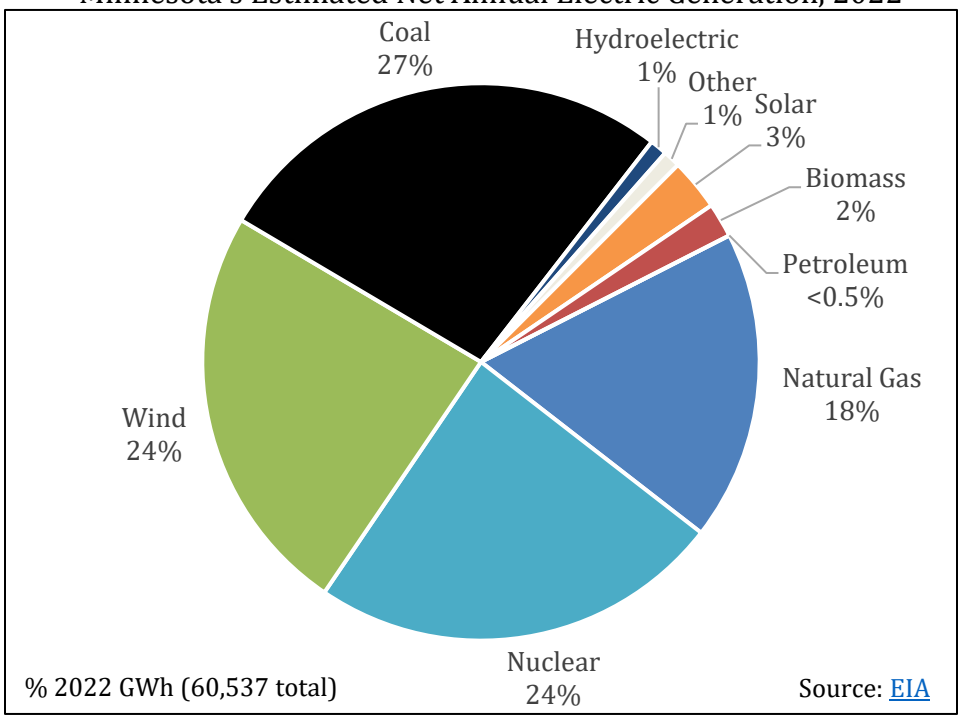
State Brief: Minnesota

BACKGROUND

Minnesota's Estimated Net Annual Electric Generation, 2022



While at one point coal dominated Minnesota's electric generation mix, its contribution has declined in recent years. The state's two nuclear power plants, Prairie Island and Monticello, typically account for approximately a quarter of the state's electricity generation. The North Star State has a large agricultural sector and in 2021, ranked fifth in the nation for ethanol production. The state has the most E85 (an 85% ethanol and 15% gasoline mix) fueling stations in the nation.

Non-hydroelectric renewables are the largest contributor to net electric generation in Minnesota. The state is a national leader in wind energy development. In 2021, the state ranked in the top ten states for wind generation and ranked ninth in the nation for wind capacity. The state's wind farms accounted for 24% of total in-state electricity generation in 2022.

The 2023 legislative session resulted in several significant changes to Minnesota's energy, environment, and climate laws. House File 2310 has been hailed as "transformative" and provides significant funding for clean energy technologies and resources including electric vehicles (EVs), solar, and energy efficiency. House File 7, enacted in February 2023, updated the state's net zero emissions and renewable energy goals.

In 2023, the Solar Energy Industries Association (SEIA) ranked the state 16th in the country in terms of installed solar capacity (1,782 megawatts (MW)). SEIA also ranks the state 32nd for projected growth over the next five years with 1,612 MW in expected installations. Recent solar growth is at least partially due to the success of Minnesota's community solar program, which was adopted in 2013 and which House File 2310 expanded.

The 2023 U.S. Energy and Employment Report found that in 2022, Minnesota had an estimated 125,194 energy workers (4.3% of total state employment), which includes 43,133 workers employed in energy efficiency. In a 2022 report, Minnesota ranked 20th nationally for clean energy jobs, with approximately 57,931 Minnesotans employed by the industry.

The Governor appoints the five members of the bipartisan Minnesota Public Utilities Commission (MPUC), which regulates the state's eight major investor-owned electric and gas utilities as well as certain municipal or cooperative utilities. The MPUC also reviews large energy infrastructure siting requests. The state is under unified control with Democratic majorities in both chambers of the state legislature and Democratic Governor Tim Walz, who took office in January 2019.

POLICY STRENGTHS AND OPPORTUNITIES

The National Renewable Energy Laboratory (NREL) developed the notion of "policy stacking,"[1] 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.

For example, before financial incentives for combined heat and power (CHP) will be successful, there are two key considerations for deployment. First, 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.

INVESTING IN THE WORKFORCE

In 2022, there were nearly 3.1 million net-zero aligned jobs in the U.S., comprising over 40% of total energy jobs. However, a lack of qualified candidates across occupations and education levels could impede states' abilities to modernize their grids and deploy clean energy resources. To ensure that the workforce can meet industry demand, policymakers can consider several policies to educate and train qualified candidates. This can simultaneously enhance industry employment and provide economic opportunity to individuals and local communities.

House File 7 requires that integrated resource plans (IRPs) submitted by utilities to the MPUC include local jobs impacts and that the Commission give preference to any utility proposal, including power purchase agreements and certificates of need for new transmission and generation facilities, that create local job opportunities. The bill also directs the MPUC to prioritize hiring workers from communities that host a retiring generation facility.

The policies states can explore to address workforce development include:

1. **Incentive Programs** – States can attract new workers to the field by providing financial and other incentives to students who pursue education in specified trades or in the science, technology, engineering, and math (STEM) fields. States might require that graduating students remain and work in the state for a given time to remain eligible for the incentive. In conjunction with this, states might also provide economic development incentives to companies employing students with training in specified STEM and trades fields. To ensure safety in the workplace, states can adopt programs that will cover the costs of OSHA training.

   Initiatives to improve access to broadband and public transportation in underserved communities can boost access to educational and employment opportunities.

2. **Education and Continuing Education** – Existing electrician training and mentorship programs can be expanded to encourage more young people to enter the industry. Policymakers can direct public colleges and universities, with input from industry, offices of economic and workforce development, and other interested parties, to create new trades and STEM programs. This could include the development of "green" credentialing programs. States can also provide financial resources to organizations that educate or retrain students in STEM and trades professions.

   For the state's existing energy workforce, policymakers might direct state departments of workforce services or their equivalent to work with utilities and other interested parties to develop continuing education and training

[1] V.A. Krasko and E. Doris. 2012. "Strategic Sequencing for State Distributed PV Policies: A Quantitative Analysis of Policy Impacts and Interactions." *National Renewable Energy Laboratory*. Available: http://www.nrel.gov/docs/fy13osti/56428.pdf.

programs for existing utility employees to remain in their field or to transition to a new role. Incentive programs might also be developed for employers that design roles that include ongoing skills development and continuous learning to help keep pace with evolving roles.

3. **Establishing an Office of Workforce Development** – States might also consider establishing a dedicated workforce development office. In some states, these have been established to specifically address training needs in energy transition communities.

The Interstate Renewable Energy Council (IREC) developed a set of Career Maps to demonstrate the various types of careers offered in the clean energy industry. The Green Buildings Career Map, the Solar Career Map, and the HVAC/R Map are helpful tools for anyone from job seekers and employers to policymakers looking to explore the employment opportunities presented by the industry. IREC also created a Registered Apprentices Toolkit for Clean Energy Employers, which provides information about and resources for implementing Registered Apprenticeship Programs (RAPs) to spur the development of a clean energy workforce.

MODERNIZING UTILITIES AND EMPOWERING CONSUMERS

The electric grid is a complex system of generation, transmission, and distribution. Aging infrastructure emerging technologies are forcing the grid to modernize to keep pace with historic and emerging expectations. Grid modernization encompasses a broad range of actions intended to make the electrical system more resilient, interactive, and capable of meeting current and future demand.

The transition to a digital economy requires affordable, sustainable, and reliable electricity and creates challenges and opportunities for grid management. Emerging physical and cybersecurity threats and increased demand for faster outage response times require, at minimum, real-time incident tracking and response capabilities. Increased grid penetration of distributed energy resources (DERs) such as renewable energy coupled with increasing adoption of energy efficiency, energy storage, microgrids, and other technologies will provide economic benefits, increase security, and ensure more reliable, resilient, and clean energy. Utility-scale renewable energy may require expanded transmission capabilities. As adoption of these innovations increases, so too will the need for modern grid technology to strengthen the grid, the implementation of which will require substantial planning and investment by states and utilities.

By allowing a two-way flow of information between the electric grid and grid operators and between utilities and their customers, new technologies enable utilities to better manage the grid and provide opportunities for consumers to customize their services to fit their priorities and to reduce their electric bills. By enabling better tracking and management of resources, emerging technologies improve system reliability and resiliency. These technologies also allow grid operators to incorporate central and distributed energy resources, energy storage technologies, and electric vehicles (EVs). This all assists in addressing the challenges associated with planning, congestion, asset utilization, and energy and system efficiency.

On the customer's side of the meter, dynamic pricing, advanced metering infrastructure (AMI), and other technologies allow a more dynamic exchange of information and electricity between a consumer and their electric provider. Grid modernization is associated with greater consumer choice by allowing customers to meet their energy priorities by producing and storing their own energy or through contracting for innovative clean energy services from different providers.

Grid modernization will require a suite of policy changes to support advancements in grid technologies, grid management, and utility regulation.

In 2009, the MPUC issued an order requiring utilities to submit annual reports on past, current, and planned grid modernization projects. The plans are required to include information on total costs, cost effectiveness, reliability, and security. The commission also defined a smart grid in the same order as something that "allows deployment and integration of distributed and renewable resources, 'smart' consumer devices, automated systems, and electricity storage and peak shaving technologies." The MPUC closed the grid modernization docket in 2014, refocusing its efforts on supporting an "integrated, dynamic grid."

Following several community 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. In 2018, the MPUC ordered Xcel Energy to develop an Integrated Distribution Plan (IDP) for 2020-2029 in conjunction with any Grid Modernization Report required by law. The plan was released November 1, 2019. The plan includes projects to increase advanced metering infrastructure, expand technology to reduce energy loss, and automate grid management technologies. The MPUC accepted the Xcel IDP in June 2022 and also approved Xcel's request to develop three microgrid projects to be called the Resilient Minneapolis Project (RMP). Xcel had committed $9 million to the RMP, but revoked the funding in June 2023, placing the project on hold.

The Minnesota Department of Commerce's 2020 Energy and Policy Conservation Quadrennial Report and the state's 2025 Energy Action Plan both address grid modernization. The e21 Initiative is an ongoing collaborative public engagement effort working to develop and implement policies to modernize the state's grid. Recently, Minnesota investigated performance-based regulation, which led to the creation of a 7-step process for identifying the need for performance incentives. In 2020, the MPUC ordered Xcel Energy to pursue three key steps towards developing performance metrics.

The Infrastructure Investment and Jobs Act of 2021 (IIJA) is a landmark federal spending bill that includes funding earmarked for grid modernization projects. This includes $11 billion for Department of Energy (DOE) grants directed specifically towards electric infrastructure resiliency projects (including grid hardening against severe weather and cybersecurity improvements), $2.5 billion for transmission development, and $3 billion for the Smart Grid Investment Matching Grant Program.[2] Enacted August 2022, the Inflation Reduction Act (IRA) set aside $2 billion for loans for constructing new high-capacity transmission lines and upgrading interties. The bill includes funding for technical assistance and grants for states and tribal governments, which includes assistance for siting transmission projects. The bill also directs DOE to undertake interregional transmission planning, modeling, and analysis, including analysis of transmission for offshore wind and the use of grid-enhancing technologies (GETs).[3]

There are policies that Minnesota's policymakers could adopt to support in-state grid modernization efforts:

1. States might decide to require that utilities develop and propose a ten-year grid modernization plan to the PUC 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. States might also provide incentives or cost recovery mechanisms for utilities that meet grid modernization goals. Currently, Xcel Energy is the only utility required to submit a grid modernization plan.

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.

3. State policy should include measures to protect data regarding customer behavior but can also encourage the use of this information to facilitate additional improvements in grid management and customer service. To address this, policymakers can develop legislation or direct commissions to promulgate rules that clarify that the customer owns the energy data associated with their 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. States could establish customer access to energy data through the Green Button Connect program, for example.

The adoption of incentives for or a requirement to integrate a certain amount of renewable energy and energy storage on the grid alongside enhanced building energy standards and electric vehicle policies can also support grid modernization efforts.

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[2] For more information on the grid-related earmarks included in the IIJA, see Potomac Law Group's January 2022 analysis: "The Infrastructure, Investment & Jobs Act of 2021: What's in It for You? (Part V: Grid Infrastructure and Resiliency)." Available: https://www.potomaclaw.com/news-Infrastructure-Investment-Jobs-Act-of-2021-Whats-In-It-For-You-Part-V-Grid-Infrastructure-and-Resiliency.

[3] J. Runyon and J. Engel. 2022. "The Inflation Reduction Act is Signed into Law." *PowerGrid International*. 16 August. Available: https://www.power-grid.com/td/the-inflation-reduction-act-is-signed-into-law/#gref.

MAINSTREAMING RENEWABLES

Renewable energy is increasingly seen as the least cost and lowest risk form of energy (excluding energy efficiency). 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 integrating distributed renewable energy resources. In the U.S., the expansion of renewable energy has been one of the most consequential shifts in electricity generation over the last decade. According to the EIA, renewable energy generation surpassed coal and nuclear generation in 2022, and more than half of all new generation capacity in 2023 is expected to be solar. As of 2022, there were more than 470,000 jobs in the wind and solar industry. Accordingly, it is in the interest of policymakers to ensure that their states are well positioned to benefit from this shift.

While the IIJA doesn't provide money for specific renewable energy projects, the funding in the Act will benefit renewable energy development as grid resiliency, increased deployment of energy storage, and modernized transmission are all essential to the successful integration of renewable energy generation. The IRA appropriated $369 billion to fund a variety of energy and climate initiatives – the largest climate investment in U.S. history. The bill also extended the investment tax credit (ITC) and the production tax credit (PTC) through the end of 2024 and revived the PTC for solar projects. For projects placed in service in 2025, the bill "effectively extended" the ITC and PTC by creating new tax credits for zero emission facilities. The bill also extended the residential energy property tax credit through 2034 and created a new advanced manufacturing production credit, to apply to sales of components for constructing wind and solar energy facilities beginning in 2023.[4]

The IRA also includes several provisions related to energy equity, including $3 billion to the Environmental Protection Agency (EPA) for grants for community-led projects in disadvantaged communities and $27 billion for nonprofit, state, and local climate finance institutions supporting the deployment of low- and zero-emission technologies. In support of rural communities, the bill also includes a $1 billion appropriation to the U.S. Department of Agriculture (USDA) for loans to finance renewable energy projects, $1 billion for USDA's Rural Energy for America Programs, and $9.7 billion to USDA to finance rural electric cooperatives' purchases of renewable energy.

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

Customer-Oriented Policies

1. **Interconnection, Net Energy Metering (NEM), and Streamlined Permitting** – In general, customers want a clear, streamlined, affordable, and predictable system for connecting renewable energy systems to the grid. Minnesota's PUC updated its interconnection standards in 2019. The standards are modeled on the FERC Small Generator Interconnection process with a three-tiered process, which is meant to simplify the process of interconnection. These processes apply to systems up to 10 MW in capacity. All utilities in Minnesota offer net metering. The state's policy sets a system capacity limit of one MW and does not currently set an aggregate capacity limit. NEM rates and compensation procedures in Minnesota are determined by a variety of factors, largely dependent on system size, customer choice, and utility type. Typically, net excess generation for systems less than 40 kilowatts (kW) is compensated at the average retail utility energy rate. Customers with 40 kW and larger systems are credited at the avoided cost rate. The state allows aggregated net metering.

   Minnesota is the 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. To date, no utilities have submitted a VOST to the MPUC for approval, with the exception that state law requires that Xcel Energy's Minnesota Community Solar Gardens program use the rate.

[4] For a detailed discussion of the IRA's tax provisions, see: A.S. Levin-Nussbaum. 2022. "Update: President Biden Signs Historic Legislation Providing Expansive Clean Energy Tax Incentives." *The National Law Review*. 17 August. Available: https://www.natlawreview.com/article/update-president-biden-signs-historic-legislation-providing-expansive-clean-energy.

The state might consider establishing either statewide standards for streamlined permitting processes, or resources to support local governments that voluntarily implement a streamlined program. In May 2021, NREL launched the SolarAPP+, an online platform designed to automate the solar permitting process. By running compliance checks and processing permit approvals, the service is intended to drastically reduce permit wait times. Currently restricted to rooftop solar, thirty-two communities in five states have adopted the platform, processing over 15,000 permits for more than 100 MW of generation with an estimated 15,000 hours saved in permit review time.

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 requires that utilities file Community-Based Energy Development (C-BED) Tariffs and that utilities at least consider entering into power purchase agreements (PPAs) with C-BED projects. Minnesota was one of the first states to allow community solar, establishing a program for Xcel Energy in 2013. The utility's program has become one of the most robust community solar programs in the country. Since its launch in 2014, the program has grown considerably with over 826 MW in operation as of 2023. Enacted in May 2023, House File 2310 expanded the community solar program by increasing the project capacity limit from one MW to five MW. The bill also created carve-outs, requiring that 30% of a project's capacity be allotted to low- and moderate-income (LMI) customers, and beginning in 2024, that a total of 55% of the project's capacity be allotted to LMI households, public interest subscribers (which include Tribal or local government entities, schools, and non-profits), and affordable housing providers. Lastly, the bill set annual growth caps on the program. To expand program participation, the state might consider expanding its policy to additional utilities.

   Low credit ratings often deter participation in renewable energy markets; this can affect LMI households' adoption of renewable energy solutions. As discussed, Minnesota has adopted an LMI carve-out for its shared renewables policy. States that have a shared renewables program may want to coordinate this program with implementation of the federal Weatherization Assistance Program (WAP) to provide recipients of assistance with access to participation in a shared system.

3. **Adapt Energy Assistance Programs** – Programs such as the Low-Income Home Energy Assistance Program (LIHEAP) and WAP provide assistance for paying utility bills and reducing household energy costs. Including distributed energy resources as eligible for funding under these programs can reduce energy costs and increase energy security for those LMI families who are able to benefit from WAP and LIHEAP. Colorado, for example, includes rooftop solar in their WAP program. For approval to add solar to a state's implementation of WAP, a state must show that the investment would be cost-effective – achieving a Savings to Investment Ratio (SIR) of 1.0 or more.[5] Since 2015, Minnesota has received $85.2 million from WAP and $8.7 million from the State Energy Program (SEP) which has helped to fund a number of initiatives in the state.

4. **Fund Distributed Generation (DG) for Community Organizations** – Organizations or groups that provide support services for LMI communities can be provided funding to install solar or other distributed energy resources. Sites such as homeless shelters, food banks, clinics, and community centers often have enough rooftop area for solar installations. After installation, these resources can reduce an organization's utility bills, freeing up funds for other activities that support the community.

5. **On-Bill Financing/Pay As You Save (PAYS)** – On-bill Financing and Repayment programs enable consumers to invest in energy upgrades with no upfront payment. The utility or a third party will pay the initial costs to install the upgrade with the cost of that upgrade recovered through the utility bill. Because repayment includes consideration of the cost savings resulting from the energy upgrade, customers can see monetary benefits almost immediately. Once equipment costs are recovered, the equipment belongs to the customer. State policies that reduce lending risk by creating a loan loss reserve and/or a credit enhancement fund can encourage lending to

[5] For guidance on the state approval process, see WAP Memorandum 024 (2017), the Solar Template for Incorporating Solar Photovoltaics into WAP, and the Preliminary Assessment Guide for Integrating Renewable Energy into Weatherization (2019).

customers that might otherwise not qualify for a loan and can keep interest rates low. A handful of cooperative utilities in Minnesota offer on-bill financing.

In 2020, the city of Minneapolis requested MPUC approval for a $50 million PAYS pilot program with CenterPoint Energy. In 2020, the Minnesota Citizens Utility Board published suggestions concerning the pilot program, its viability in Minneapolis, and the program's potential impact on LMI customers.

6. **Corporate Procurement** – Many Fortune 100 and 500 companies have established either climate goals or commitments to purchase renewable energy. Since 2014, over 70 gigawatts (GW) of renewable energy has been procured by corporate entities. In the first half of 2022, corporations entered contracts for 21 GW. This is leading policymakers to provide additional avenues for businesses to procure renewable energy. In 2019, Walmart, with a goal to meet a 100% renewable energy target, 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 RECs or renewable energy through green tariffs, own shares in C-BEDs, and develop or lease onsite renewable energy projects. Policymakers might also consider incorporating corporate renewable procurement targets into the state's IRP process. By integrating these renewable purchase commitments into the IRP process, utilities 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. The state's renewable energy standard (RES), originally established in 2007, set 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 included a statewide target of 10% solar capacity by 2030. Enacted in February 2023, House File 7 set a 100% carbon-free by 2040 target for all utilities in the state. Utilities are also setting their own GHG reduction goals and are increasingly investing in clean energy resources. Great River Energy, the energy provider for more than two dozen distribution cooperatives in Minnesota, plans to get half of its electric generation from renewables by 2030. The utility expects that it will be able to meet the 90% carbon-free by 2035 target set by House File 7. Minnesota Power was the first utility in Minnesota to deliver 50% renewable energy and expects to provide more than 70% renewable energy by 2030. Rochester Public Utilities announced a 100% renewable energy by 2030 target. Xcel Energy has set a net-zero by 2050 goal.

To increase utility adoption of clean energy technologies, Minnesota's policymakers might consider the following:

1. **Transmission Development Policies** – Renewable energy resources rely heavily on robust transmission networks that connect generation to demand. For states within regional transmission organizations (RTOs), state governments can fund utility commission and energy office engagement in RTO processes, and generally support transmission build-out through these channels. In non-RTO states or single-state RTOs like New York and California, one successful model has been the creation of a state transmission authority, which handles state transmission planning in cooperation with incumbent utilities. New Mexico's Renewable Energy Transmission Authority provides an instructive example – it informs transmission investments to push forward key transmission projects that achieve the state's clean energy goals cost-effectively.

   Utilities owning or operating electric transmission lines in Minnesota are required to file biennial Transmission Projects Reports. Reports are filed jointly by the utilities (the Minnesota Transmission Owners (MTO)) and are required to identify anticipated inadequacies in the transmission system and solutions to address these. Statute requires that reports also provide a status update on utilities' efforts to meet the RES. In a 2020 order, the MPUC directed the MTO to "provide a full discussion and analysis of next steps for identifying gaps between the existing and currently planned transmission system and the transmission system that will be required to meet the companies' publicly stated clean energy goals" and to address transmission solutions needed to meet statutory goals.

2. **Competitive Procurement Requirements** – In most states, consumers have little choice about where their electricity comes from. As utilities find that renewable energy is increasingly the lowest-cost electricity source, they have to decide how much they should buy and when. Unfortunately for customers, utilities may have either a vested interest in continuing to operate fossil plants, or they doubt the efficacy of new renewable resources. States can overcome reluctance to renewable energy by requiring utility procurement decisions to undergo a competitive process, revealing the lowest cost alternatives to the utility's existing contracts and fleet of power plants. A best practice is "all-source procurement," a process that allows all resources to compete to fill a system need identified by the utility.

   States can start by requiring PUCs to begin a participative planning process that links planning outcomes to procurement decisions and ensures that state policy objectives are included in system planning. For some states, this might mean setting up a planning process. For others, it might involve revisiting planning and procurement rules and asking whether the current process results in policy-aligned procurement. States might amend existing rules to require utility commission approval of utility plans or require consideration of public comments. Regulators may need explicit direction to consider objectives beyond reliability, affordability, and safety.

   In Minnesota, participants in the planning process are authorized to propose alternative plans, planning and procurement decisions are required to consider the cost of carbon, and procurement is overseen by an independent evaluator.

ENERGY STORAGE

Energy storage offers a unique opportunity to dynamically manage supply and demand while also maximizing the value of grid resources. By deploying storage to strategic locations, utilities can more effectively manage their energy portfolios. First, storage allows utilities to manage intermittent demand – helping reduce peak demand requirements. Because the generation resources that provide peak power are the system's most expensive, reducing peak demand can save consumers money. Second, the responsiveness of energy storage can allow utilities to implement voltage regulation and other ancillary services, which improve system efficiency. Third, because storage technologies can both store and dispatch power, storage enables better integration of intermittent power generation resources, like wind and solar, to the grid.

The flexibility of battery storage combined with advanced metering infrastructure can allow customers to control 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 also lead to a number of economic and environmental gains.

Energy storage can also help the commercial sector avoid demand charges, which establish an incremental cost above energy usage based on the highest period (highest 15 minutes, for example) of demand during the month. Eliminating spikes in demand with storage can reduce these costly charges for businesses. As utilities around the country consider implementing or extending demand charges to other sectors, energy storage will become more relevant as both a customer cost-saving investment and a system efficiency measure.

Declining costs and technological advancements in battery storage have contributed to increased deployment. The EIA expects total battery storage deployment to more than triple from 7.8 GW in 2022 to 30 GW in 2025. State policies can further encourage this by establishing both a framework for easy integration of energy storage resources onto the grid and a marketplace that monetizes the benefits of energy storage for cost-effective investment.

Xcel Energy completed its one MW Wind-to-Battery project in Luverne in 2009; it was the first such project in the U.S. In 2020, Xcel announced a $650 million energy storage pilot program that will run from 2023 – 2025. The PUC recently approved a 10 MW long-duration energy storage system pilot project to be built by Form Energy near the Sherco powerplant, which will be fully retired by 2030.

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 the MPUC, 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 House File 2, the 'Omnibus Jobs and Energy Bill.' The legislation included provisions requiring the Commissioner of Commerce to conduct an energy storage cost-benefit analysis 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' IRPs evaluate energy storage options.

House File 2310 appropriated $7 million to fund grants for solar plus storage projects, $500,000 for a study to identify in-state iron resources that could be used in long-term battery storage technologies, and $250,000 for a study to determine in-state storage capacity needed to meet the state's decarbonization goals.

The IIJA provides a unique opportunity for funding energy storage projects. The IIJA provides $505 million for grants to support energy storage demonstration projects, more than $7 billion for building out the U.S. battery supply chain, and $14 billion for grid resilience programs that include energy storage as a qualified technology. The IRA extended the ITC to include standalone energy storage systems. When the ITC is replaced by the technology neutral Clean Electricity Investment Tax Credit (CEITC) in 2025, qualified storage facilities placed in service after 2024 will remain eligible. The advanced manufacturing production credit will apply to battery cells and modules and the critical minerals used in their production. The $27 billion GHG Reduction Fund, also established by the bill, will provide funding enabling low-income or disadvantaged communities to adopt zero-emission technologies including energy storage.

There are several policy opportunities to take advantage of the growing technological advances in and declining costs of energy storage and build upon recent federal initiatives. The recommendations here draw heavily from IREC's 2017 report, "Charging Ahead – An Energy Storage Guide for Policymakers." Policymakers in Minnesota could consider the following:

1. Instruct the utilities commission to evaluate the value of energy storage in multiple strategic locations across the utility system and consider a requirement to deploy storage where it is cost-effective or identify the price point at which it will be cost-effective. Ensure that cost-effectiveness calculations include all of the benefits storage can deliver to the system, including frequency regulation and avoided investments in new infrastructure.

2. Require the inclusion of energy storage as a critical piece of the energy system as both a demand and supply management resource. Some states have required that utilities evaluate the cost effectiveness of non-wires alternatives to large transmission and generation investments. Alternatively, states might want to require that utilities develop a distribution investment plan that identifies the locations on the distribution system where energy storage or other distributed resources would offer the greatest value.

3. 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.

4. Add energy storage as an eligible technology under existing clean energy policies like renewable portfolio standards or energy efficiency programs. Massachusetts was the first state in the nation to include energy storage in its three-year energy efficiency plan in 2019.

5. Finance and incentivize energy storage for customers and utilities. Incentives can 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 of 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 could also signal to customers the value of leveraging storage and better align customer costs with system costs. Financing energy storage installations for commercial customers could help reduce their demand charges. 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.

6. Clear data access policies that allow third parties to provide energy management services based on signals from the utility can greatly increase the value of efforts to monetize the value stream offered by energy storage. State policy should include measures to protect customer data, while also encouraging the use of this information to facilitate additional improvements to grid management and customer services. To address this, policymakers can develop legislation or rules that clarify who owns the energy data associated with customer 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.

7. Consider taking advantage of the "direct pay" option available to state and local governments for energy storage investment tax credits (ITC) available in the IRA. The direct pay option allows states (or other qualified entities without tax obligations) to be directly refunded a 30% ITC from the federal government after the project is online. The IRA also allows for up to a 70% credit for projects that incorporate domestic components, serve low-moderate income projects, and/or are located in energy communities.

THE BUILT ENVIRONMENT

In the U.S., buildings consume nearly 40% of total energy used.[6] Because it reduces energy demand and emissions and creates savings for utility customers, energy efficiency[7] often plays a prominent role in state energy and climate policies. Coupled with beneficial electrification, which involves replacing direct fossil fuel use with electricity, there is even greater potential to reduce energy costs and pollution, and provide more resilient, comfortable, and healthy buildings. This is especially the case in states where increasing levels of low carbon resources are supplying the electric grid. When policies are adopted to shift energy sources for such things as space and water heating, to highly efficient electric alternatives, states can maximize achieving the dual objectives of increased energy efficiency and reduced emissions. In some cases, this can also result in lower energy costs.

The American Council for an Energy Efficient Economy (ACEEE) publishes a State Energy Efficiency Scorecard that evaluates states' energy efficiency programs and policies in six policy areas, focusing on equity and policies that assist low-income and disadvantaged households. Minnesota ranked tenth in the 2022 report. In addition to its Energy Efficiency Scorecard, ACEEE tracks how states are incorporating equity into their energy efficiency and clean energy programs and policies.

Minnesota has taken several steps to incorporate energy efficiency and beneficial electrification into its built environment. The 2020 Minnesota State Building Code is the minimum construction standard throughout the state, though it is not enforceable by municipalities unless adopted by local ordinance. Chapter 13 of the Code sets minimum energy efficiency standards. For residential buildings, the state has adopted the 2012 International Energy Conservation Code (IECC). The 2018 IECC governs commercial construction. In 2022, several Minnesota cities lobbied to adopt updated building energy codes sooner than the state for large and commercial buildings.

Senate File 3035, enacted in May 2023, updated Minnesota's commercial building code and requires at least an 80% reduction in annual net energy consumption by 2036. The law also requires the Minnesota Department of Labor to adopt the most recent commercial building energy codes starting in 2024. House File 2310 established a residential heat pump rebate program, which will provide eligible applicants up to $4,000 for a cold-climate air source heat pump. The legislation also authorizes the development of contractor training programs related to the installation and operations of heat pumps.

The Minnesota Department of Administration and the state at large has adopted Buildings, Benchmarks & Beyond (B3) for its sustainable building guidelines. These guidelines are similar to other sustainable building standards, including Leadership in Energy and Environmental Design (LEED), and are required for all state-funded projects. In 2011, Minnesota established the Guaranteed Energy Savings Program (GESP), within the Department of Commerce, which provides technical, contractual, and financial assistance for energy efficiency and renewable energy improvements through energy savings performance contracts (ESPCs). Executive Order 19-25, issued in April 2019,

[6] For additional information, see ACEEE Building Policies and Codes.

[7] Energy efficiency includes a multitude of measures to reduce energy consumption. These measures range from behavioral changes to installing energy efficient appliances to full building renovations, including updating a building's envelope.

requires state agencies with state-owned buildings to adopt cost-effective energy efficiency and renewable energy strategies to reduce energy use and greenhouse gas emissions.

Minnesota first allowed revenue decoupling as a pilot program in 2007. The MPUC has since approved revenue decoupling for three gas utilities: CenterPoint Energy, Minnesota Energy Resources Corporation, and Great Plains Natural Gas; and one electric utility, Xcel Energy. The state has a shared benefits incentive program for both gas and electric utilities. Utilities earn benefits as they increase energy savings. Incentives are generally capped at 30% of a utility's conservation improvement program (CIP) expenditures, though utilities may exceed the cap up to 35% if they meet or exceed certain energy savings targets.

The IIJA provides $500 million for grants to fund energy efficiency and renewable energy upgrades in public schools, $3.5 billion for the Weatherization Assistance Program, and increases funding for the Energy Efficiency and Conservation Block Grant program by $550 million and the State Energy Program by $500 million. The IRA appropriates $4.3 billion to DOE for an energy efficiency rebate program that will be administered through state energy offices. Another $4.3 billion appropriation will fund electrification rebates for single- and multi-family homes. The bill also extends the tax credits for residential energy efficiency improvements and new efficient home construction and increases the maximum deduction for energy efficient commercial buildings. A $837.5 million appropriation will be used by the Department of Housing and Urban Development (HUD) for resiliency, energy efficiency, renewable energy, and grid integration projects at public housing units.

Policymakers in Minnesota can consider a variety of policies to encourage energy efficiency and beneficial electrification:

Energy Efficiency Policies

1. **Building Codes** – The DOE projects that, over time, improvements in building codes can have the greatest single impact on energy efficiency within the built environment. On average, commercial buildings waste 30% of energy used.[8] Because buildings will be around for generations, energy efficiency within the built environment is a matter of statewide and long-term importance. States can set requirements for energy systems, require statements of energy use, and set performance standards for energy use or emissions. Building codes can be required by state legislation or implemented through 'home rule', where local governments set their own standards or adopt more strict building codes than those mandated by the state.

   The IIJA includes a $225 million appropriation for a competitive grant program to support the "sustained cost-effective implementation of updated building energy codes." The grant program will run for five years, through fiscal years 2022 – 2026. In December 2022, DOE issued the Resilient and Efficient Codes Implementation Funding Opportunity Announcement to support the adoption of updated building energy codes. Approximately $45 million is available for this competitive grant program. The program requires the participation of a "relevant state agency" and projects must be tied to "an updated building energy code."

2. **Appliance Efficiency Standards** – Appliance efficiency standards set minimum requirements for efficiency in everything from washing machines to water heaters. Efficiency standards save consumers money on utility bills and reduce energy demand on the grid, most importantly reducing peak energy demand. Some states have elected to adopt the federal appliance standards that were in effect on January 1, 2017.[9] These include, among other things, standards on metal halide lamp fixtures, residential furnaces and boilers, and external AC to DC power supplies. Minnesota has not adopted appliance efficiency standards beyond federal standards.

3. **Low-Income Energy Efficiency Programs** – While equity should be incorporated into all policy development, it is often necessary to ensure that specific programs are targeted towards historically underserved populations. Recent research suggests that weatherization improvements can reduce energy use by 25-35%, allowing households to reduce their financial energy burden. The federal WAP program provides energy efficiency upgrades for income qualified homeowners. However, there might be difficulty in reaching individuals who are eligible. Policymakers might require outreach and education programs targeted at eligible groups.

[8] For more information, see the Office of Energy Efficiency & Renewable Energy's Commercial Buildings Integration (CBI) Program.

[9] Based upon research conducted by the Center for the New Energy Economy.

Minnesota offers both a WAP and an Energy Assistance Program (EAP) for low-income residents that include energy bill and weatherization assistance.

4. **Energy Efficiency Resource Standards (EERS)** – EERSs require utilities to demonstrate a reduction in energy demand from programs offered to their consumers. Because this means selling less energy and reducing revenues, there is not always an incentive for the utility to make their consumers more productive or efficient users of energy. If legislatures want to ensure a more productive and efficient energy distribution system that takes advantage of the latest technological innovations, they may want to require that a utility demonstrate a percent reduction in demand through efficiency or "demand side" programs. Legislators can also instruct their utility commissions to consider energy efficiency when approving rate cases by allowing cost-recovery of energy efficiency improvements through utility bills.

   Originally adopted in 2007, Minnesota's EERS, applying to both electric and natural gas utilities, "remains one of the most productive energy efficiency policies in the nation." Enacted in 2021, House File 164 strengthened and expanded the state's EERS by increasing targets (the statewide savings target was increased to 2.5%) and adding additional eligible activities and measures for meeting utility targets.

Electrification Policies

1. **Strategically Target Beneficial Electrification** – Target areas of beneficial electrification in buildings include space and water heating systems and other systems and appliances that typically use natural gas or another fossil fuel as an energy source. According to the Environment and Energy Study Institute, new electric heat pump technology can heat space and water at efficiencies of 200 to 300 percent, compared to 67 percent efficiency in typical Energy Star gas water heaters.[10] This not only allows savings on energy bills, but it also results in reduced GHG emissions and improved indoor air quality.

2. **Adopt Tools for Advancing Electrification** – Building codes and financial incentive programs can be used to advance beneficial electrification. While in some states, local governments are primarily responsible for adopting and implementing building energy codes, in other states, a state legislature, or a code commission tasked by the legislature, adopts and implements statewide standards. Incentive programs established and implemented by states, local governments, or utilities can target replacing systems and appliances that traditionally rely on fossil fuel resources with high efficiency electric systems and appliances including water heaters, furnaces, ovens, and ranges. As an example, heat pump water heaters and space heating systems can serve as high efficiency replacements for traditionally fossil-based equipment. In conjunction with utility regulatory policy, these technologies can also serve as demand response tools. House File 2310 appropriated millions in funding for electric heat pumps and infrastructure improvements to support electrification.

   As a note, cities across the country are implementing new building codes promoting beneficial electrification by limiting or banning the installation of natural gas in new construction. State legislatures can pass enabling legislation, allowing municipalities to make independent decisions on beneficial electrification. On the other hand, some states have adopted pre-emptive legislation, banning local governments from adopting policies that limit utility service.[11]

Programmatically, there will always be greatest benefit by combining measures – incentives that bundle improvements will generate greater gains than individual measures. For example, a high efficiency heat pump will be much more effective and efficient when coupled with improved building insulation. Rather than only realizing the gains of the new mechanical component, this combination of measures will increase the efficiency of the entire system.

[10] For more information, see EESI's Beneficial Electrification.
[11] See: "States that Outlaw Gas Bans Account for 31% of US Residential/Commercial Gas Use." S&P Global, 9 June 2022. Available: https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/states-that-outlaw-gas-bans-account-for-31-of-us-residential-commercial-gas-use-70749584

ELECTRIFICATION OF THE TRANSPORTATION SECTOR

Bloomberg New Energy Finance estimates that nearly 80% of new car sales in the U.S. will be electric by 2040. Therefore, a key part of building a modernized grid involves designing infrastructure that will facilitate easy connection of electric vehicles (EVs) to the grid. One of the most important barriers to increased adoption of EVs is the consumer's awareness of the availability of EV charging stations. Ultimately, drivers want to be sure that their car will get them where they need to go. The good news is that both supportive policies for developing charging infrastructure and technological advancements have eased this "range anxiety."

ACEEE publishes a State Transportation Electrification Scorecard that evaluates states' progress in electrifying transportation in six key policy areas and offers nationally applicable policy recommendations. In 2023, Minnesota ranked 17th out of the 33 states evaluated.

Minnesota offers a handful of incentives to support EVs and EV infrastructure. House File 2310 includes an EV rebate of $600 for used EVs and $2,500 for new EVs. While the legislation did not set an income cap, rebates are limited to vehicles with certain sale prices. State policy requires that utilities offer EV charging tariffs. The state offers a grant for school bus electrification. Some utilities in the state also offer incentives to customers. In 2021, Minnesota adopted California's clean car standards for new light- and medium-duty vehicles, beginning with model year 2025. In 2023, the Minnesota Court of Appeals ruled that the adoption of California's clean car rules is constitutional and will go into effect in 2024 for all 2025 light- and medium-duty models.

The IIJA provides nearly $5 billion over the next five years to support the electrification of the transportation sector. In 2022, $615 million was made available for the installation of charging stations along designated alternative fuel corridors, through a new National Electric Vehicle Infrastructure (NEVI) formula grant program. To be eligible to receive this funding, states must have submitted a NEVI plan to the Federal Highway Administration (FHWA) by August 2022. All 50 states plus D.C. and Puerto Rico submitted a NEVI plan. Minnesota will receive an estimated $14,518,786 in Fiscal Year 2023.

The Act also provides approximately $1.1 billion for grants to state and local governments to assist with the purchase or lease of low- or no-emission vehicles for transportation fleets. To be eligible, a state must have a Zero-Emission Fleet Transition Plan in place.

The IRA extended the $7,500 EV tax credit for purchases of new plug-in EVs through 2032 and removed the eligibility cap based on number of vehicles sold by manufacturers. The Act includes requirements for material sourcing that must be met by manufacturers starting in 2027. The IRA also created a new $4,000 refundable tax credit for the purchase of used EVs and a new credit for commercial EVs. Appropriations in the Act include $1 billion for replacing medium- and heavy-duty vehicles with EVs, $3 billion to fund projects to reduce transportation sector emissions, and $3 billion to procure alternatively fueled vehicles for the federal fleet.

There are several policy opportunities to further encourage and prepare for increased market penetration of EVs in the state, including:

1. **Utility Investment in "Make-Ready" Infrastructure and Utility-Run Programs** – "Make-ready" means building and upgrading the infrastructure necessary for the installation of a charging station. RMI recommends that policies providing incentives for utilities to invest in make-ready infrastructure or charging infrastructure itself should be performance-based and encourage investments in locations that are unlikely to be targeted by the private sector, such as low-income and multi-unit dwellings. In some states, enabling legislation might be required to direct or authorize a public utilities commission to allow regulated utilities to recover the costs of providing this infrastructure.

2. **Parking Infrastructure Requirements** – In tandem with Minnesota's NEVI plan, legislation could set requirements for parking lots and other 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. Several cities in Minnesota are encouraging EV charging infrastructure build-out through their building and development policies. St. Paul requires that any new building or rehabilitation project receiving more than $200,000 in public assistance be "EV ready." Minneapolis adopted EV charging infrastructure requirements in

October 2022. Minnesota's Building Energy Code could also be updated to include requirements for EV charging infrastructure. Senate File 3035 directed the Minnesota Department of Labor to add requirements for EV ready parking spaces and EV charging capability to the code for new commercial and multifamily buildings.

3. **Rental Properties and HOAs** – Legislation can also make it easier for lessees, renters, and members of a homeowners' association (HOA) to install charging equipment. Typically, lessors are directed to allow lessees, at their own cost, to install charging systems. In some cases, lessees are required to maintain additional insurance for the system. Legislation related to HOAs typically directs these organizations to avoid restrictions that would inhibit the installation of charging equipment.

4. **EV and Charging Equipment 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 the high up-front costs of EVs and EV charging equipment. 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.[12] States have adopted other financial incentives including low-interest loans. A handful of states qualify EV charging equipment 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.

   States might consider adopting programs to incentivize the purchase of used EVs. With increasing battery capacities and falling prices, there are an increasing number of EVs with relatively low mileage that are being traded in. States might also consider programs that target LMI customers that may not qualify for a loan directly. Such a program could facilitate sales through such things as loan loss reserve and interest buy down programs.

5. **HOV and HOT Incentives** – Allowing EVs to use high-occupancy vehicle (HOV) or high-occupancy toll (HOT) lanes, regardless of number of passengers and without paying the toll, may make EV ownership more attractive. Most states require that EVs using these lanes display a decal or a particular license plate; others also limit eligibility to certain types of vehicles or to a certain number of vehicles. Minnesota is offering a one-time $125-$250 credit for EV owners to use toll lanes.

6. **Fleet Mandates** – Some states require state agencies to acquire a fixed or growing percentage of electric, hybrid, and/or alternative fuel vehicles. For instance, Massachusetts required that its state fleet be no less than 50% hybrid or alternative fuel vehicles by 2018 and set the following state fleet targets for zero emission vehicles (ZEVs): 5% by 2025; 20% by 2030; 75% by 2040; and 100% by 2050. A City of Seattle study found that the city could save millions by switching to EVs. Minnesota currently requires state agencies to submit annual sustainability plans that include plans to purchase alternative fuel vehicles wherever total lifecycle costs are less than traditional vehicles.

7. **Federal Congestion Mitigation and Air Quality (CMAQ) Funds** – CMAQ funds (almost $2.6 billion in fiscal year 2023) are available to states to assist them in meeting Clean Air Act requirements. State funds can be used to deploy EV charging infrastructure. There may be a unique opportunity to pair a request for CMAQ funds with a commitment from utilities to invest in charging infrastructure as a public/private partnership that would leverage the federal investment.

NEWS

- August 12, 2023: Minn. PUC Issues Decision Involving Minnesota Power, Otter Tail Power, Elk Creek Solar
- August 11, 2023: In Northern Minnesota, Early Adopters Make the Case for Cold-Climate Heat Pumps
- August 11, 2023: Making Sure Minnesota Gets Its Share of Green Energy Money
- July 31, 2023: Northland Transmission Line to Boost Reliability as Renewables Replace Power Plants
- June 29, 2023: CenterPoint Energy Proposes Innovations to Advance a Cleaner Energy Future in Minnesota
- May 31, 2023: Minnesota Emerges as the Midwest's Leader in the Clean Energy Transition
- May 26, 2023: With $200M for Electric Vehicles, Minnesota Aims to Boost Ownership, Charging Infrastructure

[12] A study by the Congressional Research Service suggests that tax credits are important tools for ensuring increased adoption of alternative-fueled vehicles.

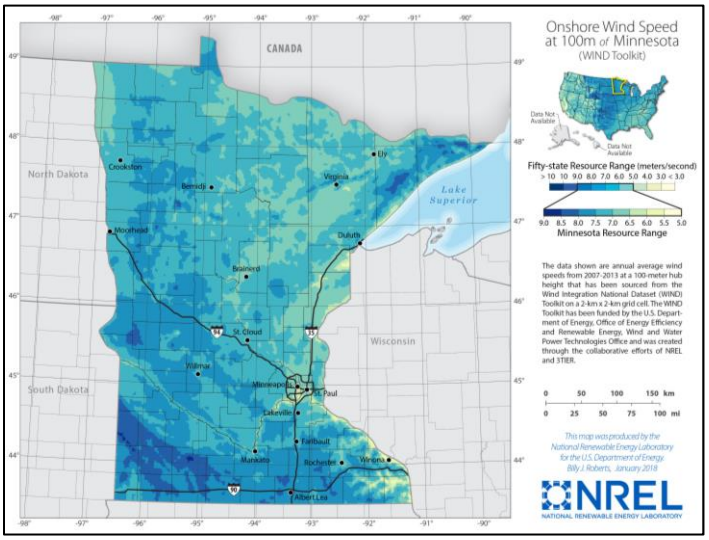
- May 24, 2023: 'New Era' Begins for Minnesota Solar and Storage Market as US$80 Million Incentives Package Passed
- May 19, 2023: St. Paul Battery Startup Sees Promise in Helping Businesses Manage Power
- May 11, 2023: ALLETE to Build Three Large Transmission Projects as it Claims Top Investor Spot for Renewable Energy

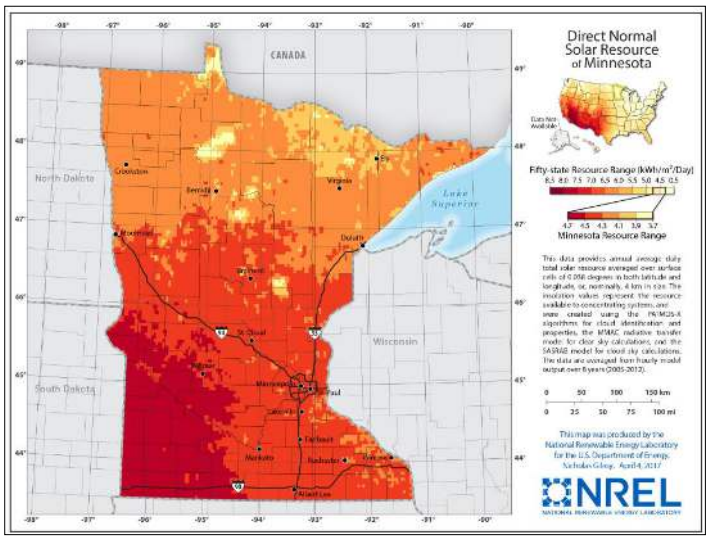
OTHER RESOURCES

- Minnesota Department of Commerce - Energy and Utilities: https://mn.gov/commerce/energy/
- Clean Energy Economy Minnesota: http://www.cleanenergyeconomymn.org/
- The American Council for an Energy-Efficient Economy, Minnesota: https://database.aceee.org/state/minnesota
- The Database of State Incentives for Renewables and Efficiency, Minnesota: https://programs.dsireusa.org/system/program/mn
- U.S. Department of Energy's Alternative Fuels Data Center, Minnesota: https://afdc.energy.gov/states/mn
- U.S. Energy Information Administration, Minnesota: https://www.eia.gov/state/analysis.php?sid=MN
- American Clean Power Association, State Fact Sheets: https://cleanpower.org/facts/state-fact-sheets/
- SPOT for Clean Energy, Minnesota: https://spotforcleanenergy.org/state/minnesota/

MINNESOTA'S WIND AND SOLAR RESOURCES

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





Our Resources

CNEE Homepage: https://cnee.colostate.edu/

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

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

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