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Siting Utility-Scale Solar and Wind in Wisconsin A Guide for Local Governments

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Photo from National Renewable Energy Laboratory by Dennis Schroeder

SUMMARY

Solar and wind energy, resources that are abundant throughout the state of Wisconsin, are among the least expensive forms of electric generation in the country—and costs of both solar and wind energy systems are forecast to continue declining. Market activity in renewable energy development is expected to continue increasing well into the future.

The Wisconsin Legislature passed the Energy Priorities Law 25 years ago, giving priority to the development and use of renewable energy sources like wind and solar energy.¹ This guide provides Wisconsin communities with an overview of long-term utility- and community-scale solar and wind development—systems sized 1 megawatt (MW) or greater. Understanding the long-term context helps communities make informed decisions in evaluating renewable energy proposals and creating plans about how future development should happen.

The Great Plains Institute is engaging local governments across the Upper Midwest on long-term planning for renewable energy. Additional guides are available on the Great Plains Institute website: www.betterenergy.org. This guide builds upon the work of RENEW Wisconsin on large-scale [solar](#) and [wind](#) development.

SUMMARY OF RENEWABLE ENERGY SITING AUTHORITY

Siting authority for solar and wind systems in Wisconsin is divided between the state and local level. Table 1 gives an overview of land use and siting authority for utility-scale wind and solar projects. State agencies grant additional permits for large systems that are not listed below, such as certificates of need and environmental permits.

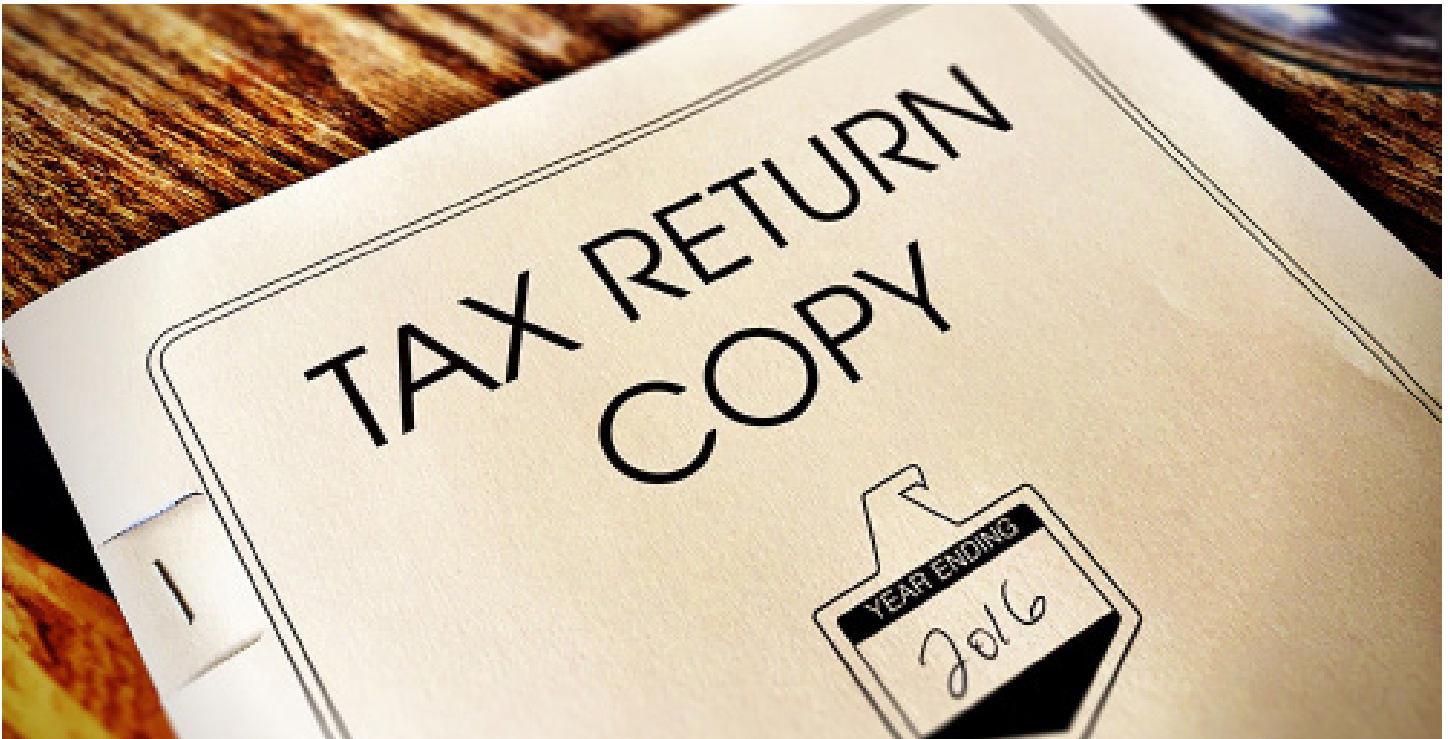
Wind: The Public Service Commission of Wisconsin (PSC) has siting authority for systems over 100 MW.² For wind energy systems under 100 MW, a local government may assume siting authority through a local ordinance, provided that requirements are not more restrictive than standards set forth by state statute.³ Local governments are not required to regulate wind energy systems. Wind energy systems are only subject to local siting requirements if the local government adopts a wind energy ordinance, though siting requirements detailed through the PSC will still apply.⁴ More information on wind energy siting authority is detailed on pages 9 and 10 of this guide.

Solar: Solar energy systems sized 100 MW or greater require permits from the PSC.⁵ Land use authority resides at the local level for solar energy systems below 100 MW. More information about solar energy siting authority and additional permits is detailed on page 8 of this guide.

Table 1. Wisconsin Siting Authority

ROLES	STATE	LOCAL
Large wind energy projects (100 MW or more)	X	
Small wind energy projects (less than 100 MW)		X
Solar energy projects (100 MW or more)	X	
Solar energy projects (less than 100 MW)		X

SUMMARY OF TAXATION AND LOCAL REVENUE



Utility-scale solar and wind development provide direct economic benefits to the community where they are located through a municipal utility aid revenue formula, as well as lease payments to landowners.

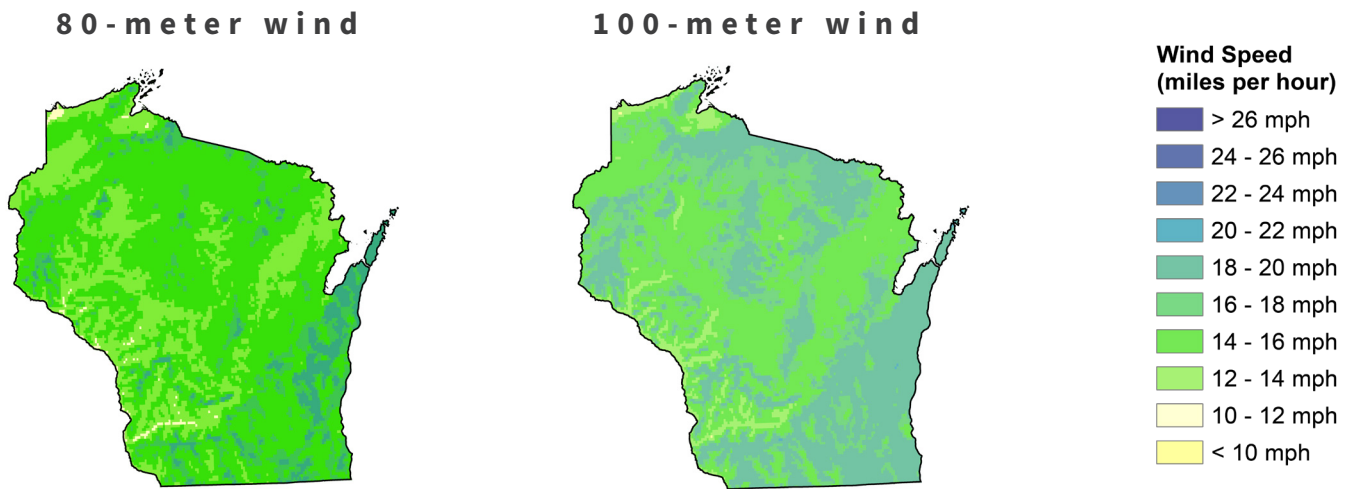
The state regulates taxes and levies on solar and wind projects depending on their size; more details are included on page 11 of this guide. Revenue from wind and solar projects distributed through the “municipal utility aid” formula (detailed on page 11 of this guide) can be a major source of revenue for local communities in Wisconsin. Equipment related to wind and solar development is exempt from sales tax—which does not affect local revenues.

Local governments benefit from solar and wind energy systems through tax revenue.

WIND AND SOLAR RESOURCES

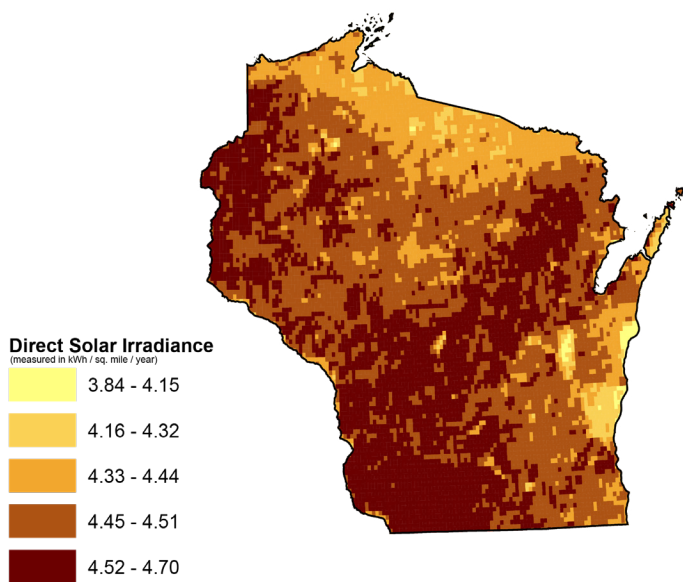
Wisconsin has abundant solar and wind resources. Figures 1 and 2 show the variation in wind and solar resources across the state. Some areas of the state do not have economic wind energy resources, but all areas of the state can economically develop solar energy. Local governments will need to consider more granular views of the data for assessing renewable energy development potential.

Figure 1. Wind Resource



Data Source: National Renewable Energy Lab (NREL) national wind speed data, 2006-2013. NREL incorporates surface wind data, upper-air data, topography, and other factors to estimate the wind resource potential over an area of many square miles. The data is most accurate for large spatial scales.

Figure 2. Solar Insolation



Data Source: National Renewable Energy Laboratory (NREL, 2019) Multi-Year PSM Direct Normal Irradiance data available through National Solar Radiation Dataset (NSRDB)

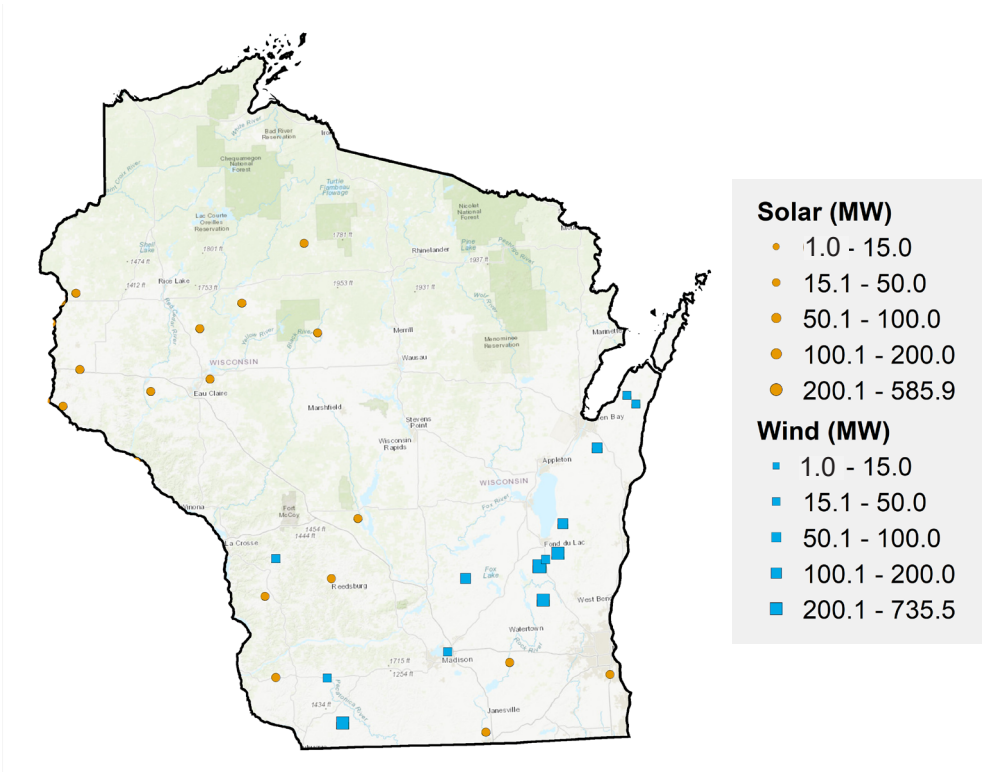
Figure 1 shows the wind potential (in miles per hour) across Wisconsin for both 80 meters and 100 meters above the ground. Blue and green areas represent the best wind resource and yellow areas represent marginal or poor resources. The elevation shows the resource at the wind turbine tower height. Most new wind farms will have turbines at 100-meter hub height or greater. The data are most accurate at large spatial scales.⁶

Figure 2 shows the solar potential across Wisconsin. Dark red areas represent the highest solar resource and light yellow areas represent the lowest solar resource.⁷ The map shows the annual average daily total solar resource measured in kWh per square mile per year.

EXISTING WIND AND SOLAR PROJECTS

A small but growing portion of Wisconsin’s energy production comes from renewable energy. Wind energy makes up about 3 percent of electricity generation in Wisconsin⁸ and solar energy makes up almost 1 percent.⁹

Figure 3. Existing Wind and Solar



Source: Adapted from US Energy Information Administration (EIA) Generation Data (via Form 860) for wind and solar energy systems, updated through through 2018. Map created January 2020.

Figure 3 shows existing solar and wind projects in Wisconsin. The state had about 737 MW of installed wind capacity and 130 MW of installed solar energy capacity as of early 2020, including distributed-generation solar energy.¹⁰ Existing capacity is expected to increase significantly, as a number of large solar and wind energy projects are under construction.

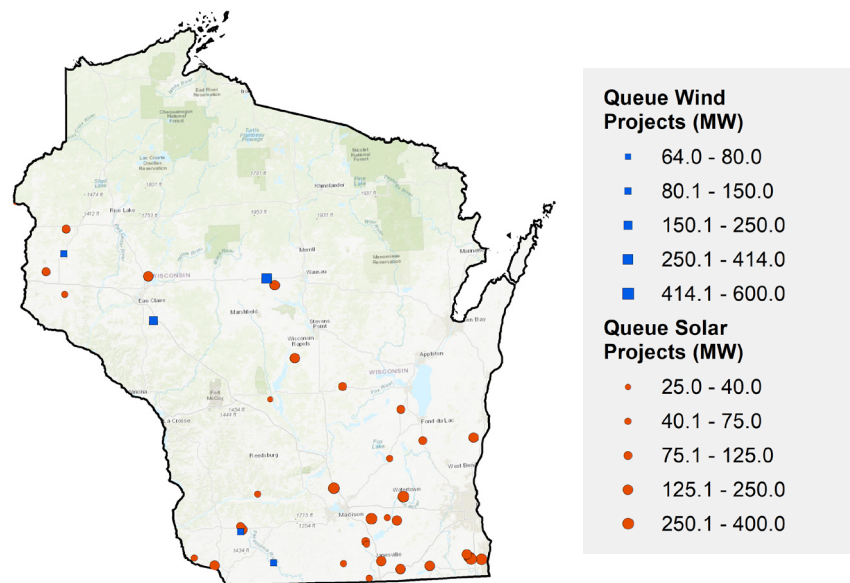


MARKET TRENDS IN WIND AND SOLAR

Wind: There has been an upsurge of wind energy permitting activity in recent years. Two proposed wind energy projects totaling 164 MW were approved for development in 2019. Several more are in the planning and investigation phase.

Solar: The Midwest is an increasingly attractive location for wholesale (larger than 10 MW) solar market developments, which could significantly increase Wisconsin's total solar deployment over the next five to seven years.

Figure 4. MISO Queue Projects



Adapted from Midcontinent Independent System Operator (MISO) public interconnection queue dataset, accessed January 2020.

Figure 4 displays proposed solar and wind energy projects that have filed an application for interconnection with the Midcontinent Independent System Operator (MISO) as of January 2020. Six wind projects, comprising 895 MW of capacity, are in the MISO queue as of January 13, 2020.¹¹ As of that same date, 33 large-scale solar projects with a generation capacity of 5,385 MW are being pursued. Projects that have reached this initial stage in the development process will not necessarily be constructed, but are an indicator of market activity and development interest.

SOLAR ENERGY SITING AND POLICY

RESOURCES FOR SITING AND DESIGN BEST PRACTICES



Photo from National Renewable Energy Laboratory by Dennis Schroeder

State Solar Policy Summary

Solar energy development is increasing in Wisconsin. Several large-scale projects (in the 100s of MW) are in construction across the state. Some of these projects are among the largest solar projects in the Midwest.

Renewable Portfolio Standard: The Wisconsin State Legislature adopted a Renewable Portfolio Standard in 1999 through Act 9 and updated it in 2005, setting a goal that 10% of energy consumed in the state come from renewable energy sources. Wisconsin has met its current 10% Renewable Portfolio Standard.

Solar Rights: The Wisconsin State Legislature also affirmed solar rights through Statute 66.0401 (1), which establishes that no county or municipality may place any restriction on the installation or use of a solar or wind energy system unless that restriction (1) preserves or protects the public

health or safety, (2) does not significantly increase the cost of the system or significantly decrease its efficiency, or (3) allows for an alternative system of comparable cost and efficiency.

In addition to the Renewable Portfolio Standard and solar rights statute, Wisconsin's Public Service Commission regulates utility practices related to distributed-generation or small-scale solar development, such as net metering and interconnection.

Existing Programs and Resources

The Wisconsin Local Government Solar Toolkit: The toolkit, developed and piloted in 2016 with Wisconsin communities, provides guidance on how to integrate both distributed and large-scale solar development into local plans and zoning ordinances.¹²

SolSmart: A number of Wisconsin communities are participating in another best practice program, the National SolSmart solar-ready certification program for local governments.¹³ The SolSmart program offers additional models and guidance on land use and solar development, as well as free technical assistance to participating communities through 2020.

Additional information is being developed on specific siting or ordinance topics that are evolving as the solar industry grows, such as decommissioning considerations, waste disposal (including solar panel replacement or wind turbine repowering), and integration of battery storage in large-scale projects.¹⁴

Local Government Policy and Impact

Local government policies and goals also impact the solar and wind market as individual communities set renewable energy, electricity, and solar development goals. In Wisconsin, several communities have adopted renewable or clean energy goals including the City of Eau Claire, Eau Claire County, Green Bay, Monona, La Crosse, Ashland, Madison, Middleton, Dane County, Fitchburg, Milwaukee, and Stevens Point.

SITING AUTHORITY

Solar energy systems sized 100 MW or more must receive a certificate of public convenience and necessity from the PSC under Statute 196.491 (2). If the PSC grants an installation a certificate of need, that permit preempts any local ordinance.¹⁵

Wisconsin statute 66.0403 (700.41) allows property owners with wind or solar energy systems to apply for permits that will guarantee unobstructed access to solar and wind resources. Permits may not be granted in the case where an obstruction already exists or if the construction of such an obstruction is well into the planning stages. The statute restricts local jurisdictions' siting considerations or conditions placed on siting for wind or solar energy systems to matters of public health and safety .

Members of the public may provide comments at each level of the siting process through the relevant body.

A comprehensive question and answer guide on solar farms, including information on siting authority, was developed by RENEW Wisconsin and can be found [here](#).¹⁶



Photo from National Renewable Energy Laboratory

WIND ENERGY SITING AND POLICY

RESOURCES FOR SITING AND DESIGN BEST PRACTICES

State Wind Policy Summary

Wind energy provides a small portion of the electricity in the state of Wisconsin, approximately three percent. Additional wind development is being investigated across the state.

SITING AUTHORITY

In Wisconsin, the Public Service Commission of Wisconsin has the authority to regulate wind energy projects with a generating capacity of 100 MW or more.¹⁷

Under State Code 128.03, a local government may assume authority over wind energy projects under 100 MW through adopting an ordinance. Local governments may not set restrictions that are stricter than the standards set forth in Wis. Admin Code ch. PSC 128 unless those restrictions do one of the following:

- serves to preserve or protect public health or safety
- does not significantly increase system cost or efficiency
- allows for an alternative system of comparable cost and efficiency

Local governments can choose to regulate wind energy systems. A number of organizations and state agencies recommend best practices for low-impact and co-beneficial development siting standards and designs, which can assist local governments in regulating and permitting systems.

The Wind Siting Council was created by the Wisconsin legislature to advise the PSC on wind siting rulemaking and to study impacts of wind energy systems. Members are appointed by the PSC.¹⁸



Siting Criteria

The PSC has siting authority for wind projects greater than 100 MW. For such systems, the PSC must consider the wind siting criteria laid out through Wis. Admin. Code ch. PSC 128 and described below.

Setback Distance: System setback distance recommendations are between zero and 3.1 times the maximum blade tip height, depending on the type of neighboring land use. For example, the setback distance recommendation for public road right-of-way is 1.1 times the maximum blade tip height, while the setback distance for an occupied community building is the lesser of 1,250 feet or 3.1 times the maximum blade tip height.¹⁹

Noise Criteria: Sound requirements dictate that systems may not exceed 50 dBA during the day and 45 dBA during the night.²⁰

Shadow Flicker: The owner of a wind energy system must work with owners of nonparticipating residences or occupied community buildings to mitigate the effects of shadow flicker “to the extent reasonably practicable.”²¹

Signal Interference: The owner of a wind energy system must use reasonable and commercially available technology to mitigate interference caused by a wind energy system.²²

Stray Voltage: The owner of a wind energy system must work with the local electric distribution company to test for stray voltage at all dairy and confined animal operations within half a mile of a wind energy system facility.²³

Construction and Operation: Owners must ensure that systems comply with construction and operation standards including physical characteristics; electrical standards; construction, operation, and maintenance standards; and emergency procedures.²⁴

Decommissioning: An owner of a wind energy system must decommission and remove the system at the end of its useful life (no electricity for 360 continuous days, or

540 days for small wind energy systems with a capacity of 300 kW or less). In the event that the system owner anticipates that the wind energy system will operate again, and decommissioning is not required, they can submit an application to their political subdivision to receive extension for repowering, repairing, or replacing the system for continued use.²⁵ Additional guidance and references on decommissioning and repowering considerations, as well as other emerging and evolving issues such as integration of battery storage and is being developed for local governments and landowners.²⁶

The Wind Siting Council through the Wisconsin PSC recommends using wind siting best practices from the National Association of Regulatory Utility Commissioners.²⁷

Public Participation

Under Wisconsin Code 128.30.5, wind energy proposal applications must be made publicly available at a local library, business office, and online (or other publicly-accessible location) by the local government. The subdivision must also establish a process for accepting and considering written public comments on the application and hold at least one public meeting both to obtain comments on the proposal and to inform the public.²⁸

A comprehensive question and answer guide on wind farms, including information on siting authority, was developed by RENEW Wisconsin and can be found [here](#).²⁹

Partial List of Wisconsin Community Wind Ordinances

Many cities and counties in Wisconsin have adopted wind development ordinances. A partial list of those local governments is provided by the Wisconsin Wind Exchange as noted below.³⁰

Cities: Barron, Calumet, Manitowoc, Monroe, New Glarus, Oconto, Spooner, Forest, Wilson, Union

Counties: Door, Iowa, Polk, Price, Racine, Sauk, Calumet, St. Croix, Grant, Monroe and Trempealeau County.

TAXATION AND INCENTIVES

Property Tax

In Wisconsin, equipment for solar and wind development is exempt from property tax, but different interpretations exist at a local level regarding valuation of land and the components subject to property tax. Components of a conventional energy system are not exempt from property tax. Local assessors determine the tax status of the underlying land and what components of solar and wind energy systems are considered components of a conventional energy system.³¹

Sales Tax

Equipment associated with solar and wind energy production are exempt from Wisconsin sales tax.³²

Utility Aid

Utilities are exempt from local taxation and are taxed by the State. All public utilities - including investor-owned, municipal, and electric cooperatives - pay into a utility aid fund in Wisconsin. The State distributes all revenues between the county and township, city, or village in which the wind or solar energy system is located to compensate the local governments in the form of utility aid.³³

Under the utility aid formula, communities that host solar and wind systems over 50 MW will receive \$4,000 per MW annually. The distribution of utility aid depends on whether the system is located in a city, village, or town. More details are shown in table 2.

Table 2. Utility Aid Fund Payment Allocation

Local Jurisdiction	Jurisdiction	Percentage	Amount paid annually per MW
System is located in a city or village	City/Village	58%	\$2,333
	County	42%	\$1,667
System is located in a town	Town	42%	\$1,667
	County	58%	\$2,333

Endnotes

- 1 Wis Stats. § 1.12(3)(b).
- 2 “Wind Siting Rules and Model Small Wind Ordinance,” NC Clean Energy Technology Center Database of State Incentives for Renewables and Energy Efficiency, <https://programs.dsireusa.org/system/program/detail/4685>.
- 3 Wis Admin. Code Trans. §128.03.
- 4 Wis Admin. Code Trans. §128.03.
- 5 “Wisconsin Legislative Council Information Memorandum: Siting of New Renewable Resource Electric Generating Facilities,” Wisconsin Legislature, http://legis.wisconsin.gov/lc/publications/im/im_2002_02.pdf.
- 6 Draxl, Caroline, Andrew Clifton, Bri-Mathias Hodge, and Jim Mccaa, “The wind integration national dataset (wind) toolkit,” National Renewable Energy Laboratory (2015).
- 7 Direct Normal Irradiance Solar Resource of Wisconsin, National Renewable Energy Laboratory, (2020).
- 8 “Solar State by State” interactive data dashboard, Solar Energy Industries Associates (SEIA), last updated Q2 2019, accessed May 2019. <https://www.seia.org/states-map>.
- 9 “Wind Energy in Wisconsin,” U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, accessed June 2019. <https://windexchange.energy.gov/states/wi>.
- 10 RENEW Wisconsin, personal communication, February 2020.
- 11 MISO Generation Interconnection Queue, Midcontinent Independent System Operator (MISO), accessed August 27th, 2019. https://www.misoenergy.org/planning/generator-interconnection/GI_Queue/.
- 12 “Local Government Solar Toolkit: Wisconsin,” GrowSolar, <https://www.growsolar.org/wp-content/uploads/2017/10/WisconsinSolarToolkitOCT2017.pdf>.
- 13 SolSmart Designation Program· SolSmart· <https://www.solsmart.org>.
- 14 “Repowering and Decommissioning,” Great Plains Institute, <https://www.betterenergy.org/blog/repowering-and-decommissioning-what-happens-in-communities-when-solar-and-wind-projects-end/>.
- 15 “Wisconsin Legislative Council Information Memorandum: Siting of New Renewable Resource Electric Generating Facilities,” Wisconsin Legislature, http://legis.wisconsin.gov/lc/publications/im/im_2002_02.pdf.
- 16 “Utility Scale Solar Farms in Wisconsin,” RENEW Wisconsin, <https://www.renewwisconsin.org/solarfarms/>.
- 17 Wis Admin. Code Trans. §128.61.
- 18 “Wind Siting Council,” PSC of Wisconsin, <https://psc.wi.gov/Pages/Renewables/WindSitingCouncil.aspx>.
- 19 Wis. Admin. Code Trans. 128.13(1a)
- 20 “Wind Siting Rules and Model Small Wind Ordinance,” NC Clean Energy Technology Center Database of State Incentives for Renewables and Energy Efficiency, <https://programs.dsireusa.org/system/program/detail/4685>.
- 21 Wis. Admin Code Trans. §128.15(1b)
- 22 Wis. Admin Code Trans. §128.16(1b)
- 23 Wis. Admin Code Trans. §128.17(1a)
- 24 Wis. Admin. Code Trans. §128.15.
- 25 Wis. Admin. Code Trans. §128.61.
- 26 “Repowering and Decommissioning,” Great Plains Institute, <https://www.betterenergy.org/blog/repowering-and-decommissioning-what-happens-in-communities-when-solar-and-wind-projects-end/>.
- 27 “Wind Turbine Siting-Health Review and Wind Siting Policy Update,” Wisconsin Wind Siting Council, 2014, <https://psc.wi.gov/SiteAssets/windSitingReport2014.pdf>.
- 28 Wis. Admin. Code Trans. §128.30(6c).
- 29 “Wind Farms in Wisconsin”, RENEW Wisconsin, <https://www.renewwisconsin.org/wind-farms/>.
- 30 “Wind Energy in Wisconsin,” U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, accessed June 2019. <https://windexchange.energy.gov/states/wi>.
- 31 “Renewable Energy Systems: Biogas, Solar & Wind – Property Tax Exemption,” Wisconsin Department of Revenue, 2014, <https://www.revenue.wi.gov/DORFAQ/renewable-energy.pdf>.
- 32 “Renewable Energy Systems: Biogas, Solar & Wind – Property Tax Exemption,” Wisconsin Department of Revenue, 2014, <https://www.revenue.wi.gov/DORFAQ/renewable-energy.pdf>.
- 33 “Shared Revenue Program,” Wisconsin Legislative Fiscal Bureau, 2017, https://docs.legis.wisconsin.gov/misc/lfb/informational_papers/january_2017/0018_shared_revenue_program_informational_paper_18.pdf.

ABOUT THE GREAT PLAINS INSTITUTE



GREAT PLAINS INSTITUTE

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www.betterenergy.org

If you would like more information on resources available (and relevant) to your specific community, please reach out to:

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