

**EXHIBIT B – AMENDED
“WIND ENERGY REGULATIONS” (AS ADOPTED 3-15-2011)**

**AMEND THE UNIFIED DEVELOPMENT ORDINANCE (UDO) ARTICLES 6, 13,
14 AND APPENDIX TO INCORPORATE NEW TEXT:**

Article 6 Use Regulations

Section 6.2 Use Table

Delete the Wind Apparatus category and add the following:

Use Category	Use Types	Residential	Nonresidential	Use Standard
Wind energy facilities	Building-Mounted	P	P	
	Tower-Mounted	C ¹	P	

¹ However, Tower-Mounted wind energy facilities on residentially used or zoned parcels shall be permitted by right up to the heights of: a) 45 feet on parcels less than 40,000 square feet, b) 75 feet on parcels 40,000 to 200,000 square feet, and c) 100 feet on parcels greater than 200,000 square feet.

Section 6.4 Accessory Uses

6.4.13 Wind Energy Facilities

Wind energy facilities include building-mounted and tower-mounted turbines, less than 200 feet in height, and are considered to be an accessory use to principal residential and nonresidential uses. It is permissible to sell excess electricity produced by a wind energy facility to an electric utility company, provided that the majority of energy produced is intended to serve the principal use on site.

6.4.13.1 Height

a. Residential Zoning Districts

1. Building-mounted turbines shall be allowed up to the height of 15 feet above the highest point of the building structure as measured from the turbine's highest point, but in no case shall exceed 45 feet above the structure's average ground elevation in a residential zoning district.
2. Tower-mounted turbines shall be permitted by right up to the heights of: 45 feet on parcels less than 40,000 square feet; 75 feet on parcels 40,000 to 200,000 square feet; and 100 feet on parcels larger than 200,000 square feet, as measured from the base of the tower to the top of a fully extended blade. Proposed turbines over these limits shall require a delegated Conditional Use Permit. Turbines shall be limited to 125 feet in height if located within 500 feet of a nonparticipating residentially zoned property.

3. The blade tip of a tower-mounted turbine shall have ground clearance of not less than 25 feet at its lowest point.

b. Nonresidential Zoning Districts

1. Building-mounted turbines shall be allowed at the height of 15 feet above the highest point of the building structure, in a nonresidential zoning district.
2. The turbine height for a tower-mounted turbine (as measured at its highest point) shall be less than 200 feet in a nonresidential zoning district. Tower-mounted turbines shall be limited to 125 feet in height if located within 500 feet of a nonparticipating residentially zoned property.
3. The blade tip of a tower-mounted turbine shall have ground clearance of not less than 25 feet at its lowest point.

6.4.13.2 Setbacks

- a. Tower-mounted turbines shall be set back a minimum distance equal to 150% of (1.5 times) the turbine height, from the exterior surface of the base of the tower to nonparticipating property lines.
- b. Tower-mounted turbines for which the generated electricity is exclusively used on-site shall be set back a minimum distance equal to 110% of (1.1 times) the turbine height, from the exterior surface of the base of the tower to nonparticipating property lines.
- c. Tower-mounted turbines shall be set back a minimum distance equal to 110% of (1.1 times) the turbine height, from third party transmission lines and communication towers.

6.4.13.3 Operating Requirements

The following are requirements for the operation of wind energy facilities. Additional requirements and standards for wind energy facilities shall apply as identified in Appendix Q. Provisions for violations, penalties and enforcement shall apply as identified under Article 13.

a. Sound Level Limitations for Wind Energy Facilities

1. The sound level limits identified below shall apply. Measurement procedures are outlined in Appendix Q subsection 4.0. Measurements can be taken at any location on nonparticipating properties and must account for ambient sound contributions.

Receiving Property	Hours of Operation	Sound Level limits
Residential	10:00 pm – 7:00 am	45 dB(A)
Residential	7:00 am – 10:00 pm	55 dB(A)
Other Non-Residential	24 hours	60 dB(A)
Industrial	24 hours	65 dB(A)

2. No facility shall operate with an average sound level more than 5 dB(A) above the non-operational ambient level, as measured within 100 feet of any residential dwelling on a neighboring property.

3. To limit the level of low-frequency sound, the average C-weighted sound level during facility operation shall not exceed the A-weighted ambient sound level by more than 20 dB.

b. Shadow Flicker

The facility's shadow flicker shall not fall on any nonparticipating residential building, built at the time of approval, for more than one hour a day. The owner must commit to a schedule for turning the turbine off during periods exceeding that limit.

c. Width

As measured at its widest point, the width of building-mounted turbine(s) shall not exceed 20 percent of the shortest width of the building's front or side elevation, for residential buildings and non-residential buildings abutting residentially used properties. The width of the building-mounted turbine shall not exceed 50 percent of the shortest width of the front or side elevation of a nonresidential building, not abutting residentially used properties.

d. Sun Glint

The facility's surface finish shall be flat or matte, so as to reduce incidence of sun glint.

e. Electronic Interference

Facilities shall not cause electromagnetic interference with communications systems. The determination of degradation of performance and of quality and proper design shall be made in accordance with good engineering practices as defined in the latest principles and standards of the American Institute of Electrical Engineers, the Institute of Radio Engineers or Electrical Industries Association.

6.4.13.4 Waivers

Requirements for setbacks, sound level limitations or shadow flicker from wind energy facilities may be waived by impacted nonparticipating property owners. The written waiver shall notify nonparticipating property owner(s) of the requirements established by this Ordinance and how the proposed wind energy facility is not in compliance. The waiver shall be signed by the nonparticipating property owner(s) giving consent to exceed the limits for setback, sound level limitations, or shadow flicker on his/her property.

Article 13 Violations, Penalties and Enforcement

Section 13.9 Wind Energy Facilities

The provisions in this Section 13.9 are in addition to the general Violation, Penalties and Enforcement provisions of Article 13. Lake County shall retain authority to enforce the Height and Setbacks and Operating Requirements for wind facilities in Section 6.4.13, and additional requirements and standards for wind energy facilities as identified in Appendix Q.

13.9.1 Violation, Cessation and Remedy

- a. Should a wind energy facility, or should any part of the facility, violate the Operating Requirements of this Ordinance, or become inoperable, the owner shall cease operations immediately.
- b. Upon receipt of a complaint or the notice of a complaint from the owner, the Director of Planning, Building and Development shall make a determination as to whether there is a violation of the permit or Operating Requirements requiring immediate cessation of operation.
- c. Once violations have been remedied, as determined by the Director of Planning, Building and Development, the facility may resume operations.

13.9.2 Finding of Default and Abandonment

- a. The owner must remedy any condition in which the wind energy facility has become inoperable, or otherwise violated the operating requirements defined under Section 6.4.13.3 for wind energy facilities within 180 days of the issue date on written notice from Lake County or be considered to be in default and the facility considered to be abandoned.
- b. The Planning Director may authorize an extension based on extenuating circumstances. All requests for extension must be made in writing, prior to the expiration of the 180 day remedy period, and provide the basis for the request and the amount of additional time requested.

13.9.5 Decommissioning of Wind Facilities

If a wind energy facility is not completely removed within 90 days of the finding of abandonment, Lake County may remove all facility components at the owner's expense. In the case of such removal, Lake County has the right to file a lien for reimbursement, for any and all expenses incurred by Lake County without limitation, including attorney fees and accrued interest.

Article 14 Definitions

Ambient Sound: The all-encompassing sound at a given location, usually a composite of sounds from many sources near and far. For the purpose of this ordinance, the "ambient sound level" shall mean the quietest of ten 10-second average sound levels measured when there are no nearby or distinctly audible sound sources (e.g., dogs, or jets). Daytime ambient measurements should be made during mid-morning weekday hours, while nighttime measurements should be made after midnight.

Low-Frequency Sound: Sound with frequencies below 100 Hz, including audible sound and infrasound, as opposed to broadband which has sound frequencies above 100 Hz. Infrasound has frequencies below 20 Hz, which if sufficiently intense, can be perceived by many individuals, and must be measured by a sound level meter using the C-weighted scale.

Noise: Sound that adversely affects the psychological or physiological well-being of people.

Nonparticipating Property: A different property that is not owned by the owner of the property on which a development is being proposed or installed.

Shadow Flicker: The on-and-off strobe light effect caused by the shadow of moving blades cast by the sun passing above or behind the turbine. Shadow flicker intensity is defined as the difference or variation in brightness at a given location in the presence and absence of a shadow.

Sound Frequency: The number of oscillations per second in hertz (Hz). How we perceive sound is partly dependant on what the frequency is. High frequency sound has more oscillations per second, whereas low frequency sound has fewer.

Sound Level: The A-weighted sound pressure level in decibels (dB) (or the C-weighted level if specified) as measured using a sound level meter that meets the requirements of a Type 2 or better precision instrument according to ANSI S1.4. The “average” sound level is time-averaged over a 1-2 minute period, using an integrating sound level meter that meets the requirements of ANSI S12.43.

Sun Glint: The reflection of sunlight off of a surface, as in the case of the blades, tower, or other component of a wind energy facility.

Tower: A tall structure, mounted in the ground, on which a wind turbine is mounted.

Turbine: The parts of a wind energy facility including the blades, nacelle and tail.

Appendix Q: Wind Energy Facilities

1.0 APPLICATION REQUIREMENTS FOR WIND ENERGY FACILITIES

See Section 6.4.13 Wind Energy Facilities for information on Height and Setbacks and Operating Requirements. See Article 13 for Violations, Penalties and Enforcement. See 3.0 below in Appendix Q for Additional Standards for Wind Energy Facilities. Other local and state regulations shall apply.

A. Project Proposal

- 1) Owner name, address and phone number.
- 2) Photos of existing conditions for proposed facility.
- 3) Project summary including the manufacturer information, number of proposed turbines, and proposed height to the top of the turbine, including tower height and length of the blades.

B. Site Plan (drawn to scale)

For tower-mounted wind energy facilities:

- 1) Existing and proposed contours, at a minimum of two foot intervals.
- 2) Location, setbacks, exterior dimensions and square footage of all structures on the owner’s property and abutting properties within 100 feet.
- 3) Location and size of existing waterways, wetlands, one hundred-year floodplains, sanitary sewers, field drain tiles, storm sewer systems, and water distribution systems.

For both tower and building-mounted facilities:

- 4) Location of any overhead or underground power lines and utility easements.
- 5) The locations and the expected duration of shadow flicker caused by the facility.

C. Waivers

- 1) Any waiver for setbacks, sound level limitations or shadow flicker signed by nonparticipating property owners shall be recorded against the impacted property with the Lake County Recorder of Deeds.
- 2) All waivers shall be submitted with the application for the wind energy facility.

D. Engineering Plans, Drawings, and Schematics

- 1) Manufacturer's engineering specifications of the tower, turbine and foundation, detailed drawing of electrical components and installation details, and expected sound level production (see Sound Level standards below).
- 2) For turbines greater than 20 kW of nameplate capacity, an Illinois licensed structural engineer's seal shall be required.
- 3) All facilities shall be designed to withstand a minimum wind velocity of 100 miles per hour.
- 4) Each facility shall conform to applicable industry standards, including those of the American National Standards Institute (ANSI). Applicants shall submit certificates of design compliance that equipment (inverter) manufacturers have obtained from Underwriters Laboratories (UL), National Renewable Energy Laboratories (NREL), Det Norske Veritas (DNV), Germanischer Lloyd Wind Energie (GL), or an equivalent third party.
- 5) All electrical wires and lines connecting each facility shall be installed underground.
- 6) To reduce potential bird perching and nesting, towers shall be a monopole rather than a lattice structure. External platforms/landings and ladders shall not be permitted on towers, unless mitigation strategies to avoid bird roosting or nesting are employed.

E. Soil Studies

Tower-mounted facilities greater than 75 feet total height OR greater than 5,000 lbs. structural weight shall require a stamped drawing by an Illinois licensed Structural Engineer and may require, as determined by relevant building officials, a soil analysis at the base of the tower, demonstrating that the soils are able to support the structural weight of the facility. Structural weight shall include the tower, wind turbine generator, and any other component(s) otherwise supported by the base foundation.

Commentary Regarding Wind and Wildlife Impacts:

Lake County will consult with the Illinois Department of Natural Resources and U.S. Fish and Wildlife Service on proposals for tower-mounted wind facilities over 75 feet in height, in accordance with applicable statutes.

Applicants for wind energy are encouraged to work with the Lake County Soil and Water Conservation District, the Illinois Department of Natural Resources and U.S. Fish and Wildlife Service to initiate natural resource reviews in order to identify potential environmental issues before submitting the application.

The Illinois Department of Natural Resources and U.S. Fish and Wildlife Service may request a wildlife study evaluating the potential impact of the proposed construction and operation of a wind energy facility on any species of concern or high quality wildlife habitat on or near the subject property.

For turbines proposed with a height of over 75 feet, within 1.5 miles of Lake County Forest Preserve District, Illinois State Park, Illinois Nature Preserve, or Illinois Natural Area Inventory lands, Lake County will provide notice to and solicit comments from those appropriate agency(ies).

F. Wildlife Impacts

Lake County may require the applicant to develop and implement an environmental plan that adequately mitigates or eliminates any potentially adverse impacts, identified through consultations, comments from noticed parties, and environmental studies.

G. Installation

Facilities must be installed according to manufacturer specifications and permitting requirements. Electrical connections must be made by a licensed electrician.

H. Climb Prevention

The base of any facility tower shall not be climbable for a vertical distance of 15 feet from the base, unless enclosed with an 8 feet tall locked fence. .

I. Braking Systems

Wind facilities shall be equipped with automatic and manual braking systems. The owner shall immediately cease operations as deemed necessary by Lake County.

J. Signage

- 1) Facilities shall have no advertising material, writing, picture, or signage other than warning, turbine tower identification, or manufacturer or ownership information.
- 2) This prohibition shall include the attachment of any flag, streamers, ribbons, spinners or waving, fluttering or revolving devices, but not including meteorological/weather devices or bird flight diverters on guy wires.
- 3) Tower-mounted facilities shall have one warning sign that shall include a notice of no trespassing, a warning of high voltage, and the phone number of the owner to call in case of emergency.

K. Lighting

- 1) The facility shall not be artificially lighted, except as required by the Federal Aviation Administration (FAA) or necessary for workers involved in maintenance or repairs. Any required lighting shall be shielded so that no glare extends beyond the property line of the facility.
- 2) Security lighting and any emergency lighting should be kept to the minimum required.
- 3) To reduce potential wildlife impacts, the facility should employ only red, or dual red and white strobe, strobe-like, or flashing lights, not steady burning lights to meet FAA requirements for visibility lighting of wind turbines, permanent meteorological towers, and communication towers.

L. Historic Districts and Landmarks

Wind facilities within 500 feet of the local historic district or landmark or a National Historic District or Landmark must receive a recommendation from the Historical and Architectural Sites Commission prior to submitting an application to the Plan Commission and Lake County Board.

2.0 SOUND LEVEL MEASUREMENT

The **Wind Energy Facilities Sound Measurement Worksheet** is intended to determine the average sound level (i.e. **Source Sound Level**) from operating wind energy facilities by

correcting for the ambient sound levels. This measurement will determine whether the sound exceeds the limits stipulated in Section 6.4 for wind facilities.

Sound Level Meters (SLM) must meet the Type 2 grade or better per the latest revision of ANSI S1.4 *American National Standard Specification for Sound Level Meters* and must have an integrating feature that meets ANSI S1.43 *American National Standard Specifications for Integrating Averaging Sound Level Meters*.

The **procedures** outlined here are based in essence on applicable portions of ANSI S12.9 *American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound* and Part 910 of Title 35: Environmental Protection, Subtitle H: Noise, Chapter 1: Illinois Pollution Control Board.

Frequency Measurement

- The A-weighted scale is most often utilized for the measurement of tonal or audible sound levels. These are sounds that range from 20 to 20,000 Hz. and that the human ear can typically hear.
- The C-weighted scale is utilized especially for measurement of low frequency sound, i.e. more bass tones or infrasound, which may or may not be audible to the human ear. Low frequency sounds can travel farther and may be enhanced in different locations such as in buildings.

Instrumentation Set-Up:

- Ensure the battery is in good condition.
- Ensure that the Sound Level Meter is calibrated according to manufacturer's instructions.
- Measurements may be taken at any location on a nonparticipating property, provided the location is not within:
 - 5 feet of small surfaces (e.g., trees, posts, etc),
 - 25 feet of a large reflective surface (e.g., shed, building, etc), or
 - 50 feet of a large reflective surface if the sound is tonal in nature.
- A tripod for the microphone or SLM is required if the sound is high-pitched. If the sound is low frequency in nature, a hand-held meter is acceptable as long as the arm is extended.
- The microphone on the SLM must be aimed toward the noise source and oriented at an angle recommended by the manufacturer (usually 45-70° off the ground).

Sound Level Limit Regulations for Wind Energy Facilities:

- The average sound level from wind facilities shall not exceed fifty-five (55) dB(A) during daytime hours or forty-five(45) dB(A) during nighttime hours at any point within neighboring, residentially zoned or used property. The different limits for daytime and nighttime sound levels are consistent with standards established by the Illinois Pollution Control Board. These sound level limits on residential properties are stricter than those established by the Illinois Pollution Control Board, because of the typical tonal, modulating and/or bass sounds experienced with wind facilities. The average sound level from wind facilities shall not exceed sixty-five (65) dB(A) on neighboring industrial properties and sixty (60) dB(A) on other neighboring nonresidential properties, at any time of the day.
- No wind facility shall operate with an average sound level that is more than 5 dB(A) above the non-operational ambient level, as measured within 100 ft. of any residential dwelling on a neighboring property.
- To limit the level of low-frequency sound, the average C-weighted sound level during wind facility operation shall not exceed the A-weighted ambient sound level by more than twenty (20) dB.

SOUND MEASUREMENT WORKSHEET INSTRUCTIONS

Source and Receiver Location:

Identify the types of property from which the sound is coming (Source) and on which the sound is being measured (Receiver).

Nature of Sound:

Identify what is the Source of the sound being measured.

Weather Conditions:

- Measurements should not be made when ground level winds exceed 10 mph.
- Use an anemometer and compass to measure **wind speed** and **direction** and identify them on the Worksheet.
- Use a thermometer to determine **temperature** and a hygrometer to measure **relative humidity** to identify any adverse conditions. All instruments must be used in accordance with the manufacturer's recommended procedures.
- As an alternative, weather conditions can be obtained from an airport or weather station reporting local conditions through an internet site.

Equipment:

Identify the type of sound level meter being used and whether measurements will be using the A-weighted scale to measure tonal or audible sound (20 to 20,000 Hz) or the C-weighted scale to measure low frequency sound (Below 200 Hz).

Calibration Check:

Follow manufacturer's instructions to ensure that the Sound Level Meter is properly calibrated. Place the calibrator on the SLM microphone and adjust the meter as necessary so that it displays the rated output of the calibrator (usually 94.0 dB). This must be repeated before and after each series of measurements to ensure SLM stability.

Measured Sound Levels:

1. **Total Sound Level:** Collect a 1-2 minute sample of the sound with the wind energy facilities operating. Wait at least one minute collect a second sample. If the samples are within 2 dB, there is repeatability and the two levels can be averaged for a total sound level. If there is more than a 2 dB difference, repeated samples should be taken to determine which levels are most in common and can be averaged. This is repeated for the C scale if low frequency sound is a concern.
2. **Ambient Sound Level:** Ambient Sound represents the background sound level observed when the source is not operating. Collect a 10-15 second sample of the Ambient Sound during a period when there are no nearby distinct or prominent sounds, such as dogs barking, a plane flying over, or a car passing by. Wait over one minute to collect a second sample. If the samples are within 2 dB, there is repeatability and the two levels can be averaged. This is repeated for the C scale if low frequency sound is a concern.
3. **Correction:** This figure calculates how to correct the Total Sound Level measurement for Ambient Sound.
 - a. Enter the difference between the Total and Ambient Sound Levels [Line 1 – Line 2]

- b. If the Ambient sound is not at least 2 dB lower than the Total Level on 3a, a determination of violation cannot be made. If the difference is 2 dB enter a “4”; for a difference of 3, enter a “3”; for a difference of 4-5, enter a “2”; for a difference of 6-9, enter a “1”; and for a difference of 10 or more, enter a “0.”

- 4. Source Sound Level:** The average sound level from the operating Wind Energy System (Source) is the Total Sound Level minus the Correction factor. [Line 4 = Line 1 – Line 3b]
- 5. Increase above Ambient Sound:** An A-weighted sound level from a sound source that is more than 5 dB above the ambient level represents a significant increase in noise and is an objective indicator of annoyance. This is the difference between Line 4 and Line 2 and is used to assess compliance with the noise ordinance on residential properties. This measurement is intended for use on neighboring properties and should only be taken within 100 feet of a residential dwelling.
- 6. Low Frequency Measurement** (if indicated): Low frequency sound can impact neighbors over a longer distance than more tonal sounds and is possibly perceived indoors. A C-weighted sound level with the turbine(s) operating that is more than 20 dB above the A-weighted ambient sound level is an objective indicator of annoyance due to a significant increase in low frequency noise. If the difference between the C-weighted level of Line 4 and the A-weighted level of Line 2 is less than 20 then Wind Energy System is considered to be in compliance with the noise ordinance.

Wind Energy Facilities Sound Measurement Worksheet

Source Property: _____
 Receiving Property: _____

___ Residential	___ Nonresidential	___ Industrial
___ Residential	___ Nonresidential	___ Industrial

Nature of Sound: _____
 Location of instruments: _____
 Wind Speed and Direction: _____
 Equipment: _____

Date:
Time:
Examiner:

Calibration Check:

Sound level with calibrator in place:

Before	Cal. Level	After
_____ dB	94.0 dB	_____ dB

Measured Sound Levels:

1 **Total Sound Level** (*source on*):

Sample 1	Sample 2	Average
dB(A)	dB(A)	dB(A)
dB(C)	dB(C)	dB(C)

2 **Ambient Sound Level** (*quiescent level with source off*):

dB(A)	dB(A)	dB(A)
dB(C)	dB(C)	dB(C)

3 **Correction** for the ambient background sound

3a. Enter the difference between lines 1 and 2:

dB(C)	dB(A)
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If Line 3a = 0 or 1 dB the source level cannot be determined

3b. If Line 3a = 2 dB → **enter 4 dB**; 3 dB → **enter 3 dB**
 = 4-5 dB → **enter 2 dB**; 6-9 dB → **enter 1 dB**
 = 10 dB or more → **enter 0 dB**

dB(C)	dB(A)
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4 **Source Sound Level** (*line 1 minus line 3b*):

dB(C)	dB(A)
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5 **Increase Above Ambient Sound** (*A-wtd level in line 4 minus A-wtd level in line 2*):

dB(A)

Measured within 100 ft of residential dwelling

6 **Low Frequency** = $C_{source} - A_{ambient}$ (*C-wtd level of line 4 minus A-wtd level of line 2*):

dB

Sound Limits (dB) on Receiving Properties:

	Industrial	Nonresidential	Residential Day / Night
Source Sound Level (A-wtd) - Line 4	65	60	55 / 45
Increase Above Ambient Sound (A-wtd) - Line 5	5		
Low Frequency, $C_{source} - A_{ambient}$ - Line 6	20	20	20