

BACKGROUND

Coal is the largest contributor to net electric generation in Minnesota. Coal's contribution has declined recently, falling from 53% in 2011 to an estimated 37% in 2018. The state's [two nuclear power plants](#), Prairie Island and Monticello, produced around 23% of the state's electric power in 2017. The North Star State is ranked fourth in the nation for ethanol production and has the most [E85](#) (an 85% ethanol and 15% gasoline mix) fueling stations in the nation.

Minnesota is a [national leader](#) in wind energy development, ranked among the top 10 states for both installed generating capacity and actual electric generation from wind. Solar energy has rapidly increased in the state since 2012, reaching an estimated [2%](#) of Minnesota's net electric generation in 2018. In-state solar [capacity](#) has increased to approximately 1,140 megawatts (MW). This is at least partially due to the success of Minnesota's [community solar program](#). A 2019 [report](#) by the National Association of State Energy Officials and the Energy Futures Initiative found that Minnesota has 47,083 traditional energy workers (1.6% of total state employment) and an additional 46,191 workers employed in energy efficiency.

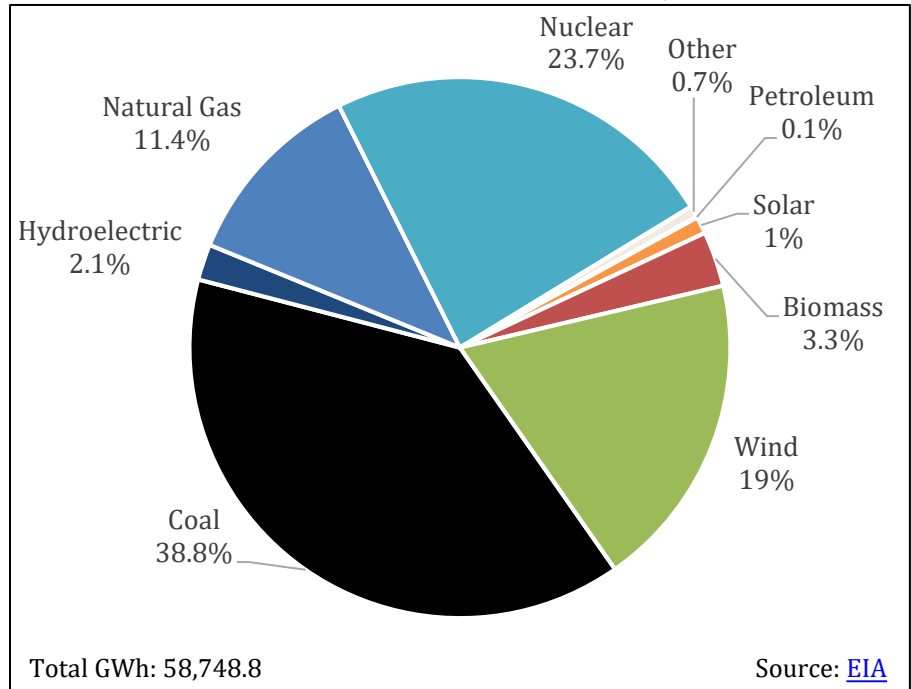
The Governor appoints the five members of the bipartisan [Minnesota Public Utilities Commission](#) (MPUC), which [regulates](#) large electric and gas utilities and large energy facilities siting. Republican majorities control both chambers of the state's [legislature](#), and Democratic Governor Tim Walz took office in January 2019.

POLICY STRENGTHS AND OPPORTUNITIES¹

The National Renewable Energy Laboratory (NREL) developed the notion of "policy stacking,"² an important framework for policymakers to consider. The basic idea behind policy stacking is that there is an interdependency and a sequencing of state policy that, when done effectively, can yield greater market certainty, private sector investment, and likelihood of achieving stated public policy objectives.

In theory, but not always in practice, clean energy policies can be categorized into one of three tiers of the policy stack. Tier 1, market preparation policies, remove technical, legal, regulatory, and infrastructure-related barriers to clean energy technology adoption. Tier 2, market creation policies, create a market and/or signal state support for clean energy technologies. Tier 3, market expansion policies, create incentives and other programs in order to expand an existing clean energy market by encouraging or facilitating technology uptake by additional market participants.

Minnesota's Net Electric Generation, 2017



¹ For more information on policy opportunities, please visit the [SPOT for Clean Energy](#). For more information on specific policy actions related to these opportunities, please review the [Clean Energy Policy Guide for State Legislatures](#).

² V.A. Krasko and E. Doris, *National Renewable Energy Laboratory*, 2012. Strategic Sequencing for State Distributed PV Policies: A Quantitative Analysis of Policy Impacts and Interactions. <https://www.nrel.gov/docs/fy13osti/56428.pdf>

For example, before financial incentives for combined heat and power (CHP) will be successful, two key considerations for deployment are having clear interconnection standards and favorable stand-by rates for customers who opt to add CHP. In this example, states should adopt policies to address interconnection and stand-by rates before adopting financial incentive programs.

GRID MODERNIZATION

The transition to a digital economy requires affordable, sustainable, and reliable electricity and presents challenges and opportunities to the grid. Emerging physical and cyber security threats, along with increased demand for faster outage response times, require, at minimum, real-time incident tracking and response capabilities. Increased grid penetration of renewable energy coupled with the adoption of advanced metering, energy storage, microgrids, electric vehicles, and other technologies to modernize our electric system will provide economic benefits, increase security, and ensure more reliable, resilient, and clean electricity. These innovations will require substantial planning and investment in grid technologies.

Grid modernization will require a suite of state and federal policy changes to support advancements in grid technologies, grid management, and utility regulation. Grid modernization strategies, while recognizing regional and inter-state diversity and avoiding one-size-fits-all plans, should take a holistic view of the electric system.

The GridWise Alliance's latest [Grid Modernization Index](#) ranks Minnesota 10th overall for grid modernization efforts. The state's ranking improved 11 places from last year's Index, due largely to policy activity in 2018. The state performs strongly in customer engagement due to the dynamic pricing and demand response programs offered by the state's investor-owned utilities (IOUs). The Minnesota Department of Commerce worked with stakeholders to develop the [Energy and Policy Conservation Quadrennial Report](#) and the state's [2025 Energy Action Plan](#), both of which address grid modernization. The [e21 Initiative](#) is a collaborative stakeholder effort working to develop policy recommendations for the MPUC. The intent is to enable the development of a utility business model that supports grid modernization and customer choice. Following several stakeholder meetings, the MPUC opened a proceeding in March 2016 to develop a framework for [integrated distribution system](#) planning. The planning process proposed by MPUC staff was [approved](#) in August 2018.

While Minnesota demonstrates leadership in this area, there are opportunities to develop policies to support in-state modernization efforts.

1. States might decide to require that utilities develop and propose a ten-year grid modernization plan to the public utilities commission within a specified timeframe. Utilities would then be required to implement that plan within another specified timeframe. Strategies and/or plans should outline a clear set of grid modernization goals and describe methods to measure, report, verify, and enforce progress towards those goals.
2. Require that utilities' integrated resource plans (IRPs) include plans to enhance cybersecurity, increase smart meter deployment and demand response and/or demand-side management (DSM) programs, and measure and report on the results of grid modernization efforts. While there is no statewide policy requiring smart meters in Minnesota, utilities have [taken the lead](#) in residential smart meter deployment.
3. Minnesota does not have clear state policies governing [customer data access](#) and privacy protections. To address this, policymakers could develop legislation or rules that, at minimum, do the following: clarify who owns the energy data associated with consumer energy usage; protect customer privacy; outline the process for allowing direct access to data by third parties; and promote access to the highest resolution of data possible. The state could establish customer access to energy data through the [Green Button](#) program, for example.

ENERGY STORAGE

Energy storage offers a unique opportunity to dynamically manage supply and demand while maximizing the value of grid resources. By deploying storage in strategic locations, utilities can more effectively manage their energy portfolios. First, storage provides management of intermittent demand – helping to flatten peak demand requirements for the utility. Second, the responsiveness of energy storage can allow the utility to implement voltage

regulation and other ancillary services, which are useful for improving system efficiency. Third, storage can dispatch power to better integrate intermittent resources like renewable energy.

The flexibility of battery storage, combined with advanced metering infrastructure, allows customers to control, for instance, how and when they use energy from the grid or from solar panels installed on their home or business. In most cases, this can provide greater cost savings than standalone solar systems. Combined with [time-varying rates or real-time pricing programs](#), state policy can further support customer choice and open a new market for energy services. Prices that better reflect the time-varying and location-dependent costs of producing and delivering electricity can lead to a number of economic and environmental gains.

Two major trends have enabled increased deployment of energy storage: declining costs and technological advances. State policy can help maximize these benefits through a combination of establishing a framework for easy integration of energy storage into the grid and establishing a marketplace that monetizes the benefits of energy storage for cost-effective investment.

Minnesota is well positioned to grow its in-state energy storage capacity. When Xcel Energy completed its one-megawatt (MW) [Wind-to-Battery](#) project in Luverne in 2009, it was the first such project in the U.S. The [Minnesota Energy Storage Alliance](#) is an organization formed by interested stakeholders to expand the energy storage market in the Midwest. In 2017, Minnesota's largest retail electric cooperative, Connexus Energy, [announced](#) plans to construct the largest battery storage project in the state with a maximum capacity of 20 MW, which will support three solar facilities. Following a two-year study, the MPUC [issued an order](#) revising interconnection standards in May 2018. The standards are a result of a collaborative effort between MPUC, the Interstate Renewable Energy Council (IREC), Fresh Energy, and the Environmental Law and Policy Center. [Energy storage](#) is included as an eligible generation project in the standards.

In the first special session of the 2019 session, Minnesota's policymakers enacted the 'Omnibus Jobs and Energy Bill' ([HF2](#)). The legislation includes provisions requiring the commissioner of commerce to conduct an energy storage cost-benefit analysis in order to quantify the value of adding storage to the grid; allowing utilities to file proposals with the MPUC to recover the costs associated with energy storage pilot projects; and requiring that utilities required to submit an IRP evaluate energy storage options during the planning process.

There are additional opportunities for developing supportive state policies:

1. Building on the study that will be conducted by Commerce, instruct utilities to evaluate the value of energy storage in multiple strategic locations across the utility system and consider a requirement to deploy storage where it will be cost effective, or identify the price point at which it will become cost effective.
2. Consider creating a mandatory energy storage procurement target or requirement for energy storage with a documented process for periodic review of progress towards that goal. Procurement targets can limit the amount of utility owned storage to be procured; require that a certain amount of storage be targeted to low-income customers; and create carve-outs for specific amounts of storage to be procured at the transmission, distribution, and customer levels. Procurement targets can jump-start market creation, spur fast learning, and guide the development of a regulatory framework.
3. Finance and incentivize energy storage for customers and utilities. Incentives could enable customers to use storage to manage their electric load and store locally produced renewable energy. Incentives in the form of rebates, grants, and tax credits can provide a bridge to scalable deployment for storage. Incentives can be designed to decline as storage values become more readily monetized and/or as the cost of storage decreases. Policymakers could allow utilities that provide incentives to customers to recover the costs of installing smart meters. This would enable dynamic and time-varying energy management from multiple distributed battery systems. This should signal to customers the value of leveraging storage while better aligning customer costs with system costs. Financing energy storage installations for commercial customers could help reduce their demand charges. Policymakers might want to start first with a policy that provides grants to pilot projects. Policy might also target solar system owners. Financial incentives should be designed to ensure that the state will meet other goals including emissions and peak demand reductions, and equitable access to clean energy.

MAINSTREAMING RENEWABLES

As the renewable energy industry has matured, technology has improved, and global production of generating equipment has increased, renewable energy is increasingly seen as the least cost and lowest risk form of energy (excluding energy efficiency). A 2019 Bloomberg New Energy Finance [report](#) predicts that renewable resources will generate at least 60% of total global electricity and 43% of U.S. electricity by 2050. With increased deployment, utilities are learning more about how to integrate renewables effectively, investors are becoming more comfortable with the technologies, and building code officials are recognizing common standards and best practices. For these reasons, it is in the interest of policymakers to ensure that their states are well positioned to benefit from the transition to clean energy resources.

To reduce barriers to customer and utility participation in the renewable energy market, policymakers in Minnesota might consider several policy options.

Customer-Oriented Policies

1. Interconnection, net metering, and streamlined permitting – In general, customers want a clear, streamlined, affordable, and predictable system for connecting renewable energy systems to the grid. Minnesota is only state to have adopted a [Value-of-Solar Tariff \(VOST\)](#) methodology that would replace the state’s net metering policy. Instead of crediting customer-generators at the retail rate, a VOST would incorporate several measurable costs and benefits to the transmission and distribution system in its rate design, including fuel costs, line losses, ancillary services, and environmental impacts. Because [no utilities](#) have submitted a VOST to the MPUC for approval, the standard net metering tariff remains in place. The state allows [aggregated net metering](#) and IOUs are required to offer meter aggregation to their customers. The state recently [updated statewide standards](#) for streamlined permitting processes for small generating systems. The new [interconnection](#) rules fast tracks permitting for systems under 20 kilowatts (kW) and establishes formal screening for “mid-size” systems. The state might also consider offering resources to support local governments that voluntarily implement a streamlined program, as [Minneapolis and St. Paul](#) have done. State incentives, such as tax credits, financial incentives, or loans can be tied to systems that are established within a designated streamlined permitting jurisdiction.
2. Shared Renewables – Due to building and property attributes and ownership issues, many customers are unable to install renewable energy technologies where they live or work. Allowing shared, or community, renewable energy projects addresses these barriers. These projects have multiple owners or subscribers who pay for a portion of the project or the generation provided by the system. Minnesota currently offers [tax credits](#) to incentivize community-based energy developments (C-BEDs), and Xcel Energy has implemented [one of the most robust community solar programs](#) in the country. Since its launch in 2014, the program has grown considerably with [585 MW](#) in operation as of July 2019 and 900 MW in projects planned for development. Xcel is [required](#) to purchase solar from community solar gardens no larger than one MW, and subscribers are compensated through the [Solar Rewards Program](#).

Low credit ratings often deter participation in renewable energy markets; this can affect low- and moderate-income (LMI) households’ adoption of renewable energy solutions. Supportive policies for shared renewables can be designed to encourage participation by LMI households; this can increase adoption of renewable technologies and reduce energy costs. Low-income participation can be encouraged either through a percentage mandate for the overall annual contracted capacity, or by offering a higher rate of payment for the portion of shared solar capacity attributed to low-income customers. States that have a shared renewable program may want to coordinate this program with implementation of the federal [Weatherization Assistance Program](#) to provide recipients of assistance with participation in a shared renewable system.

There are [several additional policy options](#) that Minnesota might consider to promote renewable energy uptake by low- and moderate-income consumers. Generally, successful state policies should be tailored to these customers, be cost-effective and financially sustainable, have measurable performance indicators, and be flexible enough to allow later changes in design.

3. Corporate Procurement – Many Fortune 100 and 500 companies have established either climate goals or commitments to purchase renewable energy. Over the last five years, [over 16 gigawatts \(GW\) of renewable](#)

[contracts](#) have been announced by corporate entities. This is leading policymakers to provide additional avenues for businesses to procure renewable energy. [EDF Renewables](#) has been active in securing power purchase agreements (PPAs). The latest 100 MW wind deal with Southern Minnesota Municipal Power Agency brought EDF's total procurement to 600 MW across multiple states. Walmart, with a goal to meet a [100% renewable energy target](#), recently [announced](#) that it would subscribe to 36 community solar projects in Minnesota. 3M entered into an [agreement](#) with Xcel energy to source 100% of its electricity for its headquarters from renewable energy. Xcel Energy filed for and received [approval](#) in 2019 to expand its renewable energy tariff program, Renewable Connect. [Minnesota's policy](#) allows companies to purchase renewable energy credits (RECs) or renewable energy through [green tariffs](#), own shares in C-BEDs, and develop or lease onsite renewable energy projects. The products available in [Minnesota](#) meet five out of six of the [Corporate Renewable Energy Buyers' Principles](#). To expand the corporate procurement market, the state could explore policies that maximize the emissions reductions potential of new renewable projects, such as a proximity requirement for renewable energy deliveries from electricity providers, or by providing bundled RECs specific to a renewable facility. In addition, it is prudent to incorporate corporate renewable purchase commitments into the IRPs that utilities submit to regulators to plan for resource needs over multiple decades. By integrating these renewable purchase commitments into the IRP process, regulators can avoid over-building resources and stranding generation assets.

Utility-Oriented Policies

Some states have created programs that aim to reduce greenhouse gas (GHG) emissions and increase investments in clean energy resources. Minnesota's [renewable energy standard](#) (RES) sets minimum requirements for electricity generation from renewable resources at 31.5% for Xcel, 26.5% for other investor-owned utilities (IOUs), and 25% for all other utilities by 2025. The RES also includes a statewide target of 10% solar capacity by 2030. [Great River Energy](#), the energy provider for more than two dozen distribution cooperatives in Minnesota, announced plans to get half of its electric generation from renewables by 2030. Great River achieved the state's 25% RPS seven years early. The [Next Generation Energy Act](#) of 2007 established statewide GHG emission reduction goals of 15% by 2015, 30% by 2025, and 80% by 2050, based on 2005 levels. Among other actions this year, Rochester Public Utilities [announced](#) a 100% renewable energy by 2030 target, and Governor Walz [proposed](#) a 100% carbon-free by 2050 target for the state.

Minnesota might see a clean peak standard as the next step in a progression from its RPS and emissions standards. [Clean Peak Standards](#) aim to increase the share of clean energy resources used to meet peak demand and decrease energy bills over the long-term by reducing peak demand in the hours when energy costs are highest. These objectives can be met through different policy options including: planning and procurement requirements that focus on peak demand; a moratorium on the construction of new peaking units or a phase out of existing units; incentives for clean energy resources delivered during peak times; and/or adopting a new clean peak standard that sets a target for clean energy deliveries during peak times.



ELECTRIFICATION OF THE TRANSPORTATION SECTOR

Bloomberg New Energy Finance [estimates](#) that 57% of all new passenger vehicle sales will be electric by 2040 and that price parity with conventional vehicles will be met for most segments in the mid-2020s. Designing infrastructure that will facilitate easy connection of electric vehicles (EVs) to the grid is a key part of building a modernized grid. The relationship between the increased adoption of EVs and the availability of EV charging stations is complicated. On the one hand, consumer range anxiety creates a barrier to increased adoption. On the other hand, while greater availability of charging stations would ease this anxiety, the relatively low numbers of vehicles on the road provides little incentive to install and make these stations available to the public. The good news is that both supportive policies for developing charging infrastructure and advancements in technology have eased range anxiety.

Minnesota offers a handful of [incentives](#) to support EVs and EV supply equipment (EVSE). [Grants](#) are available for the installation of EVSE along Minnesota's roadways, and state policy requires that utilities offer [EV charging tariffs](#). Some utilities in the state also offer [incentives](#) to customers. Xcel proposed two EV infrastructure pilot programs for the state in [2018](#). These programs will provide for a new fleet of EVs as well as public charging stations. Xcel Energy received MPUC approval to launch [a smart-charger pilot program](#) for residential customers. Minnesota requires an additional \$75 [registration fee](#) for EVs, which might dis-incentivize purchases.

There are policy opportunities to further encourage and prepare for increased market penetration of EVs.

1. EV and EV Supply Equipment (EVSE) Financing and Financial Incentives – Providing financial incentives and innovative financing options can help spur greater market penetration of EVs. Sales, property, and income tax credits are some of the simplest methods for addressing high up-front costs of EVs and EVSE. While sales tax credits are typically applied at the time of purchase, property and income tax credits may do less to address upfront cost barriers as the credit is not applied at the time of purchase.³ States have adopted other financial incentives including low-interest loans, grants, vouchers and rebates. A handful of states qualify EVSE under their property assessed clean energy (PACE) programs. A simple solution is to increase and expand existing tax credits to incentivize commercial, publicly available charging stations.
2. Charging Infrastructure Plan – Locating [charging infrastructure](#) is different from locating conventional fueling stations. For the most part, EVs are cars used for commuting and local trips. Furthermore, while a driver of a conventional vehicle stops only briefly at a gas station for the specific purpose of filling up, a driver of an EV is generally looking to refuel when they are parked for a longer period of time, for example when going shopping, going to a restaurant, or going to work. Charging infrastructure plans should attempt to pair the appropriate level of charging with a reasonable amount of time a person will be at that location. Legislation could direct a state agency to develop an infrastructure plan through a stakeholder process. Minnesota’s EV registration fee could help fund these efforts. For example, in [Washington](#) a portion of each EV registration fee is used to fund charging infrastructure development across the state.

Regional collaborations are emerging around the U.S. to coordinate the development of EV transportation and charging infrastructure. The [Michigan to Montana](#) (M2M) project is an alternative fuel infrastructure project that is supported by funding from the U.S. Department of Energy. This project, which includes Minnesota via I-94, includes plans for EV charging infrastructure.

3. Parking Infrastructure Requirements – In tandem with the development of a statewide plan, legislation could set requirements for EV parking infrastructure. Some states have adopted permitting standards for parking lots, requiring, for instance, that for every 100 parking spaces, there must be at least one EV charging space. Legislation could also incentivize utilities to develop [make-ready locations](#). These locations supply power to the point where a utility or third party developer might install an EV charging station. Minnesota’s statewide building energy code could also be updated to include requirements for EV charging infrastructure.

NEWS

- August 16, 2019: [Clean Energy Jobs are Big in Minnesota. But They Often Go to People from Out of State](#)
- August 14, 2019: [Bipartisan Meetings, Informal Conversations Seek Common Ground on Minnesota’s Energy Future](#)
- July 29, 2019: [Solar Gardens Blooming: Minnesota has More than One-Third of the Total Solar Mini-Gardens in the Nation](#)
- July 16, 2019: [National Grid Acquires Renewables Developer Geronimo for \\$100M](#)
- July 14, 2019: [Minnesota to Consider Using Energy Storage for Peaker Plants](#)
- June 20, 2019: [Pollinator-Friendly Solar Energy Becomes the Norm in Minnesota](#)
- June 17, 2019: [Boulder-based Scout Energy Developing 200-Megawatt Wind Farm in Minnesota](#)
- June 5, 2019: [Value of Solar Debate Accelerates in Minnesota](#)
- May 20, 2019: [Xcel Energy Fast-Forwards Minnesota Coal Plant Closures but Extends Nuclear Window](#)
- May 14, 2019: [Minnesota Nonprofits Using Community Solar to Help Veterans, Families in Need](#)
- May 8, 2019: [Minnesota’s Community Solar Program has Been Wildly Popular. Why Some Want to Limit it](#)

OTHER RESOURCES

- Minnesota’s Energy Landscape, the Energy Transition Lab at University of Minnesota:
<http://energytransition.umn.edu/wp-content/uploads/2016/11/The-Minnesota-Energy-Landscape.pdf>

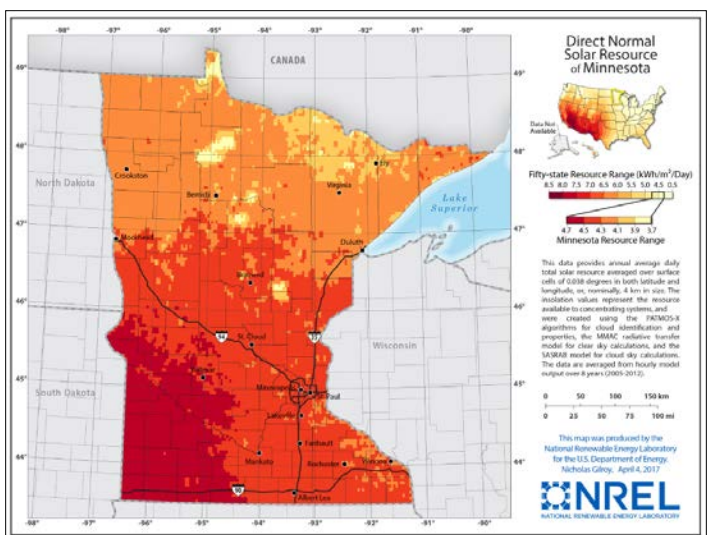
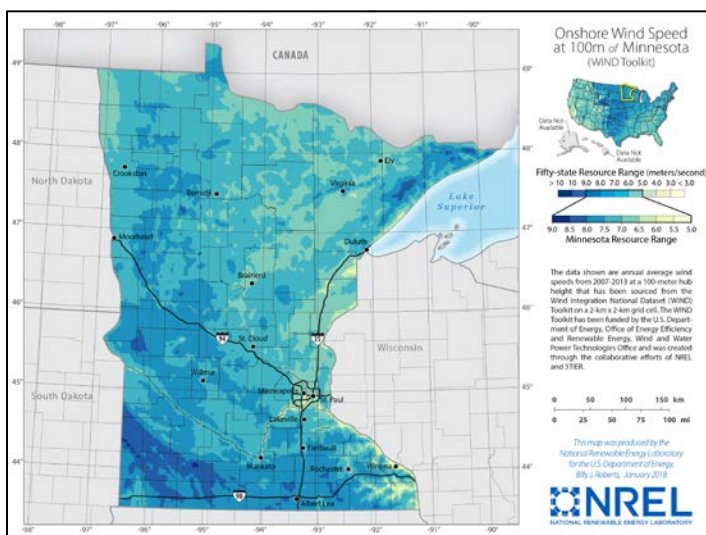
³ A [study](#) by the Congressional Budget Office however suggests that tax credits are important tools for ensuring increased adoption of alternative-fueled vehicles.

- Minnesota Department of Commerce Clean Energy: <https://mn.gov/commerce/consumers/your-home/energy-info/>
- Clean Energy Economy Minnesota: <http://www.cleanenergyeconomymn.org/>
- U.S Energy Information Administration, Minnesota: <https://www.eia.gov/state/?sid=MN>
- American Wind Energy Association (AWEA): <https://www.awea.org/resources/fact-sheets/state-facts-sheets>
- The Database of State Incentives for Renewables and Efficiency, Minnesota <http://programs.dsireusa.org/system/program?fromSir=0&state=MN>
- The American Council for an Energy-Efficient Economy, Minnesota: <https://database.aceee.org/state/minnesota>
- National Renewable Energy Laboratory Biomass Maps: <https://www.nrel.gov/gis/biomass.html>
- U.S. Department of Energy's Alternative Fuels Data Center, Minnesota: <https://www.afdc.energy.gov/states/mn>
- SPOT for Clean Energy, Minnesota: <https://spotforcleanenergy.org/state/minnesota/>
- The Rocky Mountain Institute: [From Gas to Grid – Building Charging Infrastructure to Power Electric Vehicle Demand](#)
- The GridWise Alliance: [EVs - Driving Adoption, Capturing Benefits](#)
- The Regulatory Assistance Project: [Performance-Based Regulation](#)

MINNESOTA'S WIND AND SOLAR RESOURCES

WIND <https://windexchange.energy.gov/states/mn>

SOLAR <https://www.nrel.gov/gis/solar.html>



Our Resources

CNEE Homepage: <http://cnee.colostate.edu/>

The SPOT for Clean Energy: <https://spotforcleanenergy.org/>

The Advanced Energy Legislation (AEL) Tracker: <https://www.aeltracker.org/>

Clean Energy Policy Guide for State Legislatures: <http://cnee.colostate.edu/cleanenergypolicyguide/>

The Energy Policy Podcast: <http://energypodcast.colostate.edu/>

CNEE Contact Information:

Tom Plant, Senior Policy Advisor
Tom.Plant@colostate.edu