

INTRODUCTION

The growth in the number of wind energy conversion systems (WECS) in Minnesota over the last 15 years is a remarkable sustainability initiative. But WECS have impacts on other land uses that are found in areas of wind resources, including residential homes, some agriculture, natural resources, and on the character of the community. During the 1990's, several counties in Minnesota adopted wind ordinances to address the land use conflicts of local wind development. As the popularity of wind energy increased, and as the cost dropped to the point of being cost-competitive with other sources of electric power, and increasing number of local governments found themselves trying to address proposed WECS without the proper policies or zoning tools in place. Cities have now begun to address these issues, as urban residents and businesses start looking for opportunities to improve sustainability and energy independence.

Large WECS, Small WECS

In order to address the issues associated with WECS, local governments must understand that WECS come in many different sizes and designs, with dramatically different impacts on and benefits to the community. The first distinction communities need to make in addressing WECS in their development regulations is between systems that are primarily designed as electric power generators for utility systems or wholesale power markets, and those systems that are designed primarily to provide power to a single residence or business. The former use utility-scale turbines with a capacity measured in megawatts, rise hundreds of feet into the air, and are typically (but not always), part of a wind farm system with other similar turbines. The latter are, by contrast, quite small in terms of generating capacity, height, and frequency in the landscape. Small wind systems are sometimes further divided into two categories of very small systems and larger systems. Where these divisions are made is highly dependent upon the character of the community, the type of local government, and the magnitude of the wind resource.

Model Wind Energy Ordinance

This ordinance is based primarily on the model ordinance for county governments created in 2005 by the Clean Energy Resource Teams and the Minnesota Project. The ordinance was created to help counties address the evolving dilemmas associated with utility-scale wind development (large turbines typically with over one megawatt (1 MW) of capacity). The Model Ordinance and supporting documents were prepared in partnership by:

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The accompanying guide to the CERTS model ordinance may be found at:

www.mncounties3.org/macpqa/OrdinanceLinks/wind%20ord1.pdf

Additional sources include:

- *In the Public Interest: How and Why to Permit for Small Wind Systems - A Guide for State and Local Governments, September 2008*
- *Permitting Small Wind Turbines: A Handbook, California Energy Commission, AWEA, September 2003*
- *Small Wind Energy Guide: Kandiyohi County, Minnesota, August 2007*
- *City of Minneapolis Wind Energy Ordinance*
- *City of Pipestone WECS Ordinance*

Why Zone for Small Wind Systems?

Your family's electric bill has climbed to \$400 per month and you expect it go higher. You are worried how global warming will affect your kids. And you don't want to wait around for others to fix these problems. Generating your own, clean power sounds like a great idea, and something you may even be able to afford with the rebate program your state offers for small wind turbines. So you spend months researching equipment, your neighborhood's wind resource, and ways to pay for a new turbine. All your ducks are finally in line, but when you apply for a building permit, the county office has never heard of small wind systems, or if they have, only of rumors that they are noisy and kill birds. This technology is also nowhere to be found in the zoning code and it is hard for the zoning office to find out information about how to treat this unique structure. Or, since the closest thing the zoning office has dealt with before is large, utility-scale turbines, your 5 kilowatt turbine is treated the same as a 50,000 kilowatt power plant and the permitting requirements and costs are impossibly out of reach.

Source: In the Public Interest: How and Why to Permit for Small Wind Systems, A Guide for State and Local Governments, American Wind Energy Association, September 2008

Elements of a WECS Ordinance

Counties, cities, and townships are enabled to regulate land use under Minnesota Statutes 394 and 462 for the purpose of: “promoting the health, safety, morals, and general welfare of the community.” How wind energy land use issues affect each type of community will significantly change the structure and focus of the WECS ordinance. Some common elements to consider in all communities are noted below.

A. Distinguish between Types of Wind Energy Applications

As noted earlier in the introduction, the community will likely need to distinguish between the different sizes of wind energy systems relative to the typical lot size, density, natural resources, and wind resource. Two or three categories of WECS may need to be identified in the ordinance: large scale (commercial), smaller scale (non-commercial), very small (micro).

B. Define Necessary Permits

Some WECS can be listed as permitted uses, but others should be considered conditional uses, and some applications should be prohibited. Large-scale WECS should always be conditional, in order to ensure that the specific design of the system minimizes nuisances and always for public comment. Non-commercial WECS in rural areas should probably be permitted uses. Conditional use permits may be justified for non-commercial systems where housing density is greater than a rural setting. WECS on lots smaller than one acre become problematic, although in certain circumstances half-acre lots can accommodate micro-WECS. Genuine urban density areas (either in existence or planned) should not include WECS as a permitted or conditional use, barring a change in technology that allows for decreased visual, safety, and noise impacts.

If the community chooses to utilize a wind-energy overlay district, a greater degree of flexibility should be built into the development process. Large-scale projects should probably still be conditional, but fewer conditions will allow the district to serve as an encouragement for sustainable development of local wind resources.

C. Establish Setbacks

Communities need to identify setbacks that protect surrounding land uses and community character but still allow reasonable WECS to be developed. Examples of setbacks include:

1. **Commercial**

Homes 750 feet, property lines 1.1 - 1.25 of the WECS total height, road rights-of-way 1 x total height, conservation lands 600 feet, type III, IV and V wetlands 600 feet, scenic river bluffs 500 - 1340 feet.

2. **Non-Commercial**

Property lines 1.1 x total height, ROWs 1 x total height or fall zone + 10'.

D. **Establish Safety Standards**

Communities need to identify safety standards that protect without effectively prohibiting the WECS. Requiring engineering certification on very small systems may have the same effect as prohibiting WECS. Residential areas may need some consideration of a tower as an attractive nuisance, and reasonable fall zones should always be considered.

E. **Establish Design Standards**

Design standards need to be matched to the type of WECS. Commercial systems should always have tubular towers. Treatment of power lines, color, lighting, signage, and substation should be specified. Non-commercial systems, depending on the allowed height and the surrounding land uses, may also have specific design considerations that must be followed. All WECS other than the very small category should have a decommissioning plan and provisions.

F. **Establish Other Applicable Standards**

Noise standards are particularly important for non-commercial systems in non-agricultural areas for the satisfaction of surrounding land owners and protection of the WECS owner from unwarranted complaints. Minnesota state law is based on a standard of 50 decibels at the nearest house). Electric code compliance and FAA regulations may also need to be addressed. Cities and rural areas near may need to address visual impacts

G. **Minimize Infrastructure Impacts**

Commercial systems need to address the risk to roads for both initial transportation of components and on-going maintenance of the WECS. Any system (commercial or non-commercial) that includes excavations for creating a foundation needs to protect drainage systems. Telecommunications infrastructure can be affected if care is not taken. Green infrastructure can also be affected, including habitat systems and natural viewsheds that define community character.

Urban WECS Ordinance, Pipestone

Subd. 1. General Wind energy conversion systems (WECS) are allowed as a conditional use in all zoning districts of the City of Pipestone subject to City Council approval through the conditional use permit process and the following minimum conditions:

1. *That climbing access to the tower by unauthorized personnel be restricted.*
2. *That the noise level of the system not exceed noise levels prescribed by Minnesota State Regulation NCP 1 and 2 noise standards, November 27, 1974.*
3. *That total tower height not exceed 60 feet above ground level.*
4. *That no part of the system be within 10 feet of a property line.*
5. *That the tower and tower footing be engineered to withstand wind and icing loads for this geographical area.*
6. *The following must be attested to by the commercial system manufacturer or a certified engineer:*
 - * *That the system has a type of automatic shutdown to render it inoperable in conditions of imbalance or excessive wind speeds.*
 - * *That the blade design and materials are adequate to insure safe operation in an urban area.*
 - * *That the wind turbine and wind turbine tower are compatible.*
7. *That operation of the WECS does not cause radio or television interference.*
8. *That utility interface requirements are met to the satisfaction of the Pipestone Planning Commission.*

Source: City of Pipestone Zoning Ordinance, SEC. 11.42

Alternative Standards

This model ordinance was written primarily for county or township governments, and targeted for situations typical for rural southwestern Minnesota. Many standards will need to be adapted for communities that are less rural or that have lower quality wind resources. Most cities can disregard virtually all of the commercial WECS provision except for the possibility of isolated utility-scale turbines on very large parcels that are unlikely to be subdivided or redeveloped (industrial or institutional areas). Local units of government will need to assess their own community standards and may choose alternative thresholds than shown here.

Interpretation, Conflict and Separability

The community may wish to examine the Interpretation, Conflict and Separability language in its other ordinances and utilize consistent language.

I. Wind Energy Conversion System Ordinance

- A. **Purpose** - This ordinance is established to regulate the installation and operation of Wind Energy Conversion Systems (WECS) within Model Community not otherwise subject to siting and oversight by the State of Minnesota under the Minnesota Power Plant Siting Act (MS 116C.51-116C.697.), and consistent with Model Community's Comprehensive Plan goals, including the following:
1. Goal - Encourage the sustainable use of local economic resources.
 2. Goal - Encourage development that helps meet Model Community's and the State of Minnesota's climate protection goals.
 3. Goal - Minimize conflicts between desirable land uses that may need to coexist in the same area.
- B. **Interpretation, Conflict and Separability**
1. **Interpretation** - In interpreting these regulations and their application, the provisions of these regulations shall be held to be the minimum requirements for the protection of public health, safety and general welfare. These regulations shall be constructed to broadly promote the purposes for which they are adopted.
 2. **Conflict** - These regulations are not intended to interfere with, abrogate or annul any other ordinance, rule or regulation, statute or other provision of law except as provided in these regulations. No other provision of these regulations that impose restrictions different from any other ordinance, rule or regulation, statute or provision of law, the provision that is more restrictive or imposes higher standards shall control.
 3. **Separability** - If any part or provision of these regulations or the application of these regulations to any developer or circumstances is a judged invalid by any competent jurisdiction, the judgment shall be confined in its operation to the part, provision or application directly involved in the controversy in which the judgment shall be rendered and shall not affect or impair the validity of the remainder of these regulations or the application of them to other developers or circumstances.
- C. **Enforcement, Violations, Remedies and Penalties** - Enforcement of the Wind Energy Conversion System Ordinance shall be done in accordance with process and procedures established in Section ____ of the Model Community Zoning Ordinance.

D. Definitions

Aggregated Project - Aggregated projects are those which are developed and operated in a coordinated fashion, but which have multiple entities separately owning one or more of the individual WECS within the larger project. Associated infrastructure such as power lines and transformers that service the facility may be owned by a separate entity but are also included in the aggregated project.

Commercial WECS - A WECS of equal to or greater than 100 kW in total name plate generating capacity.

Non-Commercial WECS - A WECS less than 100 kW in total name plate generating Capacity.

Fall Zone - The area, defined as the furthest distance from the tower base, in which a guyed tower will collapse in the event of a structural failure. This area is less than the total height of the structure.

Feeder Line - Any power line that carries electrical power from one or more wind turbines or individual transformers associated with an individual wind turbine to the point of interconnection with the electric power grid, in the case of interconnection with the high voltage transmission systems the point of interconnection shall be the substation serving the WECS.

Meteorological Tower - For the purposes of this Wind Energy Conversation System Ordinance, meteorological towers are those tower which are erected primarily to measure wind speed and directions plus other data relevant to siting WECS. Meteorological towers do not include towers and equipment used by airports, the Minnesota Department of Transportation, or other similar applications to monitor weather conditions.

Micro-WECS - Micro-WECS are WECS of two (2) kW nameplate generating capacity or less mounted on a tower of 60 feet or less.

Property Line - The boundary line of the area over which the entity applying for WECS permit has legal control for the purposes of installation of a WECS. This control may be attained through fee title ownership, easement, or other appropriate contractual relationship between the project developer and landowner.

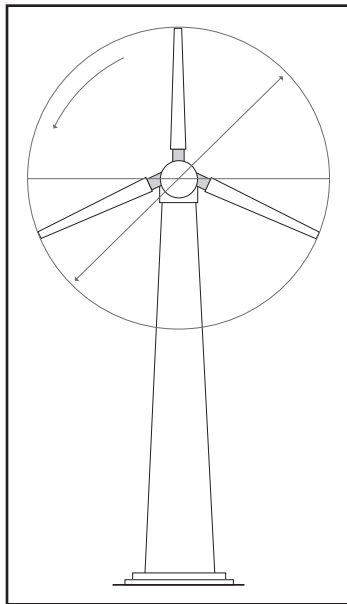
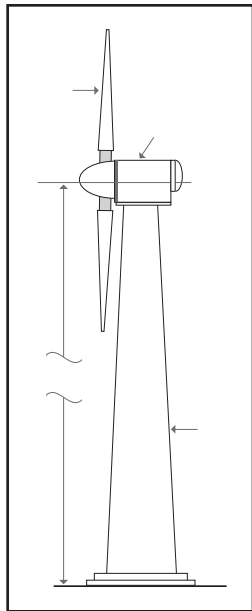
Public Conservation Lands - Land owned in fee title by State or Federal agencies and managed specifically for conservation purposes, including but not limited to State Wildlife Management Areas, State Parks, State Scientific and Natural Areas, federal Wildlife Refuges and Waterfowl Production Areas. For the purposes of this section public conservation lands will also include lands owned in fee title by non-profit conservation organizations. Public conservation lands do not include private

Commercial, Non-Commercial

Different communities will set different thresholds to distinguish between commercial and non-commercial wind energy systems. Under existing Minnesota law renewable energy projects with a electric generating capacity of less than 40 kW qualify for “net metering,” in which electric generation in excess of on-site demand is purchased by the electric utility at the retail rate. While the net metering threshold seems reasonable, the standard is actually somewhat artificial. The land use and nuisance characteristics of a 40 kW system and a 100 kW system are quite similar, especially in rural communities. Federal and state laws have established relatively favorable procedures and rates for interconnecting renewable generators of under 100 kW capacity. Some communities may find that turbines of up to 100 kW are fully consistent with other land uses and reasonably quality for a less rigorous (non-commercial) set of standards and review procedures.

Micro-WECS

This model ordinance recognizes a separate category for very small WECS that has a lower threshold for land use approval. The example here uses a capacity threshold of two kW, quite small for a generator, on a 60-foot tower, the minimum height for meaningful production. Urban communities may consider regulation for shorter towers and building mounted systems (see Minneapolis reference at the end of the ordinance) but these systems are unproven and are little more than curiosities; technology does not currently exist to meaningfully capture the turbulent and low speed urban wind resource.



lands upon which conservation easements have been sold to public resource management agencies or non-profit conservation organizations.

Rotor Diameter - The diameter of the circle described by the moving rotor blades.

Substations - Any electrical facility designed to convert electricity produced by wind turbines to a voltage greater than (35,000 KV) for interconnection with high voltage transmission lines shall be located outside of the road right of way.

Total Height - The highest point, above ground level, reached by a rotor tip or any other part of the WECS.

Transmission Line - Those electrical power lines that carry voltages of at least 69,000 volts (69 KV) and are primarily used to carry electric energy over medium to long distances rather than directly interconnecting and supplying electric energy to retail customers.

Tower - Towers include vertical structures that support the electrical generator, rotor blades, or meteorological equipment.

Tower Height - The total height of the WECS exclusive of the rotor blades.

WECS - Wind Energy Conversion System - An electrical generating facility comprised of one or more wind turbines and accessory facilities, including but not limited to: power lines, transformers, substations and metrological towers that operate by converting the kinetic energy of wind into electrical energy. The energy maybe used on-site or distributed into the electrical grid.

Wind Turbine - A wind turbine is any piece of electrical generating equipment that converts the kinetic energy of blowing wind into electrical energy through the use of airfoils or similar devices to capture the wind.

- E. **Procedures for Permits** - Zoning, Land Use, and Conditional Use permits and Variances shall be applied for and reviewed under the procedures established in this Ordinance, except where noted below.
1. The application for all WECS shall include the following information:
 - a. The names of project applicant
 - b. The name of the project owner
 - c. The legal description and address of the project

- d. A description of the project including: number, type, name plate generating capacity, tower height, rotor diameter, and total height of all wind turbines and means of interconnecting with the electrical grid.
 - e. Site layout, including the location of property lines, wind turbines, electrical wires, interconnection points with the electrical grid, and all related accessory structures. The site layout shall include distances and be drawn to scale.
 - f. Engineer’s certification of tower structure and foundation. Manufacturer certification and specification sheets may, at the discretion of Model Community, be used in place of engineering study for non-commercial WECS.
 - g. Documentation of land ownership or legal control of the property.
 - h. Non-commercial WECS shall submit a copy of the interconnection agreement with the utility or documentation that an interconnection agreement is not necessary.
 - i. Non-commercial WECS that are not connected to the electric grid shall identify location of battery or other storage device.
2. The application for commercial WECS shall also include:
- a. The latitude and longitude of individual wind turbines.
 - b. A USGS topographical map, or map with similar data, of the property and surrounding area, including any other WECS within 10 rotor diameters of the Proposed WECS.
 - c. Location of lakes, wetlands, parks, federal or state habitat areas, other protected natural areas, and County Biological Survey sites within 1,320 feet of the proposed WECS.
 - d. An acoustical analysis documenting the sound level within 1000 feet of the turbine
 - e. FAA Permit Application
 - f. Location of all known communications towers within 2 miles of the proposed WECS Decommissioning Plan
 - g. Identification of nearby WECS and description of potential impacts on wind resources on adjacent properties.
- F. **Procedure for Aggregated Projects** - Aggregated projects may jointly submit a single application and be reviewed under joint proceedings, including notices, hearings, reviews and as appropriate approvals. Permits will be issued and recorded separately. Joint applications will be assessed fees as one project.

Aggregated Projects

Large electric generating facilities are regulated by the State rather than by local governments. Aggregated projects having a combined capacity equal to or greater than the threshold for State oversight as set forth in MS Statute 216F.01 through 216F.09 (currently 5 MW for wind energy projects, except as noted below) shall be regulated by the State of Minnesota. Commercial wind developments (wind farms) are, however, sometimes broken into phases, or separated by ownership but not by geography. Aggregated projects have been a grey area regarding whether the local government has regulatory authority.

In 2007, the Statute setting regulatory thresholds was changed to better define aggregated projects and to allow counties the option of regulating wind energy projects of up to 25 MW (216.F.08), if they follow the process defined in Statute.

Alternatives to Zoning District Regulation

An alternative to setting commercial WECS standards for each zoning district is to establish a Wind Energy Development Overlay District. The community can proactively identify where the conditions are good and bad for large scale wind development based on community priorities such as viewshed protection, natural resource areas, or ultimate build-out for rural residential or urban development. The community would map an overlay with a separate set of WECS standards. The overlay concept could also be applied to small (non-commercial) WECS in some circumstances.

Standards for Micro-WECS

Communities should also consider standards for very small (micro) WECS. In particular, cities and counties with large-lot residential development (2 - 10 acre lots) are likely to need to address interest in wind energy installations for residential homes. These installations will likely be less than 10kW and be 60 to 100 feet in height. Some urban areas allow small WECS with even smaller towers. At tower heights lower than 60 feet, however, the wind resource becomes turbulent and loses much of its power. If the community wants to limit tower heights lower than 60 feet, wind turbines of any sort are not yet viable as meaningful energy sources.

G. District Regulations - WECS will be permitted, conditionally permitted or not permitted based on the generating capacity and land use district as established in the table below:

District	Non-Commercial*	Commercial	Meteorological Tower*
Agriculture (A-1, A-2, A-3)	Permitted	Conditionally Permitted	Permitted
Rural Residential	Conditionally permitted	Not permitted	Not Permitted
Rural Town Site	Not permitted	Not permitted	Not Permitted
General Business District	Not permitted	Not Permitted	Not permitted
Highway Commercial	Conditionally permitted	Not Permitted	Permitted
Light Industry	Permitted	Conditionally Permitted	Permitted
Heavy Industry	Permitted	Conditionally Permitted	Permitted
Shoreland	[may depend upon the lake and the specific district]	Not permitted	Not permitted
Urban Expansion Overlay District	Conditionally permitted	Not permitted	Not permitted
Conservation / Special Protection	[requires examination of the district purpose, the underlying resource and the impacts of a wind turbine on that resource]	[requires examination of the district purpose, the underlying resource and the impacts of a wind turbine on that resource]	[Requires examination of the district purpose, the underlying resource and the impacts of a wind turbine on that resource]
Shoreland	Conditionally permitted	Not permitted	Not permitted
Wild and Scenic River	Conditionally permitted	Not permitted	Not permitted

* Non-Commercial WECS and Meteorological towers shall require a conditional use permit if over _____ feet in height in accordance with the Model Community Zoning Ordinance.

H. Setbacks, Wind Turbines and Meteorological Towers - All towers shall adhere to the setbacks established in the table on the following page.

	Wind Turbine – Non- Commercial	Wind Turbine - Commercial WECS	Meteorological Towers
Property Lines	1.1 times the total height in Agricultural or Industrial Land Use Districts only, or the distance of the fall zone, as certified by a professional engineer + 10 feet.	1.25 times the total height	The fall zone, as certified by a professional engineer, + 10 feet or 1.1 times the total height.
Residential Dwellings*		750 feet	The fall zone, as certified by a professional engineer, + 10 feet or 1.1 times the total height.
Road Rights-of-Way**	The distance of the fall zone as certified by a professional engineer + 10 feet or 1 times the total height.	1 times the height, may be reduced for minimum maintenance roads or a road with Average Daily Traffic count of less than 10.	The fall zone, as certified by a professional engineer, + 10 feet or 1 times the total height.
Other Rights-of-Way (Railroads, power lines, etc)	The lesser of 1 times the total height or the distance of the fall zone, as certified by a professional engineer + 10 feet.	To be considered by the planning commission	The fall zone, as certified by a professional engineer, + 10 feet or 1 times the total height.
Public conservation lands	NA	600 feet	600 feet
Wetlands, USFW Types III, IV and V	NA	600 feet	600 feet
Other Structures		To be considered	
Other Existing WECS	NA	To be considered based on: - Relative size of the existing and proposed WECS -Alignment of the WECS relative to the predominant winds. -Topography -Extent of wake interference impacts on existing WECS. -Property line setback of existing WECS. -Other setbacks required. Waived for internal setbacks in multiple turbine projects including aggregated projects.	
_____ River Bluff		[500 / 1,000 / 1,320 /]	

* The setback for dwellings shall be reciprocal in that no dwelling shall be constructed within 750 feet of a commercial wind turbine.

** The setback shall be measured from future rights-of-way if a planned changed or expanded right-of-way is known.

Meteorological Towers
The community may have an existing tower ordinance in place, and may choose to regulate meteorological towers under that ordinance.

River Bluff Setback (previous page)

The intent of the setback from river bluffs is to minimize the impact on the scenic qualities of major rivers valleys such as the Mississippi, St. Croix and Minnesota. Care should be taken to avoid excessive setbacks, particularly from bluffs overlooking smaller tributaries to the major river. Wabasha County Minnesota has adopted 1/4 mile setbacks (1,325 feet) from bluffs overlooking tributaries as well as the Mississippi River. This effectively creates a broad corridor where WECS are prohibited. Areas with complex terrain are better suited to use the overlay concept rather than District-based setbacks.

Substations and Accessory Facilities

Many zoning ordinances address “essential services” which includes electric power lines and substations. Most substations are sited adjacent to the road ROWs. This conserves farm land and reduces costs for such facilities, but creates some concerns for road authorities including sight lines, snow drifting, and financial liabilities during road re-construction. Substations associated with WECS should be regulated in a manner consistent with essential service regulations. However, if not regulated under a separate standard, the WECS ordinance should establish specific setbacks for substations and lines.

Meteorological Towers Exempt from Zoning District Standards

This subsection presumes that land uses with a height greater than 100’ require a conditional use permit (common in county zoning ordinances). Communities should ensure consistency between the Standards section and District Regulations.

1. **Setbacks, Substations and Accessory Facilities** - Minimum setback standards for substations and feeder lines shall be consistent with the standards established in the Model Community General Development Standards for Essential Services.

I. Requirements and Standards

1. **Safety Design Standards**

- a. **Engineering Certification** - For all WECS, applicant must provide engineering certification of turbine, foundation, and tower design is within accepted professional standards, given local soil and climate conditions. For non-commercial and micro-WECS, certification can be demonstrated by the manufacture’s engineer or another qualified engineer.
- b. **Clearance** - Rotor blades or airfoils must maintain at least 12 feet of clearance between their lowest point and the ground.
- c. **Warnings**
 - i. For all commercial WECS, a sign or signs shall be posted on the tower, transformer and substation warning of high voltage. Signs with emergency contact information shall also be posted on the turbine or at another suitable point.
 - ii. For all guyed towers, visible and reflective objects, such as plastic sleeves, reflectors or tape, shall be placed on the guy wire anchor points and along the outer and innermost guy wires up to a height of 8 feet above the ground. Model Community may require that visible fencing be installed around anchor points of guy wires.
 - iii. Consideration shall be given to painted aviation warning on metrological towers of less than 200 feet.
- d. **Energy Storage** - Batteries or other energy storage devices shall be designed consistent with the Minnesota Electric Code and Minnesota Fire Code.

2. **Other Standards**

- a. **Total Height, Non-Commercial WECS** - Non-Commercial WECS shall have a total height, including tower and rotor at its highest point, of less than 200 feet.
- b. **Meteorological Towers Exempt from Zoning District Height Standards** - In those districts where meteorological towers are a permitted use, meteorological towers of less than 200 feet shall be exempt from the Conditional Use requirement for other land uses.

- c. **Tower Configuration**
 - i. All wind turbines that are part of a commercial WECS shall be installed with a tubular, monopole type tower.
 - ii. Meteorological towers may be guyed.
- d. **Color and Finish**
 - i. All wind turbines and towers that are part of a commercial WECS shall be white, grey and another non-obtrusive color. Blades may be black in order to facilitate deicing. Finishes shall be matt or non-reflective.
 - ii. Exceptions may be made for metrological towers, where concerns exist relative to aerial spray applicators.
- f. **Lighting** - Lighting including lighting intensity and frequency of strobe, shall adhere to but not exceed requirements established by Federal Aviation Administration permits and regulations. Red strobe lights are preferred for nighttime illumination to reduce impacts on migrating birds. Red pulsating incandescent lights should be avoided. Exceptions may be made for metrological towers, where concerns exist relative to aerial spray applicators.
- g. **Other Signage** - All signage on site shall comply with the Model Community sign ordinance. The manufacturer's or owner's company name and /or logo may be placed upon the nacelle, compartment containing the electrical generator, of the WECS.
- h. **Feeder Lines** - All communications and feeder lines, equal to or less than 34.5 kV in capacity, installed as part of a WECS shall be buried where reasonably feasible. Feeder lines installed as part of a WECS shall not be considered an essential service, as described in Model Community's General Development Standards
- i. **Waste Disposal** - Solid and Hazardous wastes, including but not limited to crates, packaging materials, damaged or worn parts, as well as used oils and lubricants, shall be removed from the site promptly and disposed of in accordance with all applicable local, state and federal regulations.
- j. **Discontinuation and Decommissioning** - A WECS shall be considered abandoned after one (1) year without energy production, unless a plan is developed and submitted to the Model Community Zoning Administrator outlining the steps and schedule for returning the WECS to service. All WECS and accessory facilities shall be removed to [ground level / four feet below ground level] within 80 days of abandonment.

Essential Services

The model ordinance references the Essential Services Ordinance for determining substation and feeder line setbacks (Setbacks, Substations on previous page, Feeder Lines on current page). The intent is not to necessarily define the feeder lines as an essential service. The model ordinance anticipates that there will be projects that run feeder lines to interconnection points that are off site. The ordinance does not intend to provide commercial projects with the same prerogatives as a essential services, but rather to simplify determination of setbacks and placement of substations and feeder lines relative to rights-of-ways.

Feeder Lines

The requirement to bury all feeder lines may, in some communities, need to include provisions for exceptions.

Discontinuation and Decommissioning

Provisions for decommissioning the site after productive use has stopped protects the community in a variety of ways. Removal of the tower and accessory structures will limit the potential for blight and safety concerns associated with un-maintained equipment. An alternative to removal is restoration of the site, in which subterranean fixtures/foundations are also removed. Restoration will facilitate the return of the site to agricultural production or other uses.

The community should also require that the developer post a decommissioning bond or other financial assurance. The local government should not bear the risk of decommissioning should the wind developer go bankrupt.

- k. **Decommissioning Plan Required** - Each commercial WECS shall have a Decommissioning plan outlining the anticipated means and cost of removing WECS at the end of their serviceable life or upon abandonment. The cost estimates shall be made by a competent party; such as a Professional Engineer, a contractor capable of decommissioning or a person with suitable expertise or experience with decommissioning. The plan shall also identify the financial resources that will be available to pay for the decommissioning and removal of the WECS and accessory facilities.
- l. **Orderly Development** - Upon issuance of a conditional use permit, all commercial WECS shall notify the Environmental Quality Board Power Plant Siting Act program Staff of the project location and details on the survey form specified by the Environmental Quality Board.

J. **Other Applicable Standards**

- 1. **Noise** - All WECS shall comply with Minnesota Rules 7030 governing noise.
- 2. **Electrical Codes and Standards** - All WECS and accessory equipment and facilities shall comply with the National Electrical Code and other applicable standards.
- 3. **Federal Aviation Administration** - All WECS shall comply with FAA standards.

- K. **Interference** - The applicant shall minimize or mitigate any interference with electromagnetic communications, such as radio, telephone, microwaves, or television signals cause by any WECS. The applicant shall notify all communication tower operators within ___ miles of the proposed WECS location upon application to Model Community for permits. No WECS shall be constructed so as to interfere with Model Community or Minnesota Department of Transportation microwave transmissions.

L. **Avoidance and Mitigation of Damages to Public Infrastructure**

- 1. **Roads** - Applicants shall:
 - a. Identify all county, city or township roads to be used for the purpose of transporting WECS, substation parts, cement, and/or equipment for construction, operation or maintenance of the WECS and or substation and obtain applicable weight and size permits from impacted road authority(ies) prior to construction.
 - b. At the request of the road authority, the applicant shall post bonds or other financial assurance, subject to approval of Model Community, sufficient to restore the road(s) to preconstruction conditions.

Interference

The radius for notification of all communications tower operators will range from two to five miles, depending on the community.

Avoidance and Mitigation of Damages

Transporting large wind turbines and components to remote sites sometimes requires using roads that are not rated for the weight of the turbine. Developers should notify local road authorities and mitigate for damage risk prior to transporting the turbine and equipment.

Similar provisions should be made green infrastructure. The USFWS and the Minnesota DNR have adopted guidelines for identifying risks and best management practices for mitigating those risks. If the community uses a wind overlay approach rather than the district-based regulation outlined here, the DNR guidelines can help define the overlay district.

2. **Drainage System** - The Applicant shall be responsible for immediate repair of damage to public drainage systems stemming from construction, operation or maintenance of the WECS.
 3. **Green Infrastructure** - The Applicant shall meet the Minnesota Department of Natural Resources Guidance for Wind Projects, June, 2009 version or most recent version, for siting wind energy facilities and mitigation of risk to natural resources, including the following standards:
 - a. Providing the following information in the application:
 - i. natural heritage concerns within the project
 - ii. public lands within one mile of the project
 - iii. conservation easements and other officially protected natural areas within a quarter mile of the project
 - iv. shoreland areas, wildlife corridors and habitat complexes, and designated scenic views.
 - d. Demonstrating how the project integrates the United State Fish and Wildlife Service (USFWS) best management practices for minimizing impacts to wildlife from wind energy projects.
- M. **Micro-turbine Standards and Urban Lots** - WECS shall be allowed on lots of less than one acre provided the following conditions are met:
1. WECS are a permitted, provisional, conditional, or allowed accessory land use in the district,
 2. The setback requirements can be met on the lot, and
 3. The tower height is less than 60 feet.

Urban Lots

This ordinance includes provisions for wind turbines on urban lots, in this case meaning lots smaller than one acre in size. Unless the tower is kept quite low, installations on lots smaller than one acre cannot meet setback requirements. Lower towers mean that the turbine is a questionable energy resource. Communities should consider not allowing WECS in areas where the turbine will dramatically underperform its rated capacity. Community sustainability is not enhanced by putting up a dramatically under-utilized wind turbine.

Urban WECS Ordinance, Minneapolis

Conditional uses - Freestanding wind energy conversion systems may be allowed as a conditional use, subject to the provisions of Chapter 525, Administration and Enforcement, sections 535.740 and 535.750, and the following location and lot size restrictions:

1. *Residence and office residence districts - Freestanding wind energy conversion systems in the residence and office residence districts shall only be located on institutional use sites.*
2. *Downtown area - Freestanding wind energy conversion systems shall be prohibited in the downtown area including all downtown districts and the area bounded by the Mississippi River, I-35W, I-94, I-394, and 3rd Avenue North (extended to the river).*
3. *Minimum lot area - No freestanding wind energy conversion system shall be established on a zoning lot less than one (1) acre in area. A maximum of one wind energy conversion system per acre of lot area shall be allowed.*

Source: City of Minneapolis Zoning Code 535.730