BEFORE
THE OHIO POWER SITING BOARD

In the Matter of the Application of Seneca Wind, LLC for a Certificate of Environmental Compatibility and Public Need for a Wind-Powered Electric Generating Facility in Seneca and Sandusky Counties, Ohio	)))))	18-488-EL-BGN

SENECA WIND, LLC'S RESPONSES TO
STAFF'S FIRST SET OF DATA REQUESTS

---

1) GE has developed risk mitigation recommendations for ice throw for their turbine models and has recommended the use of an ice detector and other measures. A recommendation derived from an independent study supported by the German Wind Energy Institute (GWEI) suggests locating turbines a distance at least 150 percent of the sum of the hub height and rotor diameter from occupied structures. Will the project comply with this setback?

The GE siting guidance states:

Setback Distance	Objects of concern within the setback distance
If icing is likely at the wind turbine site: 1.5 x (hub height + rotor diameter)	Public use areas Residences Office buildings Public buildings Parking lots Public roads (more than lightly traveled) Railroads

RESPONSE

Seneca Wind LLC ("Seneca Wind") intends to comply with the statutory setbacks under Ohio law and setbacks set forth in the Board's rules. Seneca Wind also intends to comply with conditions adopted by the Board which relate to setbacks to the extent those conditions are reasonable and consistent with Ohio law. Further, Seneca Wind intends to comply with the latest GE setback guidance, which was issued in 2017. *See* Attachment A. The setback currently recommended by GE for ice throw is 1.1 x the tip height (hub height + rotor diameter) or a minimum of 170 meters. *Id.* at pg. 7. The reference in staff's data request appears to reflect GE setback guidance issued before the issuance of the 2017 guidance, and originally derived from a German Wind Energy Institute study dating from 2003.[1]

---

[1] Seifert, H., A. Westerhllweg, and J. Kroning.2003. Risk Analysis of Ice Throw from Wind Turbines. Deutsches Windenergie-Institue GmbH (DEWI). Available at http://www.mi-group.ca/files/boreas_vi_seifert_02.pdf

Turbine ice detection systems have made tremendous advancements since the 1.5 x the tip height (hub height + rotor diameter) guidance and underlying study referenced by Staff was issued. Note that ice throw is not a risk with a non-operating turbine, and current turbine models feature sophisticated vibration sensors on the turbine blade that automatically halt operations when ice begins to accumulate. In fact, the turbines proposed in the application will use this type of ice detection equipment that will monitor ambient temperature and conditions. Ice forming on the detection unit will generate a signal shutting down the turbine, if conditions warrant.[2]

As mentioned before, the most recent setback guidance recommended by GE for ice throw is 1.1 x the tip height (hub height + rotor diameter) or a minimum of 170 meters. This latest recommendation is somewhat conservative as compared to a study conducted in Sweden from 2013 to 2016[3] , with total turbine heights of 140 meters (459 feet), where researchers found that 75% of the ice was found within one rotor diameter (90 meters) from the turbine tower, and 1% beyond 1.5 rotor diameter (140 meters). Thus, GE's current guidance is expected to provide more than adequate protection to the objects of concern noted above.

2) Please provide shape files of the noise and shadow flicker modeling.

RESPONSE

Two CDs including all shape files reflecting the OPSB Application, including the results of the noise and shadow flicker analyses, were provided to Jim O'Dell via Federal Express for delivery on August 24, 2018; please let us know if this information has not been received.

[2] Application at pgs. 63, 94-96.

[3] Lunden J. 2017 ICETHROWER - Mapping and tool for risk analysis *presentation at Winterwind* 2017. Available at: https://docplayer.net/65488739-Icethrower-mapping-and-tool-for-risk-analysis-vindkraftsforskning-i-fokus-goteborg-3-4-april-2017-jenny-lunden-poyry-sweden.html.

ATTACHMENT A
– Original –

GE Renewable Energy

Technical Documentation
Wind Turbine Generator Systems
All Onshore Turbine Types

General Description

Setback Considerations for Wind Turbine Siting

imagination at work

www.gepower.com/

Visit us at
https://renewables.gepower.com

General Description Setback Considerations for Wind Turbine Siting All Onshore Turbine Types

All technical data is subject to change in line with ongoing technical development!

imagination at work

Table of Contents

1 Introduction

This document provides setback guidance for the siting of wind turbines. This guidance considers potential safety risks associated with wind turbines such as objects (maintenance tools, ice, etc.) directly falling from the wind turbine, unlikely occurrences such as tower collapse and blade failure, and environmental / operational risks such as ice throw. The guidance is general in nature, and is based on the published advice of recognized industry associations. Local codes and other factors may dictate setbacks greater than the guidance in this document. The owner and the developer bear ultimate responsibility to determine whether a wind turbine should be installed at a particular location, and they are encouraged to seek the advice of qualified professionals for siting decisions. It is strongly suggested that wind developers site turbines so that they do not endanger the public.

2 Falling Objects

There is the potential for objects to directly fall from the turbine. The objects may be parts dislodged from the turbine, or dropped objects such as tools. Falling objects create a potential safety risk for anyone who is within close proximity to the turbine, i.e., within approximately a blade length from the turbine.

3 Tower Collapse

In very rare circumstances a tower may collapse due to unstable ground, a violent storm, an extreme earthquake, unpredictable structural fatigue, or other catastrophic events. Tower collapse presents a possible risk to anyone who is within the distance equal to the turbine tip height (hub height plus ½ rotor diameter) from the turbine.

4 Ice Shedding and Ice Throw

As with any structure, wind turbines can accumulate ice under certain atmospheric conditions. A wind turbine may shed accumulated ice due to gravity, and mechanical forces of the rotating blades. Accumulated ice on stationary components such as the tower and nacelle will typically fall directly below the turbine. Ice that has accumulated on the blades will likewise typically fall directly below the turbine, especially during start-up. However, during turbine operation under icing conditions, the mechanical forces of the blades have the potential to throw the ice beyond the immediate area of the turbine.

5 Blade Failure

During operation, there is the remote possibility of turbine blade failure due to fatigue, severe weather, or other events not related to the turbine itself. If one of these events should occur, pieces of the blade may be thrown from the turbine. The pieces may or may not break up in flight, and are expected to behave similarly to ice thrown from the blade. Blade failure presents a possible risk for anyone beyond the immediate area of the turbine.

6 Industry Best Practices

Recognized industry practices suggest the following actions be considered when siting turbines in order to mitigate risk resulting from the hazards listed above:

- Place physical and visual warnings such as fences and warning signs as appropriate for the protection of site personnel and the public.
- Remotely stop the turbine when ice accumulation is detected by site personnel or other means. Additionally, the wind turbine controller may have the capability to shut down or curtail an individual turbine based on the detection of certain atmospheric conditions or turbine operating characteristics.
- Restrict site personnel access to a wind turbine if ice is present on any turbine surface such as the tower, nacelle or blades. If site personnel absolutely must access a turbine with ice accumulation, safety precautions should include but are not limited to remotely shutting down the turbine, yawing the turbine to position the rotor on the side opposite from the tower door, parking vehicles at a safe distance from the turbine, and restarting the turbine remotely when the site is clear. As always, appropriate personnel protective gear must be worn.

7 Setback Considerations

Set back considerations include adjoining population density, usage frequency of adjoining roads, land availability, and proximity to other publicly accessed areas and buildings. Table 1 provides setback guidance for wind turbines given these considerations. GE recommends using the generally accepted guidelines listed in Table 1, in addition to any requirements from local codes or specific direction of the local authorities, when siting wind turbines.

Setback Distance from center of turbine tower	Objects of concern within the setback distance

All turbine sites (blade failure/ice throw):
1.1 x tip height[1], with a minimum setback distance of 170 meters
	- Public use areas
	- Residences
	- Office buildings
	- Public buildings
	- Parking lots
	- Public roads
	  - Moderately or heavily traveled roads if icing is likely
	  - Heavily traveled roads if icing is not likely
	- Passenger railroads

All turbine sites (tower collapse): 1.1 x tip height[2]	- Public use areas - Residences - Office buildings - Public buildings - Parking lots - Public roads - Private roads - Railroads - Sensitive above ground services[3]
All turbine sites (rotor sweep/falling objects): 1.1 x blade length[4]	- Property not owned by wind farm participants[5] - Buildings - Non-building structures - Public and private roads - Railroads - Sensitive above ground services

Table 1: Setback recommendations

The wind turbine buyer should perform a safety review of the proposed turbine location(s). Note that there may be objects of concern within the recommended setback distances that may not create a significant safety risk, but may warrant further analysis. If the location of a particular wind turbine does not meet the Table 1 recommended guidelines, contact GE for guidance, and include the information listed in Table 2 as applicable.

1 The maximum height of any blade tip when the blade is straight up (hub height + ½ rotor diameter).
2 The maximum height of any blade tip when the blade is straight up (hub height + ½ rotor diameter).
3 Services that if damaged could result in significant hazard to people or the environment or extended loss of services to a significant population. Examples include pipelines or electrical transmission lines.
4 Use ½ rotor diameter to approximate blade length for this calculation.
5 Property boundaries to vacant areas where there is a remote chance of future development or inhabitancy during the life of the wind farm.

Condition/object within setback circle	Data Required
If icing is likely at the wind turbine site	- Annual number of icing days
Residences	- Number of residences within recommended setback distance - Any abandoned residences within setback distance
For industrial buildings (warehouse/shop)	- Average number of persons-hours in area during shift - Number of work shifts per week - Any abandoned buildings within setback distance
For open industrial areas (storage/parking lot)	- Average number of persons-hours in area during shift - Number of shifts per week. - Any abandoned buildings within setback distance
For sports/assembly areas	- Average number of persons in area per day - Average number of hours occupied per day - Number of days area occupied per week - If area covered, what type of cover
For roads/waterways	- Plot of road/waterway vs. turbine(s) - Average number of vehicles per day - Type of road and speed limit (residential, country, # of lanes, etc.)
For paths/trails (walk, hike, run, bike, ski)	- Plot of paths/trails vs. turbine(s) - Average number # of persons per day by type of presence (walk, hike, etc.) - Flat or uneven/hilly terrain

Table 2: Setback recommendations