Ch. 375, Sec. 10, subsec. I Sound Level Standards for Wind Energy Developments

August 8, 2011 Draft Rule

The Department of Environmental Protection Rule Chapter 375, Section 10 is amended by adding the following new section, subsection I, Sound Level Standards for Wind Energy Developments:

I. Sound Level Standards for Wind Energy Developments.

(1) Applicability:

This section applies to grid-scale wind energy developments as defined by 35-A M.R.S.A. § 3451.6 and small-scale wind energy developments governed by 35-A M.R.S.A. §3456, hereinafter referred to as "wind energy developments," and the provisions in Section 10 (C) (1), 10 (D) (2), 10 (F), and 10 (H) of this Rule do not apply to wind energy developments.

(2) Sound Level Limits for Routine Operation of wind energy developments.

The sound levels resulting from routine operation of a wind energy development measured in accordance with the measurement procedures described in subsection I (8) shall not exceed the following limits:

(a) 75 dBA at any time of day at any property line of the wind energy development or contiguous property owned or controlled by the wind energy developer, whichever is farther from the proposed wind energy development's regulated sound sources; and

(b) 55 dBA between 7:00 a.m. and 7:00 p.m. (the "daytime limit"), and 42 dBA between 7:00 p.m. and 7:00 a.m. (the "nighttime limit") at any protected location.

(3) Tonal Sounds.

For the purposes of this subsection, a tonal sound exists if, at a protected location, the 10 minute one-third octave band sound pressure level in the band containing the tonal sound exceeds the arithmetic average of the sound pressure levels of the two contiguous one-third octave bands by 5 dB for center frequencies at or between 500 Hz and 10,000 Hz, by 8 dB for center frequencies at or between 160 and 400 Hz, and by 15 dB for center frequencies at or between 25 Hz and 125 Hz. 5 dBA shall be added to any average 10 minute sound level ($Leq_{A\ 10\text{-}min}$), for which a tonal sound occurs that result from routine operation of the wind energy development.

(4) Short Duration Repetitive Sounds ("SDRS").

For the purpose of this subsection SDRS is defined as a sequence of repetitive sounds that occur within a 10 minute measurement interval, each clearly discernible as an event and causing an increase in the sound level of 5 dBA or greater on the fast meter response above the sound level observed immediately before and after the event, each typically ±1 second in duration, and which are inherent to the process or operation of the development and are foreseeable.

(a) When routine operation of a wind energy development produces short duration repetitive sound, a 5 dBA penalty shall be added to each average 10 minute sound level ($Leq_{A\ 10\text{-}min}$) measurement interval in which greater than 5 occurrences of SDRS are present.

(5) Compliance with the Sound Level Limits

A wind energy development shall determine compliance with the sound level limits as set forth in subsection I (2) of this rule in accordance with the following:

1. Sound level data shall be aggregated in 10-minute measurement intervals within a given compliance measurement period (daytime: 7:00 am to 7:00 pm or nighttime: 7:00 pm to 7:00 am) under the conditions set forth in subsection I (8) of this rule.

2. Compliance will be demonstrated when the arithmetic average of the sound level of, at a minimum, twelve, 10-minute measurement intervals in a given compliance measurement period is less than or equal to the sound level limit set forth in subsection I (2).

3. Alternatively, if a given compliance measurement period does not produce a minimum of twelve, 10-minute measurement intervals under the atmospheric and site conditions set forth in subsection I (8) of this rule, the wind energy development may combine six or more, 10-minute measurement intervals from one 12 hour (7:00 am to 7:00 pm daytime) or (7:00 pm to 7:00 am nighttime) compliance measurement period with six or more, 10-minute intervals from another compliance measurement period. Compliance will be demonstrated when the arithmetic average of the combined 10-minute measurement intervals is less than or equal to the sound level limit set forth in subsection I (2).

(6) Variance From Sound Level Limits

A variance may be granted by the Department if (1) a development is deemed necessary in the interest of national defense or public safety and the applicant has shown that the sound level limits cannot practicably be met without unduly limiting the development's intended function, and (2) a finding is made by the Department that the proposed development will not have an unreasonable impact on protected locations. The Department shall consider the request for a variance as part of the review of a completed Site Location of Development Law application or a request for certification for a small-scale wind energy development. In granting a variance, the Department may, as a condition of approval, impose terms and conditions to ensure that no unreasonable sound impacts will occur.

(7) Submissions

Technical information shall be submitted describing the wind energy developer's plan and intent to make provision for the control of sound. The wind energy developer's plan shall contain the following:

(a) Pre-development ambient sound measurements collected in accordance with the measurement procedures described in subsection I (8);

(b) A map depicting the location of all proposed sound sources associated with the wind energy development, property boundaries for the proposed wind energy development, property boundaries of all adjacent properties within one mile of the proposed wind energy development, and the location of all protected locations located within one mile of the proposed wind energy development;

(c) A description of the major sound sources, including tonal sound sources and sources of short duration repetitive sounds, associated with the construction, operation and maintenance of the proposed wind energy development;

(d) A description of the equivalent noise levels expected to be produced by the sound sources at protected locations located within one mile of the proposed wind energy development. The description shall include a full-page isopleths map depicting the modeled decay rate of the predicted sound pressure levels expected to be produced by the wind energy development at each clearly identified protected location within one mile of the proposed wind energy development. The predictive model used to generate the equivalent noise levels expected to be produced by the sound sources shall be designed to represent the "predictable worst case" impact on adjacent properties and shall include, at a minimum, the following:

1. The maximum rated output of the sound sources operating during nighttime stable atmospheric conditions with high wind shear above the boundary layer and all other conditions that affect the in-flow airstream that can exceed the design limits for normal operation of the turbines. The sound propagation rate shall reflect a point source 6 dB decay rate for each turbine in the proposed arrangement of wind turbines;
2. Attenuation due to geometric spreading;
3. Attenuation due to air absorption;
4. Attenuation due to ground absorption/reflection;
5. Attenuation due to three dimensional terrain;
6. Attenuation due to forestation;
7. Attenuation due to meteorological factors such as but not limited to relative wind speed and direction (wind rose data), temperature/vertical profiles and relative humidity, sky conditions, and atmospheric profiles;
8. Inclusion of an "uncertainty factor" adjustment to the maximum rated output of the sound sources based on the manufacturer's recommendation; and
9. Inclusion, at the discretion of the Department, an addition to the maximum rated output of the sound sources to account for uncertainties in the modeling of sound propagation for wind energy developments. The addition may be up to 3 dBA.

(e) A description of the protected locations near the proposed wind energy development.

(f) A description of proposed major sound control measures, including their locations and expected performance.

(g) A comparison of the expected sound levels from the proposed development with the sound level limits of this regulation.

(g) A comparison of the expected sound levels from the proposed development with any quantifiable noise standards of the municipality in which the proposed development will be located and of any municipality which may be affected by the noise.

(h) A description and map identifying one or more compliance testing locations on or near the proposed wind energy development site. The identified compliance testing locations shall be selected to take advantage of prevailing downwind conditions and be able to meet the site selection criteria outlined in subsection I (8)(d)(4).

(i) A description of the compliance measurement and complaint response protocol proposed by the wind energy development. The complaint response protocol shall adequately provide for, at a minimum:

1. A 24-hour contact for complaints;
2. A complaint log accessible to the Department;
3. Analysis of each complaint in accordance with the approved compliance measurement protocol for the project; and
4. Notification of complaint findings to the Department and the complainant.

(8) Measurement Procedures

These procedures specify measurement criteria and methodology for use with wind energy development applications, compliance and complaint response. They provide methods for measuring the ambient sound and the sound from operation of the wind energy development and set forth the information to be reported.

(a) Measurement Criteria

1. Measurement Personnel

Measurements shall be supervised by personnel who are well qualified by training and experience in measurement and evaluation of environmental sound, or by personnel trained to operate under a specific measurement plan approved by the Department.

(b) Measurement Instrumentation

1. A sound level meter or alternative sound level measurement system used shall meet all of the Type 1 or 2 performance requirements of American National Standard Specifications for Sound Level Meters, ANSI S1.4.

2. An integrating sound level meter (or measurement system) shall also meet the Type 1 or 2 performance requirements for integrating/averaging in the International Electrotechnical Commission Standard on Integrating-Averaging Sound Level Meters, IEC Publication 61672-1 and ANSI 1.43.

3. A filter for determining the existence of tonal sounds shall meet all the requirements of the American National Standard Specification for Octave-Band and Fractional Octave-Band Analog and Digital Filters, ANSI S1.11 and IEC 61260, Type 3-D performance.

4. The acoustical calibrator used shall be of a type recommended by the manufacturer of the sound level meter and one that meets the requirements of American National Standard Specification for Acoustical Calibrators, ANSI S1.40.

5. The microphone windscreen used shall be of a type recommended by the manufacturer of the sound level meter.

6. Anemometer(s) used for surface (10 meter (m)) wind speeds shall have a minimum manufacturer specified accuracy of ±1 mph providing data in one second integrations and 10 min. average/maximum values for the evaluation of atmospheric stability.

7. Audio recording devices shall be time stamped (hh:mm:ss) and at a minimum 16 bit digital, recording the sound signal output from the measurement microphone at a

minimum sampling rate of 24 thousand (k) samples per second reported in wav. file format.

(c) Equipment Calibration

1. The sound level meter shall have been calibrated by a laboratory within 12 months of the measurement, and the microphone's response shall be traceable to the National Institute of Standards and Technology.

2. Field calibrations shall be recorded before and after each measurement period and at shorter intervals if recommended by the manufacturer.

3. Anemometer(s) and vane(s) shall be calibrated annually by the manufacturer.

(d) Compliance Measurement Location, Configuration, and Environment.

1. Compliance measurement locations shall be at nearby protected locations that are most likely affected by the sound from routine operation of the wind energy development subject to permission from the respective property owner(s).

2. Compliance measurement locations shall be at the center of unobstructed areas that are maintained free of vegetation and other structures or material that is greater than 2 feet in height for a 75-foot radius around the sound and audio monitoring equipment.

3. Meteorological measurement locations shall be at the center of open flat terrain, inclusive of grass and a few isolated obstacles less than 6 feet in height for a 250-foot radius around the anemometer location. The meteorological data measurement location need not be coincident with the sound and audio measurement location provided there is no greater than a 5 mile of separation between the data collection points and the measurement locations have similar characterization, i.e. same side of the mountain ridge, etc.

4. All compliance measurement location(s) sound, audio and meteorological measurement equipment shall remain in place, in good working order, collecting continuous data 24 hours per day, 7 days per week during all periods when the wind energy development's turbines are generating electricity, however when necessary for calibration or maintenance, the equipment may be removed from the compliance measurement location for up to 10 days. Written notification of such short term removal of the equipment and its reinstallation shall be submitted to the Department prior to removal and upon reinstallation.

5. Meteorological measurements of wind speed and direction shall be collected using anemometers at a 10-meter height above the ground. Results shall be reported, based on 1-second integration intervals, and shall be reported synchronously with hub level and sound level measurements at 10-minute measurement intervals. The wind speed average and maximum shall be reported.

6. The sound microphone shall be positioned at a height of approximately 4 to 5 feet above the ground, and oriented in accordance with the manufacturer's recommendations.

7. When possible, measurement locations should be at least 50 feet from any other sound source other than the wind energy development's power generating sources.

(e) Compliance Data Collection, Measurement and Retention Procedures.

1. Measurements of operational, sound, audio and meteorological data shall occur on a continuous basis 24 hours per day, 7 days per week during all periods when the wind energy development's turbines are generating electricity except as set for in subsection I (8) (d) (4).

2. All operational, sound and meteorological data collected shall be retained by the wind energy development for a period of 1 year from the date of collection and is subject to inspection by the Department and submission to the Department upon request.

3. All audio data collected shall be retained by the wind energy development for a period of two weeks from the date of collection unless subject to a complaint filed in accordance with the complaint protocol approved by the Department and is subject to inspection by the Department and submission to the Department upon request. Specific audio data collected that coincides with a complaint filed in accordance with the approved complaint protocol shall be retained by the wind energy developer for a period of 1 year from the date of collection and is subject to inspection by the Department and submission to the Department upon request.

4. Written notification of the intent to collect compliance data must be received by the Department prior to the collection of any sound level data for compliance purposes. The notification shall state the date and time of the compliance measurement period.

   Note: Notice received via electronic mail is sufficient regardless of whether it is received during business hours.

5. Compliance data from the operation of a wind energy development shall be submitted to the Department, at a minimum:

   (a) Once during the first year of facility operation;
   (b) Once during each successive fifth year thereafter until the facility is decommissioned;
   (c) In response to a community complaint regarding operation of the wind energy development and any subsequent enforcement by the Department; and
   (d) For validation of an applicant's calculated sound levels when requested by the Department.

6. All sound level, audio and meteorological data collected during a compliance measurement period for which the Department has been notified that meets or exceeds the specified wind speed parameters shall be submitted to the Department for review and approval. All data submittals shall be submitted to the Department within 30 days of notification of intent to collect compliance data.

7. Measurement shall be obtained during weather conditions when the wind turbine sound is most clearly noticeable, generally when the measurement location is

downwind of the wind energy development and maximum surface wind speeds ≤ 6 miles per hour (mph) with concurrent turbine hub-elevation wind speeds sufficient to generate the maximum continuous rated sound power from the nearest wind turbines to the measurement location. A downwind location is defined as within 45^0 of the direction between a specific measurement location and the acoustic center of the five nearest wind turbines.

[Note: These conditions typically occur during inversion periods usually between 11 pm and 5 am.]

8. In some circumstances, it may not be feasible to meet the wind speed and operations criteria due to terrain features or limited elevation change between the wind turbines and monitoring locations. In these cases, measurement periods are acceptable if the following conditions are met:

   (a) The difference between the L_{A90} and L_{A10} during any 10-minute period is less than 5 dBA; and
   (b) The surface wind speed (10 meter height) is 6 mph or less for 80% of the measurement period and does not exceed 10 mph at any time, or the turbines are shut down during the monitoring period and the difference in the observed L_{A50} after shut down is equal to or greater than 6 dBA; and
   (c) Observer logs or recorded sound files clearly indicate the dominance of wind turbine(s).

9. Measurement intervals affected by increased biological activities, leaf rustling, traffic, high water flow, aircraft flyovers or other extraneous ambient noise sources that affect the ability to demonstrate compliance shall be excluded from all compliance report data. The intent is to obtain 10-minute measurement intervals that entirely meet the specific criteria.

10. Measurements of the wind energy development sound shall be made so as to exclude the contribution of sound from other development equipment that is exempt from this regulation.

(f) Reporting of Compliance Measurement Data.

Compliance Reports shall be submitted to the Department within 30 days of notification of intent to collect compliance data or upon request by the Department and shall include, at a minimum, the following:

1. A narrative description of the sound from the wind energy development for the compliance measurement period result;
2. The dates, days of the week and hours of the day when measurements were made;
3. The wind direction and speed, temperature, humidity and sky condition;
4. Identification of all measurement equipment by make, model and serial number;
5. All meteorological, sound, windscreen and audio instrumentation specifications and calibrations;
6. All A-weighted equivalent sound levels for each 10-minute measurement interval;
7. All L_{A10} and L_{A90} percentile levels;
8. All 10 minute 1/3 octave band linear equivalent sound levels (dB);

9. All short duration repetitive events characterized by event amplitude. Amplitude is defined as the peak event amplitude minus the average minima sound level immediately before and after the event, as measured at an interval of 50 milliseconds ("ms") or less, A-weighted and fast time response, i.e. 125 ms. For each 10-minute measurement interval short duration repetitive sound events shall be reported by number for each observed amplitude integer above 4 dBA.
10. All audio (wav.) data files time stamped to coincide with the sound and meteorological data collection sequence. Should any sound data collection be observed by a trained attendant, the attendant's notes and observations may be substituted for the audio (wav.) files during the compliance measurement period;
11. All concurrent time stamped turbine operational data including the date, time and duration of any noise reduction operation or other interruptions in operations if present; and
12. All other information determined necessary by the Department.

(g) Measurement of Ambient Sound

All ambient sound measurements shall be conducted in accordance with the compliance measurement location, configuration, and environment standards outlined in subsection I (e) and the compliance reporting standards outlined in subsection I (f) of this rule.