

# Nebraska Solar Siting Guide: A Roadmap for Counties



A report by Lindsay Mouw,  
Center for Rural Affairs



CENTER *for*  
RURAL AFFAIRS

# Nebraska Solar Siting Guide: A Roadmap for Counties

Lindsay Mouw

Policy Associate,  
Center for Rural Affairs

June 2023

Nebraska Solar Siting Guide:  
A Roadmap for Counties

By:  
Lindsay Mouw, policy associate, Center for Rural Affairs.

© Copyright 2023

Center for Rural Affairs  
145 Main Street  
PO Box 136  
Lyons, NE 68038  
402.687.2100  
info@cfra.org  
cfra.org

Cover photo by Heidi Kolbeck-Urlacher.  
Other photos by Rhea Landholm, Heidi Kolbeck-Urlacher, and Center for Pollinators in Energy.

Report editing by:  
Teresa Hoffman, senior communications associate;  
Rhea Landholm, communications manager;  
Catharine Huddle, communications consultant;  
and Liz Stewart, communications consultant.

Design by:  
Kylie Kai, senior communications associate.

This publication and guidance is modeled after the  
“Iowa Solar Siting Resource Guide: A Roadmap  
for Counties,” which was developed in partnership  
by the Center for Rural Affairs and the Iowa Environmental Council.

# Contents

1	I. Introduction
1	A. State and local benefits from solar development and future potential
2	B. Best practices for community engagement
2	II. Major provisions for solar zoning regulations
2	A. Definition of terms
4	B. Application requirements and approval process
4	1. Commonly required items
4	2. Options for siting
4	a. Solar as a permitted use
4	b. Solar as a conditional use
5	3. Designating districts for solar
5	C. Setbacks
6	D. Height restrictions
6	E. Fencing
6	F. Safety and signage
6	G. Solar access space and agreements
6	H. Operations and maintenance planning
7	1. Native vegetation or other pollinator habitat management
7	I. Infrastructure and road use agreements
8	J. Decommissioning and site restoration
8	K. Other considerations
8	1. Noise
8	2. Screening
8	3. Glare
9	4. Prime farmland and agrivoltaics
10	III. Community solar considerations
10	IV. Summary of best practice recommendations
11	V. Conclusion

# I. Introduction

Solar at all scales is a growing opportunity in Nebraska. From immense growth in residential solar to the emergence of utility-scale and community projects, solar energy in Nebraska is forecasted to increase considerably.

Counties presented with the opportunity for large-scale solar projects should consider well-drafted regulations, which will address how and where solar systems can be built to preserve the safety and interests of the county and its residents while upholding private property rights and allowing for cost-effective project development.

Nebraska's first utility-scale solar project came online in 2016 with a 3.6-megawatt project in Lincoln. Multiple projects are in the works now, and at the start of 2023 there were 5,502 megawatts (MW) of potential solar projects being studied statewide for connection to the grid by regional grid operator Southwest Power Pool.<sup>1</sup>

According to the Great Plains Institute, if all proposed solar projects were built in Nebraska it would average only 0.23% of a county's total land footprint.<sup>2</sup>

This guide focuses on siting practices for utility-scale solar, with some considerations for community solar. These recommendations do not apply to residential solar energy systems, such as those used at homes, farms, and businesses to produce electricity for usage on-site.

While large-scale solar development may be in its early days, a handful of Nebraska counties have already adopted solar regulations and have seen utility-scale development. In addition to looking at existing Nebraska regulations, we have reviewed regulations and best practices from neighboring states and identified specific provisions local officials can use as a road map for their own.

---

1 "GI Active Requests." Southwest Power Pool, May 2023, [opsportal.spp.org/Studies/GIActive](https://opsportal.spp.org/Studies/GIActive). Accessed May 2023.

2 Wyatt, Jessi, and Maggie Kristian. "The True Land Footprint of Solar Energy." Great Plains Institute, Sept. 14, 2021, [betterenergy.org/blog/the-true-land-footprint-of-solar-energy](https://betterenergy.org/blog/the-true-land-footprint-of-solar-energy). Accessed May 2023.

**We encourage counties considering or updating solar regulations to use this guide as a reference to support the development and adoption of well-designed zoning regulations rooted in existing successful practices.**

*This document is not legal advice, and users of this guide should consult an attorney with any legal questions.*

## A. State and local benefits from solar development and future potential

Nebraska has what it takes to be a national leader in solar energy. The state ranks 13th in the U.S. in technical potential for solar energy production, putting it ahead of states such as Florida, Georgia, and South Carolina.<sup>3</sup> A solar photovoltaic (PV) array in Nebraska produces a comparable amount of electricity to one in Texas and more than arrays located in Hawaii.<sup>4</sup>

The rapidly improving economics of solar energy are driving large-scale projects. A recent report found that the levelized cost of energy for utility-scale solar declined 90% between 2009 and 2021.<sup>5</sup>

County officials play a large role in solar development by reviewing and approving specific projects. County regulations that guide review and approval need to strike a balance among concerns expressed by residents, landowner property rights, and successful, cost-effective solar development. Well-written regulations can also bring significant local benefits from solar generation to the community. These benefits include:

- **Lease or easement payments to landowners.** Payments to landowners provide long-term, stable streams of revenue.
- **Nameplate capacity tax revenue to counties.** Operators of energy-generation sites in Nebraska pay a nameplate capacity tax. This taxes the project's total generating capacity at a rate of \$3,518 per megawatt and remains constant

---

3 Lopez, Anthony, et al. "U.S. Renewable Energy Technical Potentials: A GIS-Based Analysis." National Renewable Energy Laboratory, July 2012, [nrel.gov/docs/fy12osti/51946.pdf](https://www.nrel.gov/docs/fy12osti/51946.pdf). Accessed May 2023.

4 Ibid.

5 "Levelized Cost of Energy+." Lazard, [lazard.com/perspective/levelized-cost-of-energy-levelized-cost-of-storage-and-levelized-cost-of-hydrogen](https://www.lazard.com/perspective/levelized-cost-of-energy-levelized-cost-of-storage-and-levelized-cost-of-hydrogen). Accessed May 2023.



throughout the life of the project.<sup>6</sup> This tax is distributed in the same way as property taxes in the community and supports essential services and infrastructure, including public schools, roads and bridges, emergency services. This reduces the need for revenue from other sources.<sup>7</sup>

- **Local economic development.** Approximately 30 Nebraska businesses are involved in the solar energy supply chain, providing more than 1,500 jobs as of 2023.<sup>8,9</sup> The U.S. Bureau of Labor Statistics estimates that employment of solar installers is expected to grow 27% from 2021 to 2031.<sup>10</sup> These jobs are in sectors including manufacturing, installation, and operations and maintenance.
- **Enhancement or protection of natural resources.** A solar site that is managed well and seeded with native and non-invasive species can improve soil health, water quality, and habitat for pollinating insects in the area.

## B. Best practices for community engagement

Community engagement is crucial for the successful development of solar energy regulations. Public participation builds trust with local residents, provides an opportunity to address concerns, and increases shared support for the regulations. During this process, it is important to remember that zoning regulations are to be “designed for the purpose of promoting the health, safety, morals, convenience, order, prosperity, and welfare of present and future inhabitants of Nebraska,” not to determine whether a specific solar project is right for the county.<sup>11</sup>

---

6 “Nameplate Capacity Tax FAQs.” Nebraska Department of Revenue, State of Nebraska, 2021, [revenue.nebraska.gov/about/frequently-asked-questions/nameplate-capacity-tax-faq](https://revenue.nebraska.gov/about/frequently-asked-questions/nameplate-capacity-tax-faq). Accessed May 2023.

7 “Nebraska Revenue Sources.” Nebraska Department of Revenue, State of Nebraska, September 2021, [revenue.nebraska.gov/sites/revenue.nebraska.gov/files/doc/research/Revenue\\_Sources\\_2021.pdf](https://revenue.nebraska.gov/sites/revenue.nebraska.gov/files/doc/research/Revenue_Sources_2021.pdf). Accessed May 2023.

8 “State Solar Spotlight: Nebraska.” Solar Energy Industries Association, [seia.org/sites/default/files/2023-01/Nebraska.pdf](https://seia.org/sites/default/files/2023-01/Nebraska.pdf). Accessed May 2023.

9 Ibid.

10 “Solar Photovoltaic Installers.” U.S. Bureau of Labor Statistics, Oct. 4, 2022, [bls.gov/ooh/construction-and-extraction/solar-photovoltaic-installers.htm](https://bls.gov/ooh/construction-and-extraction/solar-photovoltaic-installers.htm). Accessed May 2023.

11 “Nebraska Revised Statute 23-114.03.” Nebraska Legislature, [nebraskalegislature.gov/laws/statutes.php?statute=23-114.03](https://nebraskalegislature.gov/laws/statutes.php?statute=23-114.03). Accessed May 2023.

We recommend local officials consider the following best practices when drafting new zoning regulations and when they are approached about a solar development near their communities.

- **Start early:** Engage with the community as early as possible in the planning stages of the project. This helps build trust and allows for feedback and concerns to be shared and addressed.
- **Create opportunity:** Hold public meetings and provide other opportunities for community members to become engaged and share feedback during the zoning regulations development process. If a solar project is being proposed, meetings give developers a chance to provide education on solar energy development, offer specific details about the project, and answer questions from local residents.
- **Communicate clearly:** Provide clear and concise information about the project and its potential benefits and impacts on the community. Use language that can easily be understood by the public and ensure information is readily available.
- **Listen and respond:** Listen to concerns and feedback from the community and respond in a timely and transparent manner. Address concerns and provide accurate information to help alleviate any fears or misunderstandings.

## II. Major provisions for solar zoning regulations

Successful solar siting regulations will balance the interests of the county, project participants, and non-participants while allowing for cost-effective development. Regulations can preserve these interests without imposing onerous restrictions. To allow for successful solar development, regulations should rely on established best practices. Throughout this guide, we will provide our best recommendations for commercial and utility-scale solar regulations based on our research into regulations across Nebraska and the U.S.

### A. Definition of terms

As with many areas of technology and regulation, solar siting terminology uses jargon that is critical for local government officials to understand and define to create clear regulations. The list provided here is not exhaustive but defines many of the terms counties should consider adding to the definitions section of solar siting regulations.

**Utility-scale solar energy system:** A solar energy system above a certain capacity that is intended to produce electricity to sell into the market, not to directly supply end-use customers. These systems are larger than small-scale residential or business solar installations and many community systems, often covering more land area.

**Agrivoltaics:** The practice of combining agriculture and solar energy systems.

**Community solar:** A solar energy system developed by a municipality, utility, or other third party that typically allows community members to subscribe to the project.

**Developer:** An entity engaged in the design, construction, interconnection, and/or operation of a solar energy facility.

**Easement:** A legal agreement for the use of property by an entity other than the owner for a specified purpose.

**Feeder circuits/lines:** A power line or network of lines used as a collection system that carries energy produced by a solar energy system to an interconnection point like a substation. Feeder circuits are most often placed underground.

**Glare/glint:** Light reflected off a surface.

**Ground clearance:** The measurement between the ground and the bottom of modules or mounting.

**Interconnection:** Link between a generator of electricity and the electric grid. Interconnection typically requires connection via infrastructure such as power lines and a substation, as well as a legal agreement for the project to be connected to the grid.

**Module:** An individual unit comprised of multiple photovoltaic (PV) cells, with multiple modules used in a solar energy system.

**Mounting:** The method of anchoring solar energy system modules to the ground or a building.

**Non-participating landowner:** Any landowner who has not signed an agreement with the project owner or developer, often adjacent to or near the project.

**Operator:** The entity or individual that operates a solar energy system.

**Owner:** The entity or individual that has ownership over a solar energy system.



Nebraska has what it takes to be a national leader in solar energy. The state ranks 13th in the U.S. in technical potential for solar energy production.

**Participating landowner:** A landowner who has signed an agreement with a project owner or developer.

**Residential/small-scale solar energy system:** A solar energy system that is installed at a residence or business to meet the electric demand at the location. These systems are typically intended to offset electricity use for the owner and are not intended to be net generators of electricity.

**Solar access:** The ability to receive sunlight across property lines without obstruction from another's property.

**Solar energy system:** A system that converts energy from sunlight into electricity or an additional energy source such as heat.

**Substation:** A facility that converts electricity produced by a generator—such as a solar energy system—to a higher voltage, allowing for interconnection to high-voltage transmission lines.

**System height:** The height of a solar energy system, usually referring to ground-mounted systems. Total system height is the measurement from the ground to the top of the mounting or modules associated with a system.

**Transmission lines:** Power lines used to carry electricity from collection systems or substations over long distances.

## B. Application requirements and approval process

Project applications should provide essential information to county boards and zoning officials. We recommend county officials prioritize creating a clear application and review process with well-defined steps and conditions for approval. This allows a developer to clearly identify all application requirements for a proposed solar project. Boards may allow applicants to submit select information at a later date.

### 1. Commonly required items

- Name of applicant.
- Name of the project owner.
- Project development timeline.
- Description of the project—number of modules, manufacturer, mounting type, system height, system capacity, total land area covered by the system, and information about associated facilities like substations, feeder lines, battery storage, etc.
- Legal description of the property(ies) where the solar energy system will be located.
- Map of the project location and the surrounding area.
- A decommissioning plan outlining the process and financial security for system removal—including individual modules and mounting—and property restoration of the land before an easement is returned to a landowner.
- Evidence of a power purchase agreement or interconnection application for the project.
- Consultation with or notifications from relevant state and federal agencies showing the project will not be a hazard to wildlife, communications, air traffic, etc.
- Documentation of easement locations acquired for solar energy systems and associated facilities.

### 2. Options for siting

Counties can use various processes to govern solar siting. The two most straightforward options are to make solar systems a permitted use (also sometimes called an “allowed” or “principal” use) in specific zones or designate solar systems as a conditional use (also called a “special use” or “special excep-

tion”). In the case of conditional use, supervisors or commissioners should define the conditions the project must meet to be approved.

#### a. Solar as a permitted use

If county regulations designate solar as a permitted use, staff reviews projects to determine compliance with objective regulation requirements. County staff would be able to determine objective requirements, such as whether a project meets required setbacks, but would not be able to decide on subjective requirements such as whether a particular project “fits the area.” If it complies with the regulations, the project can move forward. County staff typically issue a building or zoning permit under this approach.

#### b. Solar as a conditional use

The term “conditional use” in a zoning code usually means a use may be allowed or permitted in a specified district(s) on the condition certain requirements are met. Conditional use permitting decisions depend on the applicant’s compliance with the standards specified in the zoning code as conditions for permit approval. These conditions may be more subjective but the decision criteria must be included in the regulations. Conditional uses can only be permitted subject to review and approval of a county planning commission, unless the county board of commissioners or supervisors has adopted procedures allowing themselves to retain the power to grant conditional uses, in which case the planning commission remains involved as a recommending body.<sup>12</sup> The planning commission should base its decision on and evaluate the project based on its compliance with the conditions in the regulations.

Uses permitted on this basis are generally those a county considers not generally adverse to the public’s interest but require some special review and precautions as well as an opportunity for public input.

Counties may wish to require the subsequent filing of items such as site plans, road use agreements, and decommissioning plans as conditions for approval. These are described in more detail below. If a county opts for conditional use permitting, we recommend providing applicants with the opportunity for an informal preliminary review with the county planning and zoning commission. Under Nebraska law, applicants can file an appeal

---

12 “Nebraska Revised Statute 23-114.01.” Nebraska Legislature, [nebraskalegislature.gov/laws/statutes.php?statute=23-114.01](http://nebraskalegislature.gov/laws/statutes.php?statute=23-114.01). Accessed May 2023.



of a final decision by the planning commission in district court.<sup>13</sup> Allowing for preliminary review helps provide applicants with a more predictable process and can minimize the potential for time-consuming or expensive judicial review.

### 3. Designating districts for solar

Counties may allow siting of utility-scale solar in a variety of districts. An easy place to start for solar development in zoning districts would generally be designating business, commercial, industrial, and agricultural districts as eligible for utility-scale projects. After seeing development in one or more of these areas, additional districts could be considered.

Smaller-scale or community solar may be appropriate in other zoning districts, including those within or in close proximity to residential neighborhoods. This is especially appropriate if participants in the project live in those districts.

Counties may want to consider zoning schemes that allow for mixed land usage, so dual-use solar or agrivoltaics are possible. This could include allowing development when certain land use standards are met, such as placing a certain percentage of land into pollinator habitat or agrivoltaics.<sup>14</sup> Counties could consider priority areas for solar development where dual uses are particularly valuable, such as using solar as a buffer for protected lands (buffering from other development) or an alternative land use to agriculture on ground-water recharge areas.

Examples of districts where Nebraska counties with zoning allow solar development:

- **Cass County:** Agricultural District, Transitional Agricultural District, Industrial District, Industrial/Agricultural District, Commercial/Agricultural District
- **Otoe County:** Agricultural Preservation District, Transitional Agricultural District, River Protection Corridor District, Rural Residential District, Lakeside Residential District, Mobile Home Residential District, Unincorporated Village District, Highway Commercial District, Flex District, Light Industrial District, Heavy Industrial District

---

13 Ibid.

14 Pascaris, Alexis S. "Examining existing policy to inform a comprehensive legal framework for agrivoltaics in the U.S." *Energy Policy*, Vol. 159, December 2021, [sciencedirect.com/science/article/abs/pii/S0301421521004869?via%3Dihub](https://www.sciencedirect.com/science/article/abs/pii/S0301421521004869?via%3Dihub). Accessed May 2023.

## C. Setbacks

Setbacks specify the required distance the project must be from dwellings, roads or existing rights-of-way, property lines, and other locations. Unlike setbacks for wind turbines, which are intended to address rare but dangerous scenarios such as turbine collapse, there are no safety concerns that point to the necessity of a specific setback requirement for solar facilities. Before putting setbacks into place, counties should consider the issues they are meant to address and whether a separate project requirement may better address it. While some level may be appropriate, officials should carefully consider setback distances and the limits they may place on future development. As noted later, setbacks work interactively with screening requirements; larger setbacks diminish the need for screening, and screening diminishes the need for larger setbacks.



Recommendations:

- **Property line: 50 to 200 feet**  
According to our research, 50- to 200-foot property line setbacks are most commonly used across the U.S. Setbacks should not be required if a property line is shared by two participating landowners.
- **Non-participating dwelling: 100 to 300 feet**  
Our research shows that setbacks ranging from 100 to 300 feet for residential dwellings are most commonly used. These distances appear to be workable for developers, participants, and non-participants.
- **Right of way: 100 to 150 feet**  
Similarly, our research found that 100 to 150 feet is most often used as a setback from roads and other rights of way.



Counties should include waiver provisions allowing the county or landowners to waive the mandated setback distance with the consent of the participating landowner and adjacent property owners. Waivers are an important tool to improve flexibility and allow for the potential for additional land area to become available for solar development. However, providing a waiver is not a substitute for a setback policy that can enable cost-effective solar development.

## D. Height restrictions

The height of solar arrays is typically measured by the maximum tilt of the panels. In some counties where large-scale solar is a permitted use, height restrictions match the zoning district in which they are located. Counties may also choose to set specific height limitations for solar systems and could consider allowing for less stringent restrictions if coupled with longer setbacks from neighboring properties. An example is adding 2 feet to the setback distance for each additional foot of height.<sup>15</sup>

It is important that counties do not set overly restrictive height limitations given ongoing research into potential agricultural co-uses of solar project areas such as livestock grazing and planting underneath panels. There are also no compelling safety reasons for height restrictions.

## E. Fencing

To protect the solar array and to provide for safety by preventing entry into a project area, counties should specify fencing requirements for the solar array.

Specific types of fencing may be desirable for reducing impact to wildlife or limiting aesthetic concerns. For example, deer fencing may be less visually obtrusive while also allowing wildlife and pollinators to move through a project area. If agrivoltaics are used on the site, particularly for grazing, fencing standards would need to accommodate the needs of that use, which differ from habitat-friendly fencing.

## F. Safety and signage

Projects may be required to post signs clearly featuring the name, address, and emergency contact information for the operator, in addition to warnings. Requirements typically include clear safety notices to the public, such as high voltage warnings.

## G. Solar access space and agreements

Since solar panel performance relies on the amount of sunlight collected, counties may consider how development or new vegetative plantings on neighboring properties could cast shadows onto solar

---

15 Parkson, Emma. “Model Solar Ordinances Developed for Five Midwestern States.” Great Plains Institute, Feb. 11, 2021, [betterenergy.org/blog/model-solar-ordinances](https://betterenergy.org/blog/model-solar-ordinances). Accessed May 2023.

arrays. Developers may want an assurance of continued future access to sunlight to ensure project success during its 25- to 40-year life expectancy.

Nebraska statutes encourage voluntary “protection of access to solar energy in all applicable zoning regulations or ordinances and comprehensive development plans.”<sup>16</sup>

Cass County’s zoning regulations provide for a “solar access easement” that states, “all ground-mounted neighborhood solar conversion systems shall have an executed solar access easement from any neighboring properties. Said easement shall be filed as an instrument to each property’s deed and said easement shall stay in place as long as the ground-mounted neighborhood solar conversion system is in place and operational.”<sup>17</sup>

## H. Operations and maintenance planning

Counties should adopt an operations and maintenance plan designed to avoid negative impacts on the surrounding land, water, and neighbors. We encourage counties to consider requiring native vegetation to bolster wildlife, soil, and water quality benefits. Solar projects are expected to be in operation for several decades. To address both short- and long-term maintenance of a project area, counties may require an operations and maintenance plan from developers as part of the application process. These plans may include components that address:

- Soil erosion and sediment control
- Stormwater management, including minimizing compaction of soils (bulk density)<sup>18</sup>
- Ground cover and buffer areas
- Cleaning chemicals and solvents
- Maintenance, repair, or replacement of the facility

---

16 “Nebraska Revised Statute 66-913.” Nebraska Legislature, [nebraskalegislature.gov/laws/statutes.php?statute=66-913](https://nebraskalegislature.gov/laws/statutes.php?statute=66-913). Accessed May 2023.

17 “Cass County Regulations—April 2023.” Cass County, Nebraska, February 2023, [cassne.org/plugins/show\\_image.php?id=697](https://cassne.org/plugins/show_image.php?id=697). Accessed May 2023.

18 “Photovoltaic Stormwater Management Research and Testing.” National Renewable Energy Laboratory, [nrel.gov/solar/market-research-analysis/pv-smart.html](https://nrel.gov/solar/market-research-analysis/pv-smart.html). Accessed May 2023.





Utility-scale solar project owners have a unique opportunity to invest in native vegetation on site, which achieves improved soil health and water quality, in addition to assisting at-risk pollinators. | Photo provided by Center for Pollinators in Energy

## 1. Native vegetation or other pollinator habitat management

Utility-scale solar project sites often occupy multiple acres of land and are projected to cover 3 million acres across the nation by 2030. This offers an opportunity for project owners to capture local co-benefits by establishing native vegetation on their site(s). Investing in this practice will achieve important environmental outcomes, such as improved soil health and water quality, in addition to creating habitat for a variety of at-risk pollinators, including honey bees and monarch butterflies. Improving soil health and water quality also provides developers with the practical benefits of meeting stormwater drainage permit requirements, reducing erosion on project sites, and mitigating land use concerns.<sup>19</sup>

Developers who wish to install native vegetation on solar project sites have many important consider-

---

19 Ross, Brian, et al. “Best Practices: Photovoltaic Stormwater Management Research and Testing (PV-SMaRT).” Great Plains Institute, January 2023, [betterenergy.org/wp-content/uploads/2023/01/PV-SMaRT-Best-Practice.pdf](https://betterenergy.org/wp-content/uploads/2023/01/PV-SMaRT-Best-Practice.pdf). Accessed May 2023.

ations. While these recommendations will not typically be included in zoning regulations, county officials may want to educate themselves on the options available to developers and the factors that influence developer implementation. For more information, please see the Center for Rural Affairs’ Native Vegetation and Solar Projects in Nebraska fact sheet.<sup>20</sup>

### I. Infrastructure and road use agreements

Counties should put a process in place for assessing and repairing infrastructure before construction begins. Solar construction crews will use roads in and out of a project site. Solar development projects typically have less of an impact on roads than wind development. To address potential impacts to public infrastructure, counties may adopt a road use plan that clarifies for all parties what specific impacts a developer will be held responsible for and what steps must be taken to mitigate potential damage to roads and other infrastructure.

---

20 “Fact Sheet: Native Vegetation and Solar Projects in Nebraska.” Center for Rural Affairs, Aug. 1, 2022, [cra.org/publications/fact-sheet-native-vegetation-and-solar-projects-nebraska](https://cra.org/publications/fact-sheet-native-vegetation-and-solar-projects-nebraska). Accessed May 2023.

## J. Decommissioning and site restoration

Planning for the responsibility of decommissioning is a prudent component for zoning regulations. We recommend counties 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.

Solar panels typically come with a 20- to 25-year warranty and could be useful for 35 years or longer.<sup>21</sup> Depending on the length of a landholder lease, or with a lease extension, panels that have reached their useful life could be replaced with new ones. Zoning regulations should include a notice requirement stating that once a developer/owner has determined a facility will no longer be used, the developer/owner must notify the county of its intent to stop using it and to decommission the facility in accordance with the agreed-upon plan. Decommissioning plans should include expected timelines for the completion of tasks—for example, specifying deadlines for the removal of equipment and completion of site reclamation.

Decommissioning plans also often include a provision requiring the project owner to bear the cost. These provisions ensure the county and landowners do not end up financially responsible for removing solar arrays. We recommend consulting a third-party professional who can provide location and project-specific cost estimates, and plan for them to be reviewed every 5 to 10 years to accommodate changes.

We do not recommend that counties set a time limit for automatic decommissioning, such as no production for one year. As renewable penetration increases, some facilities may be used only as “peaker” facilities on days of extremely high electricity demand. Just because a facility is not producing electricity does not mean it is not being used as a backup resource by a utility.

For more information about decommissioning, please see the Center for Rural Affairs’ Decommissioning Solar Energy Systems Resource Guide.<sup>22</sup>

---

21 “End-of-Life Management for Solar Photovoltaics.” Solar Technologies Office, Office of Energy Efficiency & Renewable Energy, U.S. Department of Energy, [energy.gov/eere/solar/end-life-management-solar-photovoltaics](https://energy.gov/eere/solar/end-life-management-solar-photovoltaics). Accessed May 2023.

22 “Decommissioning Solar Energy Systems Resource Guide.” Center for Rural Affairs, June 20, 2022, [cfr.org/publications/decommissioning-solar-energy-systems](https://cfr.org/publications/decommissioning-solar-energy-systems). Accessed May 2023.

## K. Other considerations

### 1. Noise

Inverters, the equipment that converts direct current (DC) electricity into alternating current (AC) electricity, can produce a soft sound during the daytime when the solar array is producing energy. Noticeable noise is not a common or expected impact and any noise should be imperceptible to neighboring properties even without specific noise provisions. We do not recommend adding standards for noise. Minimum setback requirements should sufficiently address these issues without adding specific, separate provisions for noise.

### 2. Screening

Some counties have chosen to adopt screening requirements in conjunction with setbacks. Counties should consider whether screening requirements would be arbitrary and what, if any, other uses currently require screening. According to the National Renewable Energy Laboratory, while aesthetic requirements are appropriate for historic districts, requiring solar energy systems to be screened from public view adds costs, can cause shading, and may prevent many installations.<sup>23</sup>

### 3. Glare

Given how solar panels are constructed, glare or reflected light is not typically a major issue.

According to the American Planning Association, “[solar panels] are constructed of dark-colored materials and covered with anti-reflective coatings, new solar PV and thermal systems typically reflect as little as 2% of incoming sunlight.”<sup>24</sup>

Similarly, a summary of research from the National Energy Research Laboratory states, “PV modules exhibit less glare than windows and water. Solar PV modules are specifically designed to reduce reflection, as any reflected light cannot be converted into

---

23 Day, Megan. “Best Practices in Zoning Solar.” National Renewable Energy Laboratory, April 21, 2017, [nrel.gov/state-local-tribal/blog/posts/best-practices-in-zoning-for-solar.html](https://nrel.gov/state-local-tribal/blog/posts/best-practices-in-zoning-for-solar.html). Accessed May 2023.

24 “Planning for Solar Energy.” American Planning Association, Sept. 28, 2017, [solSMART.org/resource/planning-for-solar-energy](https://solSMART.org/resource/planning-for-solar-energy). Accessed May 2023.



electricity. PV modules have been installed without incident at many airports.”<sup>25</sup>

Counties wishing to address this low-risk potential impact can include a provision in their regulations, such as Burt County has:

“Solar panel placement should be prioritized to minimize or negate any glare onto nearby properties or roadways, without unduly impacting the functionality or efficiency of the solar energy conversion system.”<sup>26</sup>

#### 4. Prime farmland and agrivoltaics

As the development of large-scale solar occupies more land, there may be concerns about the impact on prime farmland. However, in an analysis of zero-carbon energy simulations for Nebraska, Stanford University found the state would need 25 gigawatts (GW) of solar generation to reach net-zero carbon emissions by 2050. This means emissions from energy production are reduced to the point that any greenhouse gasses going into the atmosphere are balanced by their removal out of the atmosphere.<sup>27</sup>

**The amount of land that would be required to achieve net-zero emissions is equal to just 0.44% of the total land in the state.<sup>28</sup> In contrast, farm operations comprise 90.5% of Nebraska’s total land area.<sup>29</sup>**



Agrivoltaics is the practice of combining solar energy systems with agricultural operations. These practices can create a variety of benefits for local farmers, increased pollinators and wildlife habitat, reduced soil erosion, and improved soil health and water quality.

While the placement of solar panels may limit agricultural uses for prime farmland, the construction and operation of a solar energy system typically has less impact than other forms of development such as residential or commercial. Once a system has been decommissioned and removed, land can be returned to agricultural use with minimal reclamation.

County officials should consider the potential for agrivoltaics, which is the practice of combining solar energy systems with agricultural operations, such as livestock grazing, crop cultivation, beekeeping, or habitat for pollinators and wildlife. These practices can create a variety of economic and environmental benefits such as new revenue streams for local farmers, increased pollinators and wildlife habitat, reduced soil erosion, and improved soil health and water quality.

Solar energy and agriculture do not require an either/or approach. Through thoughtful planning, local decision-makers can craft policies that respect the property rights of local landowners and allow them to take advantage of opportunities to diversify their income, while at the same time encouraging agrivoltaic practices that preserve the agricultural values of the local community.

We do not recommend any provisions that prohibit solar on prime farmland. If a county already has a provision that prohibits certain uses on designated prime farmland, it may consider adding solar as an acceptable use, especially in conjunction with dual-use operations.

---

25 Day, Megan, and Benjamin Mow. “Research and Analysis Demonstrate the Lack of Impacts of Glare from Photovoltaic Modules.” National Renewable Energy Laboratory, July 31, 2018, [nrel.gov/state-local-tribal/blog/posts/research-and-analysis-demonstrate-the-lack-of-impacts-of-glare-from-photovoltaic-modules.html](https://www.nrel.gov/state-local-tribal/blog/posts/research-and-analysis-demonstrate-the-lack-of-impacts-of-glare-from-photovoltaic-modules.html). Accessed May 2023.

26 “Burt County, Nebraska, Zoning Regulations.” Burt County, Nebraska, pp 145, [burtcounty.ne.gov/pdfs/planning\\_zoning/zoning\\_regulations.pdf](https://www.burtcounty.ne.gov/pdfs/planning_zoning/zoning_regulations.pdf). Accessed May 2023.

27 “What is Net Zero?” Net Zero Climate, University of Oxford, [netzeroclimate.org/what-is-net-zero](https://www.netzeroclimate.org/what-is-net-zero). Accessed May 2023.

28 Jacobson, Mark Z., et al. “Zero air pollution and zero carbon from all energy at low cost and without blackouts in variable weather throughout the U.S. with 100% wind-water-solar and storage.” Renewable Energy, 2021, [web.stanford.edu/group/efmh/jacobson/Articles/1/21-USStates-PDFs/21-USStatesPaper.pdf](https://www.stanford.edu/group/efmh/jacobson/Articles/1/21-USStates-PDFs/21-USStatesPaper.pdf). Accessed May 2023.

29 “2022 State Agriculture Overview: Nebraska.” National Agricultural Statistics Service, U.S. Department of Agriculture, May 14, 2023, [nass.usda.gov/Quick\\_Stats/Ag\\_Overview/stateOverview.php?state=NEBRASKA](https://nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=NEBRASKA). Accessed May 2023.

### III. Community solar considerations

Community solar, or Community-based Energy Development (C-BED), is a unique model where a solar generation project has at least 25% of the gross power purchase agreement payments flowing to the qualified owner(s) or as payments to the local community.<sup>30</sup>

As solar energy gains momentum across Nebraska, community solar projects are becoming more common. Cities including Norfolk, Scottsbluff, and Kearney have constructed community solar projects. For many residents, the projects offer an opportunity to invest in renewable energy without having to construct a system on their own.

This type of project allows renters, homeowners, and businesses with shaded roofs, and other community members to enjoy the benefits of solar energy while offering an opportunity for utilities to provide a clean source of energy to residents and businesses.

Typically, community solar arrays are much larger than residential solar, but smaller than utility-scale solar. Therefore, utility-scale solar regulations should not be applied to C-BED projects, but they should have their own regulations that take into account the unique characteristics of C-BED projects, such as:

- Proximity to high-intensity energy users
- Strong local demand for renewable electricity
- Access to the electric grid, allowing for interconnection without building substantial new infrastructure

Often, community solar projects offer ways for community members to participate in the project through a mechanism such as an investment or subscription with the benefits of the project passed along to subscribers. Other community solar projects supply power to public facilities, thereby decreasing municipal utility costs, and passing the benefits along to taxpayers in the area. Similar to utility-scale solar, community solar is a great opportunity to incorporate agrivoltaics, such as solar grazing and beekeeping, maximizing the benefits to the community.

### IV. Summary of best practice recommendations

**Community engagement:** Start early in the planning process, create opportunities for local residents to share feedback and concerns, and provide clear and accessible information.

**Application and approval process:** Establish a clear and well-defined application process with a set of known application requirements. Solar projects should be treated either as a permitted use or as a conditional use in a variety of established zoning districts.

**Setbacks:** Ensure setbacks balance multiple interests and support cost-effective solar development.

- Property lines: 50 to 200 feet
- Non-participating dwellings: 100 to 300 feet
- Rights of way: 100 to 150 feet
- Offer waivers for voluntary reduction in setbacks from dwellings or property lines by neighboring landowners.

**Operations and maintenance plans as well as land use:** Include an operations and maintenance plan and adopt land use requirements in the zoning regulations.

**Ground cover:** Encourage the implementation of native vegetation or other pollinator habitat on the project site and allow for possible dual-use or agrivoltaic practices.

**Infrastructure:** Require a plan for reviewing and providing for repairs of potential impacts to roads and other infrastructure from solar project construction.

**Decommissioning:** Require a decommissioning plan as part of the application and approval process to ensure the land will be restored and the associated costs will be covered once a project is no longer operating.

---

30 “Nebraska Revised Statute 70-1903.” Nebraska Legislature, [nebraskalegislature.gov/laws/statutes.php?statute=70-1903](https://nebraskalegislature.gov/laws/statutes.php?statute=70-1903). Accessed May 2023.

## V. Conclusion

For counties considering regulations for utility-scale solar, well-drafted and balanced solar siting regulations are important. Creating regulations in advance of development can help local decision-makers ensure development is done in a way that meets the needs of their community and ensures there is time to receive community input and feedback on the proposed language. Our review of zoning regulations across Nebraska and the U.S. shows counties can adopt workable regulations that enable successful solar development while balancing community concerns. Most counties have additional provisions included in their adopted regulations, but we have focused on the major provisions critical to the success of zoning regulations. While counties can attract solar development without adopting specific regulations, we believe the clarity and predictability that comes from solar regulations can be beneficial for the county, its residents, and developers.

**Acknowledgment:** This publication and guidance is modeled after the “Iowa Solar Siting Resource Guide: A Roadmap for Counties,” which was developed in partnership by the Center for Rural Affairs and the Iowa Environmental Council.<sup>31</sup>

---

31 “Iowa Solar Siting Resource Guide: A Roadmap for Counties.” Center for Rural Affairs and Iowa Environmental Council, March 6, 2020, [cfra.org/publications/iowa-solar-siting-resource-guide](https://cfra.org/publications/iowa-solar-siting-resource-guide). Accessed May 2023.

## About the Center for Rural Affairs

Established in 1973, the Center for Rural Affairs is a private, nonprofit organization with a mission to establish strong rural communities, social and economic justice, environmental stewardship, and genuine opportunity for all while engaging people in decisions that affect the quality of their lives and the future of their communities.

