	Residential	Participating	44:41:00	0:53	235
907	Residential	Participating	46:02:00	1:07	251
426	Residential	Participating	46:18:00	1:34	153
836	Residential	Participating	54:43:00	1:12	155
583	Residential	Participating	58:53:00	1:01	296
4471	Residential	Participating	59:20:00	0:47	321

[1] There were no identified Schools, Office Buildings, or Storefronts within the Study Area
[2] Structures in rural settings that are usually associated with agriculture or maintenance buildings.

Although shadow flicker at these receptors theoretically exceeds the 30-hour per year threshold, these calculations do not take into account the actual location and orientation of windows, or the screening effects associated with existing, site-specific conditions and obstacles such as trees (i.e., does not take into account the results of the viewshed analysis) and/or buildings. Further, this analysis assumes turbine rotors are continuously in motion and that each receptor location is occupied year-round.

Given these assumptions, the predicted shadow-flicker frequency represents a conservative scenario, and almost certainly overstates the actual frequency of shadow flicker that would be experienced at any given receptor location. In addition, many of the modeled shadow flicker hours are expected to be low intensity because they would occur during the early morning or late afternoon hours when the sun is low in the sky. As the sun sinks below the horizon, more of its light is scattered by the atmosphere, which has the effect of dampening its brightness and therefore reducing its ability to cast dark shadows (EMD, 2013). As stated previously 16% of these receptors are on parcels owned by Facility participants, 5% are periodically/seasonally occupied cabins, and an additional 5% are unknown structures that are usually associated with agriculture or maintenance buildings. Details regarding shadow flicker effects predicted at the remaining non-participant receptors are presented in Table 15-3. Results of predicted shadow flicker at each receptor is provided in Attachment B of the Shadow Flicker Report (see Appendix U).

To provide a more realistic prediction of where shadow flicker will actually be perceived, *WindPRO* model results were compared to the results of a viewshed analysis conducted for the Facility. A viewshed map was created using ArcGIS modeling to define areas of potential Facility visibility within the study area. The viewshed map identified areas within the study area that could have an unobstructed line of sight to any portion of one or more of the proposed turbines. The viewshed analysis takes into consideration the screening effect of mapped forest vegetation with an assumed average height of 40 feet. Once the viewshed analysis was completed, the areas covered by the mapped forest vegetation layer were designated as "not visible" on the resulting data layer. In most forested areas, views will be well screened by the overhead tree canopy. The viewshed analysis indicates that 17 of the 46 non-participant receptors predicted to experience over 30 hours of shadow flicker will not have views of the Facility due to screening provided by mapped topography and vegetation (see Table 15-3 and Appendix U, Figure 4).

Table 15-3. Daily Effect to Non-Participating Receptors Predicted to Exceed 30 Hours of Shadow Flicker

Receptor ID	Predicted Annual Shadow Flicker (hh:mm/year)	Turbines Contributing Shadow Flicker	Approximate Times of Day Receptor Potentially Affected by Flicker[1]	Vegetation Viewshed Analysis Results
589	30:25	T76, T79, T87	2:15PM - 3:30PM	Visible
811	30:51	T55, T72, T83, T89	6:30AM - 7:15AM	Visible
			2:45PM - 4:00PM	
			5:30PM - 5:45PM	
			6:00PM - 7:45PM	
561	31:09	T35, T40, T76, T79	7:30AM - 8:30AM	Visible
			8:45AM - 9:45 AM	
			6:00PM - 8:00PM	
4506	32:04	T65, T69	6:45PM - 8:00PM	Not Visible
912	32:54	T24, T29, T33	7:00AM - 9:30AM	Visible
584	33:56	T64, T79, T87	6:00AM - 7:15AM	Visible
			3:30PM - 4:30PM	
			4:45PM - 6:15PM	

Receptor ID	Predicted Annual Shadow Flicker (hh:mm/year)	Turbines Contributing Shadow Flicker	Approximate Times of Day Receptor Potentially Affected by Flicker[1]	Vegetation Viewshed Analysis Results
768	34:00	T44, T47, T52, T60	6:00AM - 6:45AM	Visible
			7:00PM - 8:30PM	
3670	34:01	T7, T18	2:00PM - 4:15PM	Not Visible
427	34:26	T44, T46, T47	7:00AM - 8:30AM	Not Visible
			7:30PM - 8:30PM	
585	34:29	T64, T79, T87	6:00AM - 7:00AM	Visible
			3:30PM - 4:30PM	
			4:45PM - 6:30PM	
2620	34:36	T63, T73, T77, T85, T92, T93	7:00AM - 9:00AM	Visible
			9:30AM - 10:00AM	
			4:00PM - 5:00PM	
592[2]	34:58	T68, T76, T87	2:45PM - 5:00PM	Visible
			5:45PM - 7:00PM	
687	35:17	T76, T87	6:30AM - 7:30AM	Visible
966	36:11	T4, T6, T11, T22, T37	7:15AM - 9:15AM	Not Visible
			1:30PM - 2:15PM	
			4:45PM - 7:00PM	
604	36:14	T68, T769, T76	3:15PM - 4:15PM	Visible
			7:00 PM - 8:15PM	
4084	36:34	T1, T9, T22, T26, T34	7:30AM - 10:30AM	Not Visible
			4:30PM - 7:45PM	
2629	36:53	T63, T77, T82, T85	7:00AM - 8:45AM	Visible
			2:30PM - 4:00PM	
2807[2]	37:12	T50, T51, T84	6:00PM - 8:00PM	Visible
2627	37:40	T63, T77, T82, T85	6:45AM - 8:45AM	Visible
			2:15PM - 4:00PM	
650	38:12	T53, T55, T81, T86	7:15AM - 9:00AM	Visible
			4:30PM - 7:30PM	
570[2]	38:41	T40	6:00AM - 7:30AM	Not Visible
806	39:47	T53, T55, T89, T91	6:30AM -8:00AM	Visible
			2:30PM - 3:30PM	
			4:30PM - 5:30PM	
4449[2]	39:49	T73, T77, T82, T85	3:30PM - 6:45PM	Not Visible
			7:00PM - 8:00PM	
544	39:53	T35, T62, T66,	6:30AM - 8:00AM	Visible

Receptor ID	Predicted Annual Shadow Flicker (hh:mm/year)	Turbines Contributing Shadow Flicker	Approximate Times of Day Receptor Potentially Affected by Flicker[1]	Vegetation Viewshed Analysis Results
		T91	4:00PM - 5:45PM	
807	40:34	T53, T55, T89, T91	6:30AM - 7:45AM 3:00PM - 4:00PM 4:30PM - 6:15PM	Not Visible
4058	40:37	T4, T6, T11, T17, T22	8:00AM - 10:15AM 2:30PM - 3:15PM 6:00PM - 7:30PM	Visible
991	40:41	T44, T47, T52, T59, T60	7:30AM - 9:45AM 4:45PM - 7:45PM	Not Visible
648	42:15	T53, T55, T81, T86	7:15AM - 8:45AM 3:30PM - 5:30PM 6:00PM - 7:00PM	Visible
4085	44:07	T1, T9, T22, T26, T34	8:00AM - 9:30AM 10:00AM - 10:30AM 4:30PM - 6:00PM 6:15PM - 7:30PM	Not Visible
968	44:44	T4, T6, T11, T22, T37	7:00AM - 9:00AM 1:00PM - 2:00PM 5:00PM - 5:15PM 5:30PM - 7:30PM	Not Visible
547	45:05	T64, T75, T79	6:30AM - 9:00AM 3:45PM - 4:30PM	Visible
564	46:00	T35, T40, T76, T79	7:15AM - 9:30AM 6:00PM - 8:00PM	Visible
967	46:49	T4, T6, T11, T22, T37	7:00AM - 9:00AM 1:00PM - 2:00PM 5:00PM - 5:15PM 5:30PM - 7:30PM	Not Visible
576	47:12	T35, T40, T76, T79	7:00AM - 9:30AM 6:00PM - 7:00PM 7:30PM - 8:15PM	Visible
574	49:32	T76, T79, T87	6:30AM - 8:45AM	Visible
770	52:35	T44, T47, T52, T60	6:00AM - 7:30AM 6:30PM - 8:15PM	Visible
769	56:17	T44, T47, T52,	6:00AM - 7:30AM	Visible

Receptor ID	Predicted Annual Shadow Flicker (hh:mm/year)	Turbines Contributing Shadow Flicker	Approximate Times of Day Receptor Potentially Affected by Flicker[1]	Vegetation Viewshed Analysis Results
		T60	6:30PM - 8:30PM	
542	57:30	T35, T40, T62, T66, T91	6:00AM - 7:45AM	Visible
			3:45PM - 6:00PM	
851	62:09	T2, T3, T5, T7	7:00AM - 9:30AM	Visible
			7:00PM - 8:30PM	
977	64:00	T1, T9, T26, T34	7:00AM - 9:15AM	Not Visible
			6:30PM - 7:30PM	
2801[2]	64:13	T32, T42, T51, T80, T84	6:00AM - 6:30AM	Not Visible
			7:00AM - 8:30AM	
			3:15PM - 6:00PM	
			7:30PM - 8:30PM	
4468	65:30	T4, T6, T11, T22, T26	6:30AM - 7:15AM	Not Visible
			8:00AM - 9:15AM	
			3:00PM - 5:00PM	
			7:00PM - 7:45PM	
425	67:38	T44, T46, T59, T74, T88	7:30AM - 9:30AM	Visible
			3:15PM - 6:30PM	
4470[2]	68:00	T8, T9, T19, T43	6:15AM - 8:30AM	Not Visible
			6:30PM - 8:00PM	
4448	69:18	T8, T9, T19, T43	6:00AM - 8:30AM	Visible
			6:30PM - 8:00PM	
837	98:56	T61, T62, T89	6:30AM - 8:30AM	Not Visible

[1]The times of day presented in Table 2 represent the range of times during which each structure could potentially experience shadow flicker throughout the year; however, no structures will experience shadow flicker every day during all those hours. See Attachment B for detailed calendars that illustrate the specific times of year and day that each structure may experience shadow flicker.

[2]Structures that are either unoccupied or periodically occupied cabins or unknown structures typically associated with agriculture or maintenance buildings. These structures are considered non-participating receptors, but are not considered non-participating residences.

A qualitative review of the potential impact from shadow flicker on recreational areas was also conducted. Recreational resources (parks, trails, campgrounds) were mapped in relation to the shadow flicker model results/isolines (see Appendix U, Figure 4). Two regional snowmobile trails (Bath Snowflakes Snowmobile Trail and Quad County Snowmobile Trails), a bike trail, and a scenic overlook are located within the Study Area, and portions of these recreational areas will experience shadow flicker. In general, however, the Facility will have minimal impact on recreational areas because viewers will not be subject to shadow flicker for extended periods of time. In addition, based on the viewshed analysis, a large portion of the recreational resources that are within the Study Area are anticipated to have limited to no views of Facility turbines, limiting and/or eliminating shadow flicker from these areas.

Because the Baron Winds Facility is located adjacent to the Cohocton Wind Project and the Dutch Hill Wind Project, there exists the potential for cumulative shadow flicker impacts at certain receptors (i.e., those occurring within a 10-rotor diameter distance of Baron Winds turbines and a 10-rotor diameter distance of turbines in one or both of the other project(s)). To evaluate the potential for cumulative shadow flicker impacts from the Cohocton Wind and Dutch Hill Wind projects, a second shadow flicker analysis was run for selected turbines. Both the Cohocton Wind and Dutch Hill Wind projects use Clipper C96 turbines with a rotor diameter of 96 meters. To determine receptors that would be potentially affected by turbines from Baron Winds and the other projects, a buffer defining the maximum distance of potential effect was applied to the existing Cohocton Wind turbines (960 meters), Dutch Hill turbines (960 meters), and to the proposed Baron Winds turbines (1,400 meters). No receptors were located within the areas where the Dutch Hill and Baron Winds buffers overlapped, so no cumulative impacts are anticipated as a result of these turbines. The 10 receptors located within the area where the Cohocton Wind and Baron Winds buffers overlap have the potential for cumulative shadow flicker impacts.

The analysis was run using the same software described above, along with latitude and longitude coordinates for the 10 receptors that were located in the area of potential cumulative impact. The remaining input variables, assumptions, and model methodology used are the same as described above. The results of this analysis are presented below in Table 15-4, below, with the “predicted shadow flicker” columns representing shadow flicker from the Baron Winds Facility only, and the “cumulative predicted” columns representing the combined shadow flicker impacts from both Baron Winds and Cohocton Wind facilities.

Table 15-4. Daily Effect to Structures with Potential Cumulative Shadow Flicker

Receptor ID	Receptor Type	Receptor Status	Predicted Annual Shadow Flicker (hh:mm/ year)	Cumulative Predicted Annual Shadow Flicker (hh:mm/ year)	Predicted Max Daily Shadow Flicker (hh:mm/ day)	Cumulative Predicted Max Daily Shadow Flicker (hh:mm/ day)	Predicted Shadow Flicker (days/ year)	Cumulative Predicted Shadow Flicker (days/ year)	Viewshed Analysis Results
767	Residential	Non-Participating	3:08	9:00	0:24	0:28	27	101	Not Visible
771	Cabin	Non-Participating	11:35	12:24	0:27	0:27	77	99	Visible

As indicated in Table 15-4, the cumulative shadow flicker results indicate that no receptors will exceed 30 hours of shadow flicker per year. Thus, no additional receptors are anticipated to exceed the 30-hour threshold when the effect of both projects is taken into consideration.

Although shadow flicker has been alleged to cause or contribute to health effects, blade pass frequencies for modern commercial scale wind turbines are very low. According to the Epilepsy Society (2012), approximately five percent of individuals with epilepsy have sensitivity to light. Most people with photosensitive epilepsy are sensitive to flickering around 16-25 Hz (Hertz or Hz = 1 flash per second), although some people may be sensitive to rates as low as 3 Hz and as high as 60 Hz. Modern wind turbines (including the proposed Senvion 3.6 MW MM140) typically operate at a frequency of 1 Hz or less, and there is no evidence that wind turbines can trigger seizures (British Epilepsy Association, 2007; Ellenbogen et al., 2012; Parsons Brinckerhoff, 2011; NHMRC, 2010).

Currently, with the exception of flashing fire alarms, the United States does not have any recommendations, guidelines, standards, regulations, or rules regarding photosensitivity (Harding et al., 2005). Large wind turbines (2 MW or more), such as those proposed for this Facility, typically rotate at a frequency lower than the frequency that would pose risk to developing photoepileptic seizures (McCunney et al., 2014). As of 2014, there has been no published report of a rotating wind turbine triggering a photoepileptic seizure (McCunney et al., 2014).

The primary concern with shadow flicker is the annoyance it can cause for adjacent homeowners. Annoyance can trigger physiological reactions of the autonomic nervous and/or endocrine systems that increase the risk of cardiovascular disorders. However, annoyance is not itself a disease or physical illness; rather, it is a variable and subjective response to stimuli that can include many other things besides shadow flicker.

In summary, *WindPRO* predicted that 55 receptors will receive more than 30 hours/year of shadow flicker from the Facility wind turbines. Nine of these receptors are located of properties owned by Facility participants, while the remaining 46 receptors are non-participating. However, six of the non-participating receptors are unoccupied or occupied only periodically (cabins, seasonal structures, and/or unknown structures). Although shadow flicker at these receptors exceeds the 30-hour per year threshold, these calculations do not take into account the actual location and orientation of windows, or the screening effects associated with existing, site-specific conditions and obstacles such as trees (i.e., does not take into account the results of the viewshed analysis) and/or buildings. Further, this analysis assumes turbine rotors are in continuous motion. Given these assumptions, the predicted shadow-flicker frequency represents a conservative scenario, and overstates the actual frequency of shadow flicker that would be experienced at any given receptor location. In addition, many of the modeled shadow flicker hours are expected to be low intensity because they would occur during the early morning or late afternoon hours when the sun is low in the sky. As the sun sinks below the horizon, more of its light is scattered by the atmosphere, which has the effect of dampening its brightness and therefore reducing its ability to cast dark shadows (EMD, 2013).

Additional evaluation through viewshed analysis was conducted for all non-participating receptors predicted to receive more than 30 hours of shadow flicker per year. This analysis revealed that of the 46 non-participating receptors, 17 are not anticipated to receive any shadow flicker due to the extent of screening by intervening vegetation not included in the *WindPRO* software, leaving 29 non-participating receptors predicted to receive more than 30 hours per year. Of these 29 non-participating receptors, two are unknown structures, which are typically structures in rural settings usually associated with agriculture or maintenance buildings. These structures are not residential and, as such, individuals at these structures will not actually experience 30 hours per year of shadow flicker. Therefore, only 27 non-participating residential receptors will have views of the Facility and potentially experience over 30 hours of shadow flicker per year.

Depending on the final turbine layout and model selected, there may be no non-participating residential receptors that are predicted to receive more than 30 hours/year of shadow flicker, and thus no need to mitigate shadow flicker impacts. Following final turbine model selection and final project participant parcels, the Applicant will prepare an updated receptor-specific shadow flicker analysis for non-participating residential receptors. This analysis will take into account any screening by existing yard trees, buildings, or proximity to stands of trees and the number and/or orientation of windows in residential receptors. Additionally, this analysis will use Facility-specific meteorological data to account for wind being below or above generation speeds. If, based on the final turbine layout and model selected, there are non-participating receptors predicted to receive more than 30 hours/year of shadow flicker, the Applicant may pursue neighbor agreements with the owners of those receptors.

Many of the modeled shadow flicker hours are expected to be of low intensity, as they will occur during the early morning or late afternoon hours when the sun is low in the sky. When the sun sinks low on the horizon, more of its light is scattered by the atmosphere, which has the effect of dampening its brightness and therefore reducing its ability to cast dark shadows. Following the final shadow-flicker analysis, if shadow flicker is modeled to exceed 30 hours per year at a non-participating residence, the following mitigation options are available: 1) work with the landowner to become a Facility participant, 2) plant trees or install window blinds to block the shadow flicker, and/or 3) install detection systems on turbines causing greater than 30 hours per year of shadow flicker at non-participating receptors. These mitigation options can be easily implemented even after the Facility has been constructed.

(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 stations/EMS stations
- Emergency services mobile land sites
- U.S. Environmental Protection Agency-regulated facilities
- Bridges
- Regulated dams
- Flood hazard areas

(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. Wind energy facilities are safer than other forms of energy production, since significant use and storage of combustible fuels are not required. They also emit no air pollutants, unlike other common types of energy production facilities.

As discussed in Section (e) above, the potential public safety concerns associated with the operation of wind power projects are unique and include blade throw and tower collapse, audible frequency and low frequency noise, ice shedding and ice throw, and shadow flicker. However, as discussed 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 Cohocton, Dansville, Fremont, and Wayland, the local school districts, and Steuben County (see Exhibit 27). When fully operational, the Facility will provide up to 300 MW of electric power generation with no emissions of pollutants or greenhouse gases to the atmosphere. 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, is moderate in most locations. 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 L_{night} at any non-participating residences. Other impacts include loss of forest land, 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 analyses 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 and displacing some of the energy (and emitted pollutants) created by fossil fuel generators, which result in significant environmental impacts (Driscoll et. al., 2007; NYSDEC, 2010).

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 overall 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 need for turbine-specific scheduled curtailment of operations 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), Steuben County, and the Towns of Cohocton, Dansville, Fremont, and Wayland 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 up to 30 years. Specifically, the land to be developed for wind turbines, access roads, the O&M building, the overhead collection lines, meteorological towers, and collection substation, a total of 126.6 acres, 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., represent a long-term commitment of these resources, which will not be available for other projects. However, some of these materials (e.g., steel, gravel, cables) will be retrievable 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 ([redacted] MWh) 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 the 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 adverse 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 safety, congestion, and damage to highways in the area is avoided or minimized. 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 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 the 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, sediment and erosion control plan, 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 an Emergency Action Plan with local first responders.
- Developing a Site Security Plan.
- Developing and implementing a complaint resolution plan to address landowner concerns throughout Facility construction and operation.
- Preparing a compensatory wetland mitigation plan to mitigate impacts to federal and 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).

If additional, unanticipated mitigation is necessary as a result of unforeseen operational impacts, the Applicant will work with the Department of Public Service staff and any affected town(s) to develop an acceptable remedial plan to address any such impacts, with a timeline for implementation.

In addition, as previously mentioned the Applicant will implement a Complaint Resolution Plan (see Appendix T), 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. 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 I.

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