

KEY FACTS

On the Road to 100 Percent Renewables for Minnesota

Strengthening the State's Energy Transition

With the right policies and priorities, Minnesota can meet its electricity needs completely and equitably with renewable energy by 2035 and dramatically reduce its use of fossil fuels in vehicles and buildings.

- ✓ **Less fossil fuel generation = better health**
More than **\$1.2 billion** in public health savings by 2040
- ✓ **More renewable energy = more jobs and other economic benefits**
Almost **\$5 billion** in net labor income by 2040
- ✓ **We must act now to avert the worst of climate change**
An **87 percent** drop in heat-trapping emissions from the power sector between 2020 and 2040
- ✓ **A clean energy future for all**
To advance racial and economic justice in the transition to clean energy, Minnesota policymakers must ensure that **traditionally excluded groups**—including Black, Brown, Indigenous, immigrant, and low-income communities—and fossil fuel-dependent workers **have power in decisionmaking** and receive direct benefits from the transition.



Union of
**Concerned
Scientists**

Minnesota Needs a Renewable Electricity Future—and It is Possible

Climate change already affects Minnesota, and insufficient action to address this crisis will mean more harm to the state’s residents. As just one example, increases in extreme heat could put more than 535,000 outdoor workers in the state at risk of losing an average of four workdays per person each year, jeopardizing more than \$391 million in total earnings each year (UCS 2021).

To act on climate change, Minnesota must eliminate heat-trapping emissions from how the state generates electricity. It also must convert transportation, heating, and other sectors to run on carbon-free electricity instead of fossil fuels.

In considering the path forward, Minnesota must account for effects of our energy choices beyond climate change so that the benefits of cleaning our electricity grid reach everyone. Specifically, the transition to clean energy must end historic inequities that have overexposed low-income communities and communities of color to air pollution.

Recognizing the urgent need for action, in 2017 Minnesota joined the US Climate Alliance (USCA), a group of states committed to upholding the objectives of the 2015 Paris Climate Accords. New legislative proposals would update the state’s target for reducing heat-trapping emissions to achieve “net zero” emissions by 2050. As the state decarbonizes its economy, the electricity sector plays a key role given the adverse climate and health consequences of burning coal, gas,¹ and other fossil fuels to generate electricity and given the importance of electrifying heating and transportation. Just last year, Governor Tim Walz proposed a 100 percent clean energy standard to require all electric utilities in Minnesota to use only carbon-free energy resources by 2040.

The Union of Concerned Scientists partnered with COPAL, a local environmental justice group, to explore potential pathways to reach 100 percent renewable electricity in Minnesota on a timely basis. Using the Regional Energy Deployment System (ReEDS) electricity model from the National Renewable Energy Laboratory, we examined how a portfolio of resources under a strengthened renewable electricity standard (RES) could meet all of the state’s electricity needs by 2035. Our “100% RES” scenario also modeled high levels of electrification as the state works to meet its overall climate goals, given the need to decarbonize sectors like transportation and heating. In addition, we partnered with the research nonprofit Greenlink Analytics to assess how a transition to renewable energy most directly affects everyday lives, in terms of changes in public health, jobs, and household energy bills.

A Faster Move to Renewable Electricity Brings Many Benefits

Energy Capacity and Generation

Under current policies and plans—the “No New Policy” scenario in our analysis—the state has about 3 gigawatts (GW) of wind capacity in 2040, producing about 10,200 gigawatt-hours (GWh) in that year; 7.2 GW of solar produces about 13,100 GWh. Wind and solar go from 26 percent of the state’s electricity generation in 2020 to 67 percent in 2040. However, that increase does not displace all fossil fuel generation. While coal generation disappears, electricity from gas remains at 21 percent of its 2020 total.

By building out wind, solar, and batteries for energy storage more aggressively, Minnesota can meet 100 percent of its electricity consumption with renewable energy by 2035, even with high electrification. By 2040, the 100% RES scenario yields almost 13 GW of wind, more than 13 GW of solar, and 6 GW of batteries. These wind and solar resources produce 50,300 GWh and 24,400 GWh in that year, respectively, going from 26 percent of electricity supply in 2020 to 82 percent by 2040—thus meeting growth in electricity demand (Figure 1).

While renewable resources meet all of Minnesota’s electricity consumption needs in the 100% RES scenario, gas plants continue operating. This is because the Midwest power grid, like grids in much of the United States, is interconnected across states and power is exported across state lines.

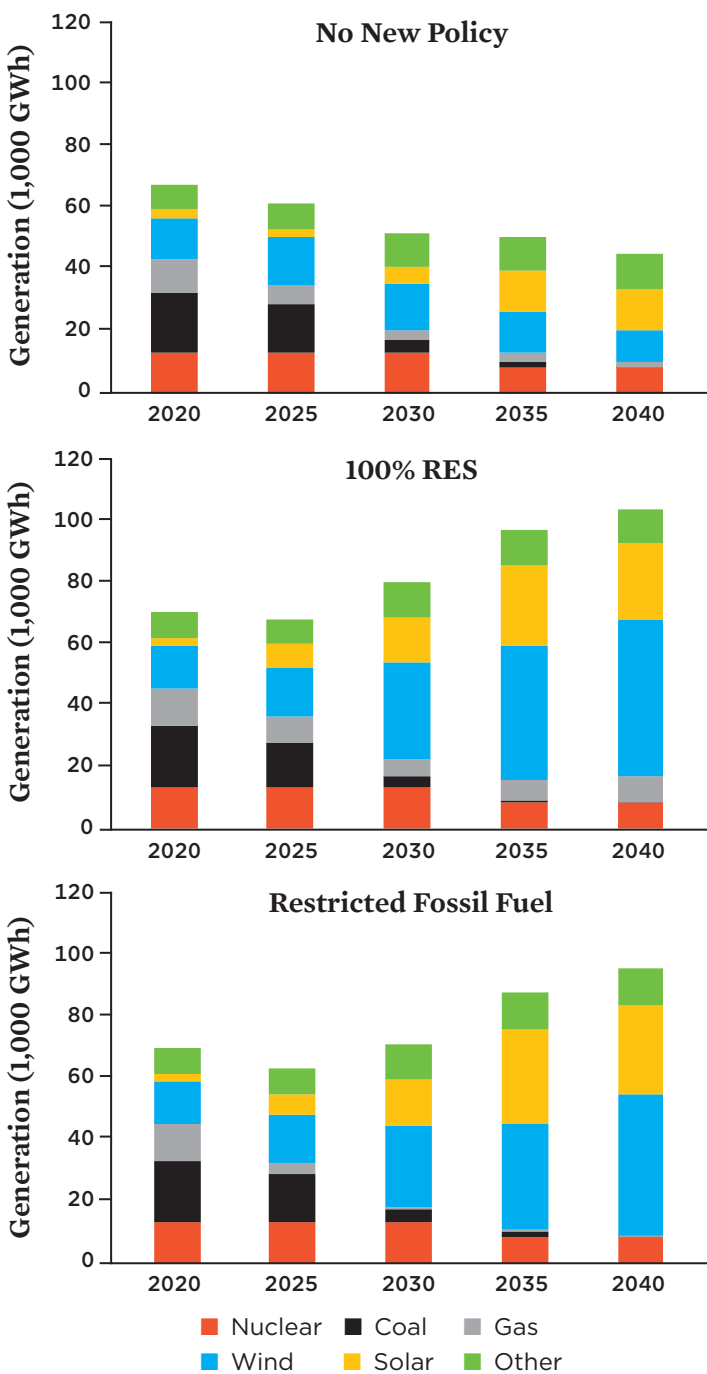
To better reflect how Minnesota might achieve its goals for carbon reduction, we also modeled a “Restricted Fossil Fuel”



Tony Webster/Wikimedia Commons (BY-SA CC2.0)

As Minnesota decarbonizes its economy, the electricity sector plays a key role given the adverse climate and health consequences of fossil fuel-fired power plants (such as the coal-fired Sherco plant in Becker, one of the state’s most polluting facilities). Our modeling research shows that Minnesota can meet 100 percent of its electricity needs by 2035 using renewable resources.

FIGURE 1. Minnesota Electricity Generation in Three Scenarios, 2020–2040



While coal generation declines under the No New Policy and 100% RES scenarios, the 100% RES leads to much more wind and solar power. The Restricted Fossil Fuel scenario leads to even greater growth in renewable energy and avoids dangerous overreliance on gas.

Notes: "Solar" includes utility scale and distributed solar. "Gas" includes combined-cycle and combustion turbine. "Other" includes hydro, landfill gas, oil-gas-steam, and Canadian imports.

TABLE 1. Health Benefits from a Renewable Energy Transition in Minnesota

Health Impact	Cumulative Avoided Numbers, 2022–2040
Premature Deaths	80–180
Asthma Exacerbations	2,260
Lost Workdays	10,600

scenario, which included restricting the construction of new combined-cycle, gas-fired plants. This scenario eliminates the model's construction of a new gas plant in Minnesota in 2040, slightly decreases wind to just under 12 GW, and increases solar to about 17 GW by 2040. Minnesota would need to retire some existing gas plants remaining at that point to fully eliminate emissions from the power sector.

Public Health Benefits

Replacing electricity generated by burning fossil fuels with renewable electricity in the 100% RES scenario reduces the amount of air pollution that power plants and vehicles emit, such as sulfur dioxide (SO₂), nitrogen oxides (NO_x), particulate matter, and mercury and other toxic pollutants. Improvements in air quality yield substantial health benefits, including reductions in lung and heart ailments, asthma, diabetes, and developmental problems in children. The avoided health impacts from the electricity sector alone would save Minnesota more than \$1.2 billion² in public health costs between 2022 and 2040, largely due to eliminating SO₂ and reducing carbon dioxide (CO₂) and NO_x pollution from power plants (Table 1).

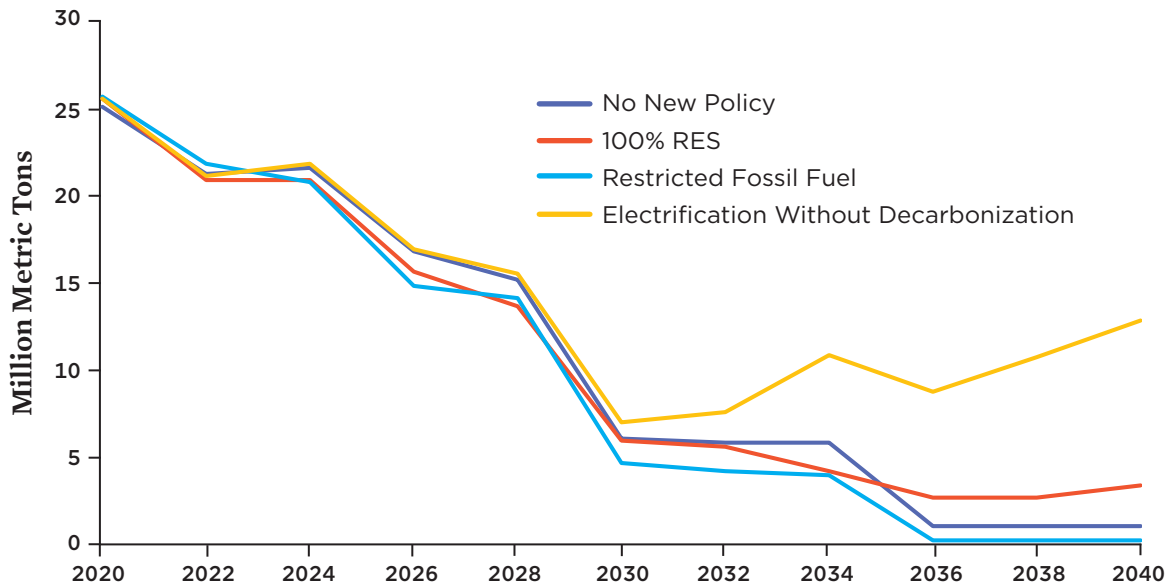
Emissions Reductions

Cleaning up the power sector can decrease emissions of CO₂. While emissions from Minnesota's power sector will likely decline under current plans to retire coal plants in the No New Policy scenario, the reductions leading up to 2035 are faster and greater in the 100% RES scenario (Figure 2, p. 4). Limiting the construction of new gas-fueled plants while simultaneously transitioning to 100 percent renewable energy in the Restricted Fossil Fuel scenario produces even better results. By contrast, pushing for electrification without a strong focus on decarbonization (an "Electrification Without Decarbonization" scenario) increases CO₂ emissions significantly after 2030.

Economic Benefits

The 100% RES scenario yields significant economic benefits, with substantial net growth in three key economic categories above those under the No New Policy scenario.

FIGURE 2. Carbon Dioxide Emissions in Four Scenarios, 2020–2040



Avoiding construction of new gas plants and moving to 100 percent renewables under the Restricted Fossil Fuel scenario keeps Minnesota’s electricity sector CO₂ emissions trending toward near-zero, even with high electrification of the transportation and building sectors.

- **Jobs:** Minnesota gains more than 160,000 additional job-years—meaning more than 40,000 additional jobs³—in the construction or installation of new power capacity, chiefly wind and solar, by 2040. Thousands of additional jobs are created in most years, offsetting by far any jobs lost in retiring fossil fuel power plants.⁴
- **Labor Income:** Cumulatively, labor income in Minnesota increases \$4.9 billion more by 2040. Labor income includes wages and salaries, benefits, and payroll taxes, as well as income earned by self-employed individuals and unincorporated business owners.
- **Gross Domestic Product (GDP):** The jobs increase fuels \$10.4 billion in additional growth of the state GDP by 2040.

Affordability

Consumers must be able to afford a renewable energy transition. One key metric is “energy burden,” the percentage of income a household or individual spends on electricity and gas. Based on considering only electricity and gas expenses, the average residential energy burden across the state rises from 4.0 percent in 2020 to 4.8 percent in 2040 in the 100% RES scenario, compared with 4.6 percent in the No New Policy scenario. Yet the strong electrification push in the 100% RES scenario brings substantial savings from reduced gasoline use for households switching to

electric vehicles, as well as savings from reduced propane use for households adopting electric heat pumps; the energy-burden calculation in our modeling did not reflect those benefits.

Recommendations: Ensuring a Just and Equitable Energy Transition

Minnesota, like other states that pledge to reduce carbon emissions, has technically feasible and highly beneficial paths to achieving 100 percent renewable energy. A transition away from fossil fuels can yield cleaner air, better health, and more jobs. However, the outcomes can be inequitable if Minnesota does not implement the transition with care. We must ensure that everyone reaps the benefits and that the transition does not perpetuate historic inequities in the energy sector.

Here are key recommendations as Minnesota moves away from fossil fuels and toward renewable energy, improves affordability for low- and moderate-income households, and ensures good decisionmaking throughout:

- **Target reductions in power plant pollution.** State policy should prioritize reducing pollution in already overburdened communities, deter new investments in the infrastructure for fossil fuel power, and avoid dangerous overreliance on gas. For example, Minnesota regulators should require utilities to analyze renewables, battery storage, and other

cleaner options fully before allowing any new gas plants to be constructed.

- **Promote just transitions for fossil fuel workers and frontline communities.** As fossil fuel power plants close—such as several planned retirements of coal plants owned by Xcel Energy and Minnesota Power—job training, income support, and incentives for responsibly siting infrastructure for clean energy and manufacturing at former fossil fuel sites will be key to a successful transition for workers and fossil fuel–dependent communities.
- **Directly invest in communities to increase clean energy.** State policies should promote direct investments in expanding rooftop and community solar, energy efficiency, and the electrification of transportation and heating, with a priority on investments in historically underserved people and communities.
- **Reduce energy burdens.** The move to clean energy will likely reduce average residential energy costs in most or all years compared with the No New Policy scenario, but, without due attention, it could increase energy burdens for low- and moderate-income households at some points. Unequal access to energy efficiency, rooftop solar, and other clean energy strategies could keep low- and moderate-income households from enjoying reduced energy costs. Minnesota should ensure that costs incurred by electric utilities for clean energy—and legacy costs spread over declining numbers of gas users (Dyson, Glazer, and Tepin 2019)—are addressed through either targeted energy rates or statewide policies, including energy-efficiency measures to reduce consumption.
- **Develop workforce programs and entrepreneurship initiatives in renewable energy to foster high-quality, good-paying jobs.** The state must strive to advance a diverse, equitable, and inclusive workforce in clean energy industries. Everyone should be able to participate in and benefit from growth in the many sectors of the industry. In Illinois, for example, the 2021 Climate and Equitable Jobs Act provides for several workforce hubs across the state to expand access to quality jobs and economic opportunities, particularly for economically disadvantaged communities; it also mandates an incubator program to provide statewide training, mentorship, and recruitment opportunities for small clean energy businesses and contractors (Collingsworth 2021).
- **Ensure that frontline communities have power in decisionmaking.** Legislators and entities like the Minnesota Public Utilities Commission and the Minnesota Pollution Control Agency must continue working to improve



Courtesy of COPAL

Members of COPAL joined local advocates and community members to protest a proposed oil pipeline expansion in Minnesota over threats to Indigenous treaty rights and ecosystems. The state can reduce its reliance on oil and other fossil fuels—and their associated impacts—by investing aggressively in renewable energy, battery energy storage, and electrification.

equitable treatment and meaningful involvement in decisionmaking.

- **Target transmission additions and “non-wires” alternatives at reducing reliance on urban-based fossil fuel plants.** Responsibly sited electric transmission and non-wires alternatives, such as distributed generation, energy storage, and energy efficiency, are needed to expand renewable electricity, accelerate the closure of fossil plants, and mitigate the harms in communities most exposed to power plant pollution. Legislators and other state leaders should enact policies that promote equitable siting while advancing clean energy.
- **Ensure sustainable and responsible life cycles for clean energy technologies.** Minnesota should encourage responsible supply chains, incentivize the use of local manufacturers of renewable equipment, and enact policies to require recycling and reuse opportunities and make them available statewide.
- **Support strong federal policies.** State leaders should advocate for a strong national clean energy standard to accelerate decarbonization in *all* states and drive a swift transition to a clean, carbon-free electricity system.

This fact sheet is part of a multi-state analysis of the potential effects of bold clean energy action by leadership states. Learn more at www.ucsusa.org/resources/road-100-percent-renewables.

James Gignac is the senior Midwest energy analyst in the UCS Climate and Energy Program. **Edyta Sitko** is the energy organizing manager in the program. **John Rogers** is the energy campaign analytic lead in the program. **Marco Hernández** is the former public policy director at COPAL. **Paula García** is the senior bilingual energy analyst in the UCS Climate and Energy Program. **Sandra Sattler** is the senior energy modeler in the program.

Acknowledgments

This analysis was made possible through the generous support of the Bezos Earth Fund, the Common Sense Fund, Energy Foundation, the Heising-Simons Foundation, The Joyce Foundation, The John D. and Catherine T. MacArthur Foundation, and UCS members.

For their thoughtful reviews and contributions, we thank Chris Conry (100% Campaign), Leslee Gutiérrez (COPAL), and Matt Cox and Samantha McDonald (Greenlink Analytics), along with Marc Miller and David Gerratt (for editing and design assistance). At UCS we thank Anthony Eyring, Ashtin Massie, Cynthia DeRocco, Heather Tuttle, Jiayu Liang, Juan Declet-Barreto, Kristina Dahl, Lisa Nurnberger, Meghan Hassett, Megy Karydes, Michelle Rama-Poccia, Sital Sathia, Verónica López Gamboa, and Youngsun Baek.

Organizational affiliations are listed for identification purposes only. The opinions expressed herein do not necessarily reflect those of the organizations that funded the work or the individuals who reviewed it. COPAL and the Union of Concerned Scientists bear sole responsibility for the report's contents.

Endnotes

1. "Gas" in this document refers to what is traditionally called natural gas.
2. Findings from our analysis are expressed in 2020 dollars.
3. A job-year is defined as a full-time position held by one person for one year. A person holds a job for an average of four years (BLS 2020).
4. Minnesota's coal, gas, and oil-fired power plants employed 2,100 people in 2021 (DOE 2021).

References

- BLS (Bureau of Labor Statistics). 2020. "Employee Tenure Summary." Press release, September 22. <https://www.bls.gov/news.release/tenure.nr0.htm>
- Collingsworth, Jessica. 2021. "Illinois Secures a Major Climate and Equity Victory." *The Equation* (blog). September 14. <https://blog.ucsusa.org/jessica-collingsworth/illinois-secures-a-major-climate-and-equity-victory>
- DOE (US Department of Energy). 2021. *Energy Employment by State*. <https://www.energy.gov/sites/default/files/2021-07/USEER%202021%20Main%20Body.pdf>
- Dyson, Mark, Grant Glazer, and Charles Tepin. 2019. *Prospects for Gas Pipelines in the Era of Clean Energy*. Basalt, CO: Rocky Mountain Institute. <https://rmi.org/insight/clean-energy-portfolios-pipelines-and-plants>
- UCS (Union of Concerned Scientists). 2021. "Extreme Heat Could Threaten \$391.2 Million Annually in Minnesota Outdoor Worker Earnings by Midcentury." Press release, August 15. <https://www.ucsusa.org/about/news/extreme-heat-could-threaten-391-million-annually-minnesota-outdoor-worker-earnings>

www.ucsusa.org/resources/road-100-percent-renewables
es.ucsusa.org/recursos/en-la-ruta-hacia-100-por-ciento-energia-renovable



COPAL's mission is to unite Latinxs in Minnesota in active grassroots communal democracy that builds racial, gender, social and economic justice across community lines.

3702 E. Lake Street
Minneapolis, MN 55406
www.copalmn.org



The Union of Concerned Scientists puts rigorous, independent science to work to solve our planet's most pressing problems. Joining with people across the country, we combine technical analysis and effective advocacy to create innovative, practical solutions for a healthy, safe, and sustainable future.

NATIONAL HEADQUARTERS
Two Brattle Square
Cambridge, MA 02138-3780
(617) 547-5552