

February 2020

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

The information and work presented herein was funded in part by Energy Foundation. This guide was authored by Jenna Greene, Brian Ross, and Jessi Wyatt.



Photo from National Renewable Energy Laboratory by Dennis Schroeder

SUMMARY

Solar and wind energy, resources that are abundant throughout the state of Minnesota, 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.

This guide provides Minnesota communities with an overview of long-term utility- and community-scale solar and wind development—systems sized one 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.

SUMMARY OF RENEWABLE ENERGY SITING AUTHORITY

Siting authority for solar and wind systems in Minnesota is divided between the state and local level depending on system size. 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.

The Minnesota Public Utilities Commission (PUC) has the authority to grant siting permits for solar energy systems over 50 MW in generating capacity. For solar energy systems under 50 MW, local governments have siting authority.¹ Counties in Minnesota may assume land use permitting responsibility for wind projects up to 25 MW of capacity by written resolution.² For wind projects in counties who have not assumed responsibility, and where the wind project is five (5) MW or more, the PUC maintains jurisdiction over siting and land use permitting.

Table 1. Minnesota Siting Authority

ROLES	STATE	LOCAL
Large solar energy projects (50 MW or more)	X	
Small solar energy projects (less than 50 MW)		X
Large wind energy projects (over 25 MW)	X	X
Medium wind energy projects (over 5 MW and under 25 MW)	X	X
Small wind energy projects (under 5 MW)		X
Expansion of wind systems greater than 5 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 property and production tax revenue.

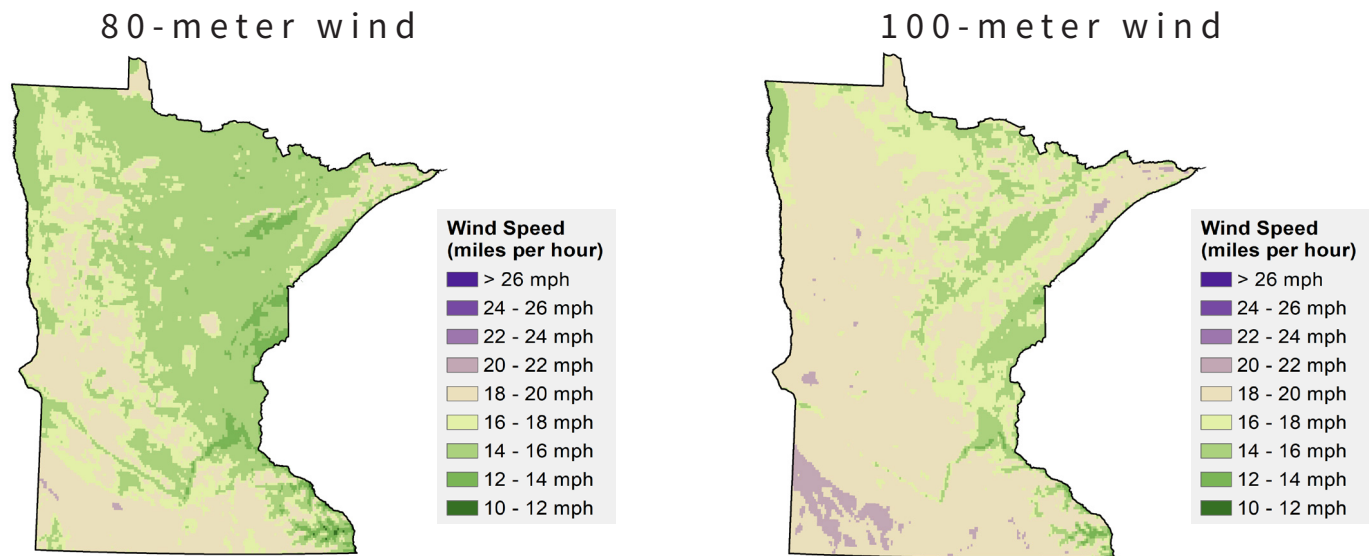
The state exempts solar and wind energy equipment from local property taxes, but applies a “production tax” in lieu of property taxes. The production tax is levied at different rates and for different lengths of time depending on the size of system and technology type (see more details on pages 12-13). Property and production tax revenue from wind and solar projects is a major source of tax revenue for a number of counties in Minnesota.

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

WIND AND SOLAR RESOURCES

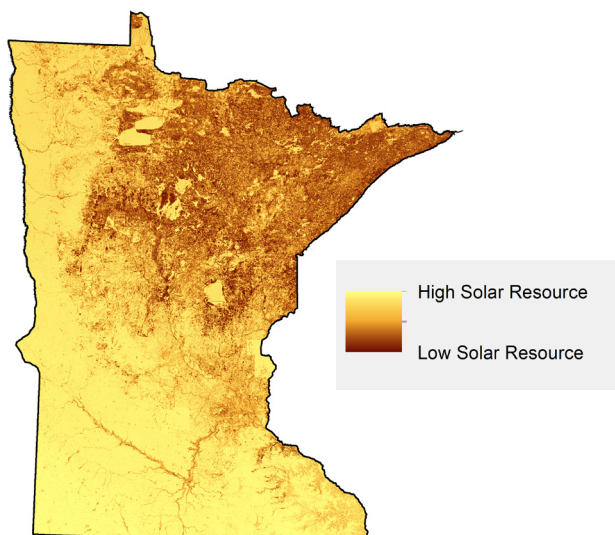
Minnesota has abundant solar and wind resources. Figures 1 and 2 are a useful guide to identify regions with the best resource potential for renewable energy development. Local governments will need to consider more granular views of the data for assessing renewable energy development potential.

Figure 1. Wind Resource



Source: Adapted from 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.

Figure 2. Solar Resource



Source: Adapted from University of Minnesota, *Uspatial Solar Insolation Raster Data, 2007 - 2013*

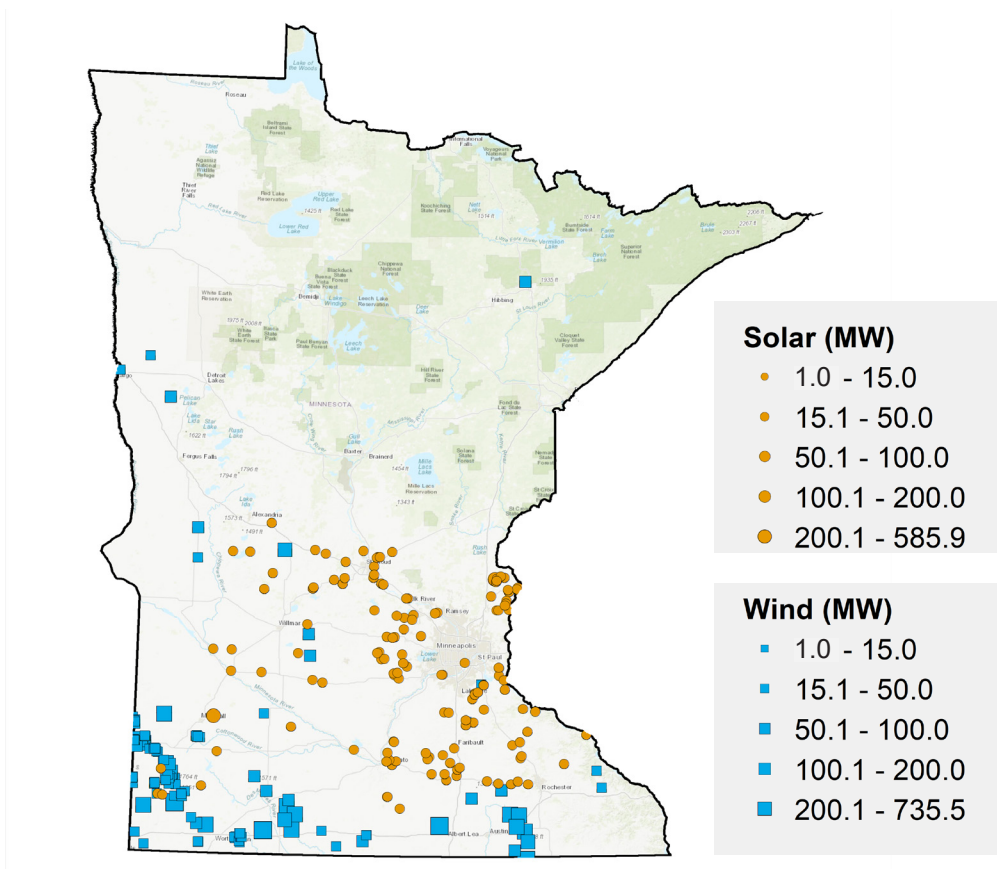
Figure 1 shows the wind potential (in miles per hour) across Minnesota for both 80 meters and 100 meters above the ground. Purple areas represent the best wind resource and green areas represent marginal or poor resources. The elevation shows the resource at the wind turbine tower height. Most new wind farms will have turbines at 100-meter hub height or greater. The data is most accurate at large spatial scales.³

Figure 2 shows the solar potential across Minnesota. Light yellow areas represent the highest solar resource and dark orange areas represent the lowest solar resource. Scientists collect solar resource data with LiDAR technology to measure the amount of solar resource available for a given area.⁴

EXISTING WIND AND SOLAR PROJECTS

A growing portion of Minnesota’s energy production and usage comes from renewable energy. Wind energy makes up almost 18 percent of electricity net generation in Minnesota (3,845 MW) and solar energy makes up about two percent (1,140 MW).

Figure 3. Existing Wind and Solar



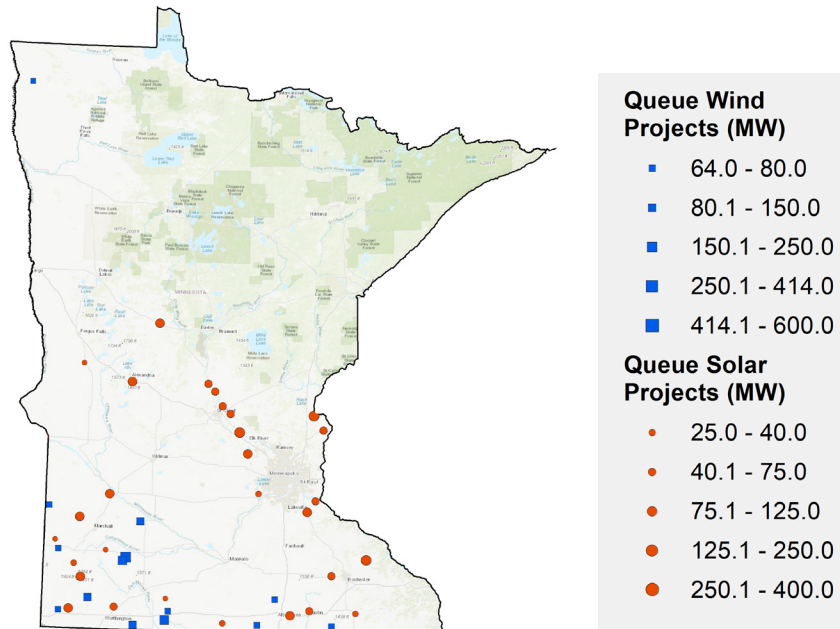
Source: Adapted from US Energy Information Administration (EIA) Generation Data (via Form 860) for wind and solar energy systems, updated through through 2018. Map created January 2020.

Figure 3 shows existing utility- and community-scale solar and wind projects in Minnesota. Though Figure 3 shows existing projects through 2018, the state had about 1,140 MW of installed solar capacity⁵ and 3,845 MW of installed of wind energy capacity in early 2020.⁶



MARKET TRENDS IN WIND AND SOLAR

Figure 4. MISO Queue Projects



Source: Adapted from Midcontinent Independent System Operator (MISO) public interconnection queue dataset, accessed January 13, 2020.

Wind: Wind energy deployment in Minnesota is increasing. Approximately 265 MW are currently under construction across the state and several gigawatts (GW) are in the investigation and planning phase.

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

Figure 4 displays proposed solar and wind energy projects that have filed an application for interconnection with the Midcontinent Independent System Operator (MISO)⁷ as of January 2020. 15 wind projects, comprising 3,000 MW of capacity, are in the MISO queue as of January 13, 2020.⁸ As of January 13, 2020, developers are pursuing 35 large-scale solar projects, with a generation capacity of 4,500 MW.⁹ 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 rapidly accelerating in Minnesota. Solar energy provides two percent of the electricity in Minnesota, ranking it in the top 15 states for solar installations in the country in 2019.

Minnesota is the leader in Midwestern solar deployment with over 1,000 MW of solar capacity installed through 2018, more than any other Midwestern state. Solar energy growth is continuing, with forecast deployment reaching two GW within five years and reaching as high as 10 percent (5-6 GW) of total energy consumed in the state by 2030. Several large-scale projects (over 100 megawatts) are being considered.

In 2007, Minnesota enacted a mandatory **Renewable Portfolio Standard** for all utilities in the state to generate or procure at least 25 percent of their electricity sales from renewable energy sources by 2025.¹⁰ Utilities are on track to exceed this standard.

In the same year, the Minnesota legislature passed the **Next Generation Energy Act**, requiring investor-owned utilities to reduce energy sales by 1.5 percent.¹¹ The utilities are required to spend a percentage of their revenues to advance energy efficiency and renewable energy.

In 2013, the Minnesota Legislature passed a suite of laws related to solar, including community solar legislation, which became the basis for the largest community solar program in the nation. The overarching **Solar Energy Standard** passed requires that Minnesota's public utilities generate or procure 1.5 percent of their retail electricity sales from solar energy.¹²

Community Solar Programs

Minnesota's Community Solar program is administered by Xcel Energy and regulated by the state. Private developers own most of the projects and sell the subscriptions to retail customers (residential, business, and institutional).¹³ Minnesota's Community Solar Garden program is the largest in the country. There is no limit on the MW capacity of community solar projects in Minnesota.¹⁴ Community Solar Garden installations must acquire land use or zoning permits at the county, township, or city level depending on jurisdictional authority.¹⁵

Photo from National Renewable Energy Laboratory by Dennis Schroeder



Existing Programs and Resources

The Minnesota Local Government Solar Toolkit, developed and piloted in 2016 with Minnesota communities by GPI, provides guidance on how to integrate both distributed and large-scale solar development into local zoning code.¹⁶ A number of Minnesota communities are participating in another best practice program, the National SolSmart solar-ready certification program for local governments.¹⁷ 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.

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. Dozens of local governments in Minnesota set supportive goals or targets for clean or renewable energy, and several counties have specifically included solar goals. The Washington County Energy Plan provides an example of how counties have included solar goals in their planning processes.¹⁸

Partial List of Minnesota Solar Ordinances

Many counties in Minnesota have passed ordinances related to utility-scale solar development. These counties include Blue Earth, Carlton, Chisago, Clay, Goodhue, Lyon, Mower, and Stearns County.



Photo from National Renewable Energy Laboratory

SITING AUTHORITY

Large solar developments, 50 megawatts or greater, require a site permit granted by the Minnesota Public Utilities Commission (PUC). These developments are not bound by local land use regulation, but still give high deference to such regulations. Additionally, the PUC considers the effects of large solar developments on prime agricultural soils, vegetation, animals, materials, and aesthetic values, among many other considerations. Solar developments less than 50 megawatts are reviewed at the local government level. Minnesota Statute 216E , Electric Power Facility Permits, describes the siting process for solar energy systems. Additional permits are typically needed from other regulating entities.

Public Input

For community- or utility-scale projects, community members may give input through two mechanisms:

- **Through the Minnesota Public Utilities Commission.** The PUC conducts site review and issues approvals. Public comment periods occur through the PUC, wherein individuals and groups may provide comments on large wind or solar developments.
- **Through local zoning hearings.** Zoning authority in Minnesota resides with local governments (except where the state exempts it). Zoning approvals must include opportunities for community members to voice their support, concerns, questions, or interests at public hearings.

Additional resources

(1) [Pollinator Friendly Solar Program](#)¹⁹

(2) [Minnesota Department of Natural Resources solar siting best practice guidance](#)²⁰

WIND ENERGY SITING AND POLICY

RESOURCES FOR SITING AND DESIGN BEST PRACTICES

State Wind Policy Summary

Wind energy provides 18 percent of electricity in Minnesota, ranking the state within the top ten wind energy users in the country. In 2007, Minnesota enacted a mandatory **Renewable Portfolio Standard** for all utilities in the state to generate or procure at least 25 percent of their electricity sales from renewable energy sources by 2025. Utilities are on track to exceed this standard.

SITING AUTHORITY

The Wind Siting Act, Minnesota Statute 216F, lays out the process for siting wind energy projects in Minnesota.

Additional permits may be needed from other regulatory entities. Projects must also be in compliance with Federal Aviation Association standards for lighting and location of the turbines. Other permits might be required for siting wind energy systems depending on their location, features, and size.

Large Utility-Scale Wind Energy Projects

Authority: The PUC has permitting authority for wind projects greater than five MW. Counties can assume permitting authority for projects between 5 MW and 25 MW if requested by the county and approved by the PUC.²¹ For counties to elect to regulate these large-scale wind energy projects, the county must submit a letter of their intention to the PUC and adopt permitting authority through a county board resolution.²²

Although the PUC has permitting authority for wind projects greater than five MW under MN Statute 216.F.07,²³ the PUC considers zoning and land use controls from county, local, and special purpose governments, and defers to their zoning standards when practical.



Permitting by the Commission: The permitting process for large wind energy projects is detailed in Minnesota Administrative Rule 7854.²⁴ Permits through the PUC are required, as stated above. In these applications, environmental impacts must be considered.

Public participation: The PUC will provide public notice of a draft site permit after the application is accepted. After the notice is published in the Environmental Quality Board Monitor, there will be a minimum of 30 days for public written comments to the PUC. The PUC will also hold at least one public informational meeting near the proposed project, with at least 10 days notice to the public and more than 10 days prior to the end of the public comment period.²⁵

County standards: Under Minnesota Statute 216F.081, a county ordinance may adopt standards for large wind energy projects that are more stringent than standards in commission rules or commission's permit standards. County standards may be considered and applied when considering a permit application for a large wind energy project. However, the commission may find good cause not to apply the standards.²⁶

Public Input

For large, utility-scale projects, community members may provide input through two mechanisms.

PUC: The PUC grants the generating certificate for projects. Public comment periods occur wherein individuals and groups may provide comments on large wind developments.

Local Zoning Hearings: Zoning approvals must include opportunities for community members to voice support, concerns, questions, or interests at public hearings.

Expansion of systems

A new project is considered an expansion if the new system is within five miles of any turbine in the existing system, both projects are under common ownership, and the application is submitted to the PUC less than three years

after the existing system began operating.²⁷ To expand upon a wind energy system in an amount equal to or greater than five MW requires a site permit from the PUC.

Small Utility-Scale Wind Energy Projects

Small wind energy projects are defined by the Minnesota Legislature as equal to or less than five MW in size. Counties have siting authority for these projects (five MW or less), which must be permitted through local ordinances and review.²⁸

Partial List of Minnesota Community Wind Ordinances

Many cities and counties in Minnesota have developed ordinances regulating wind energy development.²⁹ City ordinances address primarily small scale or individual turbines, while county ordinances address utility-scale projects.

Minnesota counties with wind ordinances include Chippewa, Chisago, Clay, Clearwater, Cottonwood, Douglas, Fillmore, Freeborn, Goodhue, Lyon, Martin, Mower, Murray, Norman, Otter Tail, Pipestone, Renville, Stearns, Stevens, Washington, and Wright County.

TAXATION AND INCENTIVES

Distribution of Revenues

The county auditor splits the tax revenue from solar and wind energy systems on an 80 percent county basis and a 20 percent cities/township basis for the county in which the system lies.^{30,31}

Production Taxation

The energy produced by wind and solar energy systems is taxed at different levels depending on the size of the project. Tables 2 and 3 show the production tax rate levied on energy produced by wind and solar systems in the state.

Table 2. Solar Energy Production Tax

Size	Production Tax
1 MW (AC) or less	No production tax
Greater than 1 MW	\$1.20 per MWh

Table 3. Wind Energy Production Tax

Size	Production Tax
0.25 MW or less	No production tax
0.25 MW - 2 MW	\$0.12 per MWh
2 MW - 12 MW	\$0.36 per MWh
Over 12 MW	\$1.20 per MWh

Property Taxation

Solar: The county assessor may decide whether the real property underlying the solar array is primarily used for solar production.³² If the property where the system is located is used primarily for solar energy production, then the property is classified with regard to the system and property taxes are collected accordingly.³³

Wind: Typically, the value of the land where the wind turbine is located is valued in the same way as similar land that does not have a wind turbine.³⁴

Sales Tax

Equipment associated with solar energy production and for wind energy production are all exempt from Minnesota sales tax.^{35,36}

PRODUCTION TAX REVENUE

Figures 5 and 6 show tax revenue levied from solar and wind production and total production in Minnesota by year. The resulting production tax revenue is split between the county and township/city in which the development is located. Over the period studied, there was an increase in tax revenue and total energy production for both wind and solar energy systems throughout the state.

Figure 5. Solar Production and Tax Revenue

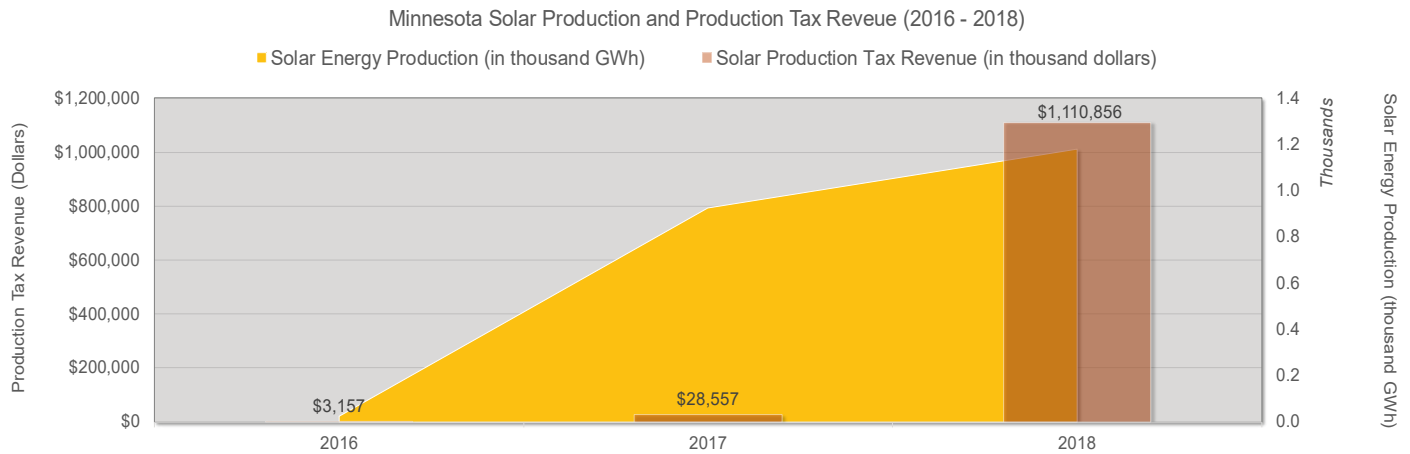


Figure 6. Wind Production and Tax Revenue

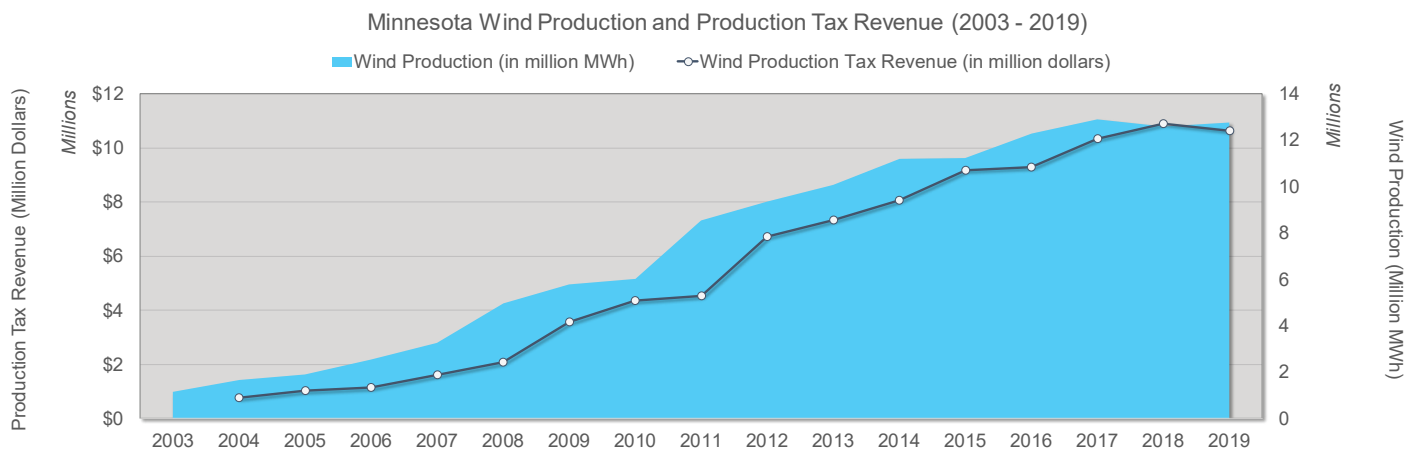


Figure 5. Solar Production and Tax Revenue displays data on solar energy production and tax revenue generation between 2016 and 2019. For solar energy systems, data is only available starting in 2016. Over this period, solar energy systems showed increases in both total production, as well as production tax revenue. Production tax revenue rose from about three thousand dollars in 2016 to over \$1 million dollars in 2018. Similarly, energy production increased from about two Gigawatt-hours (GWh) to over one thousand GWh in 2019. This figure was adapted from Minnesota Department of Revenue data.³⁷

Figure 6. Wind Production and Tax Revenue details wind production and tax revenue from 2003 through April 2019. Between 2003 and 2019 wind energy production in Minnesota increased from two to over 12 million MWh. Wind production tax revenue experienced a similar increase during that period, from about \$1 million dollars in 2003 to over \$12 million dollars in 2019. This figure was adapted from Minnesota Department of Revenue data.³⁸

Endnotes

- 1** “Energy Facilities Permitting,” Minnesota Public Utilities Commission (PUC), accessed June 2019. <https://mn.gov/puc/permitting/>.
- 2** Minn. Stat. § 216F.08.
- 3** Draxl, Caroline, Andrew Clifton, Bri-Mathias Hodge, and Jim McCaa. “The wind integration national dataset (wind) toolkit.” National Renewable Energy Laboratory (2015).
- 4** Brink, Christopher; Benjamin Gosack, Len Kne, Yuanyuan Luo, Christopher Martin, Molly McDonald, Michael Moore, Andrew Munsch, Stephen Palka, Devon Piernot, Dan Theide, Yiquan Xie, and Andrew Walz. Solar Insolation, Minnesota (2006-2012). Published in 2015. Retrieved from the Data Repository for the University of Minnesota. <http://dx.doi.org/10.13020/D6X59X>.
- 5** “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>.
- 6** “Wind Energy in Minnesota,” U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, accessed June 2019. <https://windexchange.energy.gov/states/mn>.
- 7** The Midcontinent Independent System Operator (MISO) is a non-profit organization that operates the transmission grid and energy markets in 15 states, including Minnesota.
- 8** MISO Generation Interconnection Queue, Midcontinent Independent System Operator (MISO), accessed May 2nd, 2019. https://www.misoenergy.org/planning/generator-interconnection/GI_Queue/.
- 9** MISO Generation Interconnection Queue, Midcontinent Independent System Operator (MISO), accessed May 2nd, 2019. https://www.misoenergy.org/planning/generator-interconnection/GI_Queue/.
- 10** Minn. Stat. § 216B.1691, subd. 2a.
- 11** Minn. Stat. § 216B.1641, subd. a.
- 12** Minn. Stat. § 216B.1692, subd. 2f.
- 13** “Tips About Community Solar,” Minnesota Department of Commerce, accessed August 2019. <https://mn.gov/commerce/consumers/your-home/energy-info/solar/tips-about-community-solar.jsp>.
- 14** Morehouse, Catherine “Minnesota community solar hits 400 MW”, Utility Dive, August 30, 2018. <https://www.utilitydive.com/news/minnesota-community-solar-hits-400-mw/531305/>.
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- 16** “Minnesota Local Government Solar Toolkit,” Grow Solar, https://www.betterenergy.org/wp-content/uploads/2018/03/MinnesotaToolkitFeb2018_Award-Banner_Web-Version_0.pdf.
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- 18** “Washington County Energy Plan,” Washington County, Minnesota (August 2018). <https://www.co.washington.mn.us/DocumentCenter/View/21599/2018-Energy-Plan-PDF>.
- 19** “BWSR Habitat Friendly Solar Program,” Minnesota Board of Water and Soil Resources, <https://bwsr.state.mn.us/bwsr-habitat-friendly-solar-program>
- 20** “Commercial Solar Siting Guidance,” Minnesota Department of Natural Resources, https://files.dnr.state.mn.us/publications/ewr/commercial_solar_siting_guidance.pdf
- 21** Minn. Stat. §216F.08.
- 22** Bjorklund, Ingrid and Larry Hartman, “Minnesota State Permitting Process for Large Wind Energy Conversion Systems,” Minnesota Department of Commerce Office of Energy Security. Presented on April 26th, 2010. http://www.cleanenergyresourceteams.org/sites/default/files/publication_files/MNPermittingWind_OES_04-26-10.pdf
- 23** Minn. Stat. § 216F.07.
- 24** Minn. R. 7854.
- 25** Minn. R. 7854.0900.
- 26** Minn. Stat. § 216F.081.

Endnotes

27 Minn. R. 7854.0300.

28 Minn. Stat. § 216F.02.

29 “Wind Energy in Minnesota,” U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, accessed June 2019. <https://windexchange.energy.gov/states/mn>.

30 Minn. Stat. § 272.029, subd. 6.

31 Minn. Stat. § 272.095, subd. 7.

32 Minn. Stat. § 272.02, subd. 24.

33 Minn. Stat. § 272.02, subd. 24.

34 Minn. Stat. § 272.02, subd. 22.

35 Minn. Stat. § 297A.67, subd. 29.

36 Minn. Stat. § 297A.68, subd. 12.

37 Minnesota Department of Revenue Solar and Wind Energy Production Tax data, 2015 - 2019 (last updated April 3, 2019) (accessed August 2019).

38 Interactive Solar and Wind Energy Production Tax Data, Minnesota Department of Revenue. Last updated April 3, 2019. Accessed August 2019. https://www.mndor.state.mn.us/ReportServer/Pages/ReportViewer.aspx?/Property%20Tax/Property_Tax_Energy_County.

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

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