

Article 10 Application

Alle-Catt Wind Farm

Case 17-F-0282

Allegany, Cattaraugus, and Wyoming Counties, New York

1001.15 Exhibit 15

Public Health and Safety

Invenergy

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Exhibit 15 Public Health and Safety

15.a Wastes Produced

The Facility will not produce significant volumes of waste. The following discussions describe the limited wastes that will be produced during construction and operation and measures to dispose of this waste.

Wastes from Construction

Facility construction will produce the following types of waste:

- Concrete truck washouts;
- Plastic, wood, and paper packaging materials;
- Woody vegetation;
- Sanitary waste from portable toilets;
- General office-type waste from construction trailer offices.

Waste from Operation

The Facility will produce the following types of waste during operation:

- Sanitary waste from O&M building;
- General office waste from O&M building;
- Used mineral oil;
- Failed components.

15.b Waste Releases to the Environment

Facility-generated wastes released into the environment will be limited to water used in cleaning concrete trucks during construction, discussed below in Section 15.c and exhaust from construction vehicles, O&M vehicles, and emergency diesel generators, discussed in Exhibit 17.

15.c Treatment of Waste Disposed On-Site

Other than concrete washouts at the wind turbine sites and an on-site septic system, ACWE will not employ special treatment processes for wastes generated by construction or operation.

Concrete Washouts

At every turbine site, contractors will create a limited amount of waste concrete when concrete trucks are washed out after they deliver concrete for turbine foundations. To control this waste, ACWE will require the contractor to dig a small concrete washout pit alongside each turbine access road or crane pad, and contractors will confine the washout from the concrete trucks to these areas. As part of backfilling the wind turbine foundation, the contractor will remove hardened materials from the washout pit and either deposit it into the foundation excavation area or truck it away from the site.

Septic System

During Facility operation, the O&M building will be served by an individual septic system. The system will be constructed in accordance with the standards set forth in 10 NYCRR Part 75, Standards for Individual Onsite Wastewater Treatment Systems. See Exhibit 39 for additional detail.

15.d Collection and Handling of Waste Disposed Off-Site

Collection and Handling of Construction Waste

ACWE will require the construction contractor to collect packaging materials and dispose of them at one of the collection facilities described below for waste from Facility operation. ACWE will also require the construction contractor to keep construction sites clean of miscellaneous debris such as food packaging and other materials by collecting them in construction vehicles or turbine site waste bins.

Collection and Handling of Waste from Facility Operation

Wastewater and solid waste from the O&M Building will be limited to sanitary waste and modest quantities of paper and packaging waste. ACWE will dispose of O&M building sanitary waste through a septic system installed in accordance with the standards set forth in 10 NYCRR Part 75. Solid waste will be stored in a dumpster at the O&M building that will be emptied periodically by a waste management contractor to be hired by ACWE and disposed of per the Cattaraugus County regulations.

ACWE will recycle or appropriately dispose of used oil. Failed or worn components will be rebuilt, recycled or placed in the trash dumpster depending on their material composition.

15.e Wind Power Impacts to Public Health

Hazards from Blade Throw, Ice Throw, and Tower Collapse

Incidents of wind turbine collapse, blade throw, and ice throw have occurred in the wind power industry, but the risks to public health presented by these types of events are extremely low due to their infrequent occurrence, low chance of impact at distances greater than the turbine tip height, and the low chance of areas being occupied at the time of such an occurrence.

ACWE is aware of eight wind turbine collapses in the United States. In each case, evidence indicates that debris landed at distances from the turbine base less than the turbine tip height. Considering that approximately 85,000 utility scale wind turbines have entered operation in the U.S. between 2000 and September 2017, the probability of a given wind turbine collapsing in any given year is 1 in 50,000.¹

Wind turbines can experience blade failures that result in portions of the blade falling to the ground. These failures are infrequent, and estimates using failure data place the probability of blade failure at 2.6×10^{-4} , i.e., or one per turbine every 3,846 years.²

In winter conditions, ice can fall or sometimes be thrown from a wind turbine. ACWE contracted Zephyr North to calculate the probabilities of 1 kg ice fragments landing different distances from a GE model 3.6-137 wind turbine with a hub height of 112 meters and a rotor diameter of 137 meters. Impacts on straight north-south and east-west roads (25 feet wide and 10 feet long) were computed at different distances from the turbine in each cardinal direction. Zephyr North's report provided as Appendix 15e, indicates the risk of ice landing on a hypothetical road depends on wind speed and direction distributions and the drag

¹ AWEA 2017 quarterly report indicates 84,944 wind turbines installed as of end of 3rd quarter of 2017. Totalling operating years for all turbines in the U.S. results in approximately 400,000 turbine-years. Eight failures out of 400,000 turbine-years is 1 in 50,000.

² Rogers, Slegers, and Costello, "A Method for Defining Wind Turbine Setback Standards," 2011.

force differences for the shape of the ice. For a turbine with 137-meter rotor diameter and 112-meter hub height, Zephyr calculated that the number of ice fragments landing on a road segment 500 feet from a turbine, per million ice releases, would range from 0.64 to 104.99. The fewest fragments would land on a road segment to the west of the turbine, and the most fragments would fall on a segment north of the turbine.

The Zephyr North report also assessed the frequency of icing conditions and of fragment release in the vicinity of the Facility. The report recommends that a reasonable upper limit assumption for the number of such ice fragments to be thrown from a Facility turbine is 500 fragments per year. This was calculated based on five icing days per year with 100 fragments released per icing day. For roads (10-foot section and 25 feet wide) at a distance of 500 feet from a Facility turbine, the highest impact value would be 0.052 impacts per year, or one impact in approximately 19 years.

Table 15-1 presents the total risk from a single wind turbine and lists these risks along with other risks regularly faced by New York residents. As shown in Table 15-1, the number of expected public safety impacts from a wind turbine built at 0.85 x tip height from a road or non-participating property line are small in comparison to other hazards.³ Even if 100 wind farms like the proposed Facility were built across the state, the expected public safety impacts would be small compared to incidents from other hazards. Just as the risks posed by WTG hazards are de minimus, the decrease in risk associated with even substantial increases in setbacks is also de minimus.

³ Icing risk calculations were performed for a wind turbine with 112m hub height and 137m rotor diameter, i.e., tip height of 592 feet. The calculations evaluated risk to an area located 500 feet from the turbine base, a distance that is approximately 0.85 times the tip height of the assumed wind turbine.

Table 15-1 Expected Annual Incidents in New York from Select Hazards, including Wind Turbines at Setback of 0.85 x Tip Height

| Projected Annual Occurrences in New York | Incident Description |
|--|--|
| 65,000 | Deer-vehicle collisions ¹ |
| 21,000 | People injured by dog bites ^{2, 3} |
| 5,200 | People injured by firearms ^{2, 3} |
| 2,200 | People killed by firearms ^{2, 3} |
| 1,030 | People killed in car accidents ⁴ |
| 29 | People struck by lightning (approximately 3 will be killed) ^{5, 3} |
| 20 | People shot in hunting-related accidents ⁶ |
| 7.0 | People injured or killed in natural gas explosions ¹² |
| 5.8 | People killed by bee stings ^{7, 3} |
| 3.0 | People killed in airline accidents (based on 20-yr avg) ^{8, 3} |
| 0.00012 | Cars impacted by wind turbine incidents if a wind turbine is built 0.85 x tip height away from a road. ^{9, 10} |
| 0.00012 | People impacted by wind turbine incidents if a wind turbine is built 0.85 x tip height away from a non-participating property line. ^{9, 11} |

Notes:

1. NYS DOT, <https://www.dot.ny.gov/programs/deerandmoose>
2. US Center for Disease Control (CDC), WISQARS, searches for 2015 using web tool at <https://webappa.cdc.gov/sasweb/ncipc/nfirates.html>, indicates nationwide statistics of 348,000 non-fatal dog bites, 84,997 non-fatal gunshot injuries, 35,325 firearm deaths.
3. Assumes 6.1% of nationwide statistics occur to NY's based on fact that 2016 census statistics show 6.1% of U.S. population lives in New York.
4. NYS DOT, 2014 Statewide Crash Statistics, table 7p, available at <https://dmv.ny.gov/statistic/2014-nyscrashsummary.pdf>.
5. U.S. National Oceanic and Atmospheric Administration (NOAA), <http://www.lightningsafety.noaa.gov/odds.shtml>, over last 30 years (1986-2015), 48 reported lightning fatalities per year in the U.S. Approximately 10% of people struck are killed. Therefore, number of people struck is approximately $48 / .10 = 480$ per year nationwide.
6. NYS DEC, http://www.dec.ny.gov/docs/wildlife_pdf/nyhrsi2016.pdf, 20-year average, 2012-2016, All incidents fatal and non-fatal.
7. US Center for Disease Control (CDC), <https://www.cdc.gov/niosh/topics/insects/>, 90-100 deaths per year in the U.S.
8. National Transportation Safety Board (NTSB), <https://www.nts.gov/investigations/data/Pages/paxfatal.aspx>, 1037 people killed in airline accidents from 1996-2017, average of 49.4 people per year. Note, this does not include fatalities from small plane crashes.
9. Includes all incidents reasonably expected from wind turbine collapse, blade fragments, or ice from a wind turbine. Assumes a WTG with 137m diameter rotor on 112m hub height; 5 icing days per year and 100 fragments thrown per day, and wind turbine located upwind of road based on prevailing wind direction; 15 weeks of the year; probability of blade failure is 2.6×10^{-4} , all blade fragments occur at blade tip, resulting in maximum release velocity.
10. Assumes 500 annual average daily traffic (AADT) rate at 50 mph and incident occurs if ice lands within 50 feet of a car;
11. Assumes a person is present on the property line, 500 feet from each wind turbine, for 15 weeks per year and 8 hours per week.
12. USDOT Pipeline and Hazardous Materials Safety Administration accident reports on incidents from natural gas distribution systems in New York.

Shadow Flicker

“Shadow flicker” occurs when a moving wind turbine shadow passes over windows or other sensitive receptors where the changing light creates a subtle or noticeable alternating of lighting levels. Exhibit 24 and the shadow analysis provided with that exhibit discuss and list expected hours of shadow impacts from the Facility. Those results show the following non-participating receptors have 30 hours or more of expected annual average shadows and will have visibility of Facility turbines:

- 39 category 1 (year-round) residences on non-participating properties,
- 4 category 2 (seasonal) residences on non-participating properties, and
- 2 category 4 residences non-participating properties,

No consistent national, state, county, or local standards exist for allowable frequency or duration of shadow flicker from wind turbines. However, standards developed by some states and agencies provide guidance in this regard. The National Association of Regulatory Utility Commissioners (NARUC) identifies a standard of 30 hours of shadow flicker per year or 30 minutes of shadow flicker per day at any occupied building as a reasonable standard.⁴

Potential Health Impacts of Shadows

The National Research Council (NRC) reviewed available literature on shadow flicker as part of its review of the environmental impacts of wind-energy documented in its report published in 2007.⁵ It wrote “In the United States, shadow flicker has not been identified as causing even a mild annoyance.” It also wrote that “Shadow Flicker can be a nuisance to people living near a wind-energy project.”

In 2015, the University of Adelaide in South Australia completed a thorough review of wind turbine health under a commission from the Australian National Health and Medical Research Council (NHMRC).⁶ They reviewed available studies on health impacts of shadow flicker and concluded, “No studies of good quality were identified that linked shadow flicker with adverse health outcomes.”

The NRC and NHMRC reports both point out that individuals with photosensitive epilepsy (PSE) may experience seizures when they are exposed to flashing lights, and they discuss the sensitivity of such individuals to seizures from wind turbine shadows. The NRC reports that according to the Epilepsy Foundation only frequencies above 10 Hz are likely to cause epileptic seizures, but the NHMRC report cites a risk at frequencies as low as 3 Hz. Due to the relatively slow rotational speed of commercial wind turbine rotors, the frequency of wind turbine shadow flicker, including those proposed for the Facility, would be 1 Hz or less,⁷ which is significantly below the levels reported as the lowest to trigger

⁴ National Association of Regulatory Utility Commissioners (NARUC). 2012. “Wind Energy & Wind Park Siting and Zoning Best Practices and Guidance for States.” A report for the Minnesota Public Utilities Commission Funded by the U.S. Department of Energy. January 2012.

⁵ National Research Council of the National Academies, “Environmental Impacts of Wind-Energy Projects,” the National Academy Press, Washington, D.C., 2007.

⁶ Merlin, T, Newton, S, Ellery, B, Milverton, J & Farah, C 2015, “Systematic review of the human health effects of wind farms,” National Health and Medical Research Council, Canberra.

⁷ Wind turbine vendors typically specify turbine rotations speeds in terms of revolutions per minute (rpm), and as wind turbine rotors have increased in diameter, the maximum rpms have decreased. For example, the GE 1.6-100 and GE 3.2-130 turbines have rotor diameters of 100m and 130m respectively, and the vendor specifies the maximum rpm for

photosensitive epilepsy in vulnerable individuals. The Facility could potentially generate shadow frequencies this fast at a window if the shadows from three or more turbines fell simultaneously on the same window. In 2014, the Journal of Occupational and Environmental Medicine (JOEM) published a paper by six medical professionals who evaluated available scientific literature on potential health impacts of wind turbines.⁸ According to the JOEM paper, as of 2014, there were no published reports of a photoepileptic seizure being triggered by looking at a rotating wind turbine.

Other health effects alleged to be caused by wind turbines are the symptoms associated with 'Wind Turbine Syndrome' including insomnia, tinnitus, dizziness, nausea, panic attacks, and palpitations. Based on a detailed review of scientific literature and other reports, an expert panel found that, "there is limited scientific evidence of an association from prolonged shadow flicker (exceeding 30 minutes per day) and potential transitory cognitive and physical health effects⁹." The same review also concluded, "there is no evidence for a set of health effects, from exposure to wind turbines that could be characterized as 'Wind Turbine Syndrome.'" The primary concern with shadow flicker is the annoyance it can cause for adjacent homeowners.

Audible Sound

A 2012 study conducted by the Massachusetts Department of Environmental Protection¹⁰ concluded, "None of the limited epidemiological evidence reviewed suggests an association between noise from wind turbines and pain and stiffness, diabetes, high blood pressure, tinnitus, hearing impairment, cardiovascular disease, and headache/migraine." In 2010, the Vermont Department of Health¹¹ concluded that "there is no direct health effect from sound associated with wind turbine facilities." In 2015, Health Canada¹² presented the results of a large-scale epidemiological study designed to address the issue of wind turbine noise and possible health effects. This was the most extensive direct health study ever conducted on this issue. While the study did find a correlation between wind turbine noise and annoyance, regarding fatigue, tinnitus, vertigo, nausea, dizziness, cardiovascular diseases, and diabetes it found "the evidence for a casual association is largely lacking for these other effects."

In preparing its 2014 JOEM paper, McCunney and his colleagues comprehensively and professionally reviewed available scientific studies on potential health impacts of wind turbines. McCunney, et al. found

these machines as 16.2 rpm and 12.1 rpm respectively. For a turbine rotating at 12 rpm, three blades pass through a given point 12 times every minute, or 36 blade passes per minute. This translates to a frequency of 0.6 Hz. 16 rpm translates to a frequency of 48 blade passes per minute, or 0.8 Hz.

⁸ McCunney, Robert J. MD, MPH; Mundt, Kenneth A. PhD; Colby, W. David MD; Dobie, Robert MD; Kaliski, Kenneth BE, PE; Blais, Mark PsyD, "Wind Turbines and Health: A Critical Review of the Scientific Literature," Journal of Occupational and Environmental Medicine, Volume 56, Number 11, November 2014.

⁹ Ellenbogen, J. M., S. Grace, W. J. Heigher-Bernays, J. F. Manwell, D. A. Mills, K. A. Sullivan, M. G. Weisskopf. "Wind Turbine Health Impact Study: Report of Independent Expert Panel." Prepared for the Massachusetts Department of Environmental Protection and Massachusetts Department of Public Health. January 2012.

¹⁰ Massachusetts Department of Environmental Protection. 2012.

¹¹ Vermont Department of Public Health. 2010.

¹² Health Canada. 2015.

that 14 studies have analyzed results of studies of eight populations near wind turbines.¹³ In their review of the studies, they generally observed:

- no clear or consistent association between wind turbine noise and harm to human health;
- a small proportion of individuals report some degree of annoyance with wind turbines, and this may be due to intermittence and correlated to individuals' attitudes toward the views of the wind turbines or perceived financial benefits of the wind turbines to other people; and
- sleep disturbance complaints, but not any other measures of health or well-being, have been associated with wind turbine noise higher than 40 to 45 dBA;

In 1999, the World Health Organization (WHO) issued a guideline on community noise that was designed to protect people from detrimental effects of community noise in non-industrial environments, including sleep disturbance, cardiovascular and psychophysiological effects, and speech interference.¹⁴ These guidelines recommend:

- to avoid sleep disturbance, average nighttime noise levels outside a bedroom window not exceed 45 dBA (WHO Guidelines, Section 3.4);
- to avoid hearing damage, lifetime 24-hour Leq noise levels be less than 70 dBA (WHO Guidelines, Section 3.2); and
- to avoid cardiovascular health impacts, lifetime 24-hour Leq noise levels be less than 65-70 dBA (WHO Guidelines, Section 3.5).

Noise analyses presented in Exhibit 19 demonstrate that the Facility will comply with all Facility noise goals, including WHO guidelines at all times, and under all conditions with five exceptions where noise levels are approximately 1 decibel (dBA) over the nighttime noise goals. However, this will be rectified prior to construction by moving or removing turbines near each of these residences, using fewer or quieter turbines, through the negotiation of an easement, or the operation of select turbines in noise-reduce mode. Therefore, the Facility will not result in public health and safety impacts.

Low-Frequency Sound

Low frequency sound is typically defined as sound from 20 to 200 Hz. Sounds in this frequency range are audible to most people, depending on the amplitude of the sound. Wind turbines generate sounds in this frequency range, as do many other common noise sources including wind and traffic. The 2014 JOEM paper reports that studies at existing wind farms found low frequency noise from wind turbines at residences did not exceed levels from other common sources such as traffic, and that empirical support is lacking for claims that low frequency noise from wind turbines causes serious health problems.

In March 2017, the French National Agency for Food Safety, Environment and Labor (ANSES) carried out measurement campaigns near three wind farms¹⁵ and concluded "wind turbines are sources of infrasound and low sound frequencies, but no exceedance of the audibility thresholds in the areas of infrasound and

¹³ Ibid, page e117.

¹⁴ World Health Organization "Guidelines for Community Noise", 1999.

¹⁵ French National Agency for Food Safety, Environment and Labor. "Health effects of noise from wind turbines." France, 2017.

low frequencies up to 50 Hz has been found.” The study further noted that “all the experimental and epidemiological data available today do not show any health effects related to exposure to noise from wind turbines, other than noise-related annoyance.”

In 2014, the Australian Medical Association¹⁶ evaluated the health impact relative to wind turbines and released a position statement, “The available Australian and international evidence does not support the view that the infrasound or low frequency sound generated by wind farms, as they are currently regulated in Australia, causes adverse health effects on populations residing in their vicinity. The infrasound and low frequency sound generated by modern wind farms in Australia is well below the level where known health effects occur, and there is no accepted physiological mechanism where sub-audible infrasound could cause health effects.”

Exhibit 19, Appendix 19 presents wind turbine octave band sound pressure levels predicted at a non-participating Category 1 and 2 residences. The predicted levels at these residences are all below the levels that ANSI standard S12.2-2008 specifies are “moderately perceptible.” Thus, low frequency noise is not expected to cause public health impacts.

Infrasound

Infrasound is sound less than 20 Hz. Sounds in this frequency range are inaudible to most people except at very high levels. The 2014 JOEM report states that infrasound measured at actual wind farms is many orders of magnitude below levels set as potentially harmful by the National Aeronautics and Space Administration (NASA) and the American Conference of Governmental Industrial Hygienists. The 2014 JOEM report concludes that operating wind turbines emit infrasound and low frequency sound; however, levels of infrasound at customary distances are typically well below audibility thresholds and neither types of sound have been shown to present unique health risks to people living near wind turbines.

Infrasound is produced by many man-made sources, such as conventional power plants, aircraft, and agricultural equipment, as well as by natural sources such as the wind blowing through trees and against houses, ocean waves, and earthquakes. In a 2016 German study¹⁷, wind turbine infrasound levels ranged from about 50 to 80 G-weighted decibels (dBG) depending on distance to the turbines, while the noise level from wind blowing through trees ranged from 50 to 75 dBG, ocean waves 55 to 75 dBG, and levels inside a passenger vehicle ranged from 100 to 105 dBG. The same study, which spanned 2 years and examined six wind turbines by different manufacturers and with different sizes and covering a power range from 1.8 to 3.2 MW, concludes that “Infrasound is caused by a large number of different natural and technical sources. It is an everyday part of our environment that can be found everywhere. Wind turbines make no considerable contribution to it. The infrasound levels generated by them lie clearly below the limits of human perception. There is no scientifically proven evidence of adverse effects in this level range.”

Similarly, a 2016 study by the Japan Ministry of the Environment states that “Super low (below 20 Hz) frequency range components of wind turbine noise are at imperceptible levels. Therefore, wind turbine noise is not an issue caused by super-low frequency range. More recently the March 2017 ANSES

¹⁶ Australian Medical Association, 2014.

¹⁷ Ministry for the Environment, Climate and Energy of the Federal State of Baden-Wurremberg. “Low frequency noise including infrasound from wind turbines and other sources.” 2016

measurement campaigns near three wind farms concluded that “The results of these campaigns confirm that wind turbines are sources of infrasound and low sound frequencies, but no exceedance of the audibility thresholds in the areas of infrasound and low frequencies up to 50 Hz has been found.” The study further noted that “all the experimental and epidemiological data available today do not show any health effects related to exposure to noise from wind turbines, other than noise-related annoyance.”

Health Canada’s 2014 Community Noise and Health Study¹⁸ was a large-scale epidemiological study conducted to address community health concerns in relation to wind turbines. This was the most extensive direct health study ever conducted, and it concluded the following regarding infrasound: “Within the normal hearing frequency range, sounds have to be at a very low level to be non-audible, and at those levels would not contribute to any type of known hearing dysfunction. For low-frequency signals, including infrasound, activation of the vestibular system is possible if the signal levels are at high intensity. For both normal subjects and even for individuals with certain medical conditions that result in lowered vestibular activation thresholds (e.g., Tullio syndrome, superior canal dehiscence, perilymphatic fistula, or enlarged vestibular aqueduct), wind turbine signals are unlikely to reach the activation threshold. It is therefore unlikely that wind turbine noise could directly cause any symptoms associated with vestibular dysfunction, such as vertigo, dizziness, vision problems, or nausea.”

15.f Public Health and Safety Maps

Public Water Supplies

Figure 15-1 maps large water withdrawals (10,000 gallons per day or more) that are permitted and mapped by the DEC and that could be considered a public water supply resource. Additional detail regarding public water supply is provided in Exhibit 23b.

Community Emergency Response

Figure 15-1 includes the locations of the police, fire, and emergency response resources within a 5-mile radius of the Facility Site. This map also includes:

- Known public water supplies
- Police stations
- Fire and EMS stations
- Emergency services antennas
- U.S. Environmental Protection Agency-regulated facilities
- Bridges
- Regulated dams
- 100- and 500-year flood zones
- The following fire departments/halls
 - Arcade Fire Department
 - Delevan Fireman’s Hall
 - Farmersville Fire Department
 - Chaffe-Sardinia Volunteer Fire Station
 - Yorkshire Volunteer Fire Department

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- Machias Fireman's Hall
- Franklinville Volunteer Fire Department
- Pike Fire Department
- Hamlet of Bliss Fire Department

Hospitals

The hospital nearest to the Facility Site is:

Bertrand Chaffee Hospital
An affiliate of Catholic Health
224 East Main Street
Springville, NY 14141

Emergency Medical Facilities

The Emergency medical facility nearest to the Facility is at the Bertrand Chaffee Hospital listed above.

Designated Evacuation Routes

ACWE is not aware of any designated evacuation routes in Allegany, Cattaraugus, or Wyoming Counties.

Existing Known Hazards

Figure 15-1 shows 100- and 500-year flood zones in the Facility Site. ACWE is unaware of any unique landslide, geological, or hydrological hazards in the Facility Site.

Dams and Bridges

Bridges that carry or cross a public road and NYSDEC regulated dams are depicted in Figure 15-1.

Flammable Materials Storage and Transportation Facilities

Based on general knowledge of the Facility Site, ACWE is not aware of any locations where significant quantities of flammable or explosive materials are stored or transferred. Detailed mapping is not publicly available for other storage sites due to their sensitivity, but a general map of NYS and these sites is available on the DEC website at: <https://www.dec.ny.gov/energy/93157.html>.

Contaminated Sites

ACWE is not aware of any contaminated sites on the Facility Site. The NYSDEC's map of contaminated sites¹⁹ identifies the following state superfund sites within 5 miles of the Facility Site:

- Previt Auto Wrecking Yard, on Galen Hill Road in the Town of Freedom, an auto wrecking yard that reportedly received 1000 drums of industrial wastes from the Motorola Plant prior to 1978.
- Prestolite Plant Site, on Main Street in the Village of Arcade, that has been used as a manufacturing plant since 1952.
- Kenneth F. Tidd Estate, on Creek Road in the Town of Yorkshire, a former junkyard.
- The Norman Rogers Site, on California Road in the Town of Yorkshire, where 165 drums of industrial waste from the Motorola factory were buried around 1978 and removed in 1989.

¹⁹ NYSDEC. "Environmental Facilities Navigator." Available at: <http://www.dec.ny.gov/gis/facilities/>.

- The Michael Wolfer Site, on Grove Street Extension in the Town of Delevan, where drums of waste oils from the Motorola factory were used for dust control on roads in a trailer park.
- Arrowhead Camping Inc., on NYS Route 16 in the Town of Yorkshire, where drums of waste oils from the Motorola factory were used for dust control on roads in a campground.
- Ballard Farm, on Ballard Road in the Town of Centerville, where approximately 130 drums of solid resins were documented by the DEC in 1986.
- Ontario Knife Company, on Empire Street in the Village of Franklinville, where until 1980 grinding sludge was deposited on a parking lot for solidification.
- Terwilliger Excavation, on NYS Route 16 in the Town of Farmersville, where drums of waste oils from the Motorola factory were used for dust control on roads.
- Route 242 Site, near NYS Route 16 and Route 242 in the Town of Machias, a former gravel mine that was used as an unauthorized dump before being backfilled.
- Boehmer Property, on NYS Route 16 in the Town of Machias, where 13 drums of industrial wastes from the Motorola where reportedly received prior to 1978.
- Machias Gravel Pit, on Very Road in the Town of Machias, a former gravel pit where that received drums of waste oil from the Motorola Plant in 1978.

The West Valley Demonstration Project, a former reprocessing facility for nuclear fuel is approximately 11 miles west of the nearest proposed wind turbine site.

15.g Significant Impacts

There are no significant impacts on the environment or public health and safety associated with the topics addressed in 15.a-f. Although there is the potential for impacts on public health and safety related to the topics addressed in 15e, the siting of the WTGs and setbacks adhered to will prevent any impacts arising to a significant level.

15.h Adverse Impacts that Cannot be Avoided

Unavoidable adverse impacts on the environment and public health and safety include those temporary impacts associated with construction activity such as noise, dust, traffic disruption and vehicle emissions, and permanent impacts associated with the dedication of land, including some wetlands, to turbine foundations, access roads and electric infrastructure, and visual, flicker and noise impacts from turbine operation and the potential for impacts to birds and bats due to the turbine operation.

ACWE will minimize temporary construction-related impacts by following a Quality Assurance /Quality Control Plan as described in Exhibit Section 12, hiring an on-site environmental monitor as discussed in Exhibit 12, and publicizing and following a complaint handling procedure.

Unavoidable, permanent impacts will be minimized by using the least amount of land needed to safely operate Facility facilities and by siting turbines, roads and electric lines away from sensitive environmental resources. Impacts associated with operations, noise, visual and flicker will be minimized by siting and screening to meet design goals for noise impacts and flicker impacts, which will be monitored for continued compliance with certificate condition requirements.

15.i Irreversible and Irretrievable Commitment of Resources

Resources irretrievably committed to the Facility include the land devoted to turbine foundations, access roads, substation and overhead electric line pole foundations. Section 22b lists the acreage permanently committed or impacted by the Facility.

15.j Measures Proposed to Minimize Impacts

Minimizing risk of impacts from blade throw, ice throw and tower collapse

ACWE has proposed minimum setbacks for safety based on assessment of the risk of potential wind turbine incidents (e.g. blade failure, ice throw, tower collapse). A minimum safety setback of 1.1 x tip height will more than adequately minimize public safety risks, and it will be consistent with the general tip height approach used in many localities. ACWE propose this safety setback be applied to:

- Public roads used year-round.
- Overhead electric transmission lines owned by public utilities.
- Boundaries of non-participating properties.
- Dwellings, whether year-round or seasonal, whether participating or non-participating.
- Barns, workshops, public buildings, commercial buildings or other structures regularly occupied by one or more people year-round.

Exhibit 6 provides tables of distances between proposed turbines and features and structures subject to setback requirements and recommendations, e.g., roads, residences, non-participating property lines, assuming up to 117 WTGs are installed, and assuming that ACWE completes lease negotiations currently in progress as shown in Exhibit 13, Appendix 13c.

With exception of the setbacks described in Exhibit 6b, the setbacks incorporated into ACWE's site plan meet ACWE's recommended setbacks. However, in certain cases they do not meet the local requirements. In these instances ACWE will either make the adjustments described in Exhibit 6b, or apply for waivers of the setback requirements in the situations described above to the appropriate town bodies and will report the results of those applications in this proceeding.

Minimizing impacts of shadow flicker

By siting the proposed WTGs carefully, ACWE has minimized the number of occupied buildings that may experience more than 30 hours of shadow flicker and will have visibility of Facility turbines as predicted by the Shadow Flicker Report. As discussed in Exhibit 24, assuming up to 117 WTGs are installed:

- 64 category 1 (year-round) residences have 30 hours or more of expected annual average shadow flicker and have visibility of Facility turbines, 25 of these are owned by participating landowners and 39 are owned by non-participating landowners.
- 8 category 2 (seasonal) residences would be expected to have 30 hours of annual shadow flicker and have visibility of Facility turbines, 4 of these are owned by non-participating landowners and 4 are owned by participating landowners.

Minimizing noise impacts

By selecting design goals for noise levels experienced at receptor locations based on health-based guidance, ACWE has minimized the impacts of Facility sound levels. ACWE has set the following Facility design goals:

- 1) The maximum expected sound level (ESL) from the operation of the Facility
 - i. 45 dBA or less expected sound level at all Category 1 and 2 on non-participating properties,
 - ii. 55 dBA or lower at Category 3 residences on non-participating properties,
 - iii. 55 dBA or less at Category 1 and 2 residences on participating properties
- 2) WHO 40 dBA standard for protection against sleep interference at Category 1 and 2 residences on non-participating properties
- 3) Towns' 50 dBA (L10) noise level limits
- 4) ESLs at outdoor and public facilities will be 55 dBA or less
- 5) ESLs at non-participating property boundaries will be 55 dBA or less
- 6) Low frequency noise and noise-induced vibration of structures in the 16, 31.5, and 33 Hz full octave bands shall be 65 dB or less at Category 1 and 2 residences on non-participating residences
- 7) Noise levels at all Category 1 and 2 residences on non-participating properties will not exhibit any discreet tones.
- 8) Tonal noise from the substation is limited to a level 5 dB less than that of other sources, or 40 dBA (ESL).

As discussed in Exhibit 19, assuming up to 117 WTGs are installed, the Facility is predicted to meet the Facility's design goals with five minor exceptions; however, these violations will be rectified prior to construction by moving or removing turbines near residences, using fewer or quieter turbines, through negotiation of an easement, or the operation of select turbines in noise-reduced mode.

15.k Measures Proposed to Mitigate or Offset Impacts

The setbacks designed into the Facility plan render unnecessary any measures to mitigate or offset the risks of impacts from blade throw, ice throw and tower collapse. Nevertheless, ACWE will conduct routine inspections and investigate all public complaints. Should any blade throw, ice throw, or tower collapse events be identified through inspections or complaints, ACWE personnel will address any unexpected risks that appear.

To mitigate potential annoyance from shadow flicker, ACWE will implement the complaint handling program provided as Appendix 19m. ACWE will investigate complaints related to the Facility, including those related to shadow flicker. When ACWE confirms shadows are occurring at a residence where the expected annual shadow hours exceed 30 hours, ACWE will fund installation of window blinds or vegetation plantings to block the shadows from landing on windows.

After the Facility begins commercial operation, ACWE will perform a post-construction noise study to measure the actual noise levels during Facility operation and verify compliance with local laws and

relevant certificate conditions. This study will be performed in accordance with the plan provided as Appendix 19l. Throughout Facility operation, ACWE will implement the complaint-handling procedure to ensure that residents are aware of how and where to file complaints and that any complaints are properly documented, responded to, and reasonably and practicably resolved. Whether as a result of the post-construction study or an individual complaint, if noise level exceedances are identified ACWE will first eliminate any exceedance caused by a maintenance need at a WTG, then refine the tuning of the wind turbines identified as the source and, finally if necessary, consider a landscaping barrier or replacement windows.

15.l Measures Proposed to Monitor Impacts

ACWE will conduct a post-operation noise study as described in Appendix 19l. The complaint handling procedure described in Appendix 19m will be used to address complaints concerning all types of impacts including those addressing matters of health and safety.

15.m Other Information

Cumulative Impacts

Article 10 regulations do not specifically require evaluations of “cumulative impacts” from other proposed projects, but the Applicant also considered the Facility’s impact from the ambient environment, which in this case includes visual, noise, shadow flicker, and ecological impacts from the existing Noble Bliss Wind Park north and east of the Facility Site in the Town of Eagle. For purposes of this review, ACWE will use the term “cumulative impacts” to refer to the combined impacts from the proposed Facility and the Noble Bliss Wind Park.

Cumulative impacts are evaluated for the following:

- Visual Impacts. Photo-simulations taken from points where existing turbines are visible, inherently incorporate cumulative impacts, and the Application includes at least one such simulation from a point where both existing turbines and the proposed Facility turbines would be visible. Visual impacts are discussed further in Exhibit 24.
- Noise. An assessment was performed to determine the combined estimated noise from the Facility and the Noble Bliss Wind Park. Exhibit 19 discusses this topic further, informed by results of the Appendix 19 noise impact assessment. As shown by Table 6-8 of Appendix 19, six non-participating residences have expected cumulative maximum noise levels of 43 dBA or more, but none of these would exceed 45 dBA. During periods of highest winds (and maximum noise), the additional impact of the ACWE Facility on these residences is on average 0.1 dBA.
- Shadow Flicker. An evaluation was done to estimate shadow flicker impacts from the Facility and the Noble Bliss Wind Park. Receptors that are located within 10 rotor diameters of the proposed Facility and turbines from the Noble Bliss Wind Park have the potential to experience cumulative shadow flicker effects. Exhibit 24 discusses this topic further.
- Ecological. Impacts to birds and bats are considered for the Facility alone and cumulatively for the above Projects. Exhibit 22 discusses assessments to impacts on birds and bats.

Generally, the impacts from the Facility will be additive or incremental to those from the existing projects. That is, the impacts of the proposed Facility will add to other impacts that may already exist, but they will not create additional impacts that are greater than the sum of impacts from the individual projects.