Planning Commission Meeting Agenda
Regular Scheduled Meeting Thursday, July 12, 2018– 6:30PM
CITY HALL COUNCIL CHAMBERS 300 CHIEF EDDIE HOFFMAN HIGHWAY

MEMBERS

Kathy Hanson
Chair
Term Expires 12/2018

Lorin Bradbury
Vice-Chair
Term Expires 12/2020

John Guinn
Commission Member
Term Expires 12/2019

Alex Wasierski
Commission Member
Term Expires 12/18

Shadi Rabi
Commission Member
Term Expires 12/19

Scott Campbell
Commission Member
Term Expires 1/2020

Thor Williams
Council Representative
Term Expires 10/19

Betsy Jumper
Ex-Officio Member

Pauline Boratko
Recorder

AGENDA

I. CALL TO ORDER

II. ROLL CALL

III. PEOPLE TO BE HEARD – (5 Minute Limit)

IV. APPROVAL OF THE AGENDA:

V. APPROVAL OF THE MINUTES:
A. Regular Meeting- June 14, 2018

VI. UNFINISHED BUSINESS:
A. Ordinance for Addresses with Fire Chief Bill Howell
B. Residential small tower structures

VII. NEW BUSINESS:

VIII. PLANNER'S REPORT

IX. SPECIAL ORDER OF BUSINESS:

X. COMMISSIONER'S COMMENTS

XI. ADJOURNMENT

Posted July 6, 2018 at City Hall, Post Office, Bethel Native Corp. and Swanson's Grocery Store Bulletin Boards

City of Bethel, Alaska
Planning Commission

June 14, 2018 Regular Meeting Bethel, Alaska

I. CALL TO ORDER:

A regular meeting of the Planning Commission was held on June 14, 2018 at the City of Bethel, Conference Room in Bethel, Alaska. Chair of the Commission Kathy Hanson called the meeting to order at 6:30 PM.

II. ROLL CALL:

Compromising a quorum of the Commission, the following members were present for roll call: Kathy Hanson, Lorin Bradbury, John Guinn, Alex Wasierski, and Shadi Rabi.

Excused Absence: Thor Williams

Also Present: Betsy Jumper, Planner; Pauline Boratko, Recorder; Fire Chief, Bill Howell; ONC Representative, Calvin Cockroft.

III. PEOPLE TO BE HEARD: No one wished to be heard

IV. APPROVAL OF THE AGENDA:

MOVED:	John Guinn	Motion to approve the agenda, moving new business item B to new business item A.
SECONDED:	Lorin Bradbury	
VOTE ON MOTION	Unanimous	

V. APPROVAL OF THE MINUTES:

MOVED:	Alex Wasierski	Motion to approve the May 10, 2018 meeting minutes and adding Shadi Rabi as present in the Roll Call.
SECONDED:	John Guinn	
VOTE ON MOTION	Unanimous	

VI. NEW BUSINESS:

A. Ordinance for Address with Fire Chief Howell: Chief Howell presented to the commission on changing the Bethel Municipal Code and ordinance on address marking requirements

B. PUBLIC HEARING: on May 14, 2018, the City of Bethel Planning Department received an application for a variance application. The legal description is lot 12, block 2, Plat number 70-444, of the Mumtretlek Subdivision. The physical address is 181 Main Street in Bethel, AK. 99559. The applicant requests lowered set back requirements as per Bethel Municipal Code in order to construct a new home.

MOVED:	John Guinn	Motion to move into public hearing
SECONDED:	Shadi Rabi	
VOTE ON MOTION	Unanimous	

ONC wishes to demolish existing home and build a new single family dwelling with lower set back requirements. They requested a setback of 3.65 feet instead of the usual 10 feet setback. The home will be constructed smaller than the existing family dwelling. There are no other homes around. Fire Chief Howell, and Planner Betsy Jumper supports this variance.

MOVED:	John Guinn	Motion to approve ONC's variance request to lower set back requirements to 3.65 feet as per BMC Code's 10 feet set back requirements in order to construct a new home
SECONDED:	Shadi Rabi	
VOTE ON MOTION	Unanimous	

MOVED:	John Guinn	Motion to move out of public hearing
SECONDED:	Shadi Rabi	
VOTE ON MOTION	Unanimous	

VII. PLANNER'S REPORT: Betsy Jumper gave her monthly report.

VIII. SPECIAL ORDER OF BUSINESS:

A. **COMMISSIONER'S COMMENTS:**

J. Guinn- no comment

L. Bradbury- Can we get Haroldson's Sub on the agenda for next meeting.

A. Wasierski- no comment.

S. Rabi- no comment.

K. Hanson- July 12th is our next meeting.

B. **ADJOURNMENT:**

MOVED:	Lorin Bradbury	Motion to adjourn the meeting.
SECONDED:	Shadi Rabi	
VOTE ON MOTION	Unanimous	

With no further business the meeting adjourned at 7:33 pm
APPROVED THIS _____ DAY OF _____, 2018

_____ _____

ATTEST: Pauline Boratko, Recorder Kathy Hanson, Chair

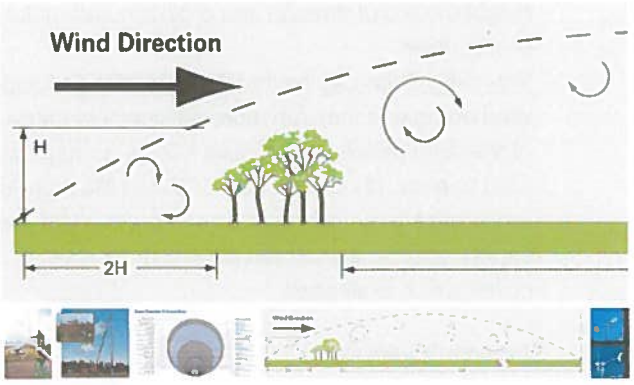
To: Pete Williams, City Manager
From: Betsy Jumper, Planner
Subject: May Manager's Report
Date: June 29, 2018

- Had a Planning Commission meeting on the 14th.
- Met with the Ayuprun Project Managers, the Public Works Director, the City Manager, and the Fire Chief to discuss the project.
- Residential site plan applications continue to come in regularly and get processed. This month we processed: construction of a detached garage; a shop addition; smokehouse construction; new residential home; and 5 site plans for infill.
- Continue working with the Port Dept. on a Army Corps. Of Engineer permit application submittal for the North Harbor Entrance expansion project.
- Continuing processing of the ONC Preliminary plat.
- Research of property owners.
- Answer public's questions on miscellaneous topics.
- Telephonic meeting with DOWL to go over the Avenues project and what is required from the Planning Dept.
- Research wind energy conversion systems in various Alaskan communities for private residential use.
- Research into City of Bethel property.
- Research and removal of two junk vehicles in the City's right-of-way.
- Went to several City Council Budget meetings--an interesting process.
- Gave report on Nuisance property to the City Council meeting 6-28-18.

Wind Power Basics

What is Wind Electricity?

Wind energy is a dynamic if invisible resource—the energy available in a moving mass of air. From grain grinding by simple wind-driven machines in ancient cultures to modern electricity-generating devices, the wind has been tapped to work for us.



Wind is a cubic energy resource. As the wind speed increases, the power available increases cubically. This means that it's very important to get into higher wind speeds, and the way we do that is with taller towers. Regardless of the turbine or tower type, going higher is the tried-and-true, reliable way to increase performance in a wind generator. And the most common mistake in wind electricity is installing a turbine on a short tower.

The swept area of a wind turbine is the second most important factor (after the wind resource itself) that determines energy production. The circle "swept" by the blades is the collector area. It's not possible to get a large amount of energy out of a small collector area. Betz' theorem says we can only get about 60% of the energy out of the wind before we start slowing it down too much and actually decreasing performance. In the real world, well-designed machines can achieve about half of that.

Turbines can be divided by orientation, directionality, generating mode, and by other characteristics. Horizontal-axis wind turbines (HAWTs) are the most common and effective orientation. Vertical-axis wind turbines (VAWTs) may appeal to the uninitiated, but continue to disappoint as far as performance and longevity—both of the machines and the companies. Upwind (the wind hits the turbine before it hits the tower) and downwind (the wind hits the tower before it hits the turbine) designs can both be very effective.

Generating devices generally fall into one of three categories. Most home-scale turbines use permanent magnet generators (PMGs), which typically have fixed coils of copper wire and rotating groups of magnets that pass by them. Some older machines use wound-field alternators, which use a small amount of the wind energy to create electro-magnetism in the rotating part of the alternator. Induction motor/generators use conventional induction motors, but have the wind push them beyond their normal operating speed, which takes them from using electricity to making electricity.

Three basic tower types are used for residential wind-electric systems. Freestanding towers are the most expensive, but can be installed in very close quarters, and are perhaps the safest to install and maintain. Tilt-up towers allow all maintenance and repair to be done on the ground, but require a large open area for installation and use. Fixed-guyed towers include lattice and pole styles that do not tilt, and must be climbed for installation and service. These are typically the least costly, and need a moderate area for installation.

A wind-electric system is much more than just the wind generator and tower. Also required are transmission wiring, electronic controls, batteries if storage or backup is desired, an inverter for household AC or grid-interconnect, as well as metering, overcurrent protection, and other standard electrical components. All appropriate components should be chosen for compatibility and functionality—it takes a whole system to make wind electricity.

Next

January 31, 2016
Opinions, Wisconsin

Light flicker from wind turbines can disturb brain function

James Protsman | Fond du Lac Reporter | January 30, 2016 | www.fdlreporter.com

A huge complaint by homeowners living near wind turbines concerns light flicker created by the rotating blades during daylight hours. When the first fluorescent lights came out they created perceptible flicker, and there were all kinds of complaints about it, such as it caused headaches, eyestrain and concentration difficulties. Newer fluorescent lights flicker at a much higher rate which most of us can't consciously detect, though some people can.

While the jury still is out on whether prolonged exposure to flicker causes serious health problems, there is no uncertainty about the fact it can significantly disturb brain function. It can "dumb down" the brain. Not a little but a lot.

Richard Caton (1842-1926) played a huge role in the discovery of the electrical nature of the brain. Using an electroencephalogram he discovered what is known as "the flicker response" in the brain, a strong burst of cerebral electrical activity when a person is exposed to flickering light. This neurological disturbance depresses mental function. It can cause a seizure in people with epilepsy, and they need to avoid flicker.

A simple experiment can show if flicker causes brain malfunction. Stand near a light switch in a room. This can be done in daylight or at night. See how high you can silently count during a single slow inhalation. This is a basic measure of brain speed. Repeat a few times. Then turn the switch on and off a few times. Then repeat the speed-counting test. You will probably notice a huge slowdown due to a rise in the difficulty of the task.

The negative effect on brain function that occurs during flicker continues for a while after it stops; it takes the body's neurological system a few minutes to return to normal. Flicker can disturb brain function even when eyes are closed and when the source of the flicker is behind rather than in front of a person.

For most people reading, thinking, speech, singing and every other form of mental work are made difficult in the presence of even faint flicker. It lowers IQ. Extremely bad for school-age children. There needs to be tests of the effect of flicker on skilled muscle movement because even a small degree of neurological disturbance makes this more difficult.

Wind turbines are springing up everywhere. They create flicker during daylight that can be measured long distances from the turbines. A moratorium on the spread of wind turbines would be prudent until the flicker problem can be fully studied and eliminated. At the very least it may mean employing black, light-blocking shades on most of the windows of a house.

Many people claim it is the low-frequency noise of the transformers and the moving blades that create health problems. Far away from any wind turbines stand near a refrigerator when the motor is running and creating a low hum. Repeat the speed-counting exercise used above. Then step away from the refrigerator and its hum and repeat the testing. If you find, as most people do, that brain speed is much faster away from the hum than in the "hum field" or "noise field" of a wind turbine even if you can't hear it, it's because a sound field of this type creates vibrations below the level of conscious perception in the brain's auditory system that can disrupt normal brain function.

Testing for the health effects of sound pollution and flicker pollution caused by wind turbines is extremely difficult and will continue to be so for a long, long time, but testing for cognitive effects is extremely fast and easy.

James Protsman

Manitowoc

URL to article: **https://www.wind-watch.org/news/2016/01/31/light-flicker-from-wind-turbines-can-disturb-brain-function/**

February 9, 2012
Opinions, Rhode Island

Wind committee concludes shadow flicker not an issue

BY HARLEY LEE, The Jamestown Press, www.jamestownpress.com 9 February 2012

When siting a wind turbine in a populated area, one of the issues that needs to be addressed is shadow flicker. In the early days of the wind energy industry in the U.S. this was not an issue as projects were being installed in remote areas. As wind energy use has increased and wind turbines are being installed closer to where people live and work –more like they are in Europe – the issue has become more important.

Shadow flicker is the shadow created by moving wind turbine blades. Since the blades can be 140 feet long or more and perched on a tower 200 feet high or more, and the sun may be at a low angle, the shadow can also be long and distant from the base of the tower. Here in the mid latitudes of the northern hemisphere, the sun will always be south of the zenith. That means the shadow will be north of the tower except near sunrise and sunset on summer days.

The shadow of a moving blade on a residence can be a significant annoyance. At a recent meeting of the Rhode Island Renewable Energy Siting Partnership, a couple living near the Portsmouth High School turbine showed a video of the shadow flicker at their house. To me, it looked like someone turning a bright light off and on over and over. It was clearly an annoyance. The key factor seems to be how many hours a year such shadows occur. For some Portsmouth neighbors of a wind turbine where the shadows only occur infrequently, the homeowners don't seem to mind. With long durations, it's annoying.

For drivers, moving shadows are common. Other vehicles – on the same road or on overpasses – cause moving shadows. A car is constantly moving in and out of shadows from trees, bridge structures, trucks, buildings, etc.

There are computer programs that can map the area where shadow flicker will occur. The Jamestown Wind Energy Committee had its contractor evaluate shadow flicker in its comparison of potential sites on Jamestown. Taylor Point scored well. The Taylor Point shadow flicker analysis is shown in Figure 7-2. The green area shows where shadows will fall with longer durations nearest the wind turbine and shorter durations farthest from the wind turbine. The key results for Taylor Point are:

- Most of the shadows fall on the water.

- No residence will be affected.

- Drivers heading east from the toll booth early on mid-summer mornings will see moving shadows for a couple seconds as they head for the bridge.

- No drivers on the bridge will be affected.

- Mechanics working in the Rhode Island Turnpike and Bridge Authority garage very early on summer mornings will see a few moments of moving shadows.

As the Wind Energy Committee concluded, Taylor Point does well from a shadow flicker standpoint.

The author is president of Endless Energy Corporation, a consultant chosen by the Town Council in December to conduct studies necessary to determine the costs and potential profitability of a Jamestown wind turbine.

URL to article: **https://www.wind-watch.org/news/2012/02/09/wind-committee-concludes-shadow-flicker-not-an-issue/**

TABLE 21.05-3: TABLE OF ACCESSORY USES – RESIDENTIAL, COMMERCIAL, INDUSTRIAL, AND OTHER DISTRICTS

P = Permitted S = Administrative Site Plan Review C = Conditional Use Review

	RESIDENTIAL														COMMERCIAL					INDUST.			OTHER					
Accessory Uses	**R-1**	**R-1A**	**R-2A**	**R-2D**	**R-2M**	**R-3**	**R-4**	**R-4A**	**R-5**	**R-6**	**R-7**	**R-8**	**R-9**	**R-10**	**B-1A**	**B-1B**	**B-3**	**RO**	**MC**	**I-1**	**I-2**	**MI**	**AF**	**DR**	**PR**	**PLI**	**W**	**Definitions and Use-Specific Standards**
Outdoor keeping of animals	P	P	P	P	P	P			P	P	P	P	P	P										P	P	P		21.05.070D.14.
Outdoor display accessory to a commercial use															P	P	P		P	P	P	P						21.05.070D.15.
Outdoor storage accessory to a commercial use																	P		P	P	P	P						21.05.070D.16.
Outdoor storage associated with a community use																	S								S	S		21.05.070D.22.
Outdoor storage of vehicles and/or equipment associated with a community use																	S								S	S		21.05.070D.23.
Parking of business vehicles, outdoors, accessory to a residential use	P	P	P	P	P	P	P	P	P	P	P	P	P	P														21.05.070D.17.
Private outdoor storage of non-commercial equipment accessory to a residential use	P	P	P	P	P	P	P	P	P	P	P	P	P	P										P				21.05.070D.18.
Telecommunications antenna only, large	P[5]	P[5]	P[5]	P[5]	P[5]	P[5]	P[5]	P[5]	P[5]	P[5]	P[5]	P[5]	P[5]	P[5]				P[6]						P[6]				21.05.040K.
Telecommunications antenna only, small	P	P	P	P	P	P	P	P	P	P	P	P	P	P														21.05.040K.
Type 4 tower	S[6]	S[6]	S[6]	S[6]	S[6]	S[6]	S[6]	S[6]	S[6]	S[6]	S[6]	S[6]	S[6]	S[6]				S								S		21.05.040K.
Vehicle repair/rebuilding, outdoor, hobby	P	P	P	P	P				P	P	P	P	P	P										P				21.05.070D.19.
Wind energy conversion system (WECS), freestanding small	S	S	S	S	S	S	S	S	S	S	S	S	S	S				S	S / C	S / C	S / C	S / C				S / C		21.05.070D.20.
Wind energy conversion system (WECS), building mounted small							S	S							S	S	S		S	S	S	S				S		21.05.070D.20.

[3] Accessory dwelling units in the R-1 and R-1A districts are limited to attached ADUs, which are added to or created within single-family dwellings.

[4] In the R-4 and R-4A districts, ADUs are allowed only on lots already improved with detached single-family dwellings as of January 1, 2014.

[5] The telecommunications antenna is allowed only when meeting the concealment standards of 21.05.040K.8.d. and as accessory to a multifamily structure containing at least seven dwelling units or to a nonresidential use.

i. Only one inoperative vehicle may stored outdoors on the site at any given time.

ii. Any vehicle being rebuilt or repaired shall be the property of the resident of the principal structure.

iii. Repair or rebuilding work shall take place to the rear or side of the principal structure and shall be screened from view from all property lines and adjacent rights-of-way by an opaque fence between six and eight feet in height, or by opaque landscaping of an equivalent height.

20. Wind Energy Conversion System (WECS)

a. *Definition*

Any device or assemblage which directly converts wind energy into usable thermal, mechanical, or electrical energy, including such devices as windmills and wind turbines, towers and supporting structures and such directly connected facilities as generators, alternators, inverters, batteries, and associated control equipment. A small WECS has a rated power capacity of not more than 25 kW and is intended to produce power primarily for on-site consumption, either instead of or as a supplement to utility power.

b. *Zoning Districts Allowed*

i. In all districts where a freestanding small WECS is allowed as an accessory use, only one WECS per lot is allowed. Adjoining lots under the same ownership shall be treated as one lot for purposes of this limitation.

ii. Notwithstanding subsection b.i. above, in the PLI, MC, I-1, I-2, and MI districts, two or three freestanding small WECS are allowed as accessory uses by conditional use approval.

iii. In the R-2M, R-3, R-4, and R-4A districts, one freestanding small WECS is only allowed on lots with only one principal structure.

iv. In the R-4 and R-4A districts, building-mounted WECS are only allowed on lots with only one principal structure.

c. *Use-Specific Standards*

i. *Submittal Requirements*

(A) Additional submittal requirements for WECS are provided in the title 21 user's guide.

(B) In addition to meeting the approval criteria of chapter 21.03 for the appropriate approval process, applicants for small WECS shall demonstrate in their application materials that the small WECS' visual impacts are minimized or mitigated for surrounding neighbors and the community. This may include, but is not limited to, information regarding site selection, turbine design or appearance, buffering, and screening of ground-mounted equipment.

ii. *Freestanding WECS*

(A) Small WECS in residential districts shall have a rated power capacity of not more than 10 kW. Small WECS in nonresidential districts shall have a rated power capacity of not more than 25 kW.

(B) The height of a small WECS shall be determined by compliance with the setback provisions of subsections ii.(E). through (G).

principal structures of the underlying zoning district by more than 10 feet.

(C) On buildings of 60 feet or less in height, building mounted WECS shall be no taller than 10 feet.

(D) On buildings over 60 feet in height, building mounted WECS shall be set back from the structure edge by at least two feet for every one foot of height greater than 10 feet.

(E) Building mounted WECS shall meet the design standards for freestanding WECS in subsections ii.(H),, (I)., (J)., (L)., (M)., and (N). above.

(F) Building mounted WECS shall be located at least 1.1 times the height of the system (rooftop to top of WECS) from all overhead power and telecommunication lines, and any telecommunication towers.

iv. *Abandoned or Unsafe WECS*
Any system that is not operated for a continuous period of 12 months shall be considered abandoned and shall be dismantled and removed from the property at the expense of the property owner.

21. Aircraft Hangar, Private Residential

a. ***Definition***
A detached accessory structure that is used for the parking and storage of private personal aircraft by residents of the principal structure.

b. ***Use-Specific Standards***

i. Hangars shall comply with all required setback standards.

ii. Such accessory uses shall serve only the residents of the property and shall not be used for commercial purposes except as part of a home occupation approved under subsection D.10, above.

iii. Both the principal use or structure and the accessory use or structure are developed in conjunction with a legally established airstrip.

iv. The gross floor area of the accessory aircraft hangar shall not exceed the gross floor area of the principal residential structure by more than 200%.

22. Outdoor Storage Associated with a Community Use
See subsection 21.05.060D.8.

23. Outdoor Storage of Vehicles and/or Equipment Associated with a Community Use
See subsection 21.05.060D.9.

E. Prohibited Accessory Uses and Structures

1. Operation of Particle Accelerators, including Cyclotrons
Operation of particle accelerator systems, including cyclotrons, is prohibited in all residential districts, whether or not such system is associated with a home occupation.

2. Fabric Structures
Frame-supported, arch-supported, or inflated tension fabric or membrane structures, fabricated off-site and assembled on-site, and typically used for garages, sheds, warehouses, or temporary or permanent shelters for automobiles, boats, or other items,

below. In no instance shall a small WECS exceed 95 feet in height.

(C) Height shall be measured as depicted in the illustration below. Structures shall not interfere with Federal Aviation Administration regulations on airport approaches. In no case shall the height exceed manufacturer's specifications.

(D) The lowest point of moving elements, such as blades or vanes, shall be at least 25 feet above grade. No blades may extend over public sidewalks or trails.

(E) WECS shall be set back at least 1.5 times the height of the system from property lines abutting residentially-zoned lots and at least 1.1 times the height of the system from property lines abutting rights-of-way and non-residentially-zoned lots.

(F) WECS shall be set back at least 25 feet from a water body edge provided that the full extent of the applicable setback distance of subsection ii.(E). above falls within the water body or the applicant's property.

(G) All systems shall be set back at least 1.1 times the height of the system from all overhead power and telecommunication lines, and any telecommunication towers.

(H) All systems shall be equipped with manual and automatic (manual or electrical) over-speed controls to limit the blade rotation speed to within the design limits of the system.

(I) The rotating turbine shall not produce vibrations that are humanly perceptible beyond the property lines of the site.

(J) Lattice type towers and towers using guy wires are prohibited.

(K) All power transmission and telemetry lines from the tower to any building or other structure shall be placed underground.

(L) No tower shall be illuminated unless required by a state or federal agency, such as the FAA.

(M) All structures in a project shall be finished in a single, non-reflective, matte finished, neutral color.

(N) No commercial or non-commercial advertisements, signs, or other messages shall be placed or painted on the tower, rotor, generator, or tail vane, except that a system or tower's manufacturer's logo may be displayed on a system generator housing in an unobtrusive manner.

iii. *Building Mounted WECS*

(A) Small WECS in residential districts shall have a rated power capacity of not more than 10 kW. Small WECS in nonresidential districts shall have a rated power capacity of not more than 25 kW.

(B) In residential districts on lots less than 20,000 square feet, a building mounted WECS shall not exceed the maximum height for

a. The wind turbine of a small wind energy system may be mounted on a building or a wind energy system tower.

b. The surfaces of all small wind energy system components that are visible when the small wind energy system is in operation shall be painted a nonreflective, neutral color.

c. A zoning permit application for a small wind energy system shall include the following information:

1. A level one site plan that shows the location of the small wind energy system.

2. Specifications for the small wind energy system including manufacturer make and model, an illustration or picture of the turbine unit, maximum rated power output, blade diameter, total height, tower color and, if proposed, the location of ladders and/or climbing pegs.

3. Tower foundation blueprints or drawings.

4. Noise decibel data prepared by the wind turbine manufacturer or qualified engineer indicating noise decibel level at the property line nearest to the location of the small wind energy system.

5. Evidence of compliance with, or exemption from, Federal Aviation Administration requirements.

6. Evidence that the small wind energy system complies with current Underwriters Laboratories standards for local utility connections.

d. Dimensional Requirements.

1. The distance from a small wind energy system to the closest property line may not be less than 1.1 times its total height.

2. All guy wires, cables and other accessory support structures for a small wind energy system must be on the same lot as the small wind energy system, but may be located within required setback areas, and shall be properly jacketed to ensure visible safety standards. [Ord. 14-18(A)(S-2) § 5, 2016].

21.58.130 Operation standards.

a. Electrical Standards.

1. A small wind energy system shall comply with the National Electric Code.

2. All electric transmission wires connected to a small wind energy system must be underground, or within the building on which the small wind energy system is mounted.

3. A small wind energy system shall not interfere with television, microwave, navigational or radio reception.

b. Noise and vibration from a small wind energy system shall not exceed the levels permitted in HCC 21.59.010(b) and (c), except during short-term events such as utility outages and severe wind storms.

c. Tower Safety.

1. The lowest part of a climbing apparatus that provides access to a wind turbine shall be at least 12 feet above the ground, and the wind energy system tower or building on which the wind turbine is mounted shall have no handholds or footholds below the climbing apparatus.

2. The lowest point through which a wind turbine blade rotates must be at least 20 feet above the ground.

d. Lighting. Except for switch type lighting, no artificial lighting shall be mounted on a small wind energy system, and a small wind energy system shall not be illuminated with artificial lighting, except when required by the Federal Aviation Administration and approved by conditional use permit.

e. Signs. No sign, flag or pennant may be attached to a small wind energy system except for the following:

1. A sign identifying the manufacturer or installer of the small wind energy system.

2. Signs warning of dangers associated with the small wind energy system.

f. Removal. The owner and the lessee of the property that is the site of a small wind energy system are jointly and severally responsible for its removal:

1. If corrective action is not taken within six months after notice that the City Engineer has found the small wind energy system to be unsafe or not in compliance with applicable law.

2. Within 90 days after the small wind energy system has not been operational for a period of at least 12 consecutive months. [Ord. 14-18(A)(S-2) § 5, 2016].

17.10.375 - Wind energy systems.

A. Intent. The purpose of this section is to establish minimum standards which protect the community from nuisance or safety impacts of small wind energy systems. It applies to small wind energy systems in all districts where they are allowed as permitted or conditional uses.

B. When Required. Small wind energy systems shall be allowed as accessory uses in all zoning districts, subject to meeting the standards of this section. The requirements of this chapter shall apply to all wind energy systems proposed after the effective date of this chapter. Any deviation from the general standards of this ordinance which is not specifically prohibited may be approved through the issuance of a conditional use permit.

C. Building Permit Required. Building permits shall be obtained for any wind energy system prior to construction and installation of the system. The planning department shall review each building permit application for compliance with the requirements of this section. An applicant for a building permit to construct a small wind energy system shall include the following materials, in addition to any submittal requirements of Title 15:

1) A scaled map with the location of the small wind energy system, its distances from all property lines as well as from all structures on adjacent properties;

2) Proof that the turbine to be constructed as a component of the small wind energy system has been certified by Underwriters Laboratories ('UL Certified');

3) If the system will be interconnected to the electrical grid, the applicant shall provide certification from the electrical utility company that they have been informed of, and approved the system for installation. Off-grid systems are exempt from this requirement;

4) Standard drawings and an engineering analysis of the small wind energy system stamped by an engineer licensed for such work which depict and describe: wind turbine structure, tower structure, base, footings, and access, including safety and stability data; and a line drawing of electrical components in sufficient detail to allow for a determination that the proposed manner of installation conforms to the National Electrical Code.

5)

Foundation and connection plans designed for the installation location of the wind energy system and stamped by an engineer licensed in the State of Alaska;

6) Noise decibel data prepared by the wind turbine manufacturer or qualified engineer indicating noise decibel level at the property line nearest to the location of the small wind energy system.

D. Approval Procedure. In addition to obtaining a building permit, the proposed small wind energy system shall be subject to one of the following approval procedures:

1) Administrative Permit (no hearing). The administrative officer is authorized to review and approve the following permits for small wind energy systems as by-right uses:

a. Vertical axis turbines which meet all general standards of this section (SMC 17.10.375) as well as the general standards of the zoning district in which they are located;

b. Applications for small wind energy systems which meet the general standards of Section 17.10.375, and are located in zoning districts other than Single-Family or Single-Family/Two-Family Residential.

2) Conditional Use Permit (public hearing required). The following applications require approval of a conditional use permit in accordance with SMC 10.10.400:

a. Applications for small wind energy systems (unless approved under 17.10.375.D.1)a.) located in the Single-Family or Single-Family/Two-Family zoning districts;

b. Applications for small wind energy systems which deviate from the general standards of Section 17.10.375.E, regardless of their zoning district.

Where a conditional use permit is required by this section, the commission may impose conditions to reduce adverse visual, noise, and safety impacts to neighboring residential areas and rights-of-way.

E. General Standards.

1) Lot and Zoning Requirements.

a.

Setbacks. No part of the wind system structure may extend closer than twenty (20) feet to any property boundary. The setback requirement shall apply to all elements of the wind energy system, including the rotor blades.

b. Lot Size. Wind energy systems shall only be allowed on lots larger than 20,000 square feet.

c. Number per lot. Only one wind energy system shall be permitted per lot.

2) Development and Design Requirements.

a. Noise. Wind energy systems shall be designed, installed, and operated so that the noise generated by the system shall not exceed fifty decibels (50 dB), as measured five (5) feet above ground level at all property lines at a time when the wind speed as measured at the Soldotna Airport is less than five (5) miles per hour; except, that sound level may be exceeded during short-term events including wind speeds exceeding five (5) miles per hour. At no time shall the noise created by the turbine exceed eighty five decibels (85 dB).

b. Height. The maximum allowable height is 80 feet, and shall be measured as the vertical distance above the average existing grade to the highest point of the rotor blade when extended at its highest position.

c. Location on lot. No small wind energy system shall be placed closer to any public right-of-way than the principal use or structure to which it is accessory. This requirement shall apply to all public right-of-way frontages, if a property has multiple frontages.

d. Clearance. Minimum blade ground clearance for horizontal axis turbines is fifteen (15) feet.

e. The surfaces of all components of small wind energy systems that are visible when in operation shall be painted a non-reflective, neutral color.

f. No part of the wind energy system, including any supporting structures, shall be used as a sign structure as defined by SMC 15.08.020. Wind energy systems shall not be artificially illuminated unless required by a state or federal agency.

g. Wind energy systems shall not be climbable up to twelve (12) feet above grade unless the system is secured in a fenced area with a minimum of a 6-foot high fence.

h. The electrical collection system connecting the small wind energy system to the electrical grid shall be installed underground.

i. Guyed and lattice support structures are prohibited.

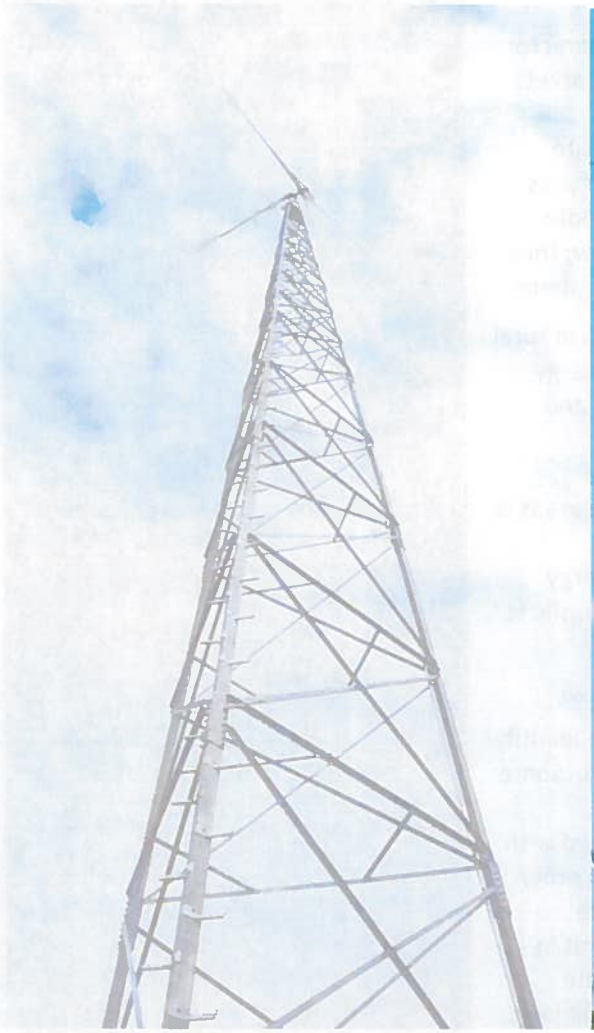
3) Maintenance. Wind energy systems shall be erected and maintained plumb, level, and true and shall be repaired, painted, and maintained in accordance with this ordinance, any manufacturer's recommendations and instructions, and with industry standards for small wind energy systems. The administrative officer or their designee may order the repair or removal of any wind energy system not maintained in accordance with this section.

4) Removal. Any wind energy system that is not operated on a functional basis for a period of 180 consecutive days is hereby declared unlawful, abandoned, and a public nuisance. In addition to other remedies provided by this chapter, the nuisance may be restrained, enjoined, or otherwise abated by the city. The planning and zoning commission may grant a waiver of this requirement in special circumstances.

5) All small wind energy systems shall comply with all regulations of the Federal Aviation Administration.

(Ord. No. 2010-011, § 4, 3-10-2010)

MINNESOTA LOCAL GOVERNMENT WIND TOOLKIT



Prepared for the Minnesota Department of Commerce, by the Great Plains Institute

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GREAT PLAINS INSTITUTE

Better Energy Better World

Minnesota Local Government Wind Toolkit

INTRODUCTION

Wind energy is now the least expensive way to generate electricity, and is taking an increasingly larger position in both our nation's and Minnesota's energy portfolio. Wind energy has no harmful emissions, reduces greenhouse gases, captures local resources for economic gain, and is now cost-competitive with other forms of electric generation. But, like all forms of development, Wind Energy Conversion Systems (WECS) affect nearby land uses (residential homes, agriculture, natural resources), and can change the character of the community in which they are located. As the market for wind energy increases and the cost of installations declines, local governments must ensure the appropriate policies or zoning tools are in place. While large wind farms are exempt from local regulation, the State must consider local priorities and regulations in environmental review; thus, local standards still affect the design of wind energy systems.

Although most of Minnesota's wind energy resource is in rural areas, even urban areas are having to address wind energy development. Increasing numbers of urban residents and businesses are looking for opportunities to improve sustainability and energy independence. The land use conflicts associated with WECS in suburban and urban areas is greater than in rural areas. Local governments must determine where and under what conditions wind energy systems are appropriate and whether nuisances and conflicts of wind energy outweigh the benefits of wind energy.

Understand Your Goals

The first step in creating a wind energy ordinance is to identify the community's goal to be achieved by the regulation. Some communities want to encourage renewable energy generation. Other communities are primarily concerned with mitigating conflicts between wind energy systems and other land uses. The first goal leads to the question of where should the community give priority to wind energy. This in turn requires the community to understand where there might be a meaningful wind energy resource; trees, buildings, and topography all have a substantial effect on the viability of the local wind resource. The second goal leads to the question of whether wind energy is appropriate for the community, and how extensively to restrict it. Communities can choose to prohibit WECS, except for those installations that are in the regulatory province of the State. Not allowing WECS in locations in areas with poor wind resources can have a positive effect on developing local energy opportunities, by guiding land owners to focus on energy efficiency, solar energy, or other resources more suitable for their site.

Model Wind Energy Ordinance

This ordinance (July, 2017 version) is drawn from a number of sources, including other model ordinances, regulatory findings, state law, and local examples. Minnesota first developed a model ordinance for county governments in 2005 (Clean Energy Resource Teams, the Minnesota Project, and County Zoning Administrators). That model focused on utility-scale wind development (multiple turbines rated in megawatt (MW) of capacity). Subsequent versions have incorporated model language for smaller, accessory use turbines.

This model adopts standards for large turbines set by the Minnesota Public Utilities Commission in its 2008 order, Docket E,G-999/M-07-I 102.

A variety of model ordinance and ordinance examples informed the development of this model. Example sources include:

- *Planning for Wind Energy. American Planning Association, November 2011.*
- *In the Public Interest: How and Why to Permit for Small Wind Systems - A Guide for State and Local Governments, 2008*
- *Distributed Wind Model Zoning Ordinance, DWEA, 2014*
- *AWEA Small Wind Zoning Ordinance, October 2004*
- *Washington State Wind Energy Toolkit, Northwest Wind, 2015*
- *Small Wind Electric Systems: A Minnesota Consumers' Guide, U.S. DOE, 2007*
- *Small Wind Energy Guide: Kandiyohi County, Minnesota, August 2007*
- *City of Mahtomedi WECS Ordinance*

Community, County, City, Township

This model uses the term "community" to refer to all types of local governments. The ordinance language refers to "model community" as a substitute for the name of the local government.

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, small in terms of generating capacity, usually shorter in height, and are installed one at a time rather than in wind farms. Non-utility-scale wind systems are further divided into large, small, and micro-wind systems. Where these divisions are made is highly dependent upon the community character, the type of local government, and the magnitude of the wind resource. This model ordinance uses a tier classification to distinguish between these different scales of WECS. Tier I refers to systems at utility scale; Tier II WECS include systems that are primarily used for power on-site or those that are net-metered; and Tier III WECS are exclusively behind-the-meter turbines up to 40 KW in capacity, including micro turbines that one might see in an urban area.

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 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 (Tier I), large and small accessory use (Tier II) in counties, and very small (Tier III, or micro-WECS) in non-rural or residential rural areas.

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. Prohibited applications can be either listed explicitly as prohibited, or simply not identified as either conditional or permitted. Tier I WECS should, where allowed, always be conditional, in order to ensure that the specific design of the system minimizes nuisances and allow for public comment. Tier II I WECS in rural areas should probably be permitted uses, with some performance or design standards to ensure compatibility with the landscape and other land uses. Conditional use permits may be justified for Tier II I 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. Urban density areas (third-acre lots, 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. Tier I 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. Identify Wind Resource Standards

Communities should identify where optimal wind resources are located, or identify the conditions that define legitimate wind resources. Installing WECS in areas with minimal wind resources is bad for both the landowner and the community. The Minnesota Department of Commerce has wind resource maps for the entire state at a 500 meter resolution. Alternatives to the statewide maps include site-specific certification by a certified wind energy assessor or installer, or performance criteria that identify the turbine will be above trees and buildings for a minimum radius distance.

D. Establish Setbacks

Communities need to identify setbacks that protect surrounding land uses and community character but still allow the community's wind resource to be developed. Examples of land uses that could dictate setbacks include:

1. Residential homes, distinguishing between homes of people who are financially participating in the project and those who are not.
2. Property lines and road rights-of-way.
3. Designated conservation or wildlife areas, wetlands, scenic river bluffs, designated scenic byways, and protected view sheds.
4. Other wind energy systems, as turbines must be located far enough from each other in order to avoid creating turbulence that diminishes the value of nearby wind resources.

E. Establish Safety Standards

Communities need to identify safety standards that are protective without effectively prohibiting the WECS. Requiring engineering certification on very small free-standing systems has 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.

F. Establish Design Standards

Design standards need to be matched to the type of WECS. Tier I systems should always have tubular towers. Treatment of power lines, color, lighting, signage, and substations should be specified. Tier II 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 micro-WECS category should have a decommissioning plan and provisions.

G. Establish Other Applicable Standards

Noise standards are particularly important for Tier II 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 residence. Building and electric code compliance and FAA regulations may also need to be addressed. Cities and rural areas near denser development may need to address visual impacts.

H. Minimize Infrastructure Impacts

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

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 216E.01 – 216E.18), encourage local wind energy development in priority wind energy areas, and meet 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.

Adapting the Model Standards

The standards within this ordinance are provided for reference, and should be modified to meet local conditions of the reader. This ordinance, with the exception of the final micro-WECS section, is primarily written for situations typical in rural agricultural areas of Minnesota. For distributed wind (Tier II) installations, cities and counties might need to modify these standards to reflect small lots and local topography. Many standards will need to be adapted for communities that are less rural or that have lower quality or more sporadic wind resources due to forested lands or topography. Most cities can disregard virtually all of the Tier I WECS provisions except for the possibility of isolated large turbines on very large parcels, or single turbines within large commercial, industrial or institutional areas.

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.

Interpretation, Conflict and Separability

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

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.

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. Tier I wind developments (wind farms) are, however, sometimes broken into phases, or separated by ownership but not by geography. In 2007, the Statute setting regulatory thresholds was changed 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.

Blade Arc - The arc created by the edge of the rotor blade that is farthest from the nacelle.

Fall Zone - The area, defined as the furthest distance from the tower base, in which a tower will collapse in the event of a structural failure. This area is no greater 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 towers 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

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 five kW, quite small for a generator, on a 60-foot tower, the minimum height for meaningful production. Urban communities may consider setting a smaller capacity (2 KW) and regulations for shorter towers and building mounted systems. But these systems remain unproven and are little more than curiosities; technology does not currently exist to generate meaningful energy in turbulent and low speed urban wind.

Micro-WECS - Micro-WECS are WECS of five (5) kW nameplate generating capacity or less mounted on a tower.

Non-Participating - Any landowner except those on whose property all or a portion of a Wind Energy Facility is located pursuant to an agreement with the Facility Owner or Operator.

Project Site – The geographic area of an aggregated site or wind farm project that includes location of all turbines.

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

Rated Power Output – the electric power output of a WECS at a constant hub height and wind speed of 25 mph.

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

Shadow Flicker – Alternating changes in light intensity caused by the movement of Wind Turbine blades casting shadow on the ground or a nearby stationary object.

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.

Tier I WECS - Utility Scale WECS of equal to or greater than 200 kW in total name plate generating capacity.

Tier II WECS - A WECS less than 200 kW in total name plate generating capacity, these include systems that are primarily used for power on-site or those that are net-metered.

Tier III WECS - Small WECS that are exclusively behind-the-meter turbines up to 40 KW in capacity, including micro turbines that may be found in urban area.

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.

Tier I, Tier II, & Tier III Turbines

This model uses a three tier system of regulating WECS based on the rated electric capacity of the turbine. However, different communities will set different thresholds to distinguish between Tier I and Tier II wind energy systems. Minnesota has a number of installations that are just smaller than 40 KW, which used to be the statewide "net metering" limit. Co-ops and municipal utilities still have a 40-KW limit for net metering, while investor-owned utilities offer a form of net metering up to one MW of distributed wind capacity. While the net metering threshold seems a reasonable threshold to separate types of WECS, 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. Some communities may find that turbines of up to 200 kW are fully consistent with other land uses and reasonably quality for a less rigorous (Tier II) set of standards and review procedures. Others may want to distinguish between a small accessory use (less than 40 KW) and larger accessory uses (40 -200).

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, and substations 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 name(s) of project applicant(s)
   b. The name(s) of the project owner(s)
   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. Location of property lines, wind turbines, electrical wires, interconnection points with the electrical grid, all related accessory structures, and all areas to be used for staging during construction or for maintenance, including distances and drawn to scale.
   f. Location and height of all buildings, structures, above ground utilities and trees located within five hundred (500) feet of each proposed Tier II WECS and within three rotor diameters of each Tier 1 WECS.
   g. Decommissioning plan, micro-WECS are exempt.
   h. An elevation drawing accurately depicting the proposed WECS and its relationship to structures on the subject site and adjacent lots.
   i. 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 Tier II WECS.
   j. Documentation of land ownership or legal control of the property.
   k. All WECS shall submit a copy of the interconnection agreement (or application for interconnection) with the utility or documentation that an interconnection agreement is not necessary.

Submittal Requirements

The information gathered from permit submittal is important to ensure the integrity and safety of a project, but can also provide valuable information to help the local government and the State better understand the value of distributed wind energy. Some elements, such longitude and latitude, are useful data to attain and may be more easily acquired by the local government staff rather than the project applicant, particularly for small systems.

Objects Within 500 Feet

Identifying structures and trees within 500 feet of the proposed WECS helps the community document that the WECS is being installed in an area with legitimate wind resources. Turbines generally must be 20-40 feet above trees and buildings within 500 feet to operate as designed.

Other Permits, Requirements

This permit procedure section refers only to zoning and land use permits. Other permits or requirement will also need to be acquired by developers. Local governments can reference some of those other permit requirements in the zoning ordinance if that makes sense for their ordinance structure. Or the local government can use a development agreement to stipulate specific standards that might not be standard. Examples include 911 addressing, road closure requirements or construction permits, regulatory signage, cross jurisdictional requirements, etc.

l. Tier II WECS that are not connected to the electric grid shall identify location of battery or other storage device.

2. The application for Tier I 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 the project site for multi-turbine projects or within 1,320 feet of any 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

g. Decommissioning Plan that includes a provision financial assurances at the discretion of Model Community.

h. Model Community may require a shadow flicker study where a Tier 1 turbine's shadow is cast on a non-participating property within the project area.

i. Identification of existing WECS within a 1-mile radius of the project site and description of potential impacts on wind resources on adjacent properties.

j. identification of all non-participating residences within the boundaries of the project site.

F. Procedure for Aggregated Projects - Aggregated projects may jointly submit a single application and be reviewed under a single proceeding, including notices, hearings, reviews and approvals. Permits will be issued and recorded separately. Joint applications will be assessed fees as one project.

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	Tier II*	Tier I	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	Not 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	[depends on the district purpose, the protected resource and the impacts of a turbine on that resource]		
Wild and Scenic River	Conditionally permitted	Not permitted	Not permitted

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

Alternatives to Zoning District Regulation

An alternative to setting Tier I WECS standards for each zoning district is to establish a Wind Energy Development Overlay District. The community can pro-actively identify where the conditions are good and bad for large scale wind development based on community priorities such as view shed 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 (Tier II) WECS in some circumstances.

Land Use Table

The land use table shown here is for a county or rural community. Urban and suburban communities will have a very different set of zoning districts and land use considerations. However, the Tier I and II WECS are probably not appropriate for urban (under 1 acre lot size) and for most districts with lots at 2 or less acres. Tier III (micro-WECS) are separately addressed at the end of this model ordinance.

H. Setbacks, Wind Turbines and Meteorological Towers

1. **Setbacks** - All towers shall adhere to the setbacks established in the above table.
2. **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.

	Tier II & Tier III Wind Turbines	Tier I Wind Turbines	Meteorological Tower
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.	5 rotor diameters along the primary wind axis, 3 rotor diameters along the secondary wind axis (rotor diameters are between 250-400 feet)	The fall zone, as certified by a professional engineer, + 10 feet or 1.1 times the total height.
Residential Dwellings, participating*	NA	750 feet	The fall zone, as certified by a professional engineer, + 10 feet or 1.1 times the total height.
Residential Dwelling, non-participating	Encompassed in property line setback.	1,000 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	1.1 times the total height	600 feet	600 feet
Wetlands, USFW Types III, IV and V	NA	600 feet	600 feet
Other Structures		To be considered	
Other Existing WECS	5 rotor diameters from existing WECS on adjacent parcels		Several factors to be considered in order to minimize or eliminate impact on existing WECS includes: the relative size of the existing and proposed WECS, the alignment of the WECS relative to the predominant winds, topography, the extent of wake interference impacts on existing WECS, and other considerations. 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 Tier I wind turbine.
** The setback shall be measured from future rights-of-way if a planned changed or expanded right-of-way is known.

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 Tier II and micro-WECS, certification can be demonstrated by the manufacturer's engineer or another qualified engineer.

b. **Rotor Safety**. Each Tier II WECS shall be equipped with both a manual and automatic braking device capable of stopping the WECS operation in high winds (40 mph or greater).

c. **Warnings**

i. For all Tier I 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.

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. Wabasha County Minnesota has adopted ¼ 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. Moreover, the County identified an area up to a mile from the bluff to be bird flyway. Areas with complex terrain and issues may be 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 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.

2. **Equipment Design and Performance Standards**

   a. **Established Wind Resource** - All WECS shall only be installed where there is an established wind resource. An established wind resource can be documented in the following ways:

   > ***Established Wind Resource***
   >
   > *These are alternative ways the community can ensure that WECS are meeting the community's renewable energy, climate protection, or energy independence goals.*

      i. The planned turbine site has a minimum 11 MPH average wind speed at the designed hub height, as documented on the most recent version of Minnesota Department of Commerce statewide wind speed maps.

      ii. The planned turbine has a minimum hub height of eighty (80) feet and the blade arc is 30 feet higher, on a vertical measurement, than all structures and trees within 300 feet of the tower.

      > ***NABCEP Certification***
      >
      > *Certification processes for small wind installers and site assessors are currently ramping up, and only a few certified professionals are currently available.*

      iii. The applicant submits an analysis conducted by a certified wind energy installer or site assessor (North American Board of Certified Energy Professional, NABCEP, or equivalent) that includes estimates of wind speed at turbine height based on measured data, estimated annual production, and compliance with the turbine manufacturer's design wind speed.

      > ***Third-Party Certifiers***
      >
      > *Several examples are given of entities that certify turbines. There is currently no single centralized place for certifying turbines.*

      iv. The proposed turbine is within the community's designed wind energy overlay district.

   b. **Total Height, Tier II & III WECS** - Tier II & III WECS shall have a total height, including tower and rotor at its highest point, of less than 200 feet in rural and industrial zoning districts, and a maximum height of 125 feet in residential and commercial districts.

   c. **Turbine Certification** - Tier II & III WECS turbines shall be certified or in the process of being certified the Small Wind Certification Council (SWCC) Micro-generation Certification Scheme (MCS), or must be listed by the Interstate Turbine Advisory Council.

   > ***Turbine Certification***
   >
   > *Third-party certification helps ensure that the WECS is actually able to produce electricity to meet the community's energy or climate protection goals.*

   d. **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.

   > ***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.*

   e. **Tower Configuration**

      i. All Tier I wind turbines shall be installed with a tubular, monopole type tower.

      ii. Meteorological towers may be guyed.

f. **Color and Finish**

i. All Tier I wind turbines and towers that 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.

g. **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.

Essential Services

The model ordinance references the Essential Services Ordinance for determining substation and feeder line setbacks (Substations on a 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 Tier I projects with the same prerogatives as an essential service, but rather to simplify determination of setbacks and placement of substations and feeder lines relative to rights-of-ways.

h. **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.

i. **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

Feeder Lines

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

j. **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.

k. **Shadow Flicker** - Tier I WECS shall be designed to avoid unreasonable adverse shadow flicker effect at any occupied buildings located on a non-participating property. Model Community may require a shadow flicker study to evaluate the degree of exposure for non-participating buildings.

Shadow Flicker

There are no current evidence-based generally-accepted standards for how much or what degree of shadow flicker constitutes an unreasonable nuisance or adverse effect. Quantifying shadow flicker is also problematic, as it depends on a wide variety of factors, some of which are difficult to estimate. Mitigation opportunities, such as screening, may or may not be deemed a reasonable option for non-participating homes. Communities will need to carefully select standards that are demonstrably not arbitrary.

3. **Discontinuation and Decommissioning**

a. **Abandonment**. 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 a 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.

b. **Decommissioning Plan Required** – Tier I and Tier II 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. For Tier I WECS Model Community may, at its discretion, require a letter of credit or security bond with adequate funds to cover decommissioning costs, and naming the Community as the executor so decommissioning of the turbine(s) can be completed if necessary.

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.

c. **Repowering** – Repowering Tier 1 or Tier II WECS is an allowed alternative to decommissioning at the end of the turbine's life. Repowering must not change any regulated component or design element of the turbine, as originally approved in the conditional use permit.

Repowering

This ordinance allows repowering of existing turbines, provided the regulated design and performance specifications are not changed. Communities should consider how to address repowering of approved WECS.

4. **Orderly Development**

   Upon issuance of a conditional use permit, all Tier I WECS applicants shall notify the appropriate State of Minnesota's Siting Act program Staff of the project location and provide details on the survey form specified by the agency.

J. Other Applicable Standards

1. **Noise** - All WECS shall comply with Minnesota Rules 7030 governing noise, or shall not exceed fifty (50) dB(A) when measured from the outside of the nearest residence, business, school, hospital, religious institution, or other inhabited structure. The audible noise from wind energy facilities may periodically exceed allowable noise levels during extreme wind events (winds above 30 mph or greater).
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.

Interference

The radius for notifying communications tower operators will likely be two to five miles, depending on the community.

L. Avoidance and Mitigation of Damages to Public Infrastructure by Tier 1 WECS

1. **Roads** - Applicants for Tier I WECS 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 pre-construction conditions.
2. **Drainage System** - The Applicant shall be responsible for immediate repair of damage to public and private drainage systems stemming from construction, operation or maintenance of the WECS, for the life of the project.
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. Provide 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.
   b. Demonstrate how the project integrates the United State Fish and Wildlife Service (USFWS) best management practices for minimizing impacts to wildlife from wind energy projects.

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 for 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.

M. Tier III (Micro-Turbine) Standards

1. **Urban Lots** - Micro- WECS shall be allowed on lots of less than one acre provided the following conditions are met:
   a. WECS are a permitted or conditional accessory land use in the _____ districts.
   b. The tower shall meet all setback requirements applicable to the lot. In all cases the base of the tower shall be setback from all property lines by a minimum of the height of the tower plus 10 feet.
   c. The tower height is less than 70 feet.

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, and is thus of small value as an energy source.

d. The proposed system must be certified to operate at noise levels lower than 50 db at a distance no greater than the distance from the base of the tower to the closest property line.

2. **Suburban Lots** - Micro- WECS shall be allowed on lots larger than two acres provided the following conditions are met:

   a. WECS are a permitted or conditional land use in the _____ districts.

   b. Provisions of Section I.2.a (Established Wind Resource) are met.

   c. The setback requirements applicable to the lot are met. In all cases the base of the tower shall be setback from all property lines by a minimum of the height of the tower plus 10 feet. For guyed towers the setback can be reduced if the documented fall zone is less than the tower height, but in no case shall the setback be less than the distance from the base of the tower to the nearest building off the site, plus 10 feet.

   d. The tower height is less than 101 feet.

   e. The proposed system must be certified to operate at noise levels lower than 50 db at a distance no greater than the distance from the base of the tower to the closest property line.

3. **Building Mounted Systems** - Building mounted WECS shall be setback from property lines by a distance equal to the tower height, and shall provide engineering documentation that the structure upon which the wind energy conversion system is to be mounted shall have the structural integrity to carry the weight and wind loads of the wind energy conversion system and have minimal vibration impacts on the structure.

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 under perform its rated capacity. Community sustainability is not enhanced by putting up a dramatically under-utilized wind turbine.

Resources for Urban Micro-Turbine Ordinances

A. ***Building-Integrated Standards***: *The City of Minneapolis includes ordinance language regulating micro-turbines that are integrated into buildings, but requires an engineering analysis to demonstrate safety. Source: City of Minneapolis Zoning Code 537.730*

B. ***Performance Standards for Urban Wind***: *The City of Mahtomedi zoning ordinance includes performance standards requiring a demonstration of a quality wind resource in an urban area. Source: City of Mahtomedi Zoning Ordinance, Subd. 9.4A*

C. ***Economic Opportunity***: *The City of St. Louis Park excludes wind turbines, except where there is reasonable economic opportunity to capture wind energy. Source: City of St. Louis Park Zoning Code, Section 36-369.*