



# Nicollet County Renewable Energy Ordinance

## TABLE OF CONTENTS

<b>SECTION 1 TITLE, REPEALER</b> .....	<b>3</b>
<b>SECTION 2 PURPOSE</b> .....	<b>3</b>
<b>SECTION 3 JURISDICTION</b> .....	<b>3</b>
<b>SECTION 4 INTERPRETATION</b> .....	<b>3</b>
<b>SECTION 5 DEFINITIONS</b> .....	<b>4</b>
<b>SECTION 6 PROCEDURES</b> .....	<b>11</b>
601 General Procedures .....	11
602 Applications for Wind Energy Conversion systems.....	11
603 Applications for Primary Use Solar Energy Systems .....	14
<b>SECTION 7 DISTRICT REGULATIONS</b> .....	<b>17</b>
701 Permitted and Conditional Uses.....	17
<b>SECTION 8 WECS GENERAL STANDARDS</b> .....	<b>18</b>
801 WECS Setbacks .....	18
802 Additional Setback Requirements.....	19
803 Safety Design Standards .....	20
804 Tower Configuration Standards.....	21
805 Abandonment and Decommissioning .....	21
806 Flicker Analysis .....	23
807 Additional Standards for Commercial WECS Projects .....	23
808 Other Applicable Standards .....	24
809 Avoidance and Mitigation of Damages to Public Infrastructure .....	25
810 Interference .....	26
<b>SECTION 9 SOLAR ENERGY SYSTEM STANDARDS</b> .....	<b>27</b>
901 General Standards .....	27
902 Roof-mounted Solar Energy Systems .....	27
903 Ground-mounted and Pole-Mounted Solar Energy Systems .....	28
904 Wall-mounted Solar Energy Systems .....	28
905 Accessory Solar Energy Systems.....	28
906 Large Solar Energy Systems .....	29
907 Photovoltaic Solar Energy Systems .....	29
908 Reflecting Solar Energy Systems.....	30
909 Decommissioning .....	30

<b>SECTION 10 ENFORCEMENT, VIOLATIONS, REMEDIES AND PENALTIES.....</b>	<b>32</b>
<b>SECTION 11 EFFECTIVE DATE .....</b>	<b>33</b>
<b>APPENDIX A .....</b>	<b>34</b>
<b>APPENDIX B .....</b>	<b>35</b>

# NICOLLET COUNTY RENEWABLE ENERGY ORDINANCE

## **SECTION 1 TITLE, REPEALER**

The title of this Ordinance is the Nicollet County Renewable Energy Ordinance, and will be referred to herein as THIS ORDINANCE.

The existing Nicollet County Wind Energy Conversions Systems Ordinance previously adopted August 11, 2009, is hereby repealed. The adoption of this Ordinance, however, shall not effect nor prevent any pending or future prosecution or legal action to abate, any existing violation of the previous Nicollet County Wind Energy Conversion Systems Ordinance provided the violation is also a violation of this Ordinance.

## **SECTION 2 PURPOSE**

This Ordinance is established to regulate the installation and operation of Renewable Energy Systems within Nicollet County not otherwise subject to siting and oversight by the State of Minnesota pursuant to Minnesota Statutes Chapters 216F, 216C.25, and 500.30, and Minnesota Rules Chapter 1325.1100, as amended. In no case shall the provisions of this Ordinance guarantee rights to solar access.

## **SECTION 3 JURISDICTION**

The jurisdiction of this Ordinance shall apply to all areas of Nicollet County outside of incorporated municipalities.

## **SECTION 4 INTERPRETATION**

This Ordinance, shall at a minimum, promote and protect the public health, safety, and general welfare. Where the provisions of this Ordinance impose greater restrictions than those of any statute, ordinance, or regulations, the provisions of this Ordinance shall be controlling. Where the provisions of any statute, ordinance or regulation impose greater restrictions than this Ordinance, the provisions of such statute, other ordinance, or regulation shall be controlling.

## SECTION 5 DEFINITIONS

For the purpose of this Ordinance, the following terms shall have the meaning given to them in this section. To the extent a term is used in this Ordinance is not defined in this section, the term shall have the meaning given in the Nicollet County Zoning Ordinance.

1. 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 as part of the aggregated project.
2. Airfoil – A part such as a blade, with a flat or curved surface, designed to provide a desired reaction force when in motion relative to the surrounding air.
3. Awning – A sheet of material stretched on a frame and used to keep the sun or rain off a storefront, window, doorway, patio, or deck.
4. Azimuth – A clockwise measurement around the horizon in degrees, beginning and ending at true north.
5. Board of Adjustment and Appeals – An officially constituted quasi-judicial body appointed by the County Board whose principle duties are to hear appeals from decisions of the Zoning Administrator and, where appropriate, grant variances from the strict application of this Ordinance.
6. C-BED (Community-based energy development) Project – As defined in Minnesota Statutes 216B.1612, as amended. Based on the total name plate generating capacity, C-BED Projects are considered to be (1) Micro-WECS, (2) Non-Commercial WECS or (3) Commercial WECS as defined in this Section.
7. Campground – A facility licensed by the Minnesota Department of Health for the purposes of camping.
8. Church – As defined in Minnesota Statute 272.02.
9. Commercial WECS – A WECS which is equal to or greater than two hundred (200) feet in total height.
10. Comprehensive Plan – Comprehensive plan means the policies, statements, goals, and interrelated plans for private and public land and water use, transportation, and community facilities including recommendations for plan execution, documented in texts, ordinances and maps which constitute the guide for the future development of the unincorporated area of the County.

11. Conditional Use – Means a specific type of structure or land use listed in the official control that may be allowed but only after an in-depth review procedure and with appropriate conditions or restrictions as provided in the official zoning controls or building codes and upon a finding that: (1) certain conditions as detailed in the Zoning Ordinance exist and (2) the structure and/or land use conform to the comprehensive land use plan if one exists and are compatible with the existing neighborhood.
12. County – Nicollet County, Minnesota.
13. County Board – Nicollet County Board of Commissioners.
14. Decibel – A unit of measure of sound pressure.
15. dB(A), A-Weighted Sound Level – A measure of over-all sound pressure level in decibels, designed to reflect the response of the human ear.
16. Dwelling – A residential building or portion thereof intended for occupancy by a single family, but not including hotels, motels, boarding or rooming houses or tourist homes.
17. Electromagnetic Communications – The use of an electromagnetic wave to pass information between two points.
18. Fall Zone – The area, defined as the furthest distance from the tower base, in which a guyed tower may collapse in the event of a structural failure.
19. Flicker – The moving shadow cast by the rotating blades of a WECS, or any intermittent, repetitive, or rhythmic lighting effect that is a direct result of rotating WECS blades.
20. Flicker Analysis – A study showing the duration and location of flicker potential.
21. Generator nameplate capacity – The maximum rated output of electrical power production of a generator under specific conditions designated by the manufacturer with a nameplate physically attached to the generator.
22. Health Care Facilities – Facilities principally engaged in providing services for health maintenance and the treatment of mental or physical conditions including but not limited to hospitals, clinics, and nursing homes.
23. Hub Height – The distance from the ground to the center axis of the turbine rotor.
24. Maximum Design Tilt (Solar Energy System) – Maximum tilt, or angle, is vertical, or ninety (90) degrees for a solar energy system designed to track daily or seasonal sun position or capable of manual adjustment on a fixed rack.

25. Meteorological Tower – For the purposes of this 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.
26. Micro-WECS – A WECS which is less than one hundred (100) feet in total height.
27. Minimum Design Tilt (Solar Energy System) – Minimum tilt, or angle, is horizontal, or zero (0) degrees for a solar energy system designed to track daily or seasonal sun position or capable of manual adjustment on a fixed rack.
28. Minnesota River Valley – For the purpose of this Ordinance, the Minnesota River Valley shall be considered to be an elevation equal to, or less than 850 feet above sea level.
29. Nameplate Capacity – The total maximum rated output of a solar energy system.
30. Native Prairie Plan – The plan shall address steps to be taken to identify native prairie within the project area, measures to avoid impacts to native prairie, including foundations, access roads, underground cable and transformers, shall not be placed in native prairie unless addressed in the prairie protection and management plan.
31. Noise Profile – A study certifying the WECS is in compliance with Minnesota Chapter 7030, as amended, of the Minnesota Pollution Control Agency noise standards.
32. Non-Commercial WECS – A WECS equal to or greater than one hundred (100) feet in total height, but less than two hundred (200) feet in total height.
33. Non-Prevailing Wind – The non-dominant wind direction in the County.
34. Power Line – An overhead or underground conductor and associated facilities used for the transmission or distribution of electricity.
35. Power Purchase Agreement – A legally enforceable agreement between two or more persons where one or more of the signatories agrees to provide electrical power and one or more of the signatories agrees to purchase the power.
36. Preliminary Acoustic Study – A study certifying the WECS will be in compliance with Minnesota Chapter 7030, as amended, of the Minnesota Pollution Control Agency.
37. Prevailing Wind – The predominant wind direction in the County.
38. Project – A WECS or combination of WECS.

39. Project Boundary/Property Line – The boundary line of the area over which the entity applying for a 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.
40. Project Owner – An individual or entity with legal ownership of a WECS project.
41. 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 agencies or non-profit conservation organizations.
42. Qualified Independent Acoustical Consultant – A person with Full Membership in the Institute of Noise Control Engineers (INCE), or other demonstrated acoustical engineering certification. The Independent Qualified Acoustical Consultant can have no financial or other connection to a WECS developer or related company.
43. Receptor – Structures intended for human habitation, whether inhabited or not, including but not limited to churches, schools, hospitals, public parks, state and federal wildlife areas, the manicured areas of recreational establishments designed for public use, including but not limited to golf courses, and camp grounds.
44. Renewable Energy – Energy from sources that are not easily depleted such as moving water (hydro, tidal and wave power), biomass, geothermal energy, solar energy, wind energy, and energy from solid waste treatment plants.
45. Roof Pitch – The final exterior slope of a building roof calculated by the rise over the run, typically but not exclusively expressed in twelfths, such as 3/12, 9/12, or 12/12.
46. Rotor – A system of airfoils connected to a hub that rotates around an axis.
47. Rotor Blades – See Airfoil.
48. Rotor Diameter (RD) – The diameter of the circle described by the moving rotor blades.
49. School – As defined in Minnesota Statute 120A.05, as amended, and private schools excluding home school sites.
50. Solar Collector – A device, structure, or part of a device or structure for which the primary purpose is to transform solar radiant energy into thermal, mechanical, chemical, or electrical energy.



51. Solar Daylighting – A device specifically designed to capture and redirect the visible portion of the solar spectrum, while controlling the infrared portion, for use in illuminating interior building spaces in lieu of artificial lighting.
52. Solar Energy – Radiant energy received from the sun that can be collected in the form of heat or light by a solar collector.
53. Solar Energy Device – A system or series of mechanisms designed primarily to provide heating, cooling, electrical power, mechanical power, solar daylighting or to provide any combination of the foregoing by means of collecting and transferring solar generated energy into such uses either by active or passive means. Said systems may also have the capacity to store energy for future utilization. Passive solar energy systems shall clearly be designed as a solar energy device, such as a trombe wall, and not merely part of a normal structure, such as a window.
54. Solar Energy System – A set of devices that the primary purpose is to collect solar energy and convert and store it for useful purposes including heating and cooling buildings or other energy-using processes, or to produce generated power by means of any combination of collecting, transferring, or converting solar energy. This definition also includes structural design features, the purpose of which is to provide daylight for interior lighting.
55. Solar Energy System, Accessory Use – A solar energy system that is secondary to the primary use of the parcel on which it is located and which is directly connected to or designed to serve the energy needs of the primary use. Excess power may be sold to a power company.
56. Solar Energy System, Active – A solar energy system whose primary purpose is to harvest energy by transforming solar energy into another form of energy or transferring heat from a collector to another medium using mechanical, electrical, or chemical means.
57. Solar Energy System, Building Integrated – An active solar energy system that is an integral part of a principal or accessory building, rather than a separate mechanical device, replacing or substituting for an architectural or structural component of the building. Such systems include, but are not limited to, solar energy systems that function as roofing materials, windows, skylights, and awnings.
58. Solar Energy System, Grid-intertie – A photovoltaic solar energy system that is connected to an electric circuit served by an electric utility company.
59. Solar Energy System, Ground-mounted – A solar collector, or collectors, located on the surface of the ground. The collector or collectors may or may not be physically affixed, or attached to the ground. Ground-mounted systems include pole-mounted systems.

60. Solar Energy System, Large – A solar energy system with a nameplate capacity of forty (40) kilowatts or more. (For numbers 1-100, you can spell out or leave as numbers or do forty (40), the rule is to be consistent. Numbers are not always consistent in this ordinance).
61. Solar Energy System, Off-grid – A photovoltaic solar energy system in which the circuits energized by the solar energy system are not electrically connected in any way to electric circuits that are served by an electric utility company.
62. Solar Energy System, Passive – A solar energy system that captures solar light or heat without transforming it to another form of energy or transferring the heat via a heat exchanger.
63. Solar Energy System, Photovoltaic – An active solar energy system that converts solar energy directly into electricity.
64. Solar Energy System, Primary Use – A solar energy system which is the primary land use for the parcel on which it is located and which generates power for sale to a power company, or other off-premise consumer.
65. Solar Energy System, Reflecting – A solar energy system that employs one or more devices designed to reflect solar radiation onto a solar collector. This definition includes systems of mirrors that track and focus sunlight onto collectors located at a focal point. The collectors may be thermal or photovoltaic.
66. Solar Energy System, Roof-mounted – A solar collector, or collectors, located on the roof of a building or structure. The collector or collectors may or may not be physically affixed, or attached to the roof.
67. Solar Energy System, Small – A solar energy system with a nameplate capacity of less than forty (40) kilowatts.
68. Solar Heat Exchanger – A component of a solar energy device that is used to transfer heat from one substance to another, either liquid or gas.
69. Solar Hot Air System – Also referred to as solar air heat; or a solar furnace. An active solar energy system that includes a solar collector to provide direct supplemental space heating by heating and re-circulating conditioned building air. The most efficient performance typically means vertically mounted on a south-facing wall.
70. Solar Hot Water System – Also referred to as a solar thermal. A system that includes a solar collector and heat exchanger that heats or preheats water for building heating systems or other hot water needs, including domestic hot water and hot water for commercial or industrial purposes.

71. Solar Mounting Devices – Devices that allow the mounting of a solar collector onto a roof surface, wall, or the ground.
72. Substation – Any electrical facility containing power conversion equipment designed for interconnection with power lines.
73. Transmission line – See Power Line.
74. Total Height – The highest point, above ground level, reached by a rotor tip or any other part of the WECS.
75. Total Name Plate Capacity – The total of the maximum rated output of the electrical power production equipment for a WECS project.
76. Tower – Towers include vertical structures that support the electrical generator, rotor blades, or meteorological equipment.
77. Tower height – The total height of the Tower exclusive of the rotor blades.
78. Wake Loss – The loss of wind resource downwind of an operating wind turbine.
79. Wake Loss Study – A study of potential impacts to the wind resource downwind of operating wind turbines.
80. Wind Energy Conversion System (WECS) – A device such as a wind charger, windmill, or wind turbine and associated facilities that converts wind energy to electric energy, including, but not limited to: power lines, transformers, substations, and meteorological towers. The energy may be used on-site or distributed into the electrical grid.
81. Wind Turbine – Any equipment that converts the kinetic energy of blowing wind into electrical energy through the use of airfoils or similar devices to capture the wind.
82. Zoning Ordinance – The Nicollet County Zoning Ordinance, regulating the use of land and water in the County; adopted 2005, as amended.

## **SECTION 6 PROCEDURES**

### **601 GENERAL PROCEDURES**

1. Zoning permits, conditional use permits and variances shall be applied for and reviewed under the procedures established in the Zoning Ordinance and Minnesota Statutes Chapter 394, except where noted below.
2. Permit Required

WECS and solar energy systems may be allowable as either permitted or conditional uses:

- A. A zoning permit shall be required for all Micro-WECS and small solar energy systems.
- B. A conditional use permit shall be required for all Non-Commercial WECS, Commercial WECS, meteorological towers, large solar energy systems, and reflecting solar energy systems.

### **602 APPLICATIONS FOR WIND ENERGY CONVERSION SYSTEMS**

1. Micro and Non-Commercial WECS

An application to the County for a permit under this section shall not be considered complete unless it contains the following information, including but not limited to:

- A. The name(s) and address(es) of all project applicant(s).
- B. The name(s) and address(es) of the project owner(s). For C-BED projects, must provide percent of ownership for each of the project owners.
- C. The legal description(s) of all properties within the project boundary.
- D. A description of the project including: number, type, total name plate generating capacity, tower height, rotor diameter, total height of all wind turbines, and means of interconnecting with the electrical grid.
- E. Site layout, including the location of project area boundaries (purchased and leased wind rights), property lines, roads, 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. Documentation of land ownership or legal control of the property and current land use on the site and surrounding area.

- G. Signed copy of the Power Purchase Agreement or documentation that the power will be utilized on-site.
  - H. Location of wetlands, scenic, and natural areas including bluffs within a one (1) mile radius of the proposed WECS.
  - I. Copies of all permits or documentation that indicates compliance with all other applicable State and Federal Regulatory Standards including, but not limited to:
    - i. Uniform Building Code, as amended.
    - ii. The National Electrical Code, as amended.
    - iii. Federal Aviation Administration (FAA), as amended.
    - iv. Minnesota Pollution Control Agency (MPCA)/Environmental Protection Agency (EPA), as amended.
    - v. Microwave Beam Path Study.
    - vi. Minnesota Pollution Control Agency Chapter 7030, Noise Standards, as amended
    - vii. Flicker Analysis.
  - J. Location of all known telecommunication towers within a two (2) mile radius of the proposed WECS.
  - K. Location of all known public or private airports or heliports within a five (5) mile radius of the proposed WECS.
  - L. Detailed Decommissioning Plan including how decommissioning costs would be covered.
  - M. Engineer's Certification of the proposed WECS.
  - N. Documentation of land ownership or legal control of all property within a project boundary and current land use on the site and surrounding area.
2. Commercial WECS

An application to the County for a permit under this section shall not be considered complete unless it contains the following information, including but not limited to:

- A. If required, a letter from the State Agency responsible for size determination of a project, pursuant to Minnesota Statutes, Chapter 216F.011, as amended.

- B. The name(s) and address(es) of project applicant(s).
- C. The name(s) and address(es) of the project owner(s). For C-BED projects, must provide percent of ownership for each of the project owners.
- D. The legal description(s) and address(es) of the project.
- E. A description of the project including: number, type, total name plate generating capacity, tower height, rotor diameter, total height of all wind turbines, and means of interconnecting with the electrical grid.
- F. Site layout, including the location of project area boundaries (wind rights purchased, leased, or acquired by easement), property lines, roads, 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.
- G. Documentation of land ownership or legal control of all property within a project boundary and current land use on the site and surrounding area.
- H. Signed copy of the Power Purchase Agreement or documentation that the power will be utilized on-site.
- I. The latitude and longitude of individual wind turbines.
- J. A USGS topographical map, or map with similar data, of the property and surrounding area, including any other WECS within ten (10) rotor diameters of the Proposed WECS.
- K. Location of wetlands, scenic and natural areas including bluffs within a one (1) mile radius of the proposed WECS and location of historic sites within a two (2) mile radius as listed by Minnesota's State Historic Preservation Office or the National Register of Historic Places.
- L. Copies of all permits or documentation that indicates compliance with all other applicable State and Federal Regulatory Standards including, but not limited to:
  - i. Uniform Building Code, as amended.
  - ii. The National Electrical Code, as amended.
  - iii. Federal Aviation Administration (FAA), as amended.
  - iv. Minnesota Pollution Control Agency (MPCA)/Environmental Protection Agency (EPA), as amended.

- v. Microwave Beam Path Study.
  - vi. Preliminary Acoustic Study.
  - vii. Noise Abatement Mitigation Plan.
  - viii. Flicker Analysis.
  - ix. Minnesota Pollution Control Agency, Chapter 7030, Noise Standards, as amended.
  - x. Wake Loss Study, if proposed project boundary is within a one (1) mile radius of another WECS project boundary
- M. Location of all known communications towers and microwave beam paths within a five (5) mile radius of the proposed WECS.
- N. Location of all known public or private airports or heliports within a five (5) mile radius of the proposed WECS.
- O. Detailed Decommissioning Plan including how decommissioning costs would be covered.
- P. Additional information stated in Minnesota Rules, part 7854.0500 (subpart 1), as amended.
- Q. Identification of any and all haul routes to be utilized for material transportation and construction activities including state, federal, county, township, or private roads within the County.
- R. Locations and site plans for all temporary, non-residential construction sites and staging areas.

**603 APPLICATIONS FOR PRIMARY USE SOLAR ENERGY SYSTEMS**

An application to the County for a permit under this section shall not be considered complete unless it contains the following information, including but not limited to:

- 1. Primary Use Solar Energy Systems
  - A. Site Plans
    - i. Existing Conditions

- 1) Existing property lines and property lines extending one hundred (100) feet from the exterior boundaries, including the names of the adjacent property owners and current use of those properties.
- 2) Existing public and private roads, showing widths of the roads and any associated easements.
- 3) Location and size of any abandoned wells, sewage treatment systems, and dumps.
- 4) Existing buildings and any impervious surface.
- 5) Topography at two (2) foot intervals and source of contour interval, unless determined otherwise by the Department. A contour map of the surrounding properties may also be required.
- 6) Existing vegetation (list type and percent of coverage; i.e. grassland, plowed field, wooded areas, etc.).
- 7) Waterways, watercourses, lakes and public water wetlands.
- 8) Delineated wetland boundaries.
- 9) Flood plain district boundary, if applicable.
- 10) The shoreland district boundary, if applicable.
- 11) Mapped soils according to the County Soil Survey.
- 12) Surface water drainage patterns.

ii. Proposed Conditions

- 1) Location and spacing of solar collectors.
- 2) Location of access roads.
- 3) Planned location of underground or overhead electric lines connecting the system to the building, substation, or other electric load.
- 4) New electrical equipment other than at the existing building or substation that is the connection point for the system.
- 5) Proposed erosion and sediment control measures, as required in Section 719 of the Zoning Ordinance.



- 6) Proposed stormwater management measures.
  - 7) Sketch elevation of the premises accurately depicting the proposed solar energy system and its relationship to any buildings or structures on adjacent lots.
- B. Manufacturer's specifications and recommended installation methods for all major equipment, including solar collectors, mounting systems, and foundations for poles or racks.
  - C. The number of collectors to be installed.
  - D. A description of the method of connecting the system to a building or substation.
  - E. A signed copy of the interconnection agreement with the local electric utility or a written explanation outlining why an interconnection agreement is not necessary.
  - F. Maintenance plan for grounds surrounding the systems.
  - G. A plan outlining the use, storage, and disposal of chemicals used in the cleaning of the collectors and/or reflectors.

**SECTION 7 DISTRICT REGULATIONS**

**701 PERMITTED AND CONDITIONAL USES**

WECS and Solar Energy Systems will be permitted, conditionally permitted, or not permitted based on the land use district as established in the tables below (P=Permitted, C=Conditionally Permitted, NP=Not Permitted):

<i><b>DISTRICT</b></i>	<i><b>Micro-WECS</b></i>	<i><b>Non-Commercial WECS</b></i>	<i><b>Commercial WECS</b></i>	<i><b>Meteorological Tower</b></i>
AG Agricultural Preservation	P	C	C	C
C Conservancy	P	NP	NP	NP
R-1 Urban/Rural Residential	P	NP	NP	NP
R-2 Multi-Family Urban	P	NP	NP	NP
B-1 Highway Business	P	C	C	C
B-2 General Business	P	C	C	C
I-1 Limited Industry	P	C	C	C
I-2 General Industry	P	C	C	C
FP Floodplain	NP	NP	NP	NP
SP Special Protection	P	NP	NP	NP
S Shoreland	NP	NP	NP	NP
RT Rural Townsite	P	NP	NP	NP

<i><b>DISTRICT</b></i>	<i><b>Solar Energy System, Small</b></i>	<i><b>Solar Energy System, Large</b></i>	<i><b>Solar Energy System, Reflecting</b></i>
AG Agricultural Preservation	P	C	C
C Conservancy	P	C	NP
R-1 Urban/Rural Residential	P	NP	NP
R-2 Multi-Family Urban	P	NP	NP
B-1 Highway Business	P	C	C
B-2 General Business	P	C	C
I-1 Limited Industry	P	C	C
I-2 General Industry	P	C	C
FP Floodplain	NP	NP	NP
SP Special Protection	P	NP	NP
S Shoreland	NP	NP	NP
RT Rural Townsite	P	NP	NP

**SECTION 8 WECS GENERAL STANDARDS**

**801 WECS SETBACKS**

All WECS and meteorological towers shall meet the following setbacks:

<i>SETBACK TYPE</i>	<i>MICRO-WECS</i>	<i>NON-COMMERCIAL WECS</i>	<i>COMMERCIAL</i>	<i>METEOROLOGICAL TOWER</i>
Project Boundary/ Property Lines	1.1 times the total height	1.1 times the total height	3 RD Non-prevailing and 5 RD Prevailing*	1.1 times the total height
Dwellings, other than project owners	1.1 times the total height	1,000 feet and sufficient distance to meet state noise standards	2,640 feet and sufficient distance to meet state noise standards	1.1 times the total height, minimum of 250 feet
Noise Standard	Minnesota Rule 7030, as amended	Minnesota Rule 7030, as amended	Minnesota Rule 7030, as amended	N/A
Road Right-of-Way	1.1 times the total height	1.1 times the total height	1.1 times the total height	1.1 times the total height
Other Right-of-Way (Railroads, Power lines, Recreational Trails, etc.)	1.1 times the total height	1.1 times the total height	1.1 times the total height	1.1 times the total height
Public Conservation Lands	1.1 times the total height	1.1 times the total height	3 RD Non-Prevailing and 5 RD Prevailing*	600 feet
Wetlands, USFW Types III, IV, and V	1.1 times the total height	1.1 times the total height	1,000 feet or 3 RD Non-Prevailing and 5 RD Prevailing*	600 feet
Other Structures	N/A	1.1 times the total height	1.1 times the total height	1.1 times the total height or a minimum of 250 feet
Other Existing WECS and Internal Turbine Spacing	N/A	3 RD Non-Prevailing and 5 RD Prevailing*	3 RD Non-Prevailing and 5 RD Prevailing*	N/A
Minnesota River Valley	N/A	2,640 feet	2,640 feet	N/A

\*See Appendix A. RD = Rotator Diameter

1. The setback for dwellings, schools, churches, health care facilities, and campgrounds shall be reciprocal in that no new dwellings, schools, churches, health care facilities, or campgrounds shall be constructed within one thousand (1,000) feet of an existing non-commercial WECS or two thousand six hundred forty (2,640) feet of an existing commercial WECS other than those owned by the project owner.
2. Setbacks shall be measured from future rights-of-way if planned, changed, or expanded rights-of-way are known.
3. Prevailing and non-prevailing rotor diameter setbacks shall be measured horizontally from the tower base.
  - A. Prevailing Wind - True North Azimuth between 290° to 30° and between 130° and 230°.\*
  - B. Non-Prevailing Wind – True North Azimuth between 30° and 130° and between 230° and 290°.\*

\*See Appendix A

4. For the purpose of this Ordinance, the Minnesota River Valley shall be considered to be an elevation equal to, or less than 850 (no hyphen)feet above sea level.

## **802 ADDITIONAL SETBACK REQUIREMENTS**

1. Based on the total height, Micro WECS, Non-Commercial WECS, or Commercial WECS as defined in this Ordinance, will follow the setbacks established for the category for which they fall under, as listed in Section 8 of this Ordinance.

2. Native Prairie

WECS and associated facilities shall not be placed in native prairie unless approved in a native prairie protection plan. A native prairie protection plan shall be submitted if native prairie is present. The permittee shall, with the advice of the DNR and any others selected by the permittee, prepare a prairie protection and management plan and submit it to the County and DNR Commissioner sixty (60) days prior to the start of construction.

3. Sand and Gravel Operations

WECS shall be prohibited in active sand and gravel operations.

4. Aviation (public and private airports)

No WECS shall be located so as to create an obstruction to navigable airspace of public and private airports in the County. Setbacks or other limitations determined in accordance with MnDOT Department of Aviation and Federal Aviation Administration (FAA) requirements.

5. Setbacks

Substations, accessory facilities, and power lines associated with the WECS not located within a public right-of-way or any utility easement required by the Zoning Ordinance shall be setback from the edge of the right-of-way as regulated in Section 6 of the Zoning Ordinance.

6. The setback for new dwellings shall be reciprocal in that no dwelling shall be constructed within the same setback as a new wind turbine would need to meet to an existing dwelling.

7. Wind turbines shall be prohibited within the Shoreland District.

**803 SAFETY DESIGN STANDARDS**

1. Engineering Certification

For all WECS, the manufacturer's engineer or another qualified engineer shall certify that the turbine, foundation and tower design of the WECS is within accepted professional standards, given local soil and climate conditions.

2. Clearance

At all times, rotor blades or airfoils must maintain at least thirty (30) feet of clearance between their lowest point and grade/ground surface.

3. Warnings

A. For all 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.

B. For all guyed towers:

i. 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 eight (8) feet above grade/ground surface.

- ii. Four (4) marker balls shall be placed sixteen (16) feet above grade and at fifty (50) foot intervals along the guy wires from grade/ground surface.
- iii. Visible, anti-climbing fencing shall be installed around anchor points of guy wires and tower base.

#### **804 TOWER CONFIGURATION STANDARDS**

1. All wind turbines, which are part of a commercial and C-BED WECS project, shall be installed with a tubular, monopole type tower.
2. Meteorological towers, Micro, and Non-Commercial wind turbines may be guyed.
3. Color and Finish

All wind turbines and towers that are part of a WECS shall be white, grey or another non-obtrusive color. Blades may be black in order to facilitate deicing. Finishes shall be matte or non-reflective.

4. 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 night-time illumination to reduce impacts on migrating birds. Red pulsating incandescent lights are prohibited.

#### **805 ABANDONMENT AND DECOMMISSIONING**

A WECS shall be considered a discontinued use after one (1) year without energy production, unless a plan is developed and submitted to the Zoning Administrator outlining the steps and schedule for returning the WECS to service.

1. Removal Requirements

When the WECS is scheduled to be decommissioned, the project owner(s)/property owner(s) shall notify the County by certified mail of the proposed date of discontinued operations and plans for removal. The owner/operator shall physically remove the WECS no more than sixty (60) days after the date of discontinued operations. At the time of removal, the WECS site shall be restored to the state it was in before the WECS was constructed or any other legally authorized use. More specifically, decommissioning shall consist of:

- A. All WECS and accessory facilities shall be physically removed to four (4) feet below grade level within sixty (60) days of the discontinuation of use.

- B. Disposal of all solid and hazardous waste in accordance with local, state, and federal waste disposal regulations.
- C. Stabilization or re-vegetation of the site as necessary to minimize erosion. The conditional use permit granting authority may allow the owner to leave landscaping or designated below-grade foundations in order to minimize erosion and disruption to vegetation.
- D. Abandonment

Absent notice of a proposed date of decommissioning, the project shall be considered abandoned when the project fails to operate for more than one (1) year without the written approval of the Zoning Administrator. The Zoning Administrator shall determine in its decision what proportion of the project is inoperable for the project to be considered abandoned. If the property owner/project owner fails to remove the WECS in accordance with the requirements of this section within sixty (60) days of abandonment or the proposed date of decommissioning, the County shall have the authority to enter the property and physically remove the WECS.

- E. Decommissioning Plan

The plan shall outline the anticipated means and cost of removing WECS at the end of their serviceable life or upon becoming a discontinued use. 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. The plan shall also address road maintenance during and after completion of the decommissioning in compliance with this Ordinance.

- F. Financial Surety

The applicant shall provide a bond in the amount of \$50,000, payable to Nicollet County, per commercial wind turbine or an amount to be determined by the County, to cover the cost of removal in the event the County must remove the WECS. The applicant shall submit a fully inclusive estimate of the costs associated with removal prepared by a Professional Engineer, a contractor capable of decommissioning or a person with suitable expertise or experience with decommissioning. The cost estimate for removal shall include an adjustment for inflation over the expected life of the project.

## **806 FLICKER ANALYSIS**

A Flicker Analysis shall include the duration and location of flicker potential for all receptors and road ways within a one (1) mile radius of each turbine within a project. The applicant shall provide a site map identifying the locations of shadow flicker that may be caused by the project and the expected durations of the flicker at these locations from sun-rise to sun-set over the course of a year. The analysis shall account for topography but not for obstacles such as accessory structures and trees. Flicker at any receptor shall not exceed thirty (30) hours per year within the analysis area.

## **807 ADDITIONAL STANDARDS FOR COMMERCIAL WECS PROJECTS**

### 1. Preliminary Acoustic Studies

An acoustic study that demonstrates the project will be compliant with Minnesota Rules 7030, as amended. This shall include the estimated dB(A) levels at all receptors within a one (1) mile of the nearest turbine within a project area and shall include accumulated sound within the project.

### 2. Local Emergency Services Notification

- A. The Applicant shall provide a copy of the project summary and site plan to local emergency services, including paid or volunteer Fire Department(s), that serve the WECS project area.
- B. The Applicant shall coordinate with local emergency services to develop and implement an emergency response plan for the WECS Project. A copy of the plan shall be submitted to the Environmental Services Department.

### 3. Pre-Construction Meeting

The applicant shall conduct a Pre-Construction meeting prior to construction commencement with a written notice sent to the following individuals a minimum of one (1) week prior to said meeting:

- A. Township Chairman
- B. County Public Works Director
- C. County Sheriff
- D. County Zoning Administrator
- E. Area Hydrologist, Minnesota Department of Natural Resources
- F. Minnesota Pollution Control Agency



- G. United States Farm Service Agency
- H. County Soil & Water Conservation District
- I. United States Fish & Wildlife Service
- J. Minnesota State Historical Society
- K. Minnesota Department of Transportation

## **808 OTHER APPLICABLE STANDARDS**

### 1. Other Signage

All signage on site shall comply with Section 731 of the Zoning Ordinance. The manufacturers' or owner's company name and/or logo may be placed upon the nacelle, the compartment containing the electrical generator, of the WECS.

### 2. Power Lines

All power lines associated with the WECS subject to County Authority equal to or less than 34.5 kV in capacity shall be buried and located within the right-of-way, subject to prior approval of the road authority. Power lines installed as part of a WECS shall not be considered an essential service. If not buried, the applicant/owner must apply for a variance and shall follow Section 5 of the Zoning Ordinance for variance procedures.

### 3. 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.

### 4. Orderly Development

Upon issuance of a conditional use permit, all WECS, as defined by Minnesota Statute 216F, as amended, if applicable shall notify the Minnesota Public Utilities Commission (PUC) Energy Facilities Permitting program Staff of the project location and details on the survey form specified by the PUC.

### 5. Noise

All WECS shall comply with Minnesota Rule 7030, as amended, governing noise.

6. Electrical Code and Standards

All WECS and accessory equipment and facilities shall comply with the National Electrical Code and other applicable standards.

7. Federal Aviation Administration

All WECS shall comply with FAA standards and permits.

**809 AVOIDANCE AND MITIGATION OF DAMAGES TO PUBLIC INFRASTRUCTURE**

1. Roads

- A. Identify all public roads to be used for the purpose of transporting WECS, substation parts, materials, and/or equipment for construction, operation or maintenance of the WECS and obtain applicable weight and size permits from the impacted road authority(ies) prior to construction.
- B. Contact the road authority for road closures, road signage removals, road signage re-locating, road signage restoring, moving permits, culverts, access/driveway permits, tile outlet permits, widening road intersections, standard utility permits and any other road activities that may require permits.
- C. Contact the County Dispatch prior to any road closures for the re-routing of emergency vehicles during the closure.
- D. Contact the road authority to conduct an inspection of the road conditions of the haul routes prior to and after construction.
- E. The applicant shall retain a registered engineer to analyze bridges along the haul routes to determine if the bridges have the capacity to support the oversized vehicles. The applicant shall provide a signed report by the registered engineer to the road authority prior to the use of the bridges identified on the haul routes.
- F. Provide a bond, in an amount determined by the road authority, to be held by the County until the Township and/or County road authority(ies) have provided the County Auditor-Treasurer with a written release that all haul routes within their jurisdiction in the County have been returned to pre-construction condition.

2. Drainage System

The Applicant shall be responsible for immediate repair of damage to public and private drainage systems stemming from construction, operation, maintenance, or decommissioning.

## **810 INTERFERENCE**

The applicant shall minimize or mitigate interference with electromagnetic communications including, but not limited to radio, telephone, microwaves, or television signals caused by any WECS. The applicant shall notify all communication tower operators within a five (5) mile radius of the proposed WECS location upon application to the County for permits. No WECS shall be constructed so as to interfere with County or Minnesota Department of Transportation microwave transmissions.

## **SECTION 9 SOLAR ENERGY SYSTEM STANDARDS**

### **901 GENERAL STANDARDS**

The following standards shall be applicable to all solar energy systems:

1. Systems shall be designed and operated in a manner that protects public safety.
2. Systems shall be in compliance with any applicable local, state and federal regulatory standards, including, but not limited to, the State of Minnesota Uniform Building Code, as amended, and the National Electric Code, as amended.
3. Systems that result in the creation of one (1) or more acres of impervious surface, must comply with the MPCA Construction Stormwater Permit Requirements.
4. Systems shall not be used to display advertising, including; signage, streamers, pennants, spinners, reflectors, ribbons, tinsel, balloons, flags, banners or similar materials. The manufacturers and equipment information, warning, or indication of ownership shall be allowed on any equipment of the solar energy system provided they comply with the prevailing sign regulations.
5. Tree removal shall be minimized and mitigated in accordance with Section 721 of the Zoning Ordinance.
6. The applicant shall submit a decommissioning plan, per the standards of this Ordinance, with the permit application.

### **902 ROOF-MOUNTED SOLAR ENERGY SYSTEMS**

The following standards shall apply to roof-mounted solar energy systems:

1. Roof-mounted solar energy systems shall not exceed by more than four (4) feet the maximum allowed height in any zoning district.
2. In addition to the structure setback, the collector surface and mounting devices for roof-mounted solar systems shall not extend beyond the exterior perimeter of the structure on which the system is mounted or built, except for when such an extension is designed as an awning.
3. The collector and racking for roof-mounted systems that have a greater pitch than the roof surface shall be set back from all roof edges by at least two (2) feet.
4. Exterior piping for roof-mounted solar hot water systems may extend beyond the perimeter of the structure on side and rear yard exposures.

5. Roof-mounted solar systems, excluding building-integrated systems, shall not cover more than eighty percent (80%) of the south-facing or flat roof upon which the collectors are mounted.

### **903 GROUND-MOUNTED AND POLE-MOUNTED SOLAR ENERGY SYSTEMS**

The following standards shall apply to ground and pole-mounted solar energy systems:

1. Ground and pole-mounted systems shall not exceed twenty (20) feet in height when oriented at maximum design tilt.
2. Ground and pole-mounted systems shall not extend into the side-yard, rear, or road right-of-way setback when oriented at minimum design tilt.
3. The total collector surface area of pole or ground mount systems shall not exceed fifty percent (50%) of the building footprint of the principal structure in the following zoning districts:
  - A. R-1, Urban/Rural Residential
  - B. R-2, Multi-Family Urban Residential
  - C. R-T, Rural Townsite
4. Ground and pole-mounted systems shall have natural ground cover under and between the collectors and surrounding the system's foundation or mounting device(s).

### **904 WALL-MOUNTED SOLAR ENERGY SYSTEMS**

The following standard shall apply to wall-mounted solar energy systems:

1. In residential zoning districts, wall-mounted solar energy systems shall cover no more than twenty-five percent (25%) of any exterior wall facing a front yard.

### **905 ACCESSORY SOLAR ENERGY SYSTEMS**

The following standards shall apply to accessory solar energy systems:

1. Accessory solar energy systems must meet all setback requirements pertinent to accessory structures for the zoning district.
2. Solar energy systems do not count as an accessory structure for the purpose of meeting limits on the total square footage of accessory structures allowed per residential lot, as set forth in Section 703.1 of the Zoning Ordinance.

3. Accessory solar energy systems shall not be located nearer the front lot line than the principal building on the lot. This requirement shall apply to the following zoning districts:
  - A. R-1, Urban/Rural Residential
  - B. R-2, Multi-Family Urban Residential
  - C. R-T, Rural Townsite

### **906 LARGE SOLAR ENERGY SYSTEMS**

The following standards shall apply to large solar energy systems:

1. All elements of the system shall meet or exceed all district regulations based on the applicable zoning district.
2. Systems shall meet the requirements of the MPCA Construction Stormwater Permit requirements.
3. Systems shall meet the requirements for erosion and sediment control as per Section 719 of the Zoning Ordinance.
4. The manufacturer's engineer or another qualified engineer shall certify that the foundation and design of the solar energy system is within accepted professional standards, given local soil and climate conditions.
5. Power and communication lines running between banks of solar collectors and to electric substations or interconnections with buildings shall be buried underground. Exemptions may be granted in instances where shallow bedrock, water courses, or other elements of the natural landscape interfere with the ability to bury lines.
6. Vegetative screening of the system may be required as a part of the conditions of approval. It shall be based on the proximity of the system to residential buildings and to abutting public rights-of-way. The vegetation shall consist of canopy and conifer trees.

### **907 PHOTOVOLTAIC SOLAR ENERGY SYSTEMS**

The following standards shall apply to photovoltaic solar energy systems:

1. For photovoltaic solar energy systems, the electrical disconnect switch shall be clearly identified and unobstructed.

2. No grid-intertie photovoltaic solar energy system shall be installed until documentation has been given to the Zoning Administrator that the owner has notified the utility company of the customer's intent to install an interconnected customer-owned generator. Documentation may consist of an interconnection agreement or a written explanation from the utility provider or contractor outlining why an interconnection agreement is not necessary. Off-grid systems are exempt from this requirement.
3. Photovoltaic solar energy system components must have an Underwriters Laboratory (UL) listing and solar hot water systems must have a Solar Rating & Certification Corporation (SRCC) rating.

### **908 REFLECTING SOLAR ENERGY SYSTEMS**

The following standards shall apply to reflecting solar energy systems:

1. Systems shall be designed and operated to prevent the misdirection of reflected solar radiation onto adjacent or nearby property, public roads, or other areas open to the public.
2. Systems shall not be permitted to be located within Zone C as designated in the Le Sueur Airport Zoning Ordinance, as amended.

### **909 DECOMMISSIONING**

A decommissioning plan shall be submitted with all applications for a solar energy system.

1. Decommissioning plans shall outline the anticipated means and cost of removing the system at the end of its serviceable life or upon its becoming a discontinued use. 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 system.
2. Decommissioning of the system must occur within sixty (60) days from either of the following:
  - A. The end of the system's serviceable life; or
  - B. The system becomes a discontinued use.
3. A system shall be considered a discontinued use after one (1) year without energy production, unless a plan is developed and submitted to the Zoning Administrator outlining the steps and schedule for returning the system to service.

4. Decommissioning shall consist of the following:
  - A. The removal of the system's foundation. An exemption from this requirement may be granted by the conditional use permit granting authority if it is determined that the removal of the foundation will significantly increase erosion and/or significantly disrupt vegetation on the site.
  - B. Disposal of all solid and hazardous waste in accordance with local, state, and federal waste disposal regulations.
  - C. The stabilization of soils and/or re-vegetation of the site as necessary to minimize erosion. The conditional use permit granting authority may allow the owner to leave landscaping or designated below-grade foundations in order to minimize erosion and disruption to vegetation.
5. The Board may require the posting of a bond, letter of credit, or the establishment of an escrow account to ensure proper decommissioning.



**SECTION 10 ENFORCEMENT, VIOLATIONS, REMEDIES AND PENALTIES**

Enforcement of this Ordinance shall be done in accordance with the process and procedures established in Section 8 of the Zoning Ordinance.

**SECTION 11 EFFECTIVE DATE**

This Ordinance shall be in full force and effect from and after July 8, 2014 of the date of its passage and publication according to law, whichever occurs first.

Dated this 8<sup>th</sup> day of July, 2014



\_\_\_\_\_  
Marie Dranttel, Chair  
Nicollet County Board of Commissioners

ATTEST:

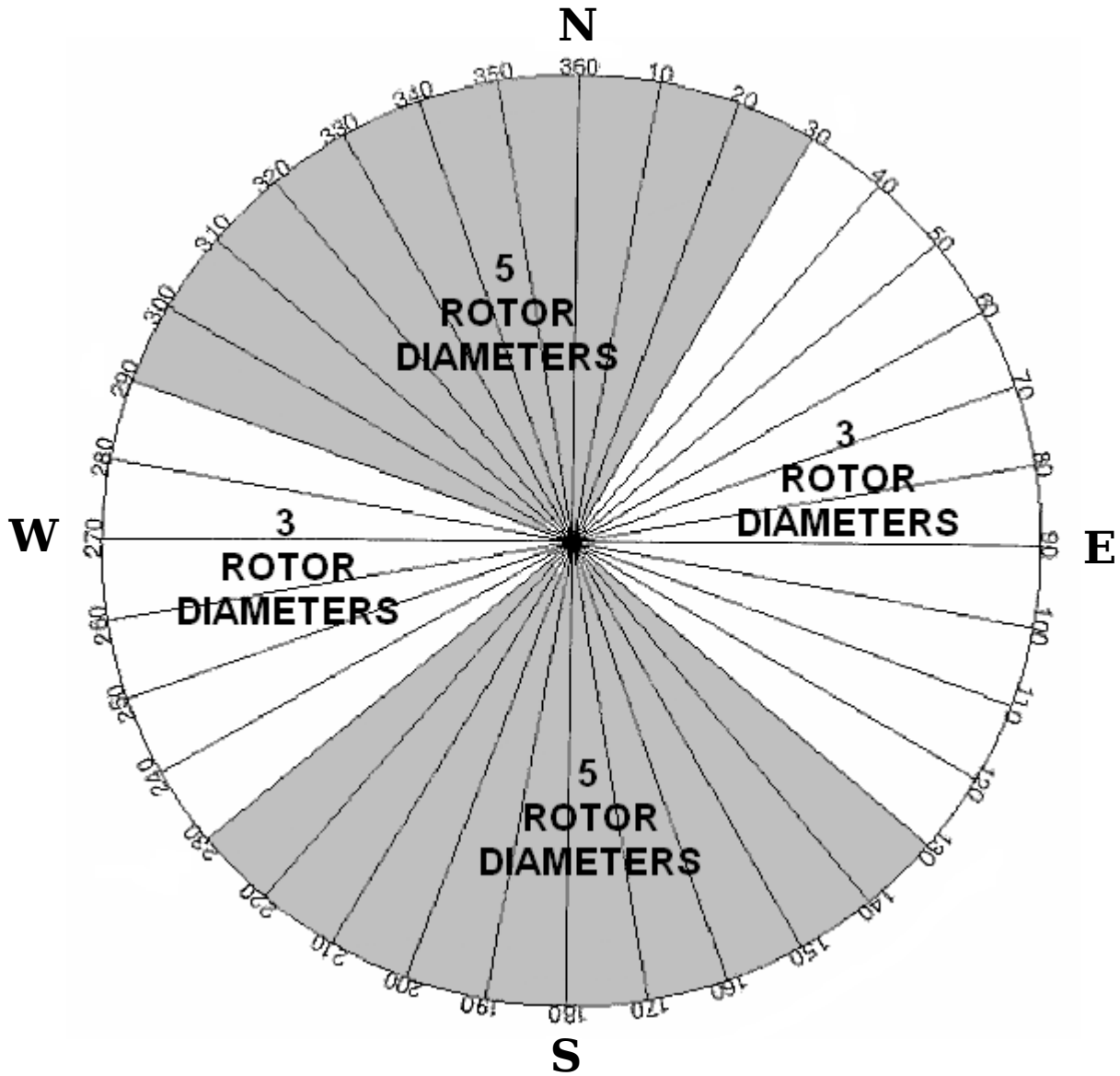


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Ryan Kroesch, Clerk to the Board

**APPENDIX A**

The shaded area represents the prevailing, or dominant wind direction in the County. The non-shaded area represents non-prevailing wind direction.

Turbines shall be spaced as defined in Section 801 of this Ordinance based on this diagram where setbacks are determined by Rotor Diameter (RD).



## APPENDIX B

### Supporting Documents:

<i>NAME OF DOCUMENT</i>	<i>DISTRIBUTED BY:</i>	<i>DATE</i>
Wind Energy Guide for County Commissioners	U.S. Dept of Energy - Energy Efficiency & Renewable Energy	10/1/06
The "How to" Guide to siting Wind Turbines to Prevent Health Risks from Sound	George W. Kamperman, P.E.	10/1/08
Wind Turbine Noise: Perspectives for Control Noise Ordinances	Geoff Leventhall	10/1/05
Why noise criteria are necessary for proper siting of Wind Turbines	George W. Kamperman, P.E.	11/02/08
Facts about wind energy and noise - Wind energy fact sheet	American Wind Energy Association	
Infrasound from Wind Turbines - Fact, Fiction or Deception	Geoff Leventhall	06/28/05
Wind Turbine Acoustic Noise	Renewable Energy Research Laboratory	6/1/02
Wind Turbine Noise - Is Low Frequency Noise a Problem for Wind Turbines?	Neil Kelley, U.S. National Renewable Energy Laboratory	
"Health, Hazard and Quality of Life Near Wind Power Installations. How Close is Close?"	Dr. Geoff Leventhall	6/25/05
Adverse Health effects of noise	Guidelines for Community Noise - "World Health Organization"	
Addressing Wind Turbine Noise	Daniel J. Alberts	10/1/06
Introduction of Acoustics Related to Wind Energy	Thomas M. Huber	3/1/09
Wind Turbine Acoustics - NASA	Harvey H. Hubbard & Kevin P. Shepherd	12/1/90
Baseline Environmental Sound Levels for Wind Turbine Projects	George F. Hessler, David M. Hessler	Nov-06
CRS Report for Congress - Wind Power in the United States: Technology, Economic, and Policy Issues	Jeffrey Logan & Stan Mark Kaplan	06/01/08
Digital Television		
Appendix B: Avail spectral sound power data; Appendix C: Sound power levels & wind speed; Appendix D: Sound power data used in calculations	WINDFARM perception	
Wind Energy Model Ordinance Options	Katherine Daniels, NY Planning Federation	10/1/05
Sound Level		
The Vibroacoustic Disease: Some Forensic Aspects	Center for Human Performance	

Various Indoor & Outdoor sound levels		
Technical meeting on exposure-response relationships of noise on health	World Health Organization	06/25/05
Noise & Health	Inter-disciplinary International Journal	11/25/08
Levels of sound produced by Various Sources		
Using Decibels		
Wind Turbine Technology Overview	NYS Energy Research & Dev Authority	10/1/05
Transmission and Wind Energy: Capturing the Prevailing Winds for the Benefit of Customers	National Grid	Sep-06
Noise and Shadow Flicker	The National Academies Press	2007
Guide for Evaluating Wind-Energy Projects	The National Academies Press	2007
Wind Farms Provide Negligible Useful Electricity	Richard S. Courtney	Mar-06
Dairy Update - Source of Stray Voltage & Effect on Cow Health & Performance	R.D. Appleman, R.J. Gustafson	Oct-07
What do we Know About Stray Voltage?	Douglas J. Reinemann	03/28/03
Advanced Wind Technology: New Challenges for a New Century	R. Thresher & A. Laxson	Jun-06
United State Annual Average Wind Power		
Regulation of Noise in the United States	Mark Bastasch	
Research into aerodynamic modulation of wind turbine noise	University of Salford	Jul-07
Wind Turbine Generator Systems - Acoustic Noise Measurement Techniques		2002
Wind Turbines & Sound: Review & Best Practice Guidelines	CanWEA, Howe Gastmeier Chapnik Limited (HGC Engineering)	02/15/07
Noise Immission from Wind Turbines	National Engineering Laboratory	02/10/99
Ecological Psychoacoustics & Auditory Displays: Hearing, Grouping & Meaning Making	Bruce N. Walker & Gregory Kramer	
International Electrotechnical Commission Standard IEC 61400-11 & Other Procedures - Acoustic Noise Measurement Techniques	Arlinda Huskey - National Renewable Energy Laboratory	2006
In the Great Plains - Prevailing Wind Erosion Direction	W.S. Chepil, F.H. Siddoway, D.V. Armbrust	1964
Report on the second meeting on night noise guidelines	European Centre for Environment & Health	2004
Monitoring Vibroacoustic Disease	Nuno A.A. Castelo Branco, Augusto J. F. Martinho Pimenta, Jose M. Reis Ferreira, Mariana Alves-Pereira	
An Overview of Existing Wind Energy Ordinances	F. Oteri	2008
Quantifying burden of disease from environmental noise: Second technical meeting report	World Health Organization - Europe	12/15/05
Effects of the wind profile at night on wind turbine sound	Journal of Sound & Vibration	01/22/03

Wind Energy Noise Impacts	The Acoustic Ecology Institute	01/06/09
Health & Safety Issues Identified & Recommended for Scrutiny	Chatham-Kent Public Health Unit	Jun-08
Environmental Impacts of Wind Farms: Myth & Reality	E. Binopoulos, P. Haviaropoulos - Centre for Renewable Energy Sources	
Tuning & Sensitivity of the human vestibular system to low-frequency vibration	Neil P. McAngus Todd, Sally M. Rosengren, James G. Colebatch	07/06/08
Wind Farms & Their Effects on Public Safety Radio Systems	LJK - Wireless Communications Engineering	02/24/05
Environmental Impacts of Wind-Energy Projects	National Academy of Sciences	2007
Aeroacoustics of Large Wind Turbines	Harvey H. Hubbard & Kevin P. Shepherd	09/12/89
What is Noise Pollution?		
Low Frequency Noise & Vibration & its Control	G. P. Van der berg	09/01/04
Utility Wind Integration State of the Art	Utility Wind Integration Group	May-06
Vibroacoustic Disease	N.A.A. Castelo Branco & M. Alves-Pereira	02/06/04
Project WINDFARMperception - Visual & acoustic impact of wind turbine farms on residents	Science Shop for Medicine & Public Health Applied Health Research	06/03/08
Ice & Snow - and the Winds do Blow - NWCC Technical Considerations in Sitting Wind Developments	National Renewable Energy Laboratory	Dec-05
Turbine Design Requirements for Safety	National Wind Technology Center	Dec-05
Wind Turbine Noise - Terminology, Measurement Techniques & Standards		Dec-05
Otsego County Planning Commission White Paper Land Use Issues of Wind Turbine Generator Sites		
Wind Turbine Noise & Vibration		
Vibroacoustic Disease		Apr-04
WTIC Jacobs 31/20 Wind Turbine Sound Level Measurements	Lake Michigan Wind & Sun Ltd	Sep-07
Overview of Existing Wind Energy Ordinances	F. Oteri	Dec-08

#### **CALIFORNIA**

Wind Energy Systems - Santa Barbara County, CA		7/1/07
Wind Energy(WE) Combining District		

#### **IOWA**

Wind Energy Production: Legal Issues & Related Liability Concerns for Landowners in Iowa & Across the Nation	Roger McEowen	1/22/09
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**ILLINOIS**

An ordinance regulating wind energy conversion systems within Logan County, IL		
Model Ordinance regulating the siting of Wind Energy Conversion Systems in Illinois	The Chicago Environmental Law Clinic & Baker & McKenzie	5/5/03

**MASSACHUSETTS**

Results of Shadow Flicker Analysis and Preliminary Acoustic Study for the Town of Fairhaven	Nils Bolgen MTC	5/1/07
Wind Turbine Noise Issues	Renewable Energy Research Laboratory	6/1/02
Model Amendment to a Zoning Ordinance or By-Law: Allowing Wind Facilities by Special Permit	Massachusetts Division of Energy Resources	
Renewable Energy Research Laboratory - Letter presented @ public meeting - wind turbine at Technology Park in Falmouth, MA	Jon G. McGowan - Professor	3/14/08
Infrasound & Psychoacoustics	University of Massachusetts at Amherst - Anthony L Rogers	12/2/05
Wind Turbine Noise, Infrasound & Noise Perception - University of Massachusetts at Amherst	Anthony L. Rogers - Renewable Energy Research Laboratory	1/18/06

**MICHIGAN**

Examples of Noise Standards & Wind Turbine Noise Regulations	Carolyn Weed - Centerville Township Commercial Wind Ordinance Committee	8/7/06
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**MINNESOTA**

A Guide to Noise Control in Minnesota - Acoustical Properties, Measurement, analysis and Regulation	Minnesota Pollution Control Agency	10/1/08
Section 21 Windpower Development / 250kw or greater - Dodge County, MN		
Wind Power Management Ordinance - Chisago County, MN		6/1/07
Wind Energy Conversion Systems - Stearns County Zoning Ordinance	Stearns County Zoning Ordinance	6/1/08
Wind Energy Ordinance - Murray County, MN	Murray County	1/1/09
Wind Energy Conversion Systems - Lyon County, MN	Lyon County	
Tower Ordinance - Faribault County, MN	Faribault County	
Minnesota's Wind Resource by Wind Speed at 80 meters	Minnesota Dept of Commerce - WindLogics	Jan-06
Public Health Impacts of Wind Turbines	Minnesota Department of Health Env. Health Division	5/1/09
2007 Minnesota Statutes - 272.029 Wind Energy Production Tax		

272.02 Minnesota Statute - Subd 22 - Wind Energy Conversion Systems		
Wind Energy Conversion Systems - Minnesota Assessors Manual	MN Dept of Revenue	5/1/06
State of Minnesota Dept of Commerce - Notice of Public Comment Period	Minnesota Dept of Commerce	9/28/07
Small Wind Electric Systems - A Minnesota Consumer's Guide	US Dept of Energy	Jan-06
Avian Use, Flight Behavior, & Mortality on the Buffalo Ridge, Minnesota, Wind Resource Area	M. Dale Stricklan, Gregory D. Johnson, Wallace P. Erickson, Sharon A. Sarappo, Richard M. Halet	
Section 14-18.5 Special Requirements for Wind Energy Conversion Sysytem - Mower County, MN		
Minnesota's Wind Power Industry is picking up speed	Mary Hoff, Stillwater	2003
Fillmore County - Wind Energy Conversion System Ordinance		2007
Plymouth Zoning Ordinance - Wind Energy Conversion System (WECS)		05/14/02
Benton County Ordinance No 347		8/6/02
Renville County Land Use Ordinance	Renville County	
Big Stone County Wind Power Management Ordinance 2006	Big Stone County	2006
Section 12- Windpower Management		02/15/05
Stevens County Interim - Wind Energy Conversion Systems Ordinance	Stevens County	01/22/07
Wind Energy Systems Fact Sheet - County Cass Environmental Services	County Cass Environmental Services	05/27/05
Wind Roses for Mankato (KMKT)	October 1996 - March 2001	
Wind Roses for Glencoe Municipal Airport (KGYL)	October 1996 - March 2001	
Wind Roses for New Ulm Municipal (KULM)	October 1996 - March 2001	
New Ulm Wind Farm - Wind Direction Occurrences - Wind Rose	Wind Logics	Dec-08
Average Wind Speed at 50m	Gustavus Adolphus College	2004-2005
Statewide Wind Power Map		
Minnesota Wind Development & Roads, Bridges & Land Use		

#### **NEW YORK**

Wind Turbine Syndrome	Nina Pierpont, MD	03/07/06
Bethany Wind Turbine Study Committee	Bethany Study Committee	01/25/07

#### **NEVADA**

Communicating the Noise Effects of Wind Farms to Stakeholders	Christopher J. Bajdek	10/01/07
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**NORTH DAKOTA**

First Engrossment - Engrossed House Bill No. 1509	Sixty-first Legislative Assembly of North Dakota	
Wind Farm Siting & Landowner Compensation: The Need for State Policy	Energy Development & Transmission Committee	03/05/08

**NORTH CAROLINA**

North Carolina Wind Working Group Model Wind Ordinance for Wind Energy Facilities in North Carolina	North Carolina Wind Working Group	07/01/08
An Ordinance to Regulate Wind Energy Systems in Ashe County, North Carolina	Ashe County	2007

**OREGON**

A Model Ordinance for Energy Projects - A Guide for Oregon Cities & Counties on Siting	Oregon Department of Energy	7/1/05
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**PENNSYLVANIA**

Model Ordinance for Wind Energy Facilities in Pennsylvania		
County of Potter Commonwealth of Pennsylvania	Potter County Wind Energy Ordinance	
An ordinance regulating the construction, locating, operating & decommissioning of wind turbine generators	County of Potter, Commonwealth of Pennsylvania	

**VERMONT**

Deerfield Shadow Flicker Analysis	AWS Truwind	6/1/06
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**WASHINGTON**

Shadow-Flicker Modeling, Wild Horse, WA	Wind Engineers, Inc	11/20/03
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**WISCONSIN**

Town of Union, Rock County Wisconsin - Wind Energy Systems Licensing Ordinance	Large Wind Turbine Study Committee	8/1/07
Wind Generator and Wind Generating Facility Ordinance for Trempealeau County - WI		
Large Wind energy System Ordinance - Manitowac County, WI		9/1/07
Wind Energy Facility - Calumet County, WI		
Wisconsin model wind ordinance for towns/counties	<a href="http://www.windaction.org">www.windaction.org</a>	2/1/07
Post Construction Noise Survey - Blue Sky & Green Field Wind Project	Hessler Associates, Inc - Consultants in Engineering Acoustics	6/1/08
Noise Assessment - Blue Sky & Green Field Wind Project	Hessler Associates, Inc - Consultants in Engineering Acoustics	3/1/06
Town of Wilton - Wind Energy Conversion Systems Ordinance (Wisconsin)	Town Board	2008