Center for Rural Affairs

Utility-Scale Energy Siting Recommendations

Officials tasked with creating or updating renewable energy ordinances are often inundated with siting resources as they seek out information. The standards below are a summary of our existing siting recommendations and more in-depth resources to be used as a short, easy-to-read fact sheet. The standards presented are informed by our research on specific ordinance topics, which include consulting industry experts and distilling trusted resources. We also created and analyzed a database of every ordinance from Iowa, Minnesota, Nebraska, and South Dakota to find industry standards. This document is a culmination of years of work, all of which can be found in our clean energy libraries **(cfra.org/cleanenergysiting and cfra.org/model-clean-energy-ordinances).**

CENTER *for* RURAL AFFAIRS

The Center for Rural Affairs is a private nonprofit organization based in Lyons, Nebraska (pop. 816). Since 1973, we've been a leading force in engaging with people to build a better rural future. One significant opportunity for building that future is through clean energy.

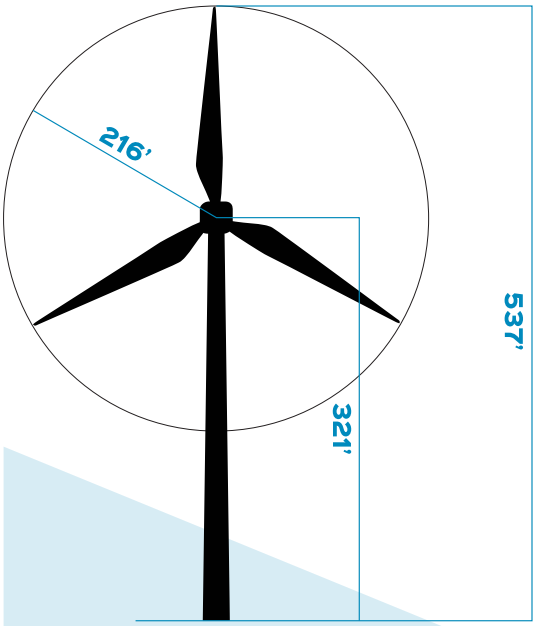
Clean energy offers numerous benefits to rural communities in the form of tax revenue, diversified income for landowners, and job creation, all while generating cost-effective, reliable power for rural homes and businesses. The Center's role in helping communities capitalize on this opportunity is to create and deliver neutral, fact-based resources to county and state officials to aid in ordinance discussions.

Setbacks

A setback is the distance of a Wind Energy Conversion System (WECS) from another object, such as a residential home. Setbacks for turbines ensure the safety of commonly populated areas in the event a turbine collapses, albeit an extremely rare circumstance. Listed below are the average setback distances for different points of interest.

- **Occupied dwellings or community buildings:** The Center has found that in the following states the most commonly used setback is two to three times the turbine height, or 1,000 ft.[1]
  - Below are the median setback ranges for the states surveyed:[2]
    - Iowa: 1,000 to 1,250 feet
    - Minnesota: 750 to 1,000 feet
    - Nebraska: 1,000 to 2,640 feet
    - South Dakota: 1,000 to 2,000 feet
- **Property line:** 1.1 times the turbine height or the turbine blade length to have no overhang from abutting systems[3]
- **Right of way:** 1.1 times the turbine height[4]
- **Communication and electrical lines:** 1.1 times the turbine height
- **Public conservation areas:** Consult with the local conservation board and state-specific departments of natural resources on any need for specific setbacks from elevated biodiverse areas
- **Airports:** Should not be greater than the Federal Aviation Administration (FAA) requirement
- **Waivers:** Officials should allow for waivers of voluntary reduction in setbacks from dwellings or property lines by neighboring landowners

Figure 1: 2022 Average turbine measurements



Turbine height is often defined as the distance from base to blade tip at its highest point. In 2022, the average height of a turbine under that definition was 537 ft. (Hub height [321 ft.] + blade length [216 ft.].)

Sources and content notes

1 This is based on all the ordinance data the Center has collected for fixed dwelling setbacks of wind turbines from Iowa (n=55), Nebraska (n=40), South Dakota (n=29), and Minnesota (n=28).
2 Using the median setback data, or in other words the middle 50% of all setbacks, offers a better look at the average setbacks for a given area by removing the most extreme case on either end. The ranges for each state can vary widely as the landscapes and population densities of each state are very different, meaning a large setback in a more rural county in western Nebraska would not be as workable for a more populated county in Iowa.
3 This is the most commonly used setback for non-participating property lines in Iowa (n=59), Minnesota (n=23), Nebraska (n=55), and South Dakota (n=33).
4 This is the most commonly used setback from rights of way for Iowa (n=58), Minnesota (n=32), Nebraska (n=55), and South Dakota (n=30).

Decommissioning

A decommissioning plan requires a project site to be sufficiently restored to pre-construction standards before any property is returned to the landowner. The plan should include:

- Defined conditions for when the decommissioning of a project will commence and the timeline of activities.
- Specific requirements for:
  - Removal of equipment to not interfere with pre-construction operations
  - Transportation and disposal or salvage of decommissioned materials
  - Restoration of land and access roadways to their previous use once the parts and equipment are removed
- A financial guarantee through an approved financial instrument on projected cost for decommissioning with a third-party estimate and periodic updates to ensure the county is not held financially responsible for any decommissioning activities.

Noise

To address noise or unwanted sound due to vibration and the rotating blades, county officials should require that a wind turbine be no louder than a certain decibel rating from the setback distance of occupied buildings. The average rating used is 45 to 60 decibels.[5]

Road-use agreement

County officials should establish a process for assessing infrastructure and designating financial responsibility for land remediation to pre-construction standards.

Shadow flicker

Shadow flicker is the effect of repetitive shadows being cast due to the turning of the blades. The Center for Rural Affairs has found the restriction for shadow flicker caused by wind turbines should be set at no more than 30 hours annually for each structure.

Lighting

Lights are required on individual turbines to alert aircraft of their presence. Officials should defer to FAA regulations; however, they can consult with developers to install aircraft detection light systems that can turn on when an aircraft is detected.

Signage

County officials should ensure signs with the project developer's name, address, emergency contact information for operators/technicians, and warnings are installed. Other signage information may be considered if warnings about icing under certain conditions or other pertinent information are needed for safety.

Wind Energy Conversion System appearance

County officials should require that all Wind Energy Conversion Systems are a uniform color(s) and limit the addition of logos or signage beyond the name and logo of the project or manufacturer.

Icing

Language for deicing and other safety measures should only be included in ordinances affecting geographical areas where ice formation is likely. Officials may require developers to share their procedures to identify ice formation and mitigate potential ice throws.

Sources and content notes, continued

5 This is based on the middle 50% of data collected for Iowa and Nebraska (n=90).

Setbacks

A setback for solar is from the edge of the project to another object, such as a residence or business. Setbacks should balance multiple interests and support cost-effective solar development. Unlike wind turbines, setbacks for solar are less about specific safety considerations related to the structures. Listed below are the average setback distances from different points of interest.

- **Non-participating dwellings:** The Center recommends 100 to 300 feet
  - Among the states surveyed, the Center found the median setback range to be 200 to 500 feet[6]
    - Below are the most common setback and median setback ranges for the states surveyed
      - Iowa: 300 feet (150 to 525 feet)
      - Minnesota: 200 feet (200 to 287 feet)
      - Nebraska: 500 feet (insufficient data)[7]
      - South Dakota: 500 feet (insufficient data)
- **Property lines:** 50 to 100 feet[8]
  - The most common property line setback for solar in each state
    - Iowa: 50 feet
    - Minnesota: 100 feet
    - Nebraska: 30 feet
    - South Dakota: 30 feet
- **Rights of way:** 50 to 100 feet[9]
- **Waivers:** Officials should allow for waivers of voluntary reduction in setbacks from dwellings or property lines by neighboring landowners.

Operations and maintenance

As a way to avoid negative impacts on surrounding land, water, and neighbors, officials can require developers to submit an operations and maintenance plan, to include information about vegetation management, soil erosion mitigation, stormwater management, cleaning chemicals, systems maintenance, and plans for repairing or replacing the facility.

Decommissioning

Ordinances should require a decommissioning plan that defines the obligations of the project developer to remove the solar array and restore the land when the project will no longer be used. The plan should include items such as:

- A notification to the county that the project will no longer be used.
- A timeline of decommissioning for the removal of parts and reclamation of the site.
- A requirement that the project owner will be financially responsible for all decommissioning provisions.
- A third-party cost estimate of decommissioning the solar project and corresponding financial surety plan.

Vegetation management or ground cover

To encourage the implementation of native vegetation or other pollinator habitats on the project site, officials should allow for possible dual-use or agrivoltaic practices. Tools like a pollinator scorecard can be used to evaluate a native vegetation plan; however, officials should avoid setting approval thresholds.

Sources and content notes, continued

6 This range is based on the range of the middle 50%, or median setback range, of the ordinance data the Center has collected for non-participating dwelling setbacks from Iowa (n=20), Nebraska (n=5), South Dakota (n=11), and Minnesota (n=19).
7 There are not enough counties with dwelling setbacks to provide a legitimate range. South Dakota had 10 solar ordinances with dwelling setbacks of 500 feet out of the 11 total solar ordinances with that setback. Nebraska only had five solar ordinances with dwelling setbacks.
8 This is based on the range of the middle 50% for the ordinance data the Center has collected for property lines from Iowa (n=16), Nebraska (n=20), South Dakota (n=5), and Minnesota (n=11).
9 This is based on the range of the middle 50% for the ordinance data the Center has collected for right of way data from Iowa (n=17), Nebraska (n=10), South Dakota (n=3), and Minnesota (n=12).

Solar ordinance standards, continued

Road-use/ public infrastructure

Officials should establish a process for assessing and repairing public infrastructure (roadways and drainage systems) before construction begins to identify what specific impacts developers are responsible for and what steps will be taken to mitigate any potential damage.

Additional

- **Glare:** Given how solar panels are constructed, glare or reflected light is not typically a major issue. If desired, officials can use language to state that panels should minimize or negate glare onto nearby properties.

- **Height restrictions:** Officials should not set overly restrictive height limitations because of the ongoing research into the potential for agricultural co-uses of solar projects such as livestock grazing and planting underneath panels.

- **Screening:** is the use of vegetation to try and shield solar arrays from public view. Officials should consider whether screening is necessary and avoid including language that would affect the solar project's performance. Screening requirements will increase costs, can cause shading, and could prevent installations.

Center for Rural Affairs clean energy resources

Siting Library:
cfra.org/cleanenergysiting

Model Clean Energy Ordinances:
cfra.org/model-clean-energy-ordinances