

## 6.6 Small and Commercial Wind Energy Conversion Systems

**6.61 Intent:** In order to balance the need for clean, renewable energy resources with the protection of the health, safety, and welfare of the residents of Gage County, Nebraska, the County finds these regulations are necessary in order to ensure that all wind energy conversion systems (CWECS) are appropriately designed, sited, and installed.

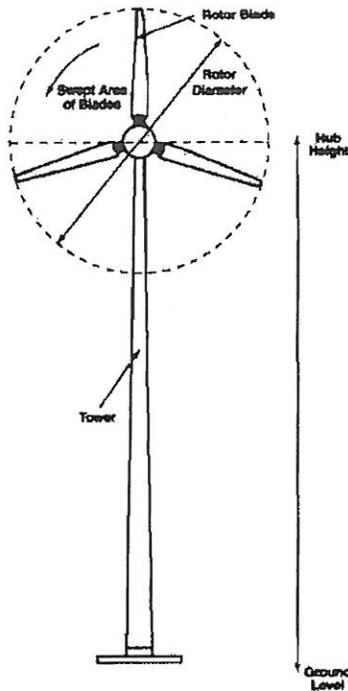
These regulations pertaining to all wind energy conversion systems are intended to respond to equipment available at the time of adoption. Gage County recognizes that this is an emerging technology and that new means of collecting wind energy, including but not limited to vertical axis wind turbine generators are under development. Accordingly, these standards will be reviewed and may be amended as technology advances.

### 6.62 Types of Wind Energy Systems:

- A. Small Wind Energy Conversion System - (SWECS) –** A wind energy conversion system which has a rated capacity of up to Twenty-Five (25) kilowatts and which is incidental and subordinated to another use of the same parcel. A system is considered a small wind energy system only if it supplies electrical power for site use, except that when a parcel on which the system is installed also received electrical power supplied by a utility company, access electrical power generated and not presently needed for onsite use may be sold back to the utility company. *(25 Kilowatt limit approved by the Gage County Planning Commission to increase to a maximum of 100 Kilowatts with Nebraska State Legislature authorization by future amendment)*
- B. Commercial Wind Energy Conversion System – (CWECS)** A wind energy conversion system under common or aggregated ownership or operating control that includes substations, MET towers, cables/wires and other building accessories, who's main purpose is to supply electricity to off-site customers.

### 6.63 Definitions:

- A. Aggregated Project –** Those projects that are developed and operated in a coordinated fashion, but which have multiple entities separately owning one or more of the individual CWECS within a 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.
- B. 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.



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

**D. Height, hub** – The height above grade of the fixed portion of the tower, including the generation unit, measured to the hub or center point of the rotor blade diameter.

**E. Height, total system** – The height above grade of the system, including the generating unit and measured the highest vertical extension of any rotor blades or rotors.

**F. Meteorological Tower** – For the purposes of wind energy conversion systems, meteorological towers are those which are erected primarily to measure wind speed and direction plus other data relevant to locating a CWECS. Meteorological towers do not include towers and equipment used by airports, the Nebraska Department of Transportation or other similar applications to monitor weather conditions.

**G. Rotor Diameter** – The diameter of the circle created by the outer most point of the rotor blades of the windmill. (see Diagram #1)

**H. Shadow flicker** – Strobe effect that occurs when sun is horizontal to rotor blades, which causes repetitive intermittent shadows that can affect people on near by properties.

**I. Substations** – Any electrical facility utilized to convert electricity produced by a Commercial Wind Energy Conversion System for interconnection with high voltage transmission lines.

**J. Tower** – The vertical component of a wind energy conversion system that elevates the wind turbine generator and attached blades above the ground.

**K. Transmission Line** – The electrical power lines that are High Voltage Transmission Lines carrying electricity over medium to long distances rather than directly interconnecting and supplying electric energy to retail customers.

L. **Wind Energy Conversion System (WECS)** – An aggregation of parts including the base, tower, generator, rotor, blades, supports, and configuration as necessary to convert the power of wind into mechanical or electrical energy, e.g. wind charger, windmill, or wind turbine.

M. **Wind Turbine Generator** – The component of a wind energy system that transforms mechanical energy from the wind into electrical energy.

#### 6.64 **Small Wind Energy Conversion System**

A Small Wind Energy Conversion System (SWECS) is a facility used for the production of a maximum of Twenty-Five (25) kilowatts of electrical energy supplied by the wind. The facility may include wind turbine(s) with total height(s) of one hundred (100) feet or less and any transmission lines. The SWECS is primarily used to generate energy for use by its owner. A small wind energy facility shall be sited and designed to minimize adverse visual impacts on neighboring properties. **To be used in conformance with Nebraska State Statutes 70-2001 through 70-2005, regarding Net Metering. (25 Kilowatt limit approved by the Gage County Planning Commission to increase to a maximum of 100 Kilowatts with Nebraska State Legislature authorization by future amendment)**

#### A. **General Site and Design Standards**

1. Located on a lot or parcel of at least three (3) acres;
2. Shall be permitted by an approved **Conditional Use Permit** to be issued in the AG-1, AG-2, AG-3 and AG-4 Zoning Districts.
3. SWECS shall maintain a minimum setback distance from any property line of one and one-half (1.5) times the total system height of the windmill for non-participating property owners. Adjoining property owners (second or third additional farm/ranch single dwelling units for the purpose of housing relatives or permanent agriculture workers) participating in the same or Aggregated Project shall have no setback requirements between adjoining properties.
4. SWECS shall maintain a minimum setback distance from any public road, or highway of at least one point one (1.1) times the total system height of the windmill from the public road or highway right-of-way.
5. In no case shall a WECS be located within any required setback or in any front yard area.

6. Turbines and towers shall be of tubular design and if painted or coated, shall be of a non-reflective white, grey, or other neutral color and shall not used to display advertising.
7. SWECS shall not be artificially lighted unless such lighting is required by the Federal Aviation Administration (FAA).
8. All electrical wires associated with a small wind energy system other than the wires necessary to connect the wind generator to the tower wiring, the tower wiring to the disconnect junction box, and the grounding wires shall be located underground.
9. The minimum distance between the ground and any part of the rotor blade system shall be thirty (30) feet.
10. All ground mounted electrical and control equipment must be labeled and secured to prevent unauthorized access. A tower may not have step bolts or a ladder within eight (8) feet of the ground that is readily accessible to the public.
11. The owner of a small wind energy facility shall minimize or mitigate any interference with electromagnetic communications, such as radio, telephone or television signals caused by the facility.
12. Construction access must be regraded and revegetated to minimize environmental impacts.
13. A SWECS application must include an agreement that addresses decommissioning and abandonment of the facility. The agreement must at a minimum provide for reuse or dismantlement of the facility at the owner's expense.

**B. Application Requirements**

1. A survey map at an appropriate scale identifying:
  - Site boundary;
  - Adjacent public right-of-ways;
  - Existing structures;
  - Proposed small wind energy system and accessory structures;
  - Adjacent ownership and existing residences;
  - Any overhead utility lines.
2. A report from a licensed engineer containing:
  - a. Small wind system specifications including manufacturer and model; rotor diameter, tower height, tower type (freestanding or guyed);

- b. Documentation to establish that the tower has sufficient structural integrity for the proposed use at the proposed location;
  - c. Certification that the small wind energy system complies with all applicable state construction and electrical codes and the National Electrical Code.
3. Compliance with FAA Regulations, including any Documentation required by the FAA certifying approval of proposed location when located within the three (3) mile Planning Jurisdiction of any airport.
  4. Signed letter of Notification by the property owner submitted to the Electrical Supplier/Purchaser, Gage County Assessor's Office, and Gage County Zoning Administrator signifying utility service is approved.
  5. Require proof of insurance on application.

**6.65 Commercial Wind Energy Conversion System – (CWECS)** A wind energy conversion system under common or aggregated ownership or operating control that includes substations, MET towers, cables/wires and other building accessories, who's main purpose is to supply electricity to off-site customers.

Commercial Wind Energy Conversion Systems may be included as an aggregated project. Such as those projects that are developed and operated in a coordinated fashion, but which have multiple entities separately owning one or more of the CWECS within a larger project. Associated infrastructure such as power lines and transformers that service the facility may be owned by a separate entity, but are also part of the aggregated project. All individual wind turbine towers of an aggregated project shall be in conformance with Section 6.55 (A) items one through 15.

**A) General Site and Design Standards:**

1. Located on a lot or parcel of at least ten (10) acres in size.
2. The entire aggregated project shall be permitted by a Special Use Permit in an AG – 1; AG – 2; AG – 3 or AG – 4 District.
3. If an aggregated project, setbacks from multiple entities (turbines) shall be one and one-tenth (1.1) times the height of the total system.
4. Each CWECS location must have a 911 address.

5. CWECS shall be designed and placed in such a manner as to minimize to the greatest extent feasible, adverse visual and noise impacts on adjacent areas. This shall include documentation of:
  - a) Noise levels conforming to the International Electromechanical Commission (IEC) Standard 61400-11 part 11; and
  - b) Projections of the "shadow flicker" on any existing structures located off the property on which the CWECS will be constructed and the extent and duration of the shadow flicker on these existing structures.
6. CWECS shall maintain a minimum setback distance from any property line of one and one-half (1.5) times the total system height of the windmill for non-participating property owners. Adjoining property owners participating in the same Aggregated Project shall have no setback requirements between adjoining properties.
7. CWECS shall maintain a minimum setback distance from any public road, or highway of at least one point one (1.1) times the total system height of the windmill from the public road or highway right-of-way.
8. In no case shall a WECS be located within any required setback or in any front yard area.
9. Structures for wind turbines shall be self-supporting tubular towers, if painted or coated shall be of a non-reflective neutral color such as white or pale gray. No lattice structure shall be used. No logos or advertisements are allowed on these structures. Each turbine shall be marked with a visible identification number located no higher than fifteen (15) feet above ground level.
10. Colors and surface treatment of the CWECS and supporting structures shall, to the greatest extent possible, minimize disruption of the natural characteristics of the site.
11. Reasonable measures shall be taken to mitigate specific adverse visual impacts such as reflections, shadow flicker, and blade glint affecting residences within or immediately adjacent to the project area.

12. CW ECS shall be equipped with air traffic warning lights or other marking lights only if so required by the Federal Aviation Administration and in which event, such light should be positioned or shielded to avoid visual impact on neighboring properties, and shall be a white flashing light from daylight till twilight and a steady red light night time. Light system must be maintained and working at all times.
13. The applicant shall minimize or mitigate any interference with electromagnetic communications, such as radio, telephone or television signals caused by any wind energy facility.
14. A Meteorological Tower is permitted by a **Conditional Use Permit** for the purposes of the Aggregated Project. Meteorological towers shall meet the same setback requirements of those established for an Aggregated Project. If the tower is non-functional, it shall be removed after a period of two (2) years.
15. CW ECS shall have a minimum setback of one-quarter (1/4) mile from any adjacent residence not owned by the owner of the CW ECS. However, no setback is required between an adjacent residence of an owner participating in the same Aggregated Project.

#### **6.66 Application Requirements**

The applicant for a conditional use permit for construction of a CW ECS shall file an application with the Gage County Zoning Administrator. The application shall include the name(s) of the project applicant(s), the name of the project owner(s), and the legal description and address for the project. The application shall also include the following documents:

- A. A survey map illustrating the following:
  1. Property lines, dimension, acreage and contours with appropriate intervals for site evaluation.
  2. Location and elevation of all components of the proposed CW ECS.
  3. Location and dimensions of all existing structures and uses on property within three hundred (300) feet of the system;
  4. Height of any structures over thirty-five (35) feet within a five hundred (500) foot radius on site or offsite of the proposed CW ECS;

5. Location of any overhead utility lines on the property;
  6. Location of all known communications towers within two (2) miles of the proposed CWECS
  7. Access roads;
  8. Adjacent ownership, land uses, existing residences, schools, churches, hospitals, public libraries, federal, state, county or local parks, recognized historic or heritage sites, identified wildlife preserves, or habitat areas to a distance of 2,640 feet (one-half mile).
  9. Provide a copy of the Easement Deed from the Gage County Register of Deeds Office for each property involved in the CWECS.
  10. Provide a map illustrating all transmission lines connecting to the Substation.
  11. Copy of Agreement or Notification of Compliance Letter between the Beatrice Airport Authority and the Applicant.
- B. Applicant shall identify potential effects in terms of constraints or benefits the wind energy facility may place on current or future use of the land within the project site and the surrounding area. The extent of any limitations due to public health and safety risks shall be specifically addressed, and the effects on the following activities shall also be addressed:
1. Existing or proposed tourist or recreation activities;
  2. Residential activities;
  3. Industrial activities;
  4. Agricultural activities;
  5. Commercial activities
- C. Soil erosion, sediment control, and storm water runoff plan shall address what types of erosion control measures will be used during each phase of the project. It shall identify plans for:
1. Grading;
  2. Construction and drainage of access roads and turbine pads;
  3. Design features to control dust;
  4. Design features to maintain downstream water quality;
  5. Re-vegetation to ensure slope stability;
  6. Restoring the site after temporary project activities;
  7. Disposal or storage of excavated materials;
  8. Protecting exposed soil;
  9. Stabilizing restored material and removal of silt fences or barriers when the area is stabilized; and

10. Maintenance of erosion controls throughout the life of the project.

D. Applicant shall provide information regarding flora and fauna of the proposed project area including:

1. Officially listed threatened or endangered species;
2. Critical habitat and habitat conditions;
3. An avian study based on the US Fish and Wildlife Services "Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines"

F. Standard drawings of the structural components of the CWECS, including structures, tower, base, and footings.

G. Certification by a registered engineer that:

1. There is a substantial need for the proposed use or CWECS, one hundred (100) kW or greater;
2. All applicable local, state, and federal building, structural and electrical codes have been followed;
3. The site is feasible for a CWECS; the CWECS can be successfully operated in the climate conditions found in Gage County;
4. The rotor and over speed control have been designed for the proposed use on the proposed site;
5. The design and safety of the proposed tower to withstand winds of ninety (90) miles per hour; and
6. If the wind turbine were to fall, no building or structure, existing or potential, would be damaged.

#### **6.67 Construction and Operations**

A. All public roads to be used for the purpose of transporting CWECS, substation parts, cement or equipment for construction, operation, or maintenance of the CWECS shall be identified and applicable weight and size permits from the impacted road authority(ies) shall be obtained prior to construction.

A pre-construction survey must be conducted with the appropriate jurisdictions to determine existing road conditions. Those included are Applicant(s); Land Owner(s); CWECS Owner(s); Township Representative(s), Highway Superintendent and/or Zoning Administrator. The survey shall include photographs and a written agreement to document the conditions of the public roads and facilities. All expenses of the survey shall be the Applicant's responsibility.

B. The CWECS owner shall be responsible for immediate repair of damage to public roads and drainage systems stemming from construction, operation, or maintenance of the CWECS

- C. 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.

#### **6.68 Safety Measures**

- A. Each CWECS shall be equipped with both manual and automatic controls to limit the rotational speed of the rotor blade so it does not exceed the design limits of the rotor.
- B. The Planning Commission shall determine the height, color, and type of fencing, if needed, for the CWECS installation. CWECS shall include no sign or advertising of any kind, except for one sign not to exceed two (2) square feet posted at the base of the tower, electrical equipment, and entrances. The sign shall contain the following information:
  - 1. Warning – high voltage
  - 2. Manufacturer's name
  - 3. Operator's name
  - 4. Emergency phone number
  - 5. Emergency shutdown procedures
- C. Each CWECS shall be properly grounded to safely sustain natural lightning strikes in conformance with the National Electric Code.
- D. Any CWECS facility shall be equipped with anti-climbing devices. Tower climbing apparatus shall not be located within fifteen (15) feet of the ground. Where the tower is capable of being climbed, a locked, protective fence at least six (6) feet high shall enclose the tower.
- E. The CWECS operator shall maintain a current insurance policy which will cover liability, installation, operation, and any possible damage or injury that might result from the failure of a tower or towers or any other part or parts of the generation and transmission facility. The amount of said policy shall be established as a condition of approval. The CWECS shall be warranted against any system failures reasonably expected in severe weather operation conditions

#### **6.69 Discontinuation and Decommissioning.**

- A. CWECS shall be considered a discontinued use after one (1) year without energy production, unless a plan is developed and submitted to the Gage County Zoning Administrator outlining the steps and schedule for returning the CWECS to service. All CWECS and accessory facilities shall be removed four (4) feet below ground level within ninety (90) days of the discontinuation of use. This period may be extended by the Zoning Administrator following a written request by an agent of the owner of the CWECS.

- B. Each CWECS shall have a decommissioning plan outlining the anticipated means and costs of removing CWECS at the end of the serviceable life or upon becoming a discontinued use. The cost estimates shall be made by a competent party, such as a profession engineer, a contractor capable of decommissioning, or a person with suitable expertise or experience with decommissioning.
- C. At the end of the aggregated project's useful life, the entire site shall be restored in accordance with the requirements of this condition within eighteen (18) months.

#### **6.610 Noise**

No CWECS shall exceed 60 dBA at the nearest structure occupied by humans. In the event of periods of severe weather, as defined by the United States Weather Service, a CWECS may exceed 60 dBA.

