

Commercial Wind Energy Facility Ordinance Provisions



Kibby Mountain, Maine

***Bethel Area Wind Power Committee
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Introduction

There has been interest by several communities in the Bethel area to have common or compatible ordinance provisions that regulate wind energy facility development. In part, this is due to the recognition that potential effects of wind energy systems may not stop at municipal boundaries. The following ordinance provisions are being prepared to allow each community options for wind energy facility regulation while considering regional impacts of such development. The suggested provisions are not intended to be a standalone ordinance. Rather they are designed to be incorporated into existing site plan review ordinances and/or standards. This will allow the provisions relating to normal review procedures and standards for commercial developments in the site plan review ordinance to be used for review of Commercial Wind Energy Facilities. Thus the suggested provisions supplement existing site plan review procedures and standards.

The suggested ordinance standards are the result of efforts of the Bethel Area Wind Power Committee. The Committee included representatives from Bethel, Greenwood, Newry and Woodstock and was appointed by the selectmen from each town. In the summer of 2010 there was an expressed interest to be proactive to commercial wind power development rather than reactive. In addition it was realized that a commercial wind energy facility will have impacts beyond the town in which they are sited. Therefore, the Committee's goal was to develop possible ordinance provisions that would consider such regional impacts. While the Town of Woodstock has approved the development of a commercial wind energy facility the other towns were not aware of any potential projects as they worked.

Over the summer and fall of 2010 the Committee met to discuss what were the potential regional impacts of Commercial Wind Power Facilities and prepared a list of those impacts. With the assistance of the Androscoggin Valley Council of Governments (AVCOG) the Committee prepared provisions that towns could include in site plan review ordinances.

Ordinance Provisions

Applicability

This Ordinance applies to any Commercial Wind Energy Facility proposed for construction after the effective date of this Ordinance. This Ordinance also applies to Associated Facilities whether or not they are located in the same municipality as the Commercial Wind Energy Facility.

Commentary: The Bethel Area Wind Power Committee (BAWPC) decided that ordinance standards should regulate commercial wind energy facilities and not personal wind energy systems. Wind energy systems can range from those providing power to one residence to grid scale projects. Some ordinances regulate all wind energy systems while others regulate those of greater than 100kW with the primary purpose of sale, resale or offsite use.

For the purposes of these ordinance provisions a Commercial Wind Power Facility is defined as a wind energy facility whose primary purpose is to sell electricity to be supplied to the regional electric power grid.

Commentary: The applicability section includes associated facilities, (elements of a Wind Energy Facility other than its Generating Facilities that are necessary to the proper operation and maintenance of the Wind Energy Facility, including but not limited to buildings, access roads, Generator Lead Lines and substations) whether or not located in the same municipality as the turbines. For example this means that if access roads would be in Bethel to access turbines in Newry, Bethel would review that portion of the associated facilities located in Bethel.

Joint meetings

If any portion of a Wind Energy Facility, including any land owned or leased by the applicant and Associated Facilities, crosses municipal boundaries, or the wind energy facility is less than 1 mile from an inhabited dwelling in an adjoining municipality all meetings and hearings to review the application must be held jointly by the planning boards from each municipality. The planning boards in each municipality, upon written agreement, may waive the requirement under this subsection for any joint meetings or hearings.

Commentary: Should each town adopt these ordinance standards joint reviews would be conducted. This provision should be added to the administrative procedures section of site plan review ordinances.

Application Submission Requirements

Commentary: These application requirements are in addition to those typically in site plan review ordinances. They are unique to wind energy projects. They should be added to the list of submission requirements contained in the Site Plan Review Ordinance.

- Location map showing the boundaries of the proposed facility site and all contiguous property under total or partial control of the Applicant or Participating Landowner(s) and any Scenic Resource or Historic Site within 2500 feet of the proposed development.
- Description of the proposed Wind Energy Facility that includes the number and aggregate generating capacity of all Wind Turbines, the Turbine Height and manufacturer's specifications for each Wind Turbine (including but not limited to the make, model, maximum generating capacity, sound emission levels and types of overspeed controls) and a description of Associated Facilities.
- Site plan showing the proposed location of each Wind Turbine, its flicker sector Associated Facilities and any of the following features located within 500 feet of any Wind Turbine: parcel boundaries, required setbacks, topographic contour lines (maximum 20-foot interval), roads, rights-of-way, overhead utility lines, buildings (identified by use), land cover, wetlands, streams, water bodies and areas proposed to be re-graded or cleared of vegetation.
- Written evidence that the provider of electrical service to the property has been notified of the intent to connect an electric generator to the electricity grid.
- Description of emergency and normal shutdown procedures.
- Photographs of existing conditions at the site.
- Site line, photographic and, if applicable any screening information.
 1. Sight Line Representations of each Wind Turbine from the nearest Occupied Building and from at least one other representative location within 500 feet of the Wind Turbine, such as a Scenic Resource or another Occupied Building. Each Site Line Representation shall be drawn at a scale sufficiently large to make it legible. If screening is proposed, the proposed screening device, such as trees, shrubs or fencing, shall be depicted on the drawing along with the sight line as altered by the screening.
 2. A current four-inch by six-inch color photograph of the proposed site of the Wind Turbine(s) taken from viewpoints corresponding to each of the Site Line Representations.
 3. One copy of each of the photographs described in b, above, onto which is superimposed an accurately-scaled and sited representation of the Wind Turbine(s).
- Certificates of design compliance obtained by the equipment manufacturers from Underwriters Laboratories, Det Norske Veritas, or other similar certifying organizations.
- Decommissioning plan.
- Written summary of operation and maintenance procedures for the Wind Energy Facility and a maintenance plan for access roads.

- Visual impact assessment.
- Sound level analysis, prepared by a qualified engineer.
- Shadow Flicker analysis based on WindPro or other modeling software approved by the Department of Environmental Protection.
- Foundation and anchoring system drawings that are stamped by a Maine-licensed professional engineer.
- Other relevant studies, reports, certifications and approvals as may be reasonably requested by the Planning Board to ensure compliance with this Ordinance.

Performance Standards

Design Safety Certification

Each Wind Turbine shall be certified that it conforms to all applicable industry standards including those of the American National Standards Institute (ANSI) and at least one of the following: Underwriters Laboratories, Det Norske Veritas, Germanischer Lloyd Wind Energies, or other similar certifying organization.

Commentary: This provision should be added to the performance standards section of site plan review ordinances.

Structure Type

With the exception of Meteorological (MET) Towers, towers shall be monopoles with no guy wires.

Commentary: This provision would prohibit lattice towers and their associated guy wires. This provision should be added to the performance standards section of site plan review ordinances.

Blade Clearance

The minimum distance between the ground and all blades of a Wind Turbine shall be 25 feet as measured at the lowest arc of the blades.

Commentary: This provision is a safety standard to minimize blades from striking objects on the ground. This provision should be added to the performance standards section of site plan review ordinances.

Signal Interference

The Wind Energy Facility shall not produce electromagnetic interference with radio, television, cellular service or internet reception.

Commentary: This provision should be added to the performance standards section of site plan review ordinances.

Overspeed Controls and Brakes

Each Wind Turbine shall be equipped with an overspeed control system that includes both an aerodynamic control such as stall regulation, variable blade pitch, or other similar system, and a mechanical brake that operates in fail safe mode certified by the manufacturer.

Commentary: This provision should be added to the performance standards section of site plan review ordinances.

Voltage Warnings

A clearly visible warning sign that conform to applicable ANSI and OSHA standards concerning voltage must be placed at the base of all pad-mounted transformers and substations.

Commentary: This provision should be added to the performance standards section of site plan review ordinances.

Visual Appearance

1. A Wind Turbine shall have a non-obtrusive color such as white, off-white or gray, with a matte finish, or as may otherwise be required by another governmental agency with jurisdiction over the Wind Energy Facility.
2. A Wind Turbine shall not be lighted artificially, except to the extent consistent with Federal Aviation Administration recommendations or other applicable authority that regulates air safety or as is otherwise required by another governmental agency with jurisdiction over the Wind Energy Facility.
3. A Wind Turbine shall not be used to support signs and shall not display Advertising except for reasonable and incidental identification of the turbine manufacturer, facility owner and operator, and for warnings.

Commentary: These provisions should be added to the performance standards section of site plan review ordinances.

Shadow Flicker and Blade Reflection

Shadow flicker and blade reflection shall not result in the following:

1. More than 30 hours of flicker per year on any non-participating occupied building regardless in which municipality it may be located.
2. More than 10 hours of flicker per year on any public or private road that interferes with traffic movement safety.
3. Flicker is possible at intersections of any public and/or private roads that interferes with traffic safety.
4. The Flicker Sector for each Wind Turbine shall be a circular sector shown on the site plan centered at the base of each Wind Turbine. The radius of each Flicker Sector shall be equal to the maximum width of the blade of each Wind Turbine times 100. The Flicker Sector shall be shown to the north of each Wind Turbine base and being limited from the radial line with an azimuth of 114 degrees counter-clockwise through north to the radial line with an azimuth of 246 degrees".

Commentary: Shadow Flicker means alternating changes in light intensity caused by the movement of Wind Turbine blades casting shadows on the ground or a stationary object. As drafted this provision would regulate shadow flicker on all non-participating occupied buildings regardless in which municipality it is located. The 30 hour per year standard is use by the Maine Department of Environmental Protection. The 10 hours per year standard for traffic to AVCOG knowledge is not supported by technical studies.

This provision should be added to the performance standards section of site plan review ordinances.

Use of Public Roads

1. The Applicant shall identify all municipal maintained public roads to be used, regardless of the municipality where located, to transport **earthen materials**, equipment and parts for construction, operation or maintenance of a Wind Energy Facility.
2. The Town Engineer or a qualified third-party engineer retained by the Planning Board and paid for by the Applicant shall document road and bridge conditions prior to construction. The Town Engineer or third-party engineer shall document road and bridge conditions again thirty (30) days after construction is complete or as weather permits and provide an assessment to the Planning Board of damage to roads and bridges attributable to the Wind Energy Facility construction.

3. The Applicant shall demonstrate, to the satisfaction of the Planning Board, that it has financial resources sufficient to comply with subsection 4, below, and the Planning Board shall require the Applicant to post a bond or other security in order to ensure such compliance.
4. Road and/or bridge damage determined to have been caused by the Applicant or its contractors shall be repaired to the satisfaction of the Town Engineer-or third-party engineer at the Applicant's expense in the time period specified by the Town Engineer or third-party engineer.

Commentary: This provision as drafted would require an applicant to repair town roads used for the construction of a wind energy facility regardless of what municipality the roads are located in.

This provision should be added to the performance standards section of site plan review ordinances.

Safety Setbacks

Wind Turbines shall be set back a horizontal distance equivalent to 150% of the Turbine Height from property boundaries, public and private rights-of-way and overhead utility lines that are not part of the proposed Generating Facility, regardless of the municipality in which located, except that the Planning Board may allow a reduced setback if the Applicant submits, in writing a legally binding waiver of the property boundary setback signed by the pertinent abutting landowner.

Commentary: The 150% setback standard relates to the wind turbine falling. It has no relation to sound standards. The setback is required regardless in what municipality property boundaries, public and private rights-of-way and overhead utility lines are located.

This provision should be added to the performance standards section of site plan review ordinances.

Hazardous Wastes

The Applicant shall be responsible for compliance with all state and federal regulations applicable to the use and disposal of hazardous wastes involved in or generated by the Wind Energy Facility construction and operation.

Commentary: This provision should be added to the performance standards section of site plan review ordinances.

Blasting

The Applicant of a Wind Energy Facility shall not commence blasting without notifying the Town's Code Enforcement Officer and submitting a blasting plan in accordance with the latest Maine Department of Environmental Protection standards. The blasting plan shall be reviewed and approved by the Code Enforcement Officer within 10 days of receipt before any blasting takes place. All blasting shall comply with Title 38 MRSA section 490-Z.14. Forty-eight hour notice shall be given to all property owners by the Applicant within a one mile radius of the blasting area (measured horizontally), regardless in which municipality located, before blasting can begin.

Commentary: This provision should be added to the performance standards section of site plan review ordinances.

Decommissioning

The Wind Energy Facility shall be decommissioned within twelve months after it ceases to generate electricity, or after any operational license has been revoked.

1. Decommissioning shall include removal and disposal off-site of all parts of the Wind Energy Facility (including foundations) in accordance with local, state and federal laws and regulations. Areas of disturbed earth shall be graded, reseeded, or otherwise re-vegetated, unless the landowner of the affected land requests otherwise in writing.
2. A Licensed Professional Engineer shall be retained by the Planning Board and paid for by the Applicant to estimate the total cost of decommissioning less salvage value of the equipment and itemization of the estimated major expenses, including the projected costs of measures taken to minimize or prevent adverse effects on the environment during implementation of the decommissioning plan. The itemization of major costs may include, but is not limited to, the cost of the following activities: turbine removal, turbine foundation removal and permanent stabilization, building removal and permanent stabilization, transmission corridor removal and permanent stabilization and road infrastructure removal and permanent stabilization
3. No permit for a Wind Energy Facility shall be issued until Decommissioning Funds have been posted by the Applicant with a bonding company or a Federal or State-chartered lending institution (the Escrow Agent) authorized to conduct such business in the State of Maine and approved by the Selectmen.
4. Estimates as described in section 2 above shall be redone every two years on the anniversary of the granting of a Wind Energy Facility Permit, and the Owner/Operator of the Wind Energy Facility shall be required to maintain Decommissioning Funds that are at least equal to the most recent estimate.
5. Decommissioning funds may be in the form of a performance bond, surety bond or other form of financial assurance acceptable to the Selectmen.
6. If the Owner/Operator of the Wind Energy Facility does not complete Decommissioning within the prescribed time period the Town may take such action as necessary (including

court action, with all legal costs to be paid by applicant) to secure the posted Decommissioning Funds and to ensure completion of the Decommissioning.

7. The Escrow Agent shall not release the Decommissioning Funds except upon written approval of Selectmen.

Commentary: This provision should be added to the performance standards section of site plan review ordinances.

Local Emergency Services

1. The Applicant shall provide a copy of the project summary and site plan to local emergency service providers, including paid or volunteer fire department(s).
2. Upon request, the Applicant shall cooperate with emergency service providers to develop and coordinate implementation of an emergency response plan.
3. A Wind Turbine shall be equipped with an appropriate fire suppression system to address fires within the Nacelle portion of the turbine or shall otherwise address the issue of fire safety to the satisfaction of the Planning Board.

Commentary: This provision should be added to the performance standards section of site plan review ordinances.

Public Inquiries and Complaints

1. The Applicant or its designee shall maintain a phone number and identify a responsible person for the public to contact with inquiries and complaints throughout the life of the Wind Energy Facility.
2. The Applicant or its designee shall provide the Code Enforcement Officer with a written notice that a complaint has been received within 10 days of its receipt. Then within 20 days of the date that the applicant or its designee received the complaint the applicant or its designee shall provide the Code Enforcement Officer with written notice of how the complaint was responded to.

Commentary: This provision should be added to the performance standards section of site plan review ordinances.

Insurance

The Applicant, Owner/operator and Licensee, as applicable, shall maintain a current appropriate insurance policy for the Wind Energy Facility that covers bodily injury and property damage in an amount commensurate with the scope and scale of the Wind Energy Facility, and acceptable to the Planning Board, which acceptance shall not be unreasonably withheld. Certificates of insurance shall be provided to the Town annually.

The policy must include the requirement that the Town will be provided at least ten days notice by the policy provider in the case of cancellation or change to the policy.

Commentary: This provision should be added to the performance standards section of site plan review ordinances.

Public Utility Grid Impact Statement

An application for a permit for Wind Energy Facility that will be connected to the Public Utility Grid shall include a Public Utility Grid Impact Statement documenting all anticipated changes to the public utility grid within the Town due to the Wind Energy Facility. The Statement shall be signed and approved by the Maine Public Utilities Commission and shall include proof of leases or rights of way for transmission lines, and an analysis of the residual capacity in the grid that will be available to other local generating projects after the construction of the Wind Energy Facility.

Commentary: This provision should be added to the performance standards section of site plan review ordinances.

Effect on Scenic Resources

1. Except as otherwise provided in this subsection, if a Commercial Wind Energy Facility is proposed for location in or is visible from a Scenic Resource, the Applicant shall provide a visual impact assessment that addresses the evaluation criteria in subsection 3. There is a rebuttable presumption that a visual impact assessment is not required for those portions of a Commercial Wind Energy Facility that are located more than three miles, measured horizontally, from a Scenic Resource. The Planning Board may require a visual impact assessment for portions of the Commercial Wind Energy Facility located more than three miles and up to eight miles from a Scenic Resource if it finds that a visual impact assessment is needed to determine if there is the potential for significant adverse effects on the Scenic Resource. Information intended to rebut the presumption must be submitted to the Planning Board by any interested Person within 30 days of acceptance of the application as complete. The Planning Board shall determine if the presumption is rebutted based on a preponderance of evidence in the record. If the scenic resource is in an adjoining municipality, joint meetings must be held by the Planning Board's of each municipality. Planning Boards, upon written agreement, may waive this requirement.
2. The Planning Board shall determine, based on consideration of the evaluation criteria in subsection 3, whether the Commercial Wind Energy Facility significantly compromises views from a Scenic Resource such that the proposed facility has an unreasonable adverse effect on the scenic character or existing uses related to scenic character of that Scenic Resource.

3. In making its determination and in determining whether an Applicant for Commercial Wind Energy Facility located more than three miles from a Scenic Resource must provide a visual impact assessment, the Planning Board shall consider:
- a. The significance of the potentially affected Scenic Resource;
 - b. The existing character of the surrounding area;
 - c. The expectations of the typical viewer;
 - d. The extent, nature and duration of potentially affected public uses of the Scenic Resource and the potential effect on the public's continued use and enjoyment of the Scenic Resource; and
 - f. The scope and scale of the potential effect of views of the Commercial Wind Energy Facility on the Scenic Resource, including but not limited to issues related to the number and extent of Wind Turbines visible from the Scenic Resource, the distance from the Scenic Resource and the effect of prominent features of the Commercial Wind Energy Facility on the landscape.

A finding by the Planning Board that the Commercial Wind Energy Facility is a highly visible feature in the landscape is not a solely sufficient basis for determination that it has an unreasonable adverse effect on the scenic character and existing uses related to scenic character of a Scenic Resource. In making its determination under subsection 2, the Planning Board shall consider insignificant the effects of portions of a Commercial Wind Energy Facility located more than 8 miles, measured horizontally, from a Scenic Resource.

Commentary: These provisions should be added to the performance standards section of site plan review ordinances.

Control of Noise

Commentary: Noise associated with Wind Energy Facilities is one of the more complex issues. Much public debate surrounds noise issues. Some ordinances try to address it by establishing setbacks while others establish maximum noise/sound levels. Towns could adopt the DEP standards or attempt to develop their own. The following standards are from the Maine Model Wind Energy Ordinance with follow the DEP standards. They have been altered in several ways including not allowing an estimate of sound levels based on population density and proximity of highways. Also the maximum sound levels have been set at 55 dBA between 7:00 a.m. and 7:00 p.m. (the "daytime hourly limit"), and 45 dBA between 7:00 p.m. and 7:00 a.m. (the "nighttime hourly limit"). These are consistent with DEP standards.

1. Sound Level Limits

a. Sound from Routine Operation of Facility.

The hourly sound levels resulting from routine operation of the facility and measured in accordance with the measurement procedures described in subsection 4 (Measurement Procedures) shall not exceed the following limits:

- i When a proposed facility is to be located in an area where the daytime pre-development ambient hourly sound level at a Protected Location, regardless in which municipality it may be located, is equal to or less than 45 dBA and/or the nighttime pre-development ambient hourly sound level at a Protected Location, regardless in which municipality it may be located, is equal to or less than 35 dBA, the hourly sound levels resulting from routine operation of the facility and measured in accordance with the measurement procedures described in section 4 shall not exceed the following limits at that Protected Location:

55 dBA between 7:00 a.m. and 7:00 p.m.
(the "daytime hourly limit"), and
45 dBA between 7:00 p.m. and 7:00 a.m.
(the "nighttime hourly limit").

For the purpose of determining whether a Protected Location has a daytime or nighttime pre-development ambient hourly sound level equal to or less than 45 dBA or 35 dBA, respectively, the Applicant shall make sound level measurements in accordance with the procedures in section 4.

- (a) For the purposes of determining compliance with the above sound level limits, 5 dBA shall be added to the observed levels of any tonal sounds that result from routine operation of the facility.
- (b) When routine operation of a facility produces short duration repetitive sound, the following limits shall apply:
 - (i) For short duration repetitive sounds, 5 dBA shall be added to the observed levels of the short duration repetitive sounds that result from routine operation of the facility for the purposes of determining compliance with the above sound level limits.
 - (ii) For short duration repetitive sounds which the Planning Board finds that due to their character and/or duration, are particularly annoying or pose a threat to the health and welfare of nearby neighbors, 5 dBA shall be added to the observed levels of the short duration repetitive sounds that result from routine operation of the facility for the purposes of determining compliance with the above sound level limits, and the maximum sound level of the short duration repetitive sounds shall not exceed the following limits:

At any Protected Location in an area for which the zoning is not predominantly commercial, transportation, or industrial:

65 dBA between 7:00 a.m. and 7:00 p.m., and
55 dBA between 7:00 p.m. and 7:00 a.m.

b. Sound from Construction of a Facility

- i. The sound from construction activities between 7:00 p.m. and 7:00 a.m. is subject to the following limits:
 - (a) Sound from nighttime construction activities shall be subject to the nighttime routine operation sound level limits contained in subsections 1.a.
 - (b) If construction activities are conducted concurrently with routine operation of the facility, then the combined total of construction and routine operation sound shall be subject to the nighttime routine operation sound level limits contained in subsections 1.a.
 - (c) Higher levels of nighttime construction sound are permitted when a duly issued permit authorizing nighttime construction sound in excess of these limits has been granted by the Codes Enforcement Officer.
- ii Sound from construction activities between 7:00 a.m. and 7:00 p.m. shall not exceed the following limits at any Protected Location:

Duration of Activity Hourly Sound Level Limit

12 hours	87 dBA
8 hours	90 dBA
6 hours	92 dBA
4 hours	95 dBA
3 hours	97 dBA
2 hours	100 dBA
1 hour or less	105 dBA

- iii. All equipment used in construction on the facility site shall comply with applicable federal noise regulations and shall include environmental noise control devices in proper working condition, as originally provided with the equipment by its manufacturer.

c. Sound from Maintenance Activities

- i. Sound from routine, ongoing maintenance activities shall be considered part of the routine operation of the facility and the combined total of the routine maintenance and operation sound shall be subject to the routine operation sound level limits contained in section 1.
- ii Sound from occasional, major, scheduled overhaul activities shall be subject to the construction sound level limits contained in section 2.b If overhaul activities are

conducted concurrently with routine operation and/or construction activities, the combined total of the overhaul, routine operation and construction sound shall be subject to the construction sound level limits contained in section 2.b

2. Submissions

a. Technical Information

Technical information shall be submitted describing the Applicant's plan and intent to make adequate provision for the control of noise. The applicant's plan shall contain information such as the following, when appropriate:

- i Maps and descriptions of the land uses, local zoning and comprehensive plans for the area potentially affected by sounds from the facility.
- ii A description of major sound sources, including tonal sound sources and sources of short duration repetitive sounds, associated with the construction, operation and maintenance of the proposed facility, including their locations within the proposed facility.
- iii A description of the daytime and nighttime hourly sound levels and, for short duration repetitive sounds, the maximum sound levels expected to be produced by these sound sources at Protected Locations near the proposed facility.
- iv A description of the Protected Locations near the proposed facility.
- v A description of proposed major sound control measures, including their locations and expected performance.
- vi A comparison of the expected sound levels from the proposed facility with the sound level limits of this regulation.

3. Terms and Conditions

The planning board may, as a term or condition of approval, establish any reasonable requirement to ensure that the Applicant has made adequate provision for the control of noise from the facility and to reduce the impact of noise on Protected Locations. Such conditions may include, but are not limited to, enclosing equipment or operations, imposing limits on hours of operation, or requiring the employment of specific design technologies, site design, modes of operation, or traffic patterns.

The sound level limits prescribed in this ordinance shall not preclude the planning board from requiring an Applicant to demonstrate that sound levels from a facility will not unreasonably disturb wildlife or adversely affect wildlife populations. In addition, the sound level limits shall not preclude the planning board as a term or condition of approval, from requiring that lower sound level limits be met to ensure that the Applicant has made adequate provision for the protection of wildlife.

4. Measurement Procedures

a. Scope. These procedures specify measurement criteria and methodology for use, with applications, compliance testing and enforcement. They provide methods for measuring the ambient sound and the sound from routine operation of the facility, and define the information to be reported. The same methods shall be used for measuring the sound of construction and maintenance activities.

b.. Measurement Criteria

i Measurement Personnel

Measurements shall be by personnel who hold professional qualifications in measurement and evaluation of environmental sound.

ii Measurement Instrumentation

- (a) 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 S1.4-1983.
- (b) 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 804 (1985).
- (c) A filter for determining the existence of tonal sounds shall meet all the requirements of American National Standard Specification for Octave-Band and Fractional Octave-Band Analog and Digital Filters, ANSI S1.11-1986 for Order 3, Type 3-D performance.
- (d) An acoustical calibrator shall be used of a type recommended by the manufacturer of the sound level meter and that meets the requirements of American National Standard Specification for Acoustical Calibrators, ANSI S1.40-1984.
- (e) A microphone windscreen shall be used of a type recommended by the manufacturer of the sound level meter.

iii Calibration

- (a) 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 Bureau of Standards.
- (b) Field calibrations shall be recorded before and after each measurement period and at shorter intervals if recommended by the manufacturer.

iv Measurement Location, Configuration and Environment

- (a) Except as noted in subsection (ii) below, measurement locations shall be at nearby Protected Locations that are most likely affected by the sound from routine operation of the facility.
- (b) For determining compliance with the 75 dBA property line hourly sound level limit described in subsection 1.a.i, measurement locations shall be selected at the property lines of the proposed facility or contiguous property owned by the Applicant, as appropriate.
- (c) The 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.
- (d) Measurement locations should be selected so that no vertical reflective surface exceeding the microphone height is located within 30 feet. When this is not possible, the measurement location may be closer than 30 feet to the reflective surface, but under no circumstances shall it be closer than 6 feet.
- (e) When possible, measurement locations should be at least 50 feet from any regulated sound source on the facility.
- (f) Measurement periods shall be avoided when the local wind speed exceeds 12 mph and/or precipitation would affect the measurement results.

c. Measurement of Ambient Sound

i. Pre-development Ambient Sound

- (a) Measurements shall be made at representative Protected Locations for periods of time sufficient to adequately characterize the ambient sound. At a minimum, measurements shall be made on three different weekdays (Monday through Friday) during all hours that the facility will operate. If the proposed facility will operate on Saturdays and/or Sundays, measurements shall also be made during all hours that the facility will operate.
- (b) Measurement periods with particularly high ambient sounds, such as significant insect activity should generally be avoided.
- (c) At any measurement location the daytime and nighttime ambient hourly sound level shall be computed by arithmetically averaging the daytime and nighttime values of the measured one hour equivalent sound levels.

Multiple values, if they exist, for any specific hour on any specific day shall first be averaged before the computation described above.

ii. Post-Facility Ambient Sound

- (a) Measurements of the post-facility ambient one hour equivalent sound levels and, if short duration repetitive sounds are produced by the facility, the maximum sound levels made at nearby Protected Locations and during representative routine operation of the facility that are not greater than the applicable limits of section 3 clearly indicate compliance with those limits.
- (b) Compliance with the limits of subsection 1.a may also be demonstrated by showing that the post-facility ambient hourly sound level, measured in accordance with the procedures of subsection c.i above during routine operation of the facility, does not exceed the pre-development ambient hourly sound level by more than one decibel, and that the sound from routine operation of the facility is not characterized by either tonal sounds or short duration repetitive sounds.
- (c) Compliance with the limits of section 1.a.i.(b)(ii) may also be demonstrated by showing that the post facility maximum sound level of any short duration repetitive sound, measured in accordance with the procedures of subsection c.i above, during routine operation of the facility, does not exceed the pre-development ambient hourly sound level by more than five decibels.

iii .If any of the conditions in (a), (b) or (c) above are not met, compliance with respect to the applicable limits must be determined by measuring the sound from routine operation of the facility in accordance with the procedures described in section 4.

d. Measurement of the Sound from Routine Operation of Facility.

i. General

- (a) Measurements of the sound from routine operation of facilities are generally necessary only for specific compliance testing purposes in the event that community complaints result from operation of the facility, for validation of an Applicant's calculated sound levels when requested by the planning board, for determination of existing hourly sound levels for an existing facility or for enforcement by the Codes Enforcement Officer.
- (b) Measurements shall be obtained during representative weather conditions when the facility sound is most clearly noticeable. Preferable weather conditions for sound measurements at distances greater than about 500 feet from the sound source include overcast days when the measurement location is downwind of the facility and inversion periods (which most commonly occur at night).

- (c) Measurements of the facility sound shall be made so as to exclude the contribution of sound from facility equipment that is exempt from this regulation.

ii Measurement of the Sound Levels Resulting from Routine Operation of the Facility.

- (a) When the ambient sound levels are greater than the sound level limits, additional measurements can be used to determine the hourly sound level that results from routine operation of the facility. These additional measurements may include diagnostic measurements such as measurements made close to the facility and extrapolated to the Protected Location, special checkmark measurement techniques that include the separate identification of audible sound sources, or the use of sound level meters with pause capabilities that allow the operator to exclude non-facility sounds.
 - (a) For the purposes of computing the hourly sound level resulting from routine operation of the facility, sample diagnostic measurements may be made to obtain the one hour equivalent sound levels for each sound component.
 - (c) Identification of tonal sounds produced by the routine operation of a facility for the purpose of adding the 5 dBA penalty in accordance with section 1.a.i.(a) requires aural perception by the measurer, followed by use of one-third octave band spectrum analysis instrumentation. If one or more of the sounds of routine operation of the facility are found to be tonal sounds, the hourly sound level component for tonal sounds shall be computed by adding 5 dBA to the one hour equivalent sound level for those sounds.
 - (d) Identification of short duration repetitive sounds produced by routine operation of a facility requires careful observations. For the sound to be classified as short duration repetitive sound, the source(s) must be inherent to the process or operation of the facility and not the result of an unforeseeable occurrence. If one or more of the sounds of routine operation of the facility are found to be short duration repetitive sounds, the hourly sound level component for short duration repetitive sounds shall be computed by adding 5 dBA to the one hour equivalent sound level for those sounds. If required, the maximum sound levels of short duration repetitive sounds shall be measured using the fast response [LAFmax]. The duration and the frequency of occurrence of the events shall also be measured. In some cases, the sound exposure levels of the events may be measured. The one hour equivalent sound level of a short duration repetitive sound may be determined from measurements of the maximum sound level during the events, the duration and frequency of occurrence of the events, and their sound exposure levels.
 - (e) The daytime or nighttime hourly sound level resulting from routine operation of a facility is the energy sum of the hourly sound level components from the facility, including appropriate penalties, (see (c) and (d) above). If the energy sum does not exceed the appropriate daytime or nighttime sound level limit, then the facility is in compliance with that sound level limit at that Protected Location.
- e. Reporting Sound Measurement Data. The sound measurement data report should include the following:

- i The dates, days of the week and hours of the day when measurements were made.
- ii The wind direction and speed, temperature, humidity and sky condition.
- iii Identification of all measurement equipment by make, model and serial number.
- iv The most recent dates of laboratory calibration of sound level measuring equipment.
- v The dates, times and results of all field calibrations during the measurements.
- vi The applicable sound level limits, together with the appropriate hourly sound levels and the measurement data from which they were computed, including data relevant to either tonal or short duration repetitive sounds.
- vii A sketch of the site, not necessarily to scale, orienting the facility, the measurement locations, topographic features and relevant distances, and containing sufficient information for another investigator to repeat the measurements under similar conditions.
- viii A description of the sound from the facility and the existing environment by character and location.

Definitions

Commentary: These definitions are unique to wind power and should be added to the definition section of the site plan review ordinance. It is recommended that these and definitions in the site plan review ordinance be reviewed for conflicting definitions.

AMBIENT SOUND: At a specified time, the all-encompassing sound associated with a given environment, being usually a composite of sounds from many sources at many directions, near and far, including the specific facility of interest.

ANSI S1.1-1960 - American National Standard Acoustical Terminology.

ANSI S12.9-1988 - American National Standard Quantities and Procedures for Description and Measurements of Environmental Sound, Part 1;

ANSI S3.20-1973 - American National Standard Psychoacoustical Terminology.

APPROVED RESIDENTIAL SUBDIVISION- A residential subdivision for which all applicable land use permits have been issued, provided that the time for beginning construction under such permits has not expired.

ASSOCIATED FACILITIES- Elements of a Commercial Wind Energy Facility other than its Generating Facilities that are necessary to the proper operation and maintenance of the Commercial Wind Energy Facility, including but not limited to buildings, access

roads, Generator Lead Lines and substations.

COMMERCIAL WIND ENERGY FACILITY- a wind energy facility whose primary purpose is to sell electricity to be supplied to the regional electric power grid. A Commercial Wind Energy Facility includes Generating Facilities and Associated Facilities.

CONSTRUCTION- Activity and operations associated with the facility or expansion of the facility or its site.

DEP CERTIFICATION- A certification issued by the Department of Environmental Protection pursuant to 35-A M.R.S. § 3456 for a Wind Energy Development.

EMERGENCY MAINTENANCE AND REPAIRS- Work done in response to an emergency at a facility.

EMERGENCY- An unforeseen combination of circumstances which calls for immediate action at a facility.

ENERGY SUM OF A SERIES OF LEVELS- Ten times the logarithm of the arithmetic sum of the antilogarithms of one-tenth of the levels.

EQUIVALENT SOUND LEVEL- The level of the mean-square A-weighted sound pressure during a stated time period, or equivalently the level of the sound exposure during a stated time period divided by the duration of the period. (NOTE: For convenience, a one hour equivalent sound level should begin approximately on the hour.)

EXISTING FACILITY- A Commercial Wind Energy Facility legally constructed before the effective date of this ordinance or a proposed Commercial Wind Energy Facility for which the Application is found complete on or before the effective date of this ordinance. Any facility with an approved permit application which has been remanded to planning board by a court of competent jurisdiction for further proceedings relating to noise limits or noise levels prior to the effective date of this ordinance shall not be deemed an existing facility and the ordinance shall apply to the existing noise sources at that facility.

EXISTING HOURLY SOUND LEVEL- The hourly sound level resulting from routine operation of an existing facility prior to the first expansion that is subject to this ordinance.

For purposes of this definition, (1) a Residence is considered planned when the owner of the parcel of land on which the Residence is to be located has received all applicable building and land use permits and the time for beginning construction under such permits has not expired, and (2) a residential subdivision is considered approved when the developer has received all applicable land use permits for the subdivision and the time for beginning construction under such permits has not expired.

FLICKER- The phenomenon of noticeable pulsating light produced by the Wind turbine blades passing between the sun and the observer and temporarily interrupting the sun's rays."

FLICKER SECTOR- A zone with the shape of a circular sector within which the observer may see the sun's rays interrupted by the Wind Turbine's blades in the phenomenon herein called Flicker. The radius of this circular sector shall be equal to the maximum width of the blade of each Wind Turbine times 100. The Flicker occurs mostly to the north of each Wind Turbine base and is limited by the radial line with an azimuth of 114 degrees going counter-clockwise through north to the radial line with an azimuth of 246 degrees". This zone represents the area north and south of the Wind Turbine within which the Flicker phenomenon throughout the year. This maximum area occurs on the day of the summer solace.

GENERATING FACILITIES- Wind Turbines and electrical lines, not including Generator Lead Lines, that are immediately associated with the Wind Turbines.

GENERATOR LEAD LINE- A "generator interconnection transmission facility" as defined by 35-A M.R.S. § 3132 (1-B).

HISTORIC AREAS- Historic sites administered by the Bureau of Parks and Lands of the Maine Department of Conservation.

HISTORIC SITE- Any site, structure, district or archaeological site which has been officially included on the National Register of Historic Places and/or on the Maine Historic Resource Inventory, or which is established by qualified testimony as being of historic significance.

HOURLY SOUND LEVEL- The equivalent sound level for one hour measured or computed in accordance with this ordinance.

LOCALLY-DESIGNATED PASSIVE RECREATION AREA- Any site or area designated by a municipality for passive recreation that is open and maintained for public use and which: a) has fixed boundaries, b) is owned in fee simple by a municipality or is accessible by virtue of public easement, c) is identified and described in a local comprehensive plan and, d) has been identified and designated at least nine months prior to the submission of the Applicant's Commercial Wind Energy Facility permit application.

MAXIMUM SOUND LEVEL- Ten times the common logarithm of the square of the ratio of the maximum sound to the reference sound of 20 micropascals. Symbol: LAFmax.

MAXIMUM SOUND: Largest A-weighted and fast exponential-time-weighted sound during a specified time interval. Unit: pascal (Pa).

METEOROLOGICAL TOWER (MET TOWER)- A Tower used for the measurement and collection of wind data that supports various types of equipment, including but not limited to anemometers, data recorders, and solar power panels. MET Towers may also include wildlife related equipment such as ANABAT detectors, bird diverts and wildlife entanglement protectors.

NACELLE- The frame and housing at the top of the Tower that encloses the gearbox and

generator.

NON-PARTICIPATING LANDOWNER- Any landowner, other than a Participating Landowner.

OCCUPIED BUILDING- A residence, school, hospital, house of worship, public library or other building that is occupied or in use as a primary residence or is customarily frequented by the public at the time when the permit application is submitted.

PARTICIPATING LANDOWNER- One or more Persons that hold title in fee or a leasehold interest with sublease rights to property on which Generating Facilities or Associated Facilities are proposed to be located pursuant to an agreement with the Applicant or an entity that has entered into an appropriate agreement with the Applicant allowing the Applicant to demonstrate the requisite right, title and interest in such property.

PLANNED RESIDENCE- A Residence for which all applicable building and land use permits have been issued, provided that the time for beginning construction under such permits has not expired.

PRE-DEVELOPMENT AMBIENT- The ambient sound at a specified location in the vicinity of a facility site prior to the construction and operation of the proposed Commercial Wind Energy Facility or expansion.

PROTECTED LOCATION- any location that is:

1. Accessible by foot, on a parcel of land owned by a Non-Participating Landowner containing a residence or planned residence, or an approved residential subdivision, house of worship, academic school, college, library, duly licensed hospital or nursing home near the development site at the time an application for a Commercial Wind Energy Facility is submitted under this Ordinance;

2. Within a State Park, a National Park, a nature preserve owned by a land trust, the Maine Audubon Society or the Maine chapter of the Nature Conservancy, the Appalachian Trail, a federally designated wilderness area, a state wilderness area designated by statute, a municipal park or a locally-designated passive recreation area, or any location within consolidated public reserve lands designated by rule by the Bureau of Public Lands as a Protected Location, or;

3. A hotel, motel, campsite or duly licensed campground that the planning board has designated a Protected Location after making a determination that the health and welfare of the guests or the economic viability of the establishment will be unreasonably impacted by noise in excess of that allowed under section (insert section pertaining to noise).

RESIDENCE- A building or structure, including manufactured housing, maintained for permanent or seasonal residential occupancy providing living, cooking and sleeping facilities and

having permanent indoor or outdoor sanitary facilities, excluding recreational vehicles, tents and watercraft.

ROUTINE OPERATION- Regular and recurrent operation of regulated sound sources associated with the purpose of the Commercial Wind Energy Facility and operating on the facility site.

SCENIC RESOURCE- Either a Scenic Resource of state or national significance, as defined in 35-A M.R.S § 3451(9) or a scenic resource of local significance located within the municipality and identified as such in a comprehensive plan, open space plan or scenic inventory adopted by the municipal legislative body.

SHADOW FLICKER- Alternating changes in light intensity caused by the movement of Wind Turbine blades casting shadows on the ground or a stationary object.

SHORT DURATION REPETITIVE SOUNDS- A sequence of repetitive sounds which occur more than once within an hour, each clearly discernible as an event and causing an increase in the sound level of at least 6 dBA on the fast meter response above the sound level observed immediately before and after the event, each typically less than ten seconds in duration, and which are inherent to the process or operation of the facility and are foreseeable.

SIGHT LINE REPRESENTATION- A profile drawing showing prominent features, including but not limited to topography, buildings, and trees, along and in relation to a line of sight extending from an observer's eye to the lowest point visible on a proposed Tower.

SIGNIFICANT WILDLIFE HABITAT- A Significant Wildlife Habitat as defined in 38 M.R.S. § 480-B(10).

SOUND COMPONENT- The measurable sound from an audibly identifiable source or group of sources.

SOUND LEVEL- Ten times the common logarithm of the square of the ratio of the frequency-weighted and time-exponentially averaged sound pressure to the reference sound of 20 micropascals. For the purpose of this ordinance, sound level measurements are obtained using the A-weighted frequency response and fast dynamic response of the measuring system, unless otherwise noted.

SOUND PRESSURE LEVEL- Ten times the common logarithm of the square of the ratio of the sound pressure to the reference sound pressure of 20 micropascals.

SOUND PRESSURE- Root-mean-square of the instantaneous sound pressures in a stated frequency band and during a specified time interval. Unit: pascal (Pa).

SUBSTANTIAL START- That construction shall be considered to be substantially commenced when any work beyond excavation, including but not limited to, the pouring of a slab or footings, the installation of piles, the construction of columns, or the placement of a Tower on a foundation has begun.

TONAL SOUND- A tonal sound exists if, at a Protected Location, the 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.

TOWER- The free-standing structure on which a wind measuring or energy conversion system is mounted.

TURBINE HEIGHT- The distance measured from the surface of the Tower foundation to the highest point of any turbine rotor blade measured at the highest arc of the blade.

WIND ENERGY FACILITY- A facility that uses one or more Wind Turbines to convert wind energy to electrical energy

WIND TURBINE- A system for the conversion of wind energy into electricity which is comprised of a Tower, generator, Nacelle, rotor and transformer.

JAM 12.29.10