



June 27, 2016

Vermont Public Service Board
112 State Street, 4th Floor
Montpelier, VT 05620

Re: Temporary Sound Standards for New Wind Electricity Generation

Dear Public Service Board Members,

Renewable Energy Vermont (REV) appreciates the Board's timely and transparent process to implement provisions of S.260 (Act 174) regarding rulemaking for sound standards related to wind electricity generation. REV respectfully submits the enclosed proposed Temporary Sound Standards for New Wind Generation Facilities in response to the Board's June 14, 2016 Request for Proposals.

The enclosed proposed rule satisfies S.260's requirement that the Board's temporary rules: (1) limit sound levels from a particular category wind generation facilities to the lowest maximum decibel levels previously authorized by the Board; and (2) provide a methodology for determining sound levels and measurement locations for wind generation facilities on a case-by-case basis. The proposal also includes compliance monitoring and complaint procedures that go beyond what S.260 requires, in order to ensure a clear, definitive, and reasonable process for wind facility neighbors, owners, and regulators.

REV's proposed rule is protective of public health. The information gathered by the Board in the three years since it began accepting comments concerning sound from wind electricity generation in Docket 8167 demonstrates that the sound limits at the currently operating projects in Vermont are protective of public health and the environment. Health Canada's 2014 *Wind Turbine Noise and Health Study* found no evidence of a link between wind turbine sound and adverse health effects, increased stress levels, diminished sleep quality, or "any significant changes in reported quality of life, or with overall quality of life and satisfaction with health" at levels comparable to what REV is proposing.¹ Likewise, Vermont's Department of Health concluded that "there is no direct health effect from sound associated with wind turbine facilities."²

REV urges the Public Service Board to continue to regulate sound from wind electricity generation on the basis of peer-reviewed science and public health standards. The enclosed proposed rule provides an appropriate mechanism for doing so, and exceeds the requirements of S.260.

¹ <http://www.hc-sc.gc.ca/ewh-semt/noise-bruit/turbine-eoliennes/pamphlet-brochure-eng.php>.

² http://healthvermont.gov/pubs/healthassessments/documents/wind_turbine_sound_10152010.pdf.



Thank you for the opportunity to provide comments on this matter. Please do not hesitate to contact us with any questions.

Respectfully submitted,

Olivia Campbell Andersen
Executive Director
Renewable Energy Vermont

Enclosure: Temporary Rule on Sound from Wind Electricity Generation

Renewable Energy Vermont represents businesses, non-profits, utilities, and individuals committed to reducing our reliance on dirty fossil fuels by increasing clean renewable energy and energy efficiency in Vermont. Vermont's clean energy economy supports at least 17,715 sustainable jobs, representing approximately 6% of Vermont's workforce. Together, we will achieve 90% total renewable energy (electric, thermal, transportation) by 2050 in order to reduce climate pollution.

REV PROPOSAL – 6/27/16

5.700 TEMPORARY SOUND STANDARDS FOR NEW WIND GENERATION FACILITIES

5.701 Applicability

These temporary rules shall apply to any Wind Electric Generation Facility that petitions for a certificate of public good under 30 V.S.A. § 248 on or after June 13, 2016.

5.702 Definitions

- (A) Board: the Public Service Board.
- (B) Department: the Department of Public Service.
- (C) Plant Capacity: plant capacity as defined in 30 V.S.A. § 8002.
- (D) Residence: a permanent structure for human habitation with a potable water supply and wastewater system that is occupied for a minimum of 90 days each year and is in existence at the time a petition for a Certificate of Public Good is filed for a wind generation facility.
- (E) Turbine Shut-Down Method: A sound monitoring method to determine background sound levels by having all turbines that a measurable effect on sound levels at a specific monitor location cease operation for a specified period of time.
- (F) Turbine Sound Pressure Level: the sound pressure level emitted by or solely attributed to the turbines of a Wind Generation Facility as measured at a specific location, in A-weighted decibels (dBA), of frequencies from 20 Hz to 10 kHz.
- (G) Wind Generation Facility: A wind electric generation facility for which a Petition for a Certificate of Public Good (“CPG”) under 30 V.S.A. § 248 is submitted to the Vermont Public Service Board on or after June 13, 2016.

5.703 Sound Standards

- (A) Turbine Sound Pressure Levels from the operation of any Wind Generation Facility with a plant capacity of 500 kW or less shall: (i) not result in audible prominent discrete-frequency tones pursuant to the choices identified in ANSI standard S12.9 Part 4 Annex C (2005) at any Residence: and (ii) shall not exceed at any Residence:
 - a. 45 dB L_{Aeq1h} (exterior) or
 - b. 30 dB L_{Aeq1h} (interior bedrooms, windows closed)

REV PROPOSAL – 6/27/16

(B) Turbine Sound Pressure Levels from the operation of any Wind Generation Facility with a plant capacity greater than 500 kW shall: (i) not result in audible prominent discrete-frequency tones pursuant to the choices identified in ANSI standard S12.9 Part 4 Annex C (2005) at any Residence; and (ii) shall not exceed at any Residence:

- a. 45 dB L_{Aeq1h} (exterior) or
- b. 30 dB L_{Aeq1h} (interior bedrooms, windows closed)

(C) For purposes of this Rule, a Residence is presumed to provide a minimum of 15 dB of sound attenuation with the windows in a closed position.

(D) The standards in subsection (B) shall not apply to any Residence that is owned or controlled by the CPG holder, that is participating in the Project, or that is subject to a sound easement recorded in the municipal land records.

5.704 Small Wind Generation Facilities

Wind Generation Facilities with a Plant Capacity of 500 kW or less shall be not be subject to the requirements of Rules 5.705 through 5.707. At the time a CPG is applied for, each such facility shall demonstrate that it can meet the sound standard set forth in Rule 5.703(A)

5.705 Sound Level Modeling for Facilities Greater than 500 kW

Prior to construction, the CPG holder of a Wind Generation Facility shall conduct sound level modeling of the sound levels from such facility based on the maximum sound power level reported by the manufacturer of the turbines in accordance with IEC 61400-11. Sound level modeling shall use the methodology defined in ISO 9613-2, *Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General method of calculation*.

5.706 First-Year Monitoring for Facilities Greater than 500 kW

(A) During the first full year of operation, the CPG holder shall develop and implement a sound monitoring program to evaluate normal turbine operations under a variety of seasonal and climactic conditions. The first-year monitoring program shall be subject to Board review and approval, and the results of the program shall be reported to the Board. The program shall include the following:

REV PROPOSAL – 6/27/16

- (1) The monitoring shall be conducted by a third party with sufficient expertise, to be approved by the Board after an opportunity for all parties to the Certificate of Public Good proceeding to provide input.
- (2) One period of monitoring shall take place during leaf-on and leaf-off conditions for a minimum of two monitoring periods.
- (3) Each monitoring period shall be long enough to collect at least two weeks of turbine operating data that includes periods when the turbines are operating at their maximum sound power level. Data shall be excluded from the data set if it is contaminated by: (i) sound not generated by the Wind Electric Generation Facility; (ii) winds greater than the wind screen specification (if any); (iii) being collected in temperatures outside of the sound level meter specification, or (iv) being collected during periods of rain.
- (4) Monitoring periods may be determined by using appropriate sound recordings, spectrogram analysis, and meteorological instrumentation, as the case may be. In addition, insect, bird, and leaf rustling noise may further be eliminated by filtering the data using an “Ai” weighting, eliminating sound from frequencies above 1,250 Hz. (consistent with that described in Paul D. Schomer, Ian M. Slauch, and George F. Hessler, *Proposed “Ai”-weighting; A weighting to remove insect noise from A-weighted field measurements*, INTERNOISE PROCEEDINGS, Volume 221, pp. 3991-4000 (2010)).
- (5) If the Turbine Shut-Down Method for determining Turbine Sound Pressure Levels is utilized, the comparison of turbine-on ambient sound pressure levels to turbine-off ambient sound pressure levels, shall be made for a minimum of three (3) thirty (30) minute intervals. The calculations shall not support a finding of non-compliance with section 5.703 when the difference between the on and off sound levels is not greater than 5 dBA.
- (6) The exact location of the microphones shall be chosen on site and based on the following list of site condition priorities:
 - (a) Microphones shall be located near Residences, but at a distance of not less than 25 feet from a building to minimize the influence of reflections.
 - (b) Microphones shall be placed in a location to avoid potential sound contamination from non-turbine sound sources such as flowing water, wind chimes, air conditioners, sounds from homes, etc.
 - (c) Microphones shall be placed at a height approximately 3 to 4 feet above grade, depending upon filed conditions.

REV PROPOSAL – 6/27/16

- (d) Microphones shall not be placed such that any structure blocks the line of sight between the microphone and a wind turbine (if otherwise visible).
 - (e) Reasonable effort shall be made given the variety of potential siting constraints to locate microphones in a manner that will capture representative sound levels at each monitoring location, taking into account all relevant factors such as minimizing line-of-sight obstructions between microphones and the facility, and maximizing the number of turbines in line-of-sight of the microphones at each monitoring location.
- (7) Concurrent meteorological measurements shall be collected at or near each microphone location to facilitate the determination of weather-induced sounds. The meteorological measurements shall not be more than 10-minute increments.
- (8) All sound level meters will meet Type II or better specifications for accuracy, and will be calibrated before and after each measurement period. All monitors will collect 1/3 octave band data from 20 Hz to 10 kHz for consecutive periods not to exceed 10 minutes. Microphones shall be fitted with wind screens suitable for measurements in windy conditions. Monitors will also collect audio recordings where permission is granted by the property owner. To protect privacy, audio recordings shall be released only under a confidentiality agreement approved by the Board.
- (B) **Measurement Locations.** At least four (4) representative monitor site(s) for the first-year monitoring program shall be selected. The sites shall be geographically distributed and located near where pre-construction modeling indicated the highest project-related sound levels could occur, subject to permission from the property owner to conduct monitoring. If a property owner withholds permission for such monitoring, the CPG holder shall seek permission to conduct monitoring at the next closest site near where the pre-construction modeling indicated the highest project-related sound levels could occur, until the required number of monitor sites are available to the CPG holder to conduct monitoring.
- (C) A facility shall be deemed to be in compliance with these Rules when at least 95 percent of the Turbine Sound Pressure Levels determined during the First Year Monitoring Program meet the sound standard specified in Section 5.703(B).

5.707 Complaint Resolution for Facilities Greater than 500 kW

- (A) The CPG holder for a wind generation facility shall provide a phone number and email address for complaints to the legislative bodies of all municipalities entitled to notice of the petition for Certificate of Public Good for the facility under Rule 5.402.

REV PROPOSAL – 6/27/16

(B) Complaint Processing.

- (1) Complaints filed under this rule shall be made first to the CPG holder for resolution. Such complaints may be submitted by email to the email address required by 5.709(A) or by telephone and must include the complainant's name, telephone number, street address, and email address if the complainant has email. Within two (2) business days of receiving a complaint, the CPG holder shall acknowledge the complaint in writing, either by email, by first class U.S. Mail or personal service. No complaints will be processed by the Public Service Board or Department of Public Service unless the complainant provides documentation that a complaint was made to the CPG holder first and the CPG holder failed to acknowledge and process the complaint in accordance with these rules.
- (2) At the time of filing a complaint, complainants shall provide the following information: (a) location of the observed sound; (b) time and date the sound occurred; (c) weather conditions (snow cover, cloud cover, wind direction and relative speed, etc.) at the time of the complaint; and (d) a description of the sound.
- (3) Within 14 days of receiving a complaint, the CPG holder shall submit a copy of the complaint and the following information to the complainant, the Department, and the Board: (a) any complainant information received; (b) whether any abnormal facility operation or maintenance conditions existed at the time of the complaint; and (c) whether the CPG holder is initiating an investigation under the procedure set forth in these rules.

(C) Investigation Procedure.

- (1) The CPG holder shall implement the procedures in subsection (3) below if each of the following conditions apply:
 - (a) the complaint is not a result of abnormal facility operation or maintenance conditions; and
 - (b) the complaint is filed by the owner or full-time occupant of a Residence located within 1.5 miles of the facility; and
 - (c) Turbine Sound Pressure Levels at the Residence are within 3 dBA of the exterior sound limit set forth in these Rules, as determined under subsection (2) below.
- (2) For purposes of determining sound levels under subsection (C)(1)(c) above, the following procedures shall apply:
 - (a) In the event that the first-year monitoring period has ended within the 5 years preceding the complaint and the complainant's Residence was used as a

REV PROPOSAL – 6/27/16

monitoring location, A-weighted sound levels at the Residence shall be determined using the first-year monitoring data.

- (b) If (a) does not apply, estimated sound levels at the Residence shall be determined by taking the A-weighted sound level from the closest monitoring location and extrapolating it to the complainant's Residence by means of the following formula:

$$L_{pc} = L_{pm} + \left(20 \times \log_{10} \frac{D_m}{D_c} \right)$$

Where:

L_{pc} = Estimated sound level at the complainant's Residence in dBA.
 L_{pm} = Sound pressure level at the nearest monitoring location in dBA.
 D_m = Distance from the facility to the relevant monitoring location in feet.
 D_c = Distance from the facility to the complainant location in feet.

- (3) Exterior sound monitoring shall be conducted by the CPG Holder if the extrapolated exterior sound level is within 1 dB of the exterior sound limit set forth in these rules.
- (4) Sound monitoring conducted under this procedure shall comply with the standards of the Board-approved first-year monitoring plan.
- (5) The official results of the monitoring shall be contained in a report that is submitted to the complainant, the Department, and the Board. This report shall contain specific information collected during the complaint monitoring, including wind speed and direction, operational status of the turbines, sound levels, and the raw sound level data collected by the sound control engineer conducting the tests.
- (6) If a violation of the sound limits set forth in these rules is found at the complainant's Residence, the CPG holder shall take all remedial steps that are necessary to meet the sound standards of section 5.703(B) at the Residence.
- (7) If the sound limits set forth in these rules is not exceeded at the complainant's Residence, the complaint shall be deemed closed when the CPG holder submits the monitoring results as required by this procedure. This investigation procedure shall not be repeated at the complainant's Residence during any five-year period.