

Noise Regulations For Wind Turbine Noise

Office of Legislative Council

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Connecticut

- Requires a noise evaluation report for proposed turbine development.
- Requires wind turbine noise and shadow flicker to be considered during siting decisions.
- Setback distances required for turbines.
 - Projects over 65 megawatts shall include setback distances from each of the proposed wind turbine locations and any alternative wind turbine locations of not less than 2.5 times the wind turbine height from all property lines at the proposed site.
 - Any alternative sites or shall comply with the wind turbine manufacturer's recommended setback distances, whichever is greater.

**Regs. Conn. State Agencies § 16-50j-94
Public Service Companies**

(d) Noise Evaluation Report.

The applicant or petitioner shall submit a noise evaluation report for each of the proposed wind turbine locations and any alternative wind turbine locations at the proposed site and any alternative sites in accordance with the noise control regulations established by the Department of Energy and Environmental Protection under [Sections 22a-69-1 to 22a-69-7, inclusive, of the Regulations of Connecticut State Agencies](#). The report shall include the following:

(1) A detailed description of the potential noise levels that would be generated by the proposed wind turbines and any alternative wind turbines at the proposed site and any alternative sites including existing sound levels at the proposed site and any alternative sites, projected sound levels to be generated by the operation of the proposed wind turbines and any alternative wind turbines, the methodology used to monitor and evaluate sound levels, the wind turbine manufacturer's technical documentation of the noise emission characteristics of the proposed wind turbines and any alternative wind turbines, and an analysis of

compliance with the noise control regulations established by the Department of Energy and Environmental Protection.

(2) Calculations in accordance with the noise control regulations established by the Department of Energy and Environmental Protection, of projected maximum cumulative sound levels generated when the proposed wind turbines and any alternative wind turbines are in operation at the proposed site and any alternative sites measured at the property lines, projected maximum day-time and night-time sound levels generated when the proposed wind turbines and any alternative wind turbines are in operation measured at the nearest receptors, and projected maximum levels of infrasonic sound, ultrasonic sound, impulsive noise and prominent discrete tones generated when the proposed wind turbines and any alternative wind turbines are in operation at the proposed site and any alternative sites measured at the nearest receptors.

(3) A study area map for the proposed site and any alternative sites depicting the noise analysis study area radius, site boundaries, sound level monitoring locations and nearest receptor locations.

(4) Identification of any potential mitigation measures to minimize sound levels at the nearest receptor locations, including utilization of best practical noise control measures in accordance with [Section 22a-69-1 to 22a-69-7, inclusive, of the Regulations of Connecticut State Agencies](#).

Regs. Conn. State Agencies § 16-50j-95 Considerations for decision

In making its decision to grant or deny an application for a certificate or to issue or not to issue a petition for a declaratory ruling, the Council shall, consistent with the Uniform Administrative Procedure Act, Chapter 54 of the Connecticut General Statutes, and the Public Utility Environmental Standards Act, Chapter 277a of the Connecticut General Statutes, consider, among other relevant facts and circumstances, the following factors:

(a) **Setback Distances.**

(1) Requirements.

(A) Any application for a certificate for a proposed wind turbine facility with a capacity of more than 65 megawatts shall include setback distances from each of the proposed wind turbine locations and any alternative wind turbine locations of not less than 2.5 times the wind turbine height from all property lines at the proposed site and any alternative sites or shall comply with the wind turbine manufacturer's recommended setback distances, whichever is greater. A copy of the wind turbine manufacturer's recommended setback distances shall be included in the application or petition. In its discretion, the Council may require greater setback distances based on the results of any evaluation report submitted under [Section 16-50j-94 of the Regulations of Connecticut State Agencies](#).

(B) Any petition for a declaratory ruling for a proposed wind turbine facility with a capacity of less than 65 megawatts shall include setback distances from each of the proposed wind turbine locations and any alternative wind turbine locations of not less than 1.5 times the wind turbine height from all property lines at the proposed site and any alternative sites or shall comply with the wind turbine manufacturer's recommended setback distances, whichever is greater. A copy of the wind turbine manufacturer's recommended setback distances shall be included in the application or petition. In its discretion, the Council may require greater setback distances based on the results of any evaluation report submitted under [Section 16-50j-94 of the Regulations of Connecticut State Agencies](#).

(2) Waiver of requirements. The minimum required setback distances for each of the proposed wind turbine locations and any alternative wind turbine locations at the proposed site and any alternative sites may be waived, but in no case shall the setback distance from the proposed wind turbines and any alternative wind turbines be less than the manufacturer's recommended setback distances from any occupied residential structure or less than 1.5 times the wind turbine height from any occupied residential structure, whichever is greater:

(A) by submission to the Council of a written agreement between the applicant or petitioner and abutting property owners of record stating that consent is granted to allow reduced setback distances; or

(B) by a vote of two-thirds of the Council members present and voting to waive the minimum required setback distances upon a showing of good cause, which includes consideration of:

- (i) land uses and land use restrictions on abutting parcels;
- (ii) public health and safety;

- (iii) public benefit and reliability;
- (iv) environmental impacts;
- (v) policies of the state; and
- (vi) wind turbine design and technology.

(b) Noise.

Noise levels generated by the operation of each of the proposed wind turbines and any alternative wind turbines at the proposed site and any alternative sites shall comply with the Department of Energy and Environmental Protection Noise Control Regulations under [Sections 22a-69-1 to 22a-69-7, inclusive, of the Regulations of Connecticut State Agencies.](#)

(c) Shadow Flicker.

(1) Requirements. Shadow flicker shall not occur more than 30 total annual hours cumulative at any off-site occupied structure location from each of the proposed wind turbine locations and any alternative wind turbine locations at the proposed site and any alternative sites.

(2) Waiver of Requirements. The maximum total annual hours of shadow flicker generated by the operation of each of the proposed wind turbines and any alternative wind turbines at the proposed site and any alternative sites may be waived:

(A) by submission to the Council of a written agreement between the applicant or petitioner and property owners of record stating that consent is granted to allow excess total annual hours of shadow flicker; or

(B) by a vote of two-thirds of the Council members present and voting to waive the total annual hours of shadow flicker requirements upon a showing of good cause, which includes consideration of:

(i) land uses and land use restrictions on abutting parcels;

(ii) public health and safety;

(iii) public benefit and reliability;

(iv) environmental impacts;

(v) policies of the state; and

(vi) wind turbine design and technology.

Delaware

- Provides that no restriction shall impede property owner from building wind for residential use by single-family homes.
- Commercial properties:
 - Set back requirements of 1.0 times turbine height from adjoining property line.
 - Noise limits of max 60 decibels (dB) measured at any location along property line, and shall not exceed 5 dB of existing noise levels of surrounding area.
- Provision for historic districts and requires buffers for any property in the historic register.

Delaware Energy Act Title 29 § 8060. Restrictions

(a) No county or municipal government, homeowner association, or association formed for the management of commonly-owned elements and facilities or for regulating use of private property shall adopt any covenant, restriction, deed restriction, zoning restriction, or subdivision restriction which prohibits or restricts the owner of a property from using a system for obtaining wind energy for a residential single family dwelling unit. Any such restriction adopted after August 8, 2009, shall be void and unenforceable. Notwithstanding the provisions of any existing county or municipal zoning ordinance or regulation, no prohibition against or restriction on wind energy systems for residential single-family homes

that is inconsistent with this section and adopted prior to August 8, 2009, shall be effective and no conditional use or other zoning review process shall be required.

(b) A county or municipal government, homeowner association, or an association formed for the management of commonly-owned elements and facilities or for regulating use of private property may place restrictions on wind energy system installations subject to subsection (a) of this section, provided such restrictions shall not be more restrictive than the following:

(1) Wind turbines shall be setback 1.0 times the turbine height from adjoining property line. Turbine height means the height of the tower plus the length of 1 blade.

(2) The aggregate noise or audible sound of a wind system shall not exceed 5 decibels above the existing average noise level of the surrounding area and shall be restricted to a maximum of 60 decibels measured at any location along the property line to the parcel where the wind system is located.

(3) Wind systems shall be free from signage, advertising, flags, streamers, any decorative items or any item not related to the operation of the wind turbine. Electric wiring for the turbines shall be placed underground for non-building integrated systems.

(4) This section shall not be applicable in any county or municipal designated historic district or historic zoning district.

(5) Any wind energy system shall be buffered from any properties or structures included on the Historic Register.

(c) The provisions of this section shall apply to wind energy systems and wind facilities that qualify for support from the Green Energy Fund, as authorized under [§ 8057](#) of this title, or other such similar programs administered by the State Energy Office.

Maine

- No statutory requirements, only regulations.
- Shall not exceed 75 dBA at any time of day at the property line of the wind development or contiguous property owned or controlled by the wind energy developer.
- 55 dBA during day and 42 dBA during night.
- Limits for low frequency noise¹ (no limits for infra sound.²)
- General Control of Noise provisions also apply to wind turbines
(see regulations attached)

Massachusetts

- Very general sound restrictions contained in Department of Environmental Protection's, Division of Air Quality Noise Regulations (310 CMR 7.10.)
- The State of Massachusetts has a model bylaw to address noise from wind turbines in towns and municipalities.
 - The model bylaw references air pollution control regulations that limit increases in broadband sound levels to not more than 10 dBA above

¹ "Low frequency noise" means sound between a frequency range of 20 and 200 hertz (Hz).

² "Infrasound" means sound below 20 Hz.

background noise levels that are exceeded 90% of the time measured during equipment operating hours.

- These criteria are measured at the property line and at nearest inhabited structure.

(see model bylaws attached)

**Excerpt from Model Amendment to a Zoning Ordinance or Bylaw:
Allowing Conditional Use of Wind Energy Facilities
Sound (Sec. 3.9.4., Sound)**

The wind facility and associated equipment shall conform with the provisions of the Department of Environmental Protection's, Division of Air Quality Noise Regulations (310 CMR 7.10), unless the Department and the Permit Granting Authority agree that those provisions shall not be applicable. A source of sound will be considered to be violating these regulations if the source:

- (a) Increases the broadband sound level by more than 10 dB(A) above ambient, or
- (b) Produces a "pure tone" condition when-- an octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more.

These criteria are measured both at the property line and at the nearest inhabited structure. Ambient is defined as the background A weighted sound level that is exceeded 90% of the time measured during equipment hours. The ambient may also be established by other means with consent from DEP. An analysis prepared by a qualified engineer shall be presented to demonstrate compliance with these noise standards, if required by the permit granting authority.

The permit granting authority, in consultation with the Department, shall determine whether such violations shall be measured at the property line or at the nearest inhabited residence.

Ohio

- No quantitative standards: developer only required to describe and evaluate noise implications of project.
- Wind developer shall describe anticipated construction noise levels.
- Wind developer shall evaluate and describe operational noise levels at boundaries closest to each turbine.
- Applicant shall use generally accepted computer modeling software (developed for wind turbine noise measurement) or similar wind turbine noise methodology, including consideration of broadband, tonal, and low-frequency noise levels.

**Ohio Administrative Code
Wind Power Electrical Generation
Chapter 4906-17-08
Social and ecological data**

(A) Health and safety.

(1) Demographic. The applicant shall provide existing and ten-year projected population estimates for communities within five miles of the proposed project area site(s).

(2) Noise. The applicant shall:

(a) Describe the construction noise levels expected at the nearest property boundary. The description shall address:

- (i) Dynamiting activities.
- (ii) Operation of earth moving equipment.
- (iii) Driving of piles.
- (iv) Erection of structures.
- (v) Truck traffic.
- (vi) Installation of equipment.

(b) For each turbine, evaluate and describe the operational noise levels expected at the property boundary closest to that turbine, under both day and nighttime conditions. Evaluate and describe the cumulative operational noise levels for the wind facility at each property boundary for each property adjacent to the project area, under both day and nighttime operations. The applicant shall use generally accepted computer modeling software (developed for wind turbine noise measurement) or similar wind turbine noise methodology, including consideration of broadband, tonal, and low-frequency noise levels.

(c) Indicate the location of any noise-sensitive areas within one mile of the proposed facility.

(d) Describe equipment and procedures to mitigate the effects of noise emissions from the proposed facility during construction and operation.

Oregon

- Established acceptable noise levels.
- A facility complies with the noise ambient background standard if the increase in noise over either the assumed ambient noise level of 26 dBA or to the actual ambient background L10 and L50 noise level, if measured, is not more than 10 dBA over this entire range of wind speeds.

Oregon Administrative Regulations Noise Control Regulations for Industry and Commerce Chapter 340-035-0035

(iii) For noise levels generated or caused by a wind energy facility:

(I) The increase in ambient statistical noise levels is based on an assumed background L50 ambient noise level of 26 dBA or the actual ambient background level. The person owning the wind energy facility may conduct measurements to determine the actual ambient L10 and L50 background level.

(II) The “actual ambient background level” is the measured noise level at the appropriate measurement point as specified in subsection (3)(b) of this rule using generally accepted noise engineering measurement practices. Background noise measurements shall be obtained at the appropriate measurement point, synchronized with windspeed measurements of hub height conditions at the nearest wind turbine location.

“Actual ambient background level” does not include noise generated or caused by the wind energy facility.

(III) The noise levels from a wind energy facility may increase the ambient statistical noise levels L10 and L50 by more than 10 dBA (but not above the limits specified in Table 8), if the person who owns the noise sensitive property executes a legally effective easement or real covenant that benefits the property on which the wind energy facility is located. The easement or covenant must authorize the wind energy facility to increase the ambient statistical noise levels, L10 or L50 on the sensitive property by more than 10 dBA at the appropriate measurement point.

(IV) For purposes of determining whether a proposed wind energy facility would satisfy the ambient noise standard where a landowner has not waived the standard, noise levels at the appropriate measurement point are predicted assuming that all of the proposed wind facility's turbines are operating between cut-in speed and the wind speed corresponding to the maximum sound power level established by IEC 61400-11

(version 2002-12). These predictions must be compared to the highest of either the assumed ambient noise level of 26 dBA or to the actual ambient background L10 and L50 noise level, if measured. The facility

complies with the noise ambient background standard if this comparison shows that the increase in noise is not more than 10 dBA over this entire range of wind speeds.

(V) For purposes of determining whether an operating wind energy facility complies with the ambient noise standard where a landowner has not waived the standard, noise levels at the appropriate measurement point are measured when the facility's nearest wind turbine is operating over the entire range of wind speeds between cut-in speed and the windspeed corresponding to the maximum sound power level and no turbine that could contribute to the noise level is disabled. The facility complies with the noise ambient background standard if the increase in noise over either the assumed ambient noise level of 26 dBA or to the actual ambient background L10 and L50 noise level, if measured, is not more than 10 dBA over this entire range of wind speeds.

(VI) For purposes of determining whether a proposed wind energy facility would satisfy the Table 8 standards, noise levels at the appropriate measurement point are predicted by using the turbine's maximum sound power level following procedures established by IEC 61400-11 (version 2002-12), and assuming that all of the proposed wind facility's turbines are operating at the maximum sound power level.

(VII) For purposes of determining whether an operating wind energy facility satisfies the Table 8 standards, noise generated by the energy facility is measured at the appropriate measurement point when the facility's nearest wind turbine is operating at the windspeed corresponding to the maximum sound power level and no turbine that could contribute to the noise level is disabled.

Rhode Island

- Only goals, no required standards.
- Goal for noise from wind turbines average less than or equal to 100 dB re 1 μPa_2 in any 1/3 octave band at a range of 100 meters at full power production.

Rhode Island Administrative Code General Policies and Regulatory Standards Code 16-1-17:860

The following are industry goals that projects should strive for. These are not required standards at this time but are targets project proponents should try to meet where possible to alleviate potential adverse impacts:

- i. A goal for the wind farm applicant and operator is to have operational noise from wind turbines average less than or equal to 100 dB re 1 μPa_2 in any 1/3 octave band at a range of 100 meters at full power production.
- ii. The applicant and manufacturer should endeavor to minimize the radiated airborne noise from the wind turbines.
- iii. A monitoring system including acoustical, optical and other sensors should be established near these facilities to quantify the effects.

Vermont

- The Public Service Board (PSB) has employed a standard based upon noise guidelines developed by the World Health Organization.
- PSB commenced investigation into the issue of appropriate sound standards for facilities that are subject to the PSB's jurisdiction under 30 V.S.A. § 248, as well as for net-metered generation facilities constructed pursuant to 30 V.S.A. § 219a.

- Order #8167 establishes: Investigation into the potential establishment of standards related to sound levels from the operation of generation, transmission and distribution equipment by entities subject to Public Service Board jurisdiction.

Wisconsin

- General requirement for designs to minimize noise from wind energy.
- With some exceptions, wind energy system shall not exceed 50 dBA during daytime hours and 45 dBA during nighttime hours.
- Contains provision for measuring and reporting compliance.
- Contains waiver provision allowing nearby residents to waive state noise requirements for wind energy producers.

Public Service Commission

Wind Energy Systems: Owner Requirements

Noise criteria Wis. Adm. Code PSC 128.14

(1) DEFINITIONS. In this section, nighttime hours are the hours beginning at 10: 00 p.m. and ending at 6: 00 a.m. daily and daytime hours are the hours beginning at 6: 00 a.m. and ending at 10: 00 p.m. daily.

(2) PLANNING. (a) The noise limits in this section apply at the outside wall of a nonparticipating residence or occupied community building that exists when the owner gives notice under s. PSC 128.105 (1) or for which complete publicly-available plans for construction are on file with a political subdivision within 30 days of the date on which the owner gives notice under s. PSC 128.105 (1).

(b) An owner shall design the proposed wind energy system to minimize noise at a residence or occupied community building to the extent reasonably practicable.

(c) An owner shall design a wind energy system to comply with the noise standards in this section under planned operating conditions.

(3) NOISE LIMITS. (a) Except as provided in par. (b), subs. (4) (c) and (5), an owner shall operate the wind energy system so that the noise attributable to the wind energy system does not exceed 50 dBA during daytime hours and 45 dBA during nighttime hours.

(b) In the event audible noise due to wind energy system operations contains a steady pure tone, such as a whine, whistle, screech, or hum, the owner shall promptly take corrective action to permanently eliminate the noise. This paragraph does not apply to sound the wind energy system produces under normal operating conditions.

(4) COMPLIANCE. (a) If an owner uses sound level measurements to evaluate compliance with this section at a nonparticipating residence or occupied community building, those measurements shall be made as near as possible to the outside wall nearest to the closest wind turbine, or at an alternate wall as specified by the owner of the nonparticipating residence or occupied community building. The owner may take additional measurements to evaluate compliance in addition to those specified by this section.

(b) Upon receipt of a complaint regarding a violation of the noise standards in sub. (3) (a), an owner shall test for compliance with the noise limits in sub. (3) (a). A political subdivision or monitoring committee established under [s. PSC 128.41](#) may not require additional testing to show compliance with sub. (3) (a) if the owner has provided the results of an accurate test conducted within 2 years of the date of the complaint showing that the wind energy system is in compliance with sub. (3) (a) at the location relating to the complaint.

(c) Methods available for the owner to comply with sub. (3) shall include operational curtailment of one or more wind turbines. Upon receipt of a complaint about a noise under sub. (3) (b), the owner shall use operational curtailment to eliminate the noise until the owner permanently corrects the problem.

(d) An owner shall evaluate compliance with sub. (3) (a) as part of pre- and post-construction noise studies. An owner shall conduct pre- and post-construction noise studies under the most current version of the noise measurement protocol as described in [s. PSC 128.50 \(2\)](#).

(5) WAIVER. Upon request by an owner of a wind energy system, an owner of an affected nonparticipating residence or occupied community building may relieve the owner of the wind energy system of the requirement to meet any of the noise limits in this section at the affected residence or occupied community building by written contract with the wind energy system owner. Unless otherwise provided in a contract signed by an owner of an affected nonparticipating residence or occupied community building, a waiver by an owner of an affected nonparticipating residence or occupied community building is an encumbrance on the real property, runs with the land until the wind energy system is decommissioned, and shall be recorded under ch. 706, Stats.

(6) NOTIFICATION. (a) Before entering into a contract under sub. (5), an owner of a wind energy system shall provide written notice of the requirements of this section to the owner of an affected nonparticipating residence or occupied community building.

(b) Before the initial operation of the wind energy system, an owner of a wind energy system shall provide notice of the requirements of this section to an owner of a nonparticipating residence or occupied community building within 0.5 mile of a constructed wind turbine that has not entered into a contract under sub. (5).