Zero-carbon sources generated 54% of Minnesota’s power last year, providing the **MAJORITY OF MINNESOTA’S ELECTRICITY** for the fourth-consecutive year.

Minnesota continues to **OUTPACE THE NATION** in power sector emission reductions - now nearly 54% below 2005 levels vs. a 42% reduction nationwide.

Minnesota’s power sector **REDUCED ITS CO₂ EMISSIONS** by 10% in 2023 to the lowest point in the 19 years the statistic has been recorded.

**RENEWABLE ENERGY** provides about **ONE THIRD** of Minnesota’s electricity generation in 2023.

Minnesotans are **CONSISTENTLY CHOOSING ELECTRIC VEHICLES**. In 2023, electric vehicle registrations **JUMPED OVER 50%** from 2022.

All **COAL-FIRED POWER PLANTS** located in Minnesota plan to be **RETIRED** by 2035, with 1.9GW having already retired over the last decade.

The state has seen a **33% BOOST** in **ENERGY PRODUCTIVITY** since 2001.

The Minnesota State Legislature had a **HISTORIC YEAR** in 2023, passing a suite of clean energy policies, tax incentives and rebates, including the 100% Clean Energy by 2040 law – one of the nation’s strongest carbon-free laws.

**HYDROGEN** puts Minnesota on the map. Spurred by IRA incentives, electrolyzer shipments **ROSE DRAMATICALLY** in 2023. **ALMOST 6%** of the nation’s total electrolyzers came from Cummins.

Minnesota is seeing **INCREASED SAVINGS** from its **ENERGY EFFICIENCY** policy ECO (Energy Conservation and Optimization). Combining 2020 and 2021, Minnesota businesses and residents **SAVED** more than $287 million in energy costs from **ECO**.
Minnesota made historic strides in the transition to clean energy in 2023. From the passage of the 100% Clean Energy by 2040 law to a suite of climate and clean energy legislation that contained an extensive list of incentives, investments and rebates, 2023 was an extraordinary year that showcased progress and commitment across policies and markets.

Early in the year and the legislative session, Minnesota joined ten other states, as well as Washington, D.C. and Puerto Rico, to enact a law that requires a transition to 100% carbon-free or renewable electricity. The landmark bill signed into law by Governor Walz on February 7, 2023, required all electric utilities to generate or procure only carbon-free energy by 2040 from sources like wind, solar, hydroelectric and nuclear. The bill also included a 55% by 2035 renewable energy standard. The Minnesota Legislature enacted additional legislation in four key areas as part of a broader Environment and Energy Omnibus Bill, which included:

- **New consumer incentives and rebates** for a variety of carbon reduction technologies, including electric vehicles (EVs), air source heat pumps and electrical panel upgrades that also leverage federal Inflation Reduction Act (IRA) dollars.
- **Funding Minnesota Energy Alley**, a new statewide initiative that provides programming, business support and seed funding for entrepreneurs and startups to demonstrate emerging energy technologies across the state.
- **Creating and funding the Minnesota Climate Innovation Finance Authority** to accelerate the adoption of proven clean energy technologies and greenhouse gas (GHG) reduction projects while also delivering benefits to historically underserved communities.
- **Funding a high-voltage transmission line upgrade** and programs for solar on schools and public buildings as well as establishing a new energy storage incentive program.

A bill creating the ‘State Competitiveness Fund’ was also passed early in the year by the Minnesota Legislature and was signed into law by Governor Walz. Ultimately funded with $190 million in total, the fund will help state, local and tribal governments and other entities pursue federal grants for clean energy infrastructure. The fund helps ensure Minnesota remains competitive for the billions in funding available through the IRA and the Infrastructure Investment and Jobs Act (IIJA), as the law requires the state to establish its own pool of matching funds. Furthermore, the fund includes resources for technical assistance and grant-writing support.

In addition to state policy advancements, the business community utilized favorable market conditions and government incentive/rebate programs to continue implementing energy projects. Some challenges, such as long interconnection queues, workforce shortages and broader inflationary pressure, slowed the industry’s progress. However, despite these hurdles, clean energy continued its growth in Minnesota.
Overview of Minnesota’s Electric Sector

For the fourth consecutive year, 54% of Minnesota’s electricity generation was provided by zero-carbon power, significantly outpacing the national share of 41%. Minnesota’s clean energy industry employs nearly 60,000 workers, and the industry grew 50% faster than the state’s overall job growth in 2022 (Source: 2023 Clean Jobs Midwest - Minnesota report).

Similar to the trends at the federal level, Minnesota’s electric sector has stabilized post-pandemic. However, during this time, Minnesota has continued to outpace the nation in carbon dioxide (CO$_2$) emissions reduction, now 54% below 2005 levels versus 42% reduction nationwide (Figure 1). Most remarkably, Minnesota’s power sector reduced its CO$_2$ emissions by 10% in 2023 to the lowest point in the 19 years the statistic has been recorded (Figure 2). Building on this success, Minnesota aims to continue to decarbonize the power sector to achieve 100% carbon-free electricity by 2040 – while simultaneously drawing attention to other economic sectors, such as transportation and buildings, to further reduce their GHG emissions as well.

Minnesota consumed 66 terawatt-hours (TWh) of electricity in 2023 and imported 8.9 TWh (Figure 3). Imported electricity accounted for 13% of consumption in 2023, up from 9% in 2022 but down from 17% in 2014. Total electricity consumption in Minnesota declined 0.2% last year.

In October 2023, the U.S. Department of Energy’s Grid Resilience and Innovation Partnerships (GRIP) Program announced a $464 million grant to construct five high-voltage transmission lines that will span Minnesota, Iowa, North Dakota, South Dakota, Nebraska, Kansas and Missouri. The project will spur the development of additional carbon-free electricity generation across the region and is anticipated to spark at least $1 billion in private investments in the energy sector.

Figure 1: Minnesota power sector carbon (CO$_2$) emissions vs U.S. emissions

Source: BloombergNEF, EIA.

Figure 2: Minnesota power sector carbon emissions with year-over-year percent changes

Source: BloombergNEF, MN Power Emissions. MMt = million metric tons

Figure 3: Minnesota electricity sales and generation

Source: BloombergNEF, EIA.

Note: Excludes generation from fuel oil
Over the last decade, consumer electricity prices in Minnesota, measured on a cents-per-kilowatt-hour (cts/kWh) basis, have continued to rise for residential, commercial and industrial clients (Figure 4). Multiple factors contribute to this trend, including fluctuating natural gas prices as well as utility infrastructure investments. In 2023, Minnesota consumer electric rates averaged 12.17 cts/kWh, up 1% from 12.04 cts/kWh in 2022 and up 28% since 2014 (in nominal terms). Minnesota’s average electricity prices today are below the U.S. average of 12.36 cts/kWh (Figure 4).

Minnesota’s electricity generation mix continues to trend toward renewables and natural gas and away from coal-fired generation (Figure 5). In the last ten years, renewables accounted for 84% of all new capacity, with all other additions being natural gas and oil plants. In 2023, preliminary data shows that Minnesota built primarily renewable power plants, totaling 606 MW of new wind and solar generation (Figure 6). All coal-fired power plants located in Minnesota plan to be retired by 2035 with 1.9 GW retired over the last decade. For context, 2.0 GW of electricity can power roughly 1.5 million American homes (Source: Solar Energy Industries Association). In 2023, 18.86 TWh of electricity generated in Minnesota came from renewable sources. 12.77 TWh of electricity generated in Minnesota came from coal. Minnesota’s new 100% Clean Energy by 2040 law, combined with the implementation of Minnesota’s Climate Action Framework, will continue to be primary drivers for this trend to continue and even speed up.

Source: Minnesota Department of Commerce, EIA.
Sustainable Energy Deployment

Energy Efficiency

In the latest edition of the State Energy Efficiency Scorecard, the American Council for an Energy-Efficient Economy (ACEEE) ranked Minnesota tenth for its overall energy efficiency programs, making it the highest-ranking state in the Midwest. Minnesota also trends positively in its energy productivity, which measures the economic benefit gained from each unit of energy used. The state has seen a 33% boost in energy productivity since 2001 (Figure 7). Minnesota continues modernizing its policies and making economic decisions supporting its energy efficiency leadership.

To strengthen the state’s Conservation Improvement Program (CIP), Governor Walz signed the Energy Conservation and Optimization Act (ECO Act) into law in 2021. CIP, now ECO, is a utility-administered program with regulatory oversight provided by the Minnesota Department of Commerce. Utility ECO portfolios promote energy-efficient technologies and practices by offering utility customers rebates, as well as marketing and technical assistance. ECO programs help Minnesota households and businesses lower energy costs by using electricity and natural gas more efficiently. According to the Minnesota Department of Commerce, through 2021 (the most recent statewide ECO data available), Minnesota’s electric utilities have met or exceeded 1.5% annual energy savings each year since 2011 (Figure 8). Additionally, the state’s natural gas utilities have generally met or exceeded 1% energy savings each year (Figure 9). In total, in years 2020 and 2021, Minnesota businesses and residents saved more than $287 million in energy costs from ECO.¹

Figure 8: Conservation Improvement Program (CIP) Electric Utilities Results

Figure 9: Conservation Improvement Program (CIP) Natural Gas Utilities Results

¹ Estimated energy cost savings were calculated by multiplying the average price per Dth of natural gas and the average price per kWh of electricity in Minnesota by the corresponding Dth and kWh ECO energy savings achievements for 2020 and 2021. This calculation does not net out CCRA/CCRC charges to customers.
Hydrogen

The IRA has significantly incentivized hydrogen projects, which is evident in the rapid increase in hydrogen supply and electrolyzer shipments (Figure 10). Before 2018, the United States produced less than 505,000 million metric tons of hydrogen annually. In comparison, in 2023, the U.S. produced over 10,373,523 million metric tons of hydrogen, a 20x increase. An estimated 437MW of hydrogen electrolyzer capacity was shipped nationwide to meet this demand (Figure 11).

Cummins, which specializes in diesel and alternative fuel engines and generators as well as related components and technology, shipped almost 6% of the nation’s total electrolyzers from their Fridley, Minnesota location.

As more hydrogen projects are developed utilizing IRA incentives, Minnesota businesses and industries stand to benefit. Opportunities include boosting manufacturing, decarbonizing sectors that are difficult to electrify – such as aviation or industrial processes – and producing sustainable aviation fuel (SAF) and green ammonia, as is being explored by numerous entities throughout the state. To accelerate the creation of a SAF industry, the Minnesota Legislature passed a bill providing a $1.50 per gallon tax credit for SAF produced or blended with aviation fuel in the state. To qualify for the credit, SAF producers must achieve at least 50% lifecycle GHG emissions reductions.

Minnesota also saw hydrogen project investment through the IIJA, which President Biden signed into law in 2021. The bill provided the U.S. Department of Energy (DOE) with $8 billion to fund regional Clean Hydrogen Hubs nationwide. In 2023, the DOE selected Minnesota and the Heartland Hydrogen Hub as a recipient of up to $925 million to produce low-carbon hydrogen at commercial scale at project locations across Minnesota, North Dakota and South Dakota. The funding is intended to spur the development of a hydrogen-based network in the Upper Midwest.
Renewables

IRA incentives combined with state policy continue to drive renewable electricity investment in Minnesota. The 100% Clean Energy by 2040 law requires 100% of electricity generated or procured for use in Minnesota to be carbon-free by 2040. This legislation aims to guide electric utilities, including investor-owned, municipal and rural electric cooperatives, to transition away from carbon-producing sources and toward clean energy such as wind and solar.

Leading by example, Xcel Energy began the retirement of its over 2GW coal plant – Sherco, in Becker, Minnesota – in December 2023. The company retired one of three coal units and plans to retire Sherco’s remaining coal-fired units in 2026 and 2030, marking the company’s full exit from coal. Xcel Energy is currently building the largest solar facility in the Midwest adjacent to the Sherco site. Sherco Solar, totaling 710MW, will generate enough electricity to power more than 150,000 homes annually and will fully replace the capacity of the coal-fired unit that retired in 2023. The company will also build a 10MW, 100-hour battery storage facility as a pilot project at the Sherco site. The project received an award of up to $35 million from the DOE and a $20 million grant commitment from the Breakthrough Energy Catalyst fund. Form Energy will develop the storage system that will allow Xcel Energy to store wind and solar power until it is distributed during periods of lower renewable production, enhancing reliability.

Figure 12: Minnesota wind and solar capacity additions

Figure 13: Minnesota cumulative renewable capacity

Over the last decade, Minnesota added primarily renewable energy to its generation mix, adding 3.9GW. This included 1.6GW of solar and 2.3GW of wind, plus 40MW of biomass. In the past five years, 2.2GW of new renewable capacity was added, including 768MW of solar and 1.4GW of wind (Figure 12). In 2023, Minnesota added 206MW of solar and 400MW of wind, which was an increase over the combined 228MW (102MW of solar and 126MW of wind) added in 2022. The overall growth trend has led total installed renewable capacity in Minnesota to rise to 6.8GW in 2023 (Figure 13). Wind accounts for nearly three-fourths of total renewable capacity, while solar is responsible for one-quarter. Between policy, funding available through the IRA and market factors, Minnesota is poised to further expand its renewable capacity in the coming years.
Electric Vehicles

2023 was an exceptional year for the electric vehicle (EV) industry at the national and state levels. The growth in sales of EVs, including battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), continues to be strong nationally, with another record-breaking year. National sales of EVs and fuel-cell vehicles hit nearly 1.46 million, up 50% from 2022. Beyond the IRA incentives that made EVs more affordable, there were a slew of new models, making EVs even more attractive to consumers.

According to the Minnesota Department of Transportation (MnDOT), as of December 2023, the state had approximately 56,010 EVs on the road. From 2019 through 2023, annual BEV registrations increased nearly 13x to 13,204 units. Annual PHEV registrations increased 48% from 2022 to 2023 to 4,179 units. Combined annual registrations increased 55% from 2022 to 2023 to 17,383 units (Figure 14). This aligns with the post-pandemic stabilization.

![Figure 14: Minnesota cumulative annual electric vehicle registrations](source: Minnesota Department of Transportation. Note: PHEV is plug-in hybrid electric vehicles, BEV is battery electric vehicles.)

As the state’s largest contributor to GHG emissions, the transportation sector is poised to slash emissions with the 2023 Minnesota Legislature passing into law a suite of investments into EV infrastructure and incentives. Over $13 million was invested in the National Electric Vehicle Infrastructure (NEVI) program, which will match federal funds to establish a fast-charging EV network across the state. EV rebate programs were created to assist consumers in purchasing both new and used EVs with $2,500 rebates available for new EVs with a suggested retail value below $55,000. Lessees and used EV purchases (with a purchase price not to exceed $25,000) were also made eligible for a $600 rebate. In an effort to reduce the purchase price, rebates were made available at the point of sale. Grants were also established to support auto dealers for training in anticipation of increased consumer demand for EVs. $13 million was also invested in electric school buses that may also leverage additional federal funding for school districts seeking to transition their bus fleets.

In the fall of 2023, Xcel Energy proposed a $45 million plan to accelerate EV adoption in Minnesota. Two pilot programs aim to provide continued support for government and nonprofit EV infrastructure and public charging efforts. The proposal would also provide rebates for home-wiring upgrades and, in one of the pilot programs, allow customers to charge EVs when energy demand is low for a flat monthly fee. The Minnesota Public Utilities Commission (PUC) will ultimately need to approve the company’s EV programs.

---

2 The Minnesota Department of Transportation has changed the data collection, reflecting a change in numbers from past reports.
The 2024 Minnesota Energy Factsheet is a project of CEEM and BCSE, with data contributions from BloombergNEF and the Minnesota Department of Commerce. We extend our thanks for the support and generous contributions of this year’s sponsors: Marsh, Full Stack Saint Paul and the McKnight Foundation.
Trimont Wind Farm in Southwestern Minnesota is re-powered by Avangrid Renewables.