



August 23, 2022

Re: Safe radius requirements for wind turbines under normal and emergency operating conditions

Vestas turbines are designed and tested according to recognized industry standards, including those issued by the IEC, and are independently certified. As in any emergency, good judgement and common sense should be used to establish a temporary clearance area, local requirements and site safety protocol should be followed, and local emergency personnel should be alerted. If a turbine incident is identified, but the situation has been mitigated, the establishment of a temporary clearance area may not be required.

As with any sophisticated electric generation equipment, abnormal operating conditions can occur, in which case the turbine monitoring sensors and control system logic are set to automatically shut down the equipment. Further, the turbines are monitored by highly trained operators who are ready to quickly respond. The many redundant systems preventing abnormal operation mean that emergency situations requiring temporary clearing of an area are extremely rare.

We refer to the information provided by relevant expert associations such as the American Clean Power Association.

Sincerely,

Ian Richardson

Lead Technical Bid Engineer
Vestas – American Wind Technology, Inc.
1417 NW Everett St.
Portland, OR 97209

Vestas-American Wind Technology, Inc. 1417 NW Everett Street, Portland, OR 97209, USA Tel: +1 503 327 2000, Fax: +1 503 327 2001, vestas-americas@vestas.com, www.vestas.com

Vestas Proprietary Notice: This document contains valuable confidential information of Vestas Wind Systems A/S. It is protected by copyright law as an unpublished work. Vestas reserves all patent, copyright, trade secret, and other proprietary rights to it. The information in this document may not be used, reproduced, or disclosed except if and to the extent rights are expressly granted by Vestas

From: [REDACTED]
To: [REDACTED]
Cc: [REDACTED]
Subject: FW: [INTERNET] Siemens Gamesa Recommended Safety Setback Distances
Date: Friday, August 19, 2022 8:24:37 AM
Attachments: [Image001.png](#)
[Image002.png](#)
[Image003.png](#)
[Image004.png](#)
[Image005.png](#)
[Image006.png](#)

FYI

Best Regards,

[REDACTED]
Director, Project Development

O: [REDACTED] | C: [REDACTED]
 MIDAMERICAN
ENERGY COMPANY.

From: [REDACTED] (SGRE ON NA S PSM) [REDACTED]
Sent: Thursday, August 18, 2022 2:45 PM
To: [REDACTED]
Subject: RE: [INTERNET] Siemens Gamesa Recommended Safety Setback Distances

THIS MESSAGE IS FROM AN EXTERNAL SENDER.
Look closely at the **SENDER** address. Do not open **ATTACHMENTS** unless expected. Check for **INDICATORS** of phishing. Hover over **LINKS** before clicking. [Learn to spot a phishing message](#).
Hi [REDACTED],

I am being told that we do not have any such requirements as we rely on the developer to use Industry Best Practices, and take into consideration any municipal, state and federal laws/regulations.

[REDACTED]

SIEMENS Gamesa
RENEWABLE ENERGY

[REDACTED]
[REDACTED]

[REDACTED]

[REDACTED] PMP
Onshore North America

Technical Documentation

Wind Turbine Generator Systems

All Onshore Turbine Types



General Description

Setback Considerations for Wind Turbine Siting



imagination at work

Visit us at
www.gerenewableenergy.com

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

Copyright and patent rights

All documents are copyrighted within the meaning of the Copyright Act. We reserve all rights for the exercise of commercial patent rights.

© 2018 General Electric Company. All rights reserved.

This document is public. GE and the GE Monogram are trademarks and service marks of General Electric Company.

Other company or product names mentioned in this document may be trademarks or registered trademarks of their respective companies.



imagination at work

Table of Contents

1	Introduction.....	5
2	Falling Objects.....	5
3	Tower Collapse.....	5
4	Ice Shedding and Ice Throw.....	5
5	Blade Failure.....	5
6	Industry Best Practices.....	6
7	Setback Considerations	7

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 $\frac{1}{2}$ 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

Setback 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	<ul style="list-style-type: none"> - Public use areas - Residences - Office buildings - Public buildings - Parking lots - Public roads <ul style="list-style-type: none"> - Moderately or heavily traveled roads if icing is likely - Heavily traveled multi-lane freeways and motorways if icing is not likely - Passenger railroads
All turbine sites (tower collapse): 1.1 x tip height ¹	<ul style="list-style-type: none"> - Public use areas - Residences - Office buildings - Public buildings - Parking lots - Heavily traveled multi-lane freeways and motorways - Sensitive above ground services²
All turbine sites (rotor sweep/falling objects): 1.1 x blade length ³	<ul style="list-style-type: none"> - Property not owned by wind farm participants⁴ - 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 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.

3 Use ½ rotor diameter to approximate blade length for this calculation.

4 Property boundaries to vacant areas where there is a remote chance of future development or inhabitation 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