

# **DRAFT- 4-23-07**

## **Model Wind Ordinance Reference Guide**

### **REFERENCE GUIDE to MODEL WIND ORDINANCE**

#### **I. HISTORY OF LEGISLATIVE AND OTHER INITIATIVES**

In order to promote clean renewable energy and to help reduce dependence on fossil fuels, the Wisconsin legislature mandated the construction of electric generating capacity powered by renewable resources in 1997 Wisconsin Act 204 (which is codified at Wis. Stat. § 196.377(2)(b) (1997-98) (“Act 204”). The statute required each of the four eastern Wisconsin utilities, Wisconsin Power and Light (Alliant Energy), Wisconsin Electric Power Company (We-Energies), Wisconsin Public Service and Madison Gas and Electric, to build or contract for an aggregate total of 50 megawatts (MW) of new renewable resource generating capacity within Wisconsin.

Although Act 204 was only one of a series of legislative initiatives aimed at promoting renewable energy, it was one of the first to cause wind farm developers to approach communities to gain permission for a wind facility. Local communities within the state of Wisconsin will continue to be faced with proposed wind farms. Most communities in Wisconsin are unprepared for this type of construction. For this reason, the Public Service Commission of Wisconsin (the “PSC”), the Wisconsin Department of Natural Resources and the Division of Energy of the Department of Administration created the Wisconsin Windpower Siting Collaborative to examine these issues. The PSC instructed the electric utilities to participate in the Collaborative and interested regulators; representatives of private industry and local governments were included in the discussions.

The model ordinance was developed by agency staff with input from stakeholders.

# **10/5/2007 DRAFT**

## **Model Wind Ordinance Reference Guide**

### **II. EXISTING LAWS AND REGULATIONS**

#### **A. Wisconsin**

An extensive and detailed procedure called the Certificate of Public Convenience and Necessity (CPCN) process is in place for the construction of large utility-sized energy projects in the state of Wisconsin. However, a CPCN is not required for energy generation facilities of less than 100 MW built by a non-utility developer (Wis. Stat. § 196.491 (1997-98)). Most wind energy projects are smaller in size, and fall below the threshold of these utility requirements

The Wisconsin state legislature has embraced renewable energy sources as desirable and necessary for the future of energy production in Wisconsin. Numerous state statutes have been enacted in recent years to help energy producers, consumers, and the state itself pursue this policy goal. See Wis. Stat. § 1.12 (1997–98) (finding that it is the goal of the state to encourage the construction in Wisconsin of renewable energy resources, including wind energy); Act 204, codified at Wis. Stat. § 196.377(2)(b) (1997-98) (requiring Wisconsin utilities to construct or procure 50 MW from renewable energy resources, including wind energy); 1999 Act 9; 2005 Act 141, Wis. Stat. § 196.378 (requiring Wisconsin utilities to procure up to 6.0% of their energy supply from renewable resources by 2010 and 10% by 2015).

To ensure that its policy goals regarding renewable energy are not unduly hindered, the state legislature has enacted legislation limiting the ability of local governments to prohibit or curtail the development of wind and solar energy systems. (Wis. Stat. § 66.031 (1997-98; subsequently re-numbered to 66.0401) hereafter “Section 66.0401”) prohibits counties, cities, towns or villages from placing any restrictions, directly or indirectly, on the installation of solar or wind energy systems unless the restriction satisfies one of three conditions: (1) the restriction serves to preserve or protect the public health or safety; (2) the restriction does not significantly increase the cost of the system or significantly decrease its efficiency; or (3) the restriction allows for an alternative system of comparable cost and efficiency. A “wind energy system” is defined by the statute as “any equipment that converts and then stores or transfers energy from the wind into usable forms of energy” (Section 66.0403(1) (m)).

In short, under the plain language of Section 66.0401, the municipalities can impose health and safety related restrictions on the construction and operation of wind farms, but may not enact or impose regulation that increases the wind farm’s cost or decreases their efficiency, or that completely bar the installation of the system.

Section 66.0403 grants an applicant the right to protect wind access, and lays out a process that a local jurisdiction would use to grant that permit. This access permit is distinct and different from a conditional use or special use permit, and has provided a source of confusion for some local jurisdictions. A local jurisdiction cannot require an applicant to have a wind access permit under 66.0403; rather it is obliged to grant a wind access permit if the applicant requests it. The distinction was clarified in state appeals court; district II, decision 00-1643 of March 7, 2001. On May 8, 2001, the state Supreme Court refused to hear the case.

## 10/5/2007 DRAFT

### Model Wind Ordinance Reference Guide

Wind turbines are exempt from property tax (state statute 70.111). It is therefore incumbent on the community to negotiate impact fees in lieu of property taxes. Fees should reflect actual costs such as road damage, fire protection and training, and law enforcement. If it is possible to obtain a baseline assessment of conditions before the project commences, for example of road condition, it may be helpful to both the developer and the local jurisdiction.

If the wind energy facility qualifies under Wisconsin Act 31 as an exempt wholesale generator, subject to the gross receipts tax, the allocation to local governments will proceed along the following formula: For a city or village, from \$4000 fee per installed megawatt, \$2333 goes to the city or village, \$1667 to the county, per megawatt per year. For an unincorporated town, the allocation is reversed: \$1667 to the town, \$2333 to the county. The allocation takes effect in 2005. The wind facility must have been placed into service after January 1, 2004.

The Bureau of Aeronautics in the state Department of Transportation must be contacted to review the impact the installation may have on the local airspace and the review the plan for warning beacons. Other state laws may govern a wind turbine installation in the same way that state laws apply to any construction project, including endangered species laws or laws regarding run-off.

The Wisconsin Department of Natural Resources, Bureau of Endangered Resources, maintains a National Heritage Inventory, which should be consulted to determine if state protected resources may be affected.

#### B. Federal

The project developer is responsible for being familiar with and adhering to federal standards, and can be expected to know federal laws since they apply to all projects a developer will have undertaken in the past.

Federal incentives for the production of wind-generated electricity have been established and renewed several times.

A state office housed in Wisconsin's Department of Administration administers a federally funded program, the Coastal Management Program, which ensures that the state's needs are addressed where there is federal involvement in a coastal project. So-called "federal consistency" can be applied to projects that affect the coastal zone. There are 15 coastal counties, and Coastal involvement can be extended to upper, non-county portion of watersheds (e.g. if changes to an impoundment affect fish movement upstream past the county line). There are three criteria that can trigger federal consistency<sup>1</sup> and preliminary inquiries have indicated that federal production tax incentives do not trigger application of federal consistency.

---

1

1. Federal money is involved
2. A federal license or permission is granted
3. Some sort of federal act by an agency is involved

**10/5/2007 DRAFT**

## **Model Wind Ordinance Reference Guide**

The Federal Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, and the Endangered Species Act all establish federal authority to protect avian species. The Fish and Wildlife Service can choose to initiate enforcement action under any of these laws, should a wind farm be responsible for the deaths or other adverse impacts on the species the laws were enacted to protect. Up to this point, no enforcement actions have been taken against wind farms, but the Service has enforced against transmission lines and other facilities that have violated the Acts.

In most cases, the Federal Aviation Administration (FAA) will require that one or more of the wind turbine towers include a warning beacon.

If an interconnection to transmission-level power lines is involved, the Federal Energy Regulatory Commission may have some jurisdiction.

### **C. Local**

There are very few local laws or regulations that specifically apply to the construction and operation of typical wind energy projects. Many municipalities have no or insufficient regulations in place to balance the needs of wind energy projects and those of communities around the state of Wisconsin. Some towns and counties have enacted zoning ordinances which mention wind energy, but this is often in the context of “back-yard turbines” rather than commercial-scale projects. In addition, some of the enacted provisions may be in violation of Section 66.0401, as this section is not widely known to drafters of local ordinances.

## **III. PROCESS DISCUSSION**

To develop the model ordinance, the subcommittee reviewed a variety of materials. These included existing and proposed ordinances from other municipalities, both from Wisconsin and from other states, state laws relating to the construction of wind projects, both from Wisconsin and other states, and a number of guides and handbooks regarding wind energy in general, as well as the construction and operation of wind projects.<sup>2</sup> Members of the subcommittee also consulted with experts within various areas of wind energy, such as municipal and state administrators and regulators, developers and vendors, and other wind energy professionals. In addition, the subcommittee utilized the expertise of its members. All of this information was material to be consulted in drafting the current document. After the drafting effort became an effort involving only state employees, the effort was further informed by discussions with land-use authorities and by observing the various siting debates taking place in Wisconsin.

## **IV. DRAFT ORDINANCE DISCUSSION**

The following is a section-by-section discussion of the model ordinance:

### **1. Purpose**

---

<sup>2</sup> An especially useful reference is the second edition of the National Wind Coordinating Committee’s *Permitting of Wind Energy Facilities: A Handbook*. (2002 revision).

# **10/5/2007 DRAFT**

## **Model Wind Ordinance Reference Guide**

The purpose of the ordinance is quite specific because Section 66.0401 precludes considerations such as aesthetics.<sup>3</sup>

### **2. Definitions**

**Wind Turbine** - While wind projects are constructed in a variety of sizes, the model ordinance only addresses commercial-scale projects. The ordinance therefore has a threshold built into the definition of Wind Turbine, such that it only applies to projects that include commercial-scale turbines, and specifically does not apply to small turbines for home or farm use. Based on the types of turbines currently available for personal use, and the types of turbines projected to be so available in the immediate future, the model ordinance applies only to projects with turbines exceeding 170 feet in height and 100 kilowatts in nameplate capacity.

**Wind Energy Facility** – In keeping with the ordinance applying to commercial-scale equipment, a facility is defined as having a commercial purpose of selling electricity to off-site customers. To meet its own energy requirements, a commercial or industrial facility could install the same size of wind turbine as turbines installed by a developer, but would not be producing the same effect on the community that a wind farm would impose. In other words, the turbine would be similar in scale to the facility hosting it, rather than a new stand-alone installation. It is expected that for such cases, a less-stringent conditional use permit could contain some of the same conditions as a wind ordinance.

### **3. Regulatory Framework (Zoning)**

There are, generally speaking, two ways a municipality may address the construction of wind projects, for wind projects are rarely the exclusive use of the underlying property - they are usually combined with another use, typically farming.

One approach is to permit wind energy as a use, either as principal or accessory, in existing zoning, which is the approach shown in the first alternative suggested language in the model ordinance. The principal use of land is the main purpose for which it is used - farming, residence, industry, etc. Generally, a zoning classification is based on the intended principal use of the property in question, and, by definition, a principal use is always permitted. For instance, in a residential zone, a property may have residences as its principal use. In addition, accessory use is generally permitted. Accessory use would be a use related to, or accessory to, the principal use. For instance, a single residence would generally be an accessory use in an agricultural zone, whereas an apartment building would not. A water well for personal use would be an accessory use in a residential zone, but a commercial well and bottling plant would not. Generally, any use that is neither principal nor accessory is not permitted.

Wind projects are typically considered an accessory use to agriculture. One or more wind turbines sufficient to meet the on-site energy needs of a commercial or industrial

---

<sup>3</sup> The provisions of the federal Wild and Scenic Rivers Act appear to be non-regulatory with regard to the view from the river of non-federal land to which Section 66.0401 applies.

## **10/5/2007 DRAFT**

### **Model Wind Ordinance Reference Guide**

enterprise would also be considered an accessory use. As discussed above, the definition of a wind energy facility in this ordinance means that it would not apply to such turbines.

If, on the other hand, a wind project is a principal use, then it would only be permitted in zones where such projects are specifically permitted. Further, if the wind project were to be the principal use, only uses accessory to the wind project would be permitted. This could create difficulties where, for instance, the proposed project is defined as an industrial use and placed in an agricultural zone. If the industrial zoning is applied to a narrow area underneath the wind turbines it creates “strip zoning” which is considered undesirable because it appears to arbitrarily assign an industrial land use amongst adjacent land uses of residences and farming. Further, farming would have to be defined as an accessory use to an industrial enterprise, flying in the face of land use precedent and practice.

Under section 3.1 option #1, a wind project may be built only in certain zones, and only with a special permit. Thus some municipal action will be required for each project, and no pre-planning for overlay zoning (discussed below) is required. In addition, the model ordinance specifically provides that a wind project may be either principal or accessory use, thereby mooted that discussion. The goal is for as simple a process as possible.

This option would appear to be open to legal challenge under Section 66.0401, but is common zoning language.

The natural continuation of the discussion of principal and accessory use is a discussion of permitted zoning for wind projects. While the specific zoning descriptions must be left to the individual municipalities, simply because each municipality has different zoning designations, the Guide addresses conceptually the type of zoning that would be appropriate locations for wind farms, assuming the first alternative language (principal and accessory use) is used. In keeping with the mandate of Section 66.0401, the intent of the model ordinance is to ensure that wind projects are only placed in locations where they do not risk the public health and safety. For that reason, wind facilities as defined in the ordinance should generally not be permitted in most residential zones. On the other hand, agricultural, commercial and industrial zones may be appropriate locations for wind projects. As noted above, strip zoning should be avoided. Determining appropriate zoning type for wind facilities should be based on complying with Section 66.0401. The foremost priority is to preserve the public health and safety, but beyond that, the municipality must heed the other two restrictions of Section 66.0401.

#### **Overlay district versus wind-specific ordinance**

With five wind facilities permitted in Wisconsin between 1998 and 2001, four employed a conditional use permit to the principal use of farming, and the fifth and largest facility was strip-zoned as M-1 manufacturing, surrounded by A-1 agriculture.

Overlay zones are designed to protect important resources and sensitive areas. Wisconsin’s mandated floodplain zoning program is an example of overlay zoning. The requirements of overlay zoning apply in addition to the underlying zoning regulations. The underlying zoning regulates the type of uses permitted, such as residential or commercial, while the overlay zone imposes specific requirements to provide additional protection.

## **10/5/2007 DRAFT**

### **Model Wind Ordinance Reference Guide**

Perhaps because overlay district zoning is not yet common, overlay districts are not readily understood. A wind overlay district would be separate from the zoning districts, but included in the same code of ordinances. Conditional use approval could be required within the overlay district, using the language of the model ordinance. This would still allow local control in the event that a town has adopted most or all of the county zoning. Alternatively the overlay district could include the ordinance language.

One relatively simple way to include the language of the model ordinance is to name wind facilities as a permitted use in certain zoning districts and establish a text amendment to the code of ordinances that establishes minimum standards, using the language provided in the model ordinance.

If the town has not adopted county zoning, it may wish to adopt a wind ordinance, although a license or permit is simpler.

#### **4. Applicability**

The language applies to wind facilities proposed after the ordinance is effective, although pre-existing wind facilities are forced to comply if they are not providing energy for 12 continuous months and likewise if modifications or alterations to a pre-existing or existing wind facility are undertaken.

#### **5. General Requirements for Wind Energy Facilities**

This section constitutes the heart of how the wind farm is placed on the landscape, and how it operates during its life. This includes things such as:

- Endangered species act

- Erosion control

- Wind turbine lighting and placement for aviation safety, both through the FAA and through the state Bureau of Aeronautics within the Department of Transportation.

- Stray voltage (regulated through the Public Service Commission of Wisconsin).

- Archeological and historical resources

Many of these concerns are addressed below in the section titled “Other Concerns.” While the local jurisdiction may wish to impose certain conditions in these areas, it does so at the risk of contradicting existing law.

##### **5.1. Visual Appearance; Lighting; Power Lines**

Modern wind turbines are very large, and neighboring landowners - as well as the general public - are understandably concerned with the aesthetic impact of wind turbine construction. There are a several variables that affect the impact of a project on visual resources. Lighting, coloring and signage are obvious ones, but spacing can be a factor, as well as

## 10/5/2007 DRAFT

### Model Wind Ordinance Reference Guide

placement of the turbines within the project setting. The size of the turbines is also a variable, and while larger turbines are taller and are visible from a longer distance, smaller turbines tend to rotate faster, be placed closer to each other and in larger numbers. In addition to the turbines themselves, access roads can also have visual impact, but this impact tends to be lessened on relatively flat terrain such as is usually found in Wisconsin.

There is not necessarily any single “right” answer to the question of how to minimize visual impact. What constitutes the least obtrusive color will vary depending on the surrounding geography and flora, as well as personal preferences. Studies have been done with special designs or markings on the turbines to reduce avian mortality, but these designs and markings are often not pleasing to the human eye. Evenly spaced rows of turbines may not be an option in hilly terrain, and signage and labeling that may be intrusive in some contexts may be aesthetically pleasing in others. The FAA will typically mandate certain minimum lighting.

Wind turbines are one element of many in the built environment, and should be viewed fairly as compared to other elements. For example a silo or a water tower can be prominent elements, as can a house atop a hill.

With these concerns in mind, it is important to remember the requirements of Section 66.0401. Municipalities, under Wisconsin state law, may not place requirements on wind project developers solely for aesthetic reasons. Likewise, preserving the aesthetic character of the town or similar language should not appear as an explicit purpose of an ordinance or use permit. That said, most visual issues can be addressed with little impact on the developer. The ordinance therefore requires neutral paint, and limits lighting and signage.

#### 5.2. Setbacks

Wind turbines are typically required to be set back from property lines and populated areas for a variety of reasons. There are aesthetics concerns, as distance is a substantial factor in both visual and sound disturbance. Aesthetics factors have been adequately and sufficiently addressed elsewhere in the ordinance as previously described.

The ordinance provides for sound limits elsewhere. While sound can be hard to measure and human perception of what is loud can be quite subjective and while setbacks help lessen the sound, it should be emphasized that setbacks are not intended to deal with sound concerns.

More important are the safety concerns. In the event of extreme weather conditions or improper construction safety hazards may occur. For this reason, wind turbines are usually required to be set back from property lines and sensitive structures. The setback thresholds are intended to reflect relative risk. The model ordinance requires four different setbacks:

- Inhabited structures: The greater of 1,000 feet or twice the total height to existing residences, schools, hospitals, churches and public libraries.



## **10/5/2007 DRAFT**

### **Model Wind Ordinance Reference Guide**

- Property lines: 1.1 times total height from the nearest property line, provided that neighboring land owners may waive this requirement. A wind project will often span several parcels of land, and construction options would be severely limited if the property line setback rule were to be applied to each parcel of land. Since there would be no advancement of the public health and safety by disallowing waiving the setback, this exception to the property line setback rule is required by Section 66.0401.
- Public Roads: 1.1 times total height from public roads.
- Communication and electrical lines: 1.1 times total height from above-ground public transmission and telephone lines.

There has been some debate about whether there should be different setback distances from a residentially zoned parcel without any structure, as from any other parcel's property line. While this debate reflects the desire to develop the residentially zoned parcel, it does not serve the public health or safety, and therefore has no place in this ordinance.

Likewise, different setbacks for inhabited structures have been proposed, depending on whether the inhabited structure belonged to a landowner who is leasing land to the wind project. Again, this distinction has no bearing on public health or safety, and should therefore not be allowed. In other words, if 1000 feet is necessary to protect one citizen, it is necessary for all citizens, whether or not they are receiving lease payments.

#### **5.3. Sound Levels**

Like visual aesthetics, sound level is a common and major issue with the erection of wind turbines. Also like visual aesthetics, sound is generally not a threat to the public health and safety, and therefore subject to only limited local restriction. Sound restrictions are very difficult to establish because individuals vary in their tolerance to sound. While turbine specifications include sound levels, those levels at the project site are difficult to predict before the turbine is actually operating.

There are two main sources of sound from wind turbines. One source is the gearbox and the other is the blades. Current turbine technology is of some aid in regard to sound reduction. The use of sound deadening material is improving the sound characteristics of the turbines. Also, towers are getting higher which makes the source of the sound more distant from the community.

Ultimately, however, the only factor truly within the control of the developer that regulates sound levels is distance. The model ordinance, therefore, effectively requires the developer to place the turbines far enough from points of measurement to keep sound level at or below the permitted level.

## **10/5/2007 DRAFT**

### **Model Wind Ordinance Reference Guide**

The model ordinance establishes a flat threshold of 50 dBA, measured at residences, schools, hospitals, churches and public libraries. 50 dBA is the standard threshold established by most similar ordinances and laws around the country. Local officials may want to consider different levels depending upon unique characteristics within their communities. The sound from turbines will carry differently depending upon the wind direction and speed. Time of day will also influence the perception of sound levels. Some municipalities may want to limit sound levels by restricting the sound that is in addition to existing background sound.

The model ordinance also establishes a 5 dBA “penalty” for the existence of pure tone, which makes sound more unpleasant to the human ear.

The NWCC *Wind Permitting: A Handbook* (2002 edition) has an extensive discussion of sound issues and measurement in particular.

#### **5.4. Minimum Ground Clearance**

There are obvious safety concerns with the rotating blades of wind turbines, and for this reason a minimum ground clearance is established. Seventy-five (75) feet is ample space to allow most common activities to take place underneath an operational turbine without raising any safety concerns. As a practical matter, most modern turbines have ground clearance well in excess of 75 feet.

In addition to the ground clearance requirement, each municipality should consider the issue of maximum height. Current wind turbines come in a variety of sizes, some with a total height in excess of 350 feet. It is reasonable to expect that turbine size will continue to increase in the future, as taller turbines tend to be more cost-effective.

At the same time, remember that many of the setback requirements in the model ordinance are tied to height, and taller turbines will therefore automatically be placed further away from buildings, property lines, roads, and power lines. The taller the turbine, the fewer spots it can be placed while meeting setback requirements.

A restriction on total height could lead to the construction of a greater number of turbines to make up for the lack of height, which would be a less efficient use of land. Finally, the municipality should remember the restriction set forth in Section 66.0401.

#### **5.5. Signal Interference**

To ensure that all forms of wireless communications are included, the model ordinance cites "electromagnetic communication". The ordinance requires the applicant to minimize or mitigate signal interference. FM radio is not affected, but UHF can be affected within three miles and VHF within  $\frac{3}{4}$  mile of a large enough turbine. By contrast, interference with microwave repeating stations falls under Federal Communications Commission jurisdiction. A discussion of electromagnetic interference can found in the 1998 edition of *Wind Permitting: A Handbook*, by the National Wind Coordinating Committee (NWCC). It is summarized below:

# 10/5/2007 DRAFT

## Model Wind Ordinance Reference Guide

*“Electromagnetic interference is the disruption of electromagnetic signals used in communication technologies including radio, television and microwaves. UHF television signals are most easily reflected by turbine blades and television reception within three miles (UHF) or 3/4 mile (VHF) of a turbine of sufficient size may be affected. The degree of interference depends on the blade material, turbine location relative to the signal path, and turbine size. Interference with FM radio reception has not been reported. Microwave repeating stations are often located on remote and rural hilltops. These stations rely on unobstructed line-of-sight paths for their signals and consequently may be affected by wind projects which intrude into the beam corridor. Turbines can be built in close proximity to such stations provided no portion of any structure intrudes into the beam path. In addition, the electrical circuits in the turbine may transmit an electromagnetic signal (sound) if it is not properly installed and maintained. If this occurs, the Federal Communications Commission requires that the interfering signal be eliminated.”*

The local jurisdiction may wish to require pre-project testing of television signal strength by a qualified independent entity. On the other hand, it could be argued that such placing such a condition, especially if it involves more than a handful of houses, contradicts the second item in Section 66.0401.

### 5.6. Safety

Most of the public health and safety concerns associated with wind energy facilities are related to the turning blades, tower failure and electric and magnetic fields. A more detailed description of these can be found in NWCC's *Permitting of Wind Energy Facilities: A Handbook*, pp. 48-52, 1998 edition. The following issues are addressed by the setbacks established in section 5.2.

**Electric connections.** Tower-to-tower electrical runs (power and control wiring) in a wind farm are routed underground. Some control could be wireless. Power wiring is fed to the local distribution system aboveground in an adjacent location, unless the power line to which the wiring would connect is also underground. These adjacent wind farm collector lines along rural roads are placed underground or overhead according to state and national safety codes. In cases where lines are commonly indistinguishable from utility sub-transmission and distribution and in addition to existing lines, cost can be weighed against safety or other concerns to decide on type of line best suited to the project's particulars.

**Tower climbing.** It is expected that wind turbine towers will be tubular, not lattice frame. The ordinance provides that the tower not be climbable, and that the access door to a tubular tower be lockable. Therefore, fencing is not required for public health or safety and may be considered on aesthetic issue by some.

**Blade Throw** refers to the rare event when a turbine blade or a piece of blade separates from the turbine and is thrown to the ground. Pieces will tend to fall to the base of the tower, i.e. directly down rather than up or out.

## 10/5/2007 DRAFT

### Model Wind Ordinance Reference Guide

**Falling Ice** is a problem that can occur in Wisconsin when the right combination of low temperature and moisture occurs. It is very unlikely that turbine blades will spin when coated with ice because the ice ruins the aerodynamic shape of the blade. The phenomenon is akin to a car driving with four flat tires. Just as the driver would detect a loss of speed and power and pull to the side of the road, the turbine control system detects a loss of power and stops the turbine. Falling ice from blades, nacelle, or tower is a danger directly under the turbine after the rotating blades have been stopped.

**Tower Failure** that results in an entire wind turbine falling to the ground is more likely to occur with small, residential-scale installations that use guyed towers. Complete tower failure is almost unheard of with commercial wind turbines; however, it is important that appropriate setbacks be established to protect people from such an eventuality.

**Electric and magnetic fields (EMF)** occur whenever and wherever electricity is used. Without these fields, electric power would not be available for everyday use. An electric field is created by applying pressure to an electric system that causes the flow of electric current. A magnetic field is created when this electric current flows through a conductor. All electrical appliances, generators and power lines are sources of magnetic fields. Magnetic fields diminish to near zero at three hundred feet from an overhead power line and are even less of an issue with underground line. Therefore, setbacks for wind turbines and placing power lines underground will mitigate any perceived health effects from EMF. In addition, the available EMF research does not establish that exposure to magnetic fields poses an increased risk to the public of cancer or non-cancerous effects. The National Research Council has concluded that: "...the current body of evidence does not show that exposures to (magnetic) fields present a human-health hazard" (National Research Council, 1996)."

#### 5.7. Infrastructure

Like any construction project, the construction (and operation) of a wind project can have a variety of socioeconomic and infrastructure impacts on the hosting community. There may be economic benefits to local business and increased employment for local labor, and there may also be increased usage of public roadways. There may also be a need to extend or expand public services, such as fire services. These impacts and needs will see substantial variation, both from municipality to municipality and from project to project. In some instances road expansion may be necessary, for example, where in other instances existing highways can accommodate any increased traffic. Ultimately, the municipality will have to determine (or require the applicant to determine) what impacts, if any, a proposed project will have on the infrastructure needs of the municipality. In some cases, such as road damage, it may be possible to assess costs specifically and accurately. In other cases, it can be difficult to quantify, and the local jurisdiction has the ability to assess an impact fee in lieu of property tax.

#### 5.8. Waste

Wind projects, while generally having no harmful emissions during operation, can nevertheless produce waste, both of the hazardous kind (chemicals) and solid kind (trash). During construction, construction machinery of various kinds operates on the site. All of these

## **Model Wind Ordinance Reference Guide**

use fuel, lubricants and other potentially hazardous substances. During operation, ill-maintained or flawed turbines may leak lubricants, and during repairs spare or used parts may be present at the project site. Construction lay-down areas will have to be cleaned and any debris removed to a licensed sanitary landfill.

Some self-policing of these issues can be expected because many, if not most, projects will be constructed on agricultural land, and the landowner or farmer will have a vested interest in keeping the project site clean and suitable for continued farming. The municipality might nevertheless consider requiring the applicant to take steps to minimize waste and pollution, for example a requirement to promptly remove and properly dispose of waste or scrap, and especially by requiring proper maintenance.

### **6. Abandonment; Site Reclamation**

Wind turbines have a very long useful life, and it is not unusual for wind projects to have agreements in place for twenty years of operation or more. Nevertheless, to preserve the public health and safety, a county should reasonably expect that a wind turbine that is not in use, for whatever reason, be removed and the site is reclaimed for other use. The model ordinance therefore provides that any turbine not in use for one full year must be removed. Upon removal, the site shall be reclaimed to a depth of four feet.

In order to verify compliance with the one-year limit on an inoperable turbine, the facility reports its turbines' output to the local jurisdiction. While these numbers may be confidential, the state energy office should be able to obtain a calendar-year-basis kilowatt-hour output. It may receive these on a confidential basis if requested, to be used only in finding a total kilowatt-hour output for wind turbines in Wisconsin.

### **7. Wind Energy Facility Siting Permits for Wind Energy Facilities**

#### **7.1. Requirement**

[Discussion of Permit Requirement]

#### **7.2. Application Process**

The intent of the model ordinance is to help provide a predictable process for obtaining a permit for a wind project, while allowing the municipalities flexibility in the operations of their administration. For that reason, much of the procedure section of the model ordinance is left for the municipality to complete, presumably in a fashion consistent with their existing procedures for other applications. Some guidance is provided in the form of suggested application content (Section \_\_\_\_). There are two additional parts of this section, however, which are important and also included.

## **10/5/2007 DRAFT**

### **Model Wind Ordinance Reference Guide**

First, the model ordinance provides that the application is made for the land, not the turbines (Section \_\_\_\_). In other ordinances, unfortunate drafting has resulted in situations where applicants must obtain individual permits for each turbine, or where applicants must obtain amendments to the permit to make minor layout changes, such as changing the number of turbines. Such a result would be contrary to Section 66.0401.

Second, the model ordinance provides that an application may only be denied if the approving entity reasonably believes that the applicant is unable or unwilling to comply with the terms of the ordinance. This will hopefully minimize the political aspect of the application procedure, and provide the applicant with a firm understanding of requirements that must be met for the construction of wind farms in Wisconsin.

#### **8. Wind Access Permits for Wind Energy Facilities; Adoption of Statutory Provisions**

[Discussion of Wind Access Permits for Wind Energy Facilities;  
Adoption of Statutory Provisions]

#### **9. 10., 11., 12., 13., 14. and 15. Enforcement, Violations, Penalties, Effective Date and other “Boilerplate”**

There is language proposed in the model ordinance to address these issues, but each municipality should adopt language that works best within the existing regulatory structure. In a municipality where there is a central enforcement ordinance, for instance, a reference to that ordinance would suffice for section 9. In another instance, the municipality may choose to amend the proposed language to conform to similar provisions in other ordinances.

#### **Other Concerns**

In addition to the subject matters addressed in the above section-by-section discussion, certain issues are primary concerns of communities that have or will have wind farms, but should not be directly addressed in the model ordinance. These are:

- A. Meteorological Towers
- B. Avian Mortality
- C. Tower Type
- D. Electrical Issues
- E. Archeological or Historical Concerns
- F. Endangered Species
- G. Road damage and soil erosion

## **10/5/2007 DRAFT**

# **Model Wind Ordinance Reference Guide**

H. Water wells

I. Shadow flicker

J. Process Issues:

- i. Period and time of construction
- ii. Hearing fees
- iii. Change orders

K.

### **A. Meteorological Towers**

A wind developer may wish to install a tower to monitor meteorological conditions and collect data at the site of a potential wind energy facility. In this event, Section 66.0401 does not apply because no useful energy is generated.

When a developer decides to apply for a permit or to qualify under the provisions of an ordinance, a meteorological tower may be part of the proposed site, and could be considered a necessary part of the facility. If the data from the tower's instruments is used for control of the wind turbines, the tower could be construed to fall under Section 66.0401. If the data is used for verifying wind turbine performance or other non-control purposes, it can be argued that the tower is not subject to Section 66.0401. However, a meteorological tower has minimal impact on the landscape, environment, and community compared to a wind energy facility or even a single wind turbine, and no special conditions are necessary. The meteorological tower would simply be named as part of the facility, as would a small building or an electrical transformer.

### **B. Avian Mortality**

It is an unfortunate fact that wind turbines kill birds. While this is a decreasing problem, due to the advent of tubular towers and the slower rotational speed of today's turbines (16-20 rpm vs. 45-50 rpm previously), it nevertheless remains a legitimate concern.

Avian mortality is not an appropriate subject matter for local regulation. The Endangered Species Act and the Migratory Bird Treaty Act, as well as other state and federal law, address avian issues. Rather than setting forth additional, and potentially conflicting, requirements, the model ordinance requires the project developer to comply with state and federal law in all regards. (Section \_\_\_\_). Any failure to comply with applicable avian mortality laws will therefore also be a violation of the ordinance.

### **C. Tower Type**

## **10/5/2007 DRAFT**

### **Model Wind Ordinance Reference Guide**

While there are a variety of types of towers used in the construction of wind projects, only two are commonly used in commercial projects - lattice and tubular. Neither tower type requires guy wires or other external supports. Each type has advantages and disadvantages. Tower type is not addressed in the model ordinance, but rather left to the discretion of the municipality whether it wishes to address the issue.

#### **D. Electrical Issues**

##### **Stray voltage**

Considerable unbiased research has been undertaken at universities for over 20 years, and it is known that dairy cattle can be adversely affected by stray voltage levels lower than those sensed by humans. Stray voltage is typically associated with on-site wiring practices and conditions or with the local electric distribution system, but not with transmission-level voltages associated with wind farms. Exposed (not underground) transmission lines can induce voltages in metal objects that are in close proximity to or directly underneath the transmission line. Available current from this induced voltage is very small. By contrast, wind energy facilities' wiring is underground.

There are state standards for acceptable levels of stray voltage and established ways of measuring it. An assortment of information on stray voltage can be found on the web site of the Public Service Commission of Wisconsin (PSCW) at <http://psc.wi.gov/electric/newsinfo/strayvol.htm>.

Although stray voltage problems associated with a wind farm are very unlikely, both the local jurisdiction and the developer may think it prudent to measure levels of stray voltage before construction and after. Although the local jurisdiction could further require a remedy if the stray voltage is above PSCW levels, this is redundant to state administrative code. Requiring a remedy for a voltage level above that required by the PSCW could be construed as placing a condition that has nothing to do with public health or safety, which is a violation of Section 66.0401.

##### **Lightning**

In order to protect the wind turbines from lightning, a continuous electrical path to the ground designed into the blades, the hub and tower-top equipment, and down the tower to the ground. Wind turbines, like trees or other tall objects, may be more likely to intercept nearby lightning strikes, but do not "attract" lightning. Lightning is *not* more likely to strike houses or cars near a wind turbine. Shorter objects under or very near a wind turbine may actually receive some protection from lightning.

#### **E. Archeological and Historical Site Features**

Wisconsin has a wide variety of cultural and archeological resources that are important to protect. The model ordinance therefore requires that the project developer comply with all state and Federal laws and regulations governing such resources.



## **10/5/2007 DRAFT**

### **Model Wind Ordinance Reference Guide**

As with any construction project, there is an ever-present risk of damaging archeologically or historically valuable sites or items. As with avian mortality concerns, these concerns are adequately and sufficiently addressed by existing state and federal law. For these purposes, a wind project is no different from any other construction project, and it would be unreasonable to place additional restrictions of this type on wind projects. The model ordinance does therefore not specifically address archeological or concerns.

#### **F. Endangered Species**

Placing at risk endangered species can occur during construction and during operation. The location of the wind energy facility may endanger species by destroying critical habitat. The model ordinance makes clear that it is the applicant's responsibility to adhere to relevant state and federal laws.

#### **G. Road damage and soil erosion**

##### **Road damage**

Road damage from heavy equipment can be significant. Because the wind equipment is exempt from property tax, the local jurisdiction and the developer may wish to agree to obtain an independent evaluation of road condition before and after the construction and to determine impact fees accordingly.

As a result of the wind farms sited in Kewaunee County, a study committee suggested the following language:

“The permit applicant shall reimburse the Town for any and all repairs and reconstruction to the town roads resulting directly from the construction of the wind turbine project. A qualified independent third party, agreed to by the Town and permit applicant, and paid for by the permit applicant, shall be hired to pre-inspect [sic] the roadways to be used during construction. This third party shall be hired to evaluate, document, and rate road condition prior to construction of the wind turbine project, and again 30 days after the wind turbine project is completed. Any road damage done by the permit applicant or one or more of its contract's or subcontractors shall be repaired or reconstructed at the permit applicant's expense.

“The permit applicant shall provide the Town with written notices of completion of construction within 30 days after the wind turbine project construction is complete. Determination as to how the roads should be repaired or reconstructed, with Wisconsin Department of Transportation standards for towns, or town standards if they exist, must be completed before the wind turbine or project is commissioned.

“At the end of the wind turbine or project construction, the Town board of supervisors, will negotiate the percentage of road repair at the time the work is actually done. Actual work on the road repair or reconstruction will occur at the earliest possible time. Any road damage caused by the permit holder or their agents during the repair, replacement, or decommissioning of any wind turbines during the \_\_\_\_\_ year life of the project shall be paid for by the permit holder per the above language.”

## **Model Wind Ordinance Reference Guide**

### **Soil erosion**

Competent and experienced construction crews who work on large projects such as a wind energy facility can be expected to know relevant laws on soil erosion and to adhere to them. It may be worth discussing with the applicant how erosion will be prevented, given the expected construction schedule and the possibility of delays.

### **H. Water Wells**

Both the Kewaunee moratorium study committee and the Addison CUP require a baseline and remediation.] Some wind turbine foundations may require breaking up and removing bedrock. Nevertheless, it is possible to include language in the ordinance to protect nearby water wells by establishing a baseline prior to excavation and requiring temporary and permanent remedies if a nearby well is contaminated.

### **I. Shadow Flicker**

Wind turbines cast shadows when the sun is not obscured. During morning and evening hours, shadows are especially long. During winter, shadows are long during much of the day, but this is mitigated somewhat by increased cloud cover and shorter days compared to summer. When the wind turbine blades are rotating, they cast moving shadows, usually more than one blade shadow passing per second. This is called shadow flicker, and the strobe-like effect can be annoying to humans, while livestock don't seem to be affected. It is possible to map the pattern of shadow and thus the affected inhabited structures. This can be done manually, or with software (see <http://www.emd.dk/default.htm>, [www.emd.dk/WindPRO/](http://www.emd.dk/WindPRO/), and also [www.resoft.co.uk](http://www.resoft.co.uk)). Either way, a prediction can also be made of the accumulated time during a day, month, or year that both a shadow would reach the inhabited structure and the sun would not be obscured.

### **J. Process Issues**

i. Period and time of construction. It may be desirable to set beginning and ending dates for the construction project as well as daily hours during which construction activity may occur.

ii. Hearing and review fees. The local jurisdiction may wish to require the applicant to reimburse the town for legal notices, meeting fees, and reasonable fees for consulting, legal advice, and engineering.

iii. Change orders. The local jurisdiction may wish to establish a process whereby the applicant or its contractor is required to request a change order for any significant change not originally negotiated or approved in the original ordinance or use permit, for example moving the location of a wind turbine or drilling rather than blasting a foundation.

\* \* \* \* \*