Advancing Minnesota's Clean Energy Economy

Building on a History of Leadership and Success

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Minnesota is a national clean energy leader. Largely because of the state's renewable energy standard (RES), Minnesotans today receive more than 15 percent of their electricity from wind, solar, and biomass resources (MDOC 2014). In fact, many utilities are already several years ahead of schedule in meeting the state's RES, which requires that they produce 25 percent of their electricity from renewables by 2025.

But despite this impressive progress, Minnesota is still heavily reliant on fossil fuels. Now is the time to chart a course for a truly clean energy future—above and beyond the current RES.

To explore such a course, we analyzed Minnesota's electricity future under today's RES—what we call the Reference case. We then analyzed the state's future under a strengthened RES: 40 percent renewable electricity by 2030. We compared these two cases to identify the impacts on Minnesota's energy future (Box 1, p. 2).

Wind turbines, such as the ones outside of Tracy, MN, pictured here, are not only an important source of renewable energy, but also a driver of significant economic benefits for host communities.

Union of Concerned Scientists

Our analysis shows that a strengthened RES would bolster the state's economy by driving significant investments in renewable energy and accelerating the state's transition to a cleaner, more diverse, and lower-carbon electricity system. An RES of 40 percent by 2030 in Minnesota:

- **drives significant economic benefits.** Greater than $6 billion in new capital investments to develop more than 3,000 megawatts of new renewable energy in Minnesota.
- **reduces Minnesota's reliance on imported electricity.** Out-of-state electricity imports are reduced each year, resulting in Minnesota being a net electricity exporter in 2030.
- **is affordable.** Total added cost of less than 0.2% of total electricity expenditures through 2030–about 12¢ per month for the typical Minnesota household.
- **is achievable.** Minnesota can maintain power reliability and meet electricity demand year-round.

The strengthened RES would also improve public health by lessening the state's reliance on fossil fuels and position the state to comply with pending federal requirements to cut carbon dioxide (CO_2) emission.

Minnesota's Long History of Clean Energy Leadership

Minnesota's leadership on clean energy goes back more than 20 years. In 1994, recognizing the need to diversify its electricity portfolio, Minnesota required its largest utility, Xcel Energy, to develop 400 MW of utility-scale wind generation capacity. In 1999, after the Minnesota Public Utilities Commission found wind to be a cost-effective electricity resource, the state doubled that requirement (Noble 2014). Then, in 2001, Minnesota adopted its first voluntary renewable energy goal, requiring all electric utilities to source 10 percent of their electricity sales from renewable energy by 2015.

In 2007, the state approved a mandatory RES that requires Xcel Energy to obtain 30 percent of its electricity sales from renewable energy by 2020, and all other utilities to achieve 25 percent by 2025. And in 2013, the legislature again strengthened the state's commitment to renewable energy, requiring investor-owned utilities to obtain an additional 1.5 percent of electricity sales from solar power by 2020.

These policies—especially the 2007 RES—have driven significant investments in renewable energy in Minnesota. From 2007 to 2013, non-hydro renewable energy jumped from 7 percent of the state's electricity generation to almost 20 percent (Figure 1).[1] Meanwhile the share of electricity generated from coal declined from 59 percent to 46 percent, and natural gas contributions nearly doubled. This shift means a cleaner, more diverse electricity supply for Minnesota.

In fact, many of Minnesota's utilities are as many as 10 years ahead of the pace in developing the renewable energy envisioned by the 2007 RES (Noble 2014; MDOC 2013). Xcel Energy, for example, now obtains enough electricity from renewable energy—and has banked enough renewable energy credits[3] over the past few years—to meet its RES obligations through at least 2020 (Xcel 2011).

BOX 1.

How We Performed Our Analysis

To explore Minnesota's energy future under various policy pathways, we used the Regional Energy Deployment System (ReEDS) model developed by the U.S. Department of Energy's National Renewable Energy Laboratory. ReEDS is a model of the power sector that optimizes the future deployment of technologies for producing and transmitting electricity throughout the contiguous United States to meet demand for power every hour of the year.

We use the model to compare the impact of different mixes of technologies to meet that demand under various policy frameworks. The model specifically accounts for a variety of factors in integrating more renewable energy into the power grid, including regional renewable resources, access to transmission infrastructure, and the impact of the variability of wind and solar power on the reliability of the electricity supply.[2]

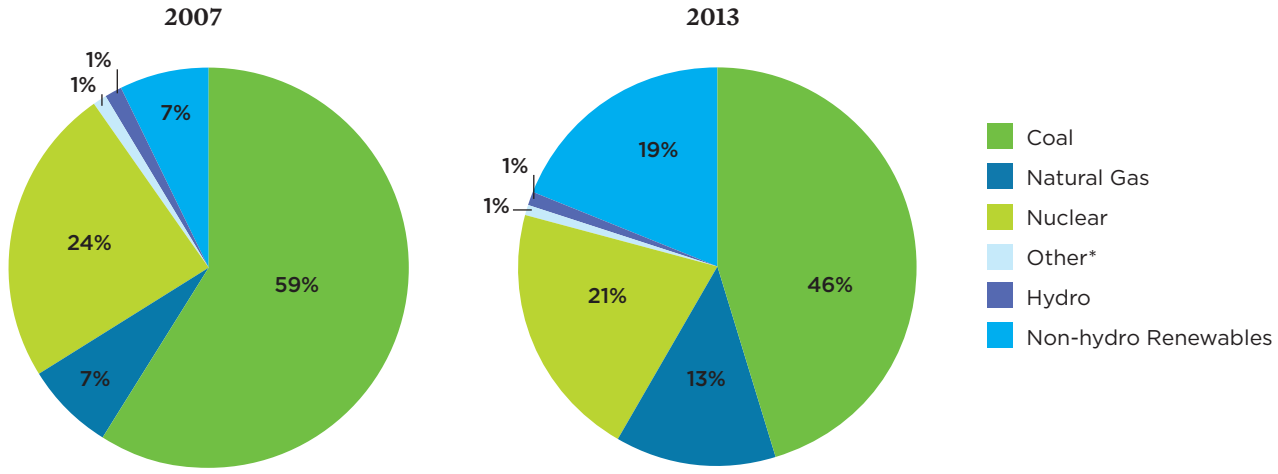
Using this tool, we analyze the interplay between policy decisions, energy use, energy prices, energy investments, and environmental impacts under different assumptions about Minnesota's energy future. (For more information on our approach, see the Appendix at *http://www.ucsusa.org/minnesotacleanenergyappx.)*

1 *Minnesota currently does not meet all its electricity demand with in-state generation. As a result, although renewable energy accounts for 19 percent of in-state generation, it fulfills about 15 percent of Minnesota's overall electricity demand.*

2 *For more information on the ReEDS model, see* http://www.nrel.gov/analysis/reeds/description.html.

3 *States typically measure compliance with renewable energy standards by issuing renewable energy credits (RECs), which are tradable certificates. Some states—like Minnesota—allow utilities to bank excess RECs in a given year, and then use them to comply with the RES in future years.*

FIGURE 1. Minnesota's Electricity Generation Mix, 2007 versus 2013



Minnesota reduced its reliance on coal from 59 percent of electricity generation in 2007 to 46 percent in 2013. Meanwhile electricity from renewables grew from 7 percent of the state's mix to 19 percent, while electricity from natural gas nearly doubled.

*"Other" includes petroleum, non-biogenic municipal solid waste, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, tire-derived fuels, and other manufactured and waste gas from fossil fuels.

SOURCE: EIA 2014A.

That progress means that investments in new renewable energy facilities will likely slow in coming years as utilities achieve full compliance with the 2007 RES. And that, in turn, means that Minnesota will likely continue to rely heavily on existing fossil fuel–fired power plants to meet the balance of its electricity needs.

With its vast untapped wind and solar resources, the state has significant potential to realize greater benefits from larger investments in clean energy. As our analysis shows, with a strengthened RES, Minnesota can cost-effectively renew its commitment to renewable energy and continue to reap the increasing economic, environmental, and public health benefits that those investments deliver.

Driving Renewable Energy Investments with a Strengthened RES

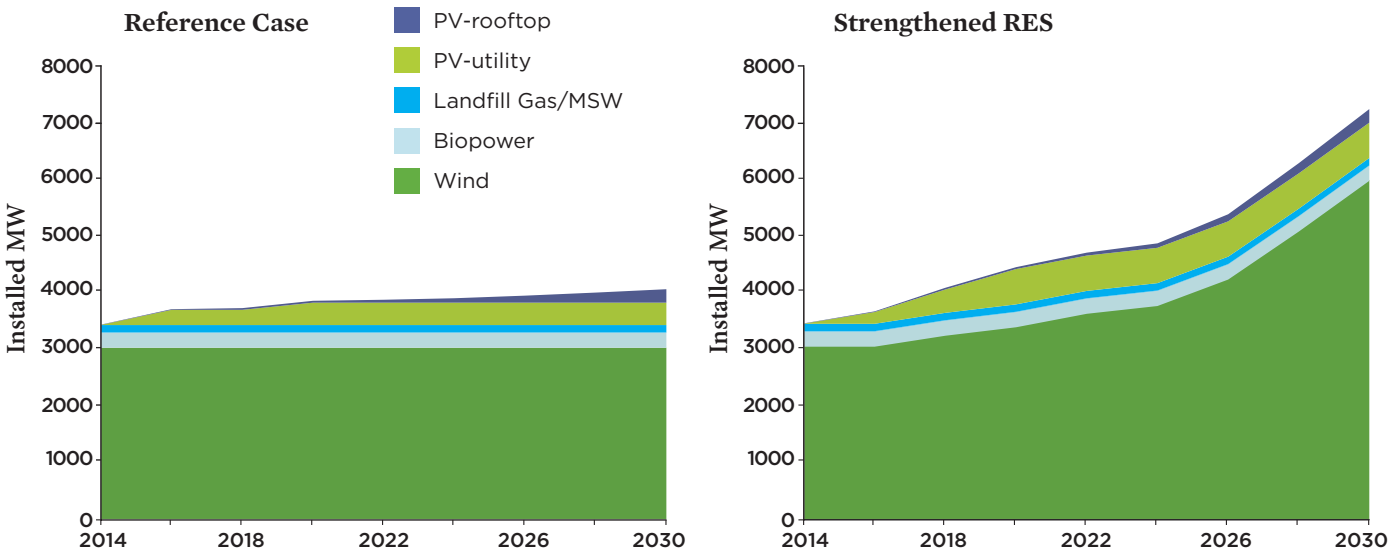
As utilities have invested in Minnesota's renewable energy resources, wind capacity in the state has more than doubled over the past seven years, reaching more than 3,000 MW in July 2014. Since 2007, this $5.6 billion in capital investment has produced more than $42 million in tax revenues to support public services (AWEA 2014; Noble 2014).[4] Owners of wind facilities also pay landowners almost $10 million annually for using their land (AWEA 2014).

Many of Minnesota's utilities are far ahead of the pace envisioned by the 2007 RES.

Solar energy has also begun to take off in the state. Not traditionally known for its strong solar resource, the state actually receives roughly the equivalent amount of sun (or solar radiation) as Houston, TX (MDOC 2012). Minnesota now has more than 14 MW of installed solar energy capacity—86 percent of which has come online since 2010 (Melville, Steichen, and Kaiser 2014). And thanks to the state's new requirement for utilities to produce 1.5 percent of their power from solar by 2020, investments in solar capacity are projected to reach more than 400 MW (Melville, Steichen, and Kaiser 2014). Xcel Energy recently took a big step in that direction when it

4 *In lieu of property taxes, the state imposes an energy production tax of 0.12¢ per kilowatt-hour (kWh) on electricity produced at large wind energy facilities. Counties with wind facilities receive roughly 80 percent of revenues from that tax, while cities and townships receive about 20 percent.*

FIGURE 2. How a Strengthened RES Would Drive Renewable Energy in Minnesota



Without a strengthened RES, development of renewable energy in Minnesota largely stagnates after 2020. However, under an RES of 40 percent by 2030, wind capacity almost doubles to nearly 6,000 MW, while utility-scale solar photovoltaic (PV) capacity rises to more than 600 MW—an increase of 56 percent over the Reference case. Landfill gas/MSW refers to gas captured from municipal solid waste or electricity generated from trash incineration.

signed contracts for more than 180 MW of solar energy in October 2014 (Shaffer 2014).[5]

Continued development of renewable energy would enable Minnesota to significantly bolster state and local economies. Our analysis shows that the deployment of renewable energy continues steadily through 2030 under the Strengthened RES case, while remaining virtually flat after 2016 under the Reference case (Figure 2).

Specifically, wind power capacity almost doubles—from 3,039 MW to 5,947 MW—under the Strengthened RES case. Utility-scale solar also shows impressive growth, rising to more than 600 MW in 2030—56 percent more growth than that spurred by the state's 1.5 percent solar standard alone.

The need to develop more renewable energy to achieve the strengthened RES drives some $6.2 billion in new capital investments through 2030—above and beyond those that would occur under the Reference case (see the table).[6] By 2030, tax payments from expanded renewable energy generation would yield more than $14 million annually for local governments. What's more, local contractors who operate and maintain these facilities would receive more than $150 million annually, while landowners would collect almost $9 million each year in lease payments from wind project owners, according to our analysis (AWEA 2014).

The economic benefits of renewable energy development would accrue across Minnesota, but rural communities would particularly gain. Investments in renewable energy already strengthen rural areas: Minnesota's southern region now has the second-highest number of clean energy jobs in the state. And the southwestern region, which has the highest concentration of renewable electricity facilities, has seen the fastest growth in clean energy employment over the past 15 years (MDEED 2014).

This growth is due largely to investments in the region's robust wind energy resource. For example, developers invested nearly $320 million in the Odell Wind Farm, which spans four counties in southwest Minnesota. Local landowners will reap more than $1 million annually in lease payments from this

5 *Xcel Energy is now seeking approval of these contracts from the Minnesota Public Utilities Commission.*

6 *Investment estimates are in undiscounted 2013 dollars. We assume capital costs for wind power of $2,280 per kW of installed capacity in 2010, which decline to $1,969 in 2020 and remain constant after that. Capital costs for utility-scale solar start at $1,925 per installed kW in 2020, declining to $1,604 in 2030. We also assume annual operation and maintenance costs of $51.82 per kW of installed wind capacity and $16.30 per kW of installed utility-scale solar.*

development, which will also contribute $850,000 in taxes and $40,000 in local expenditures each year (Geronimo n.d.).

Given Minnesota's commitment to renewable energy, rural communities will continue to reap the economic benefits of such investments. And strengthening Minnesota's commitment to clean energy would bring even greater economic benefits across the state from capital investments, job creation, tax receipts, and payments to landholders who host renewable energy facilities.

A Cost-effective Clean Energy Transition

Compliance with Minnesota's existing RES has already been affordable. The state's three largest utilities, representing more than 80 percent of Minnesota's retail electricity sales, reported little impact on rates as a result of their renewable energy investments through 2012 (MPUC 2012). Several utilities even reported savings in some years, particularly when natural gas prices spiked (Heeter 2014).

Our analysis shows that Minnesota can continue its commitment to renewable energy with essentially no impact on average retail electricity rates (Figure 3, p. 6).[7] Under the Strengthened RES case, regional retail rates across all customer classes—residential, commercial, and industrial—average just 0.2 percent (about two-tenths of 1 percent) higher annually through 2030.

The cumulative added cost of a strengthened RES through 2030 is less than 0.2 percent of the state's total expenditures on electricity—or about 12¢ per month for the typical Minnesota household.[8]

> ***Because wind and solar facilities have no ongoing fuel costs, their cost advantages improve over their lifespan—typically 20 to 25 years—as the prices of fossil fuels rise over time.***

The cost-effectiveness of the strengthened RES is due largely to continued declines in the cost of wind and solar power even as the costs of other power sources—particularly fossil fuels—continue to rise. The cost of wind energy dropped more than 60 percent from 2009 to 2013 (Wiser and Bolinger 2014). Solar costs have also declined dramatically—by 40 percent from 2008 to 2012, and another 15 percent in 2013 (Barbose, Weaver, and Darghouth 2014). Because wind and solar facilities have no ongoing fuel costs, their cost advantages improve over their lifespan—typically 20 to 25 years—as the prices of fossil fuels rise over time.[9]

By strengthening its RES, Minnesota can reap the economic, public health, and environmental benefits that investing in more renewable energy delivers while keeping rates affordable.

Additional Investments in Clean Energy under a Strengthened RES (in 2013 dollars, Undiscounted)

Technology	Capacity Installed to Meet a Strengthened RES (MW)	Capital Investment through 2030 (Millions)	Annual Expenditures on Operation and Maintenance in 2030 (Millions)
Wind Farms	2,908	$5,725	$151
Utility-scale Solar PV	223	$428	$4
Totals	3,131	$6,153	$155

Greater deployment of renewable energy under the Strengthened RES case would provide a significant economic boost for Minnesota communities. The stronger RES spurs developers to invest $6.2 billion in more than 3,000 MW of new renewable energy capacity by 2030. Annual operation and maintenance of these renewable energy facilities yields another $155 million in additional local spending that year.

7 *The ReEDS model calculates average retail electricity rates in national census regions. Minnesota's region also includes Iowa, Kansas, Missouri, Nebraska, North Dakota, and South Dakota.*

8 *We assume typical household electricity use of 600 kWh per month, and use a discount rate of 5.7 percent to calculate the net present value of electricity expenditures in 2013 dollars.*

9 *Despite recent declines in the price of natural gas, industry and government projections predict rising fossil fuel prices over the coming decades. For this analysis we used fuel cost projections from the U.S. Energy Information Administration.*

Boosting Energy Independence with a Cleaner Electricity Portfolio

Minnesota has historically been a net importer of electricity, meaning that the state's power plants do not provide enough electricity to meet the state's demand (EIA 2014b). A significant portion of electricity imports used to make up the difference come from coal-heavy states such as North Dakota and South Dakota. In fact, North Dakota sends about half of its coal-generated electricity to Minnesota (Lyderson 2014).

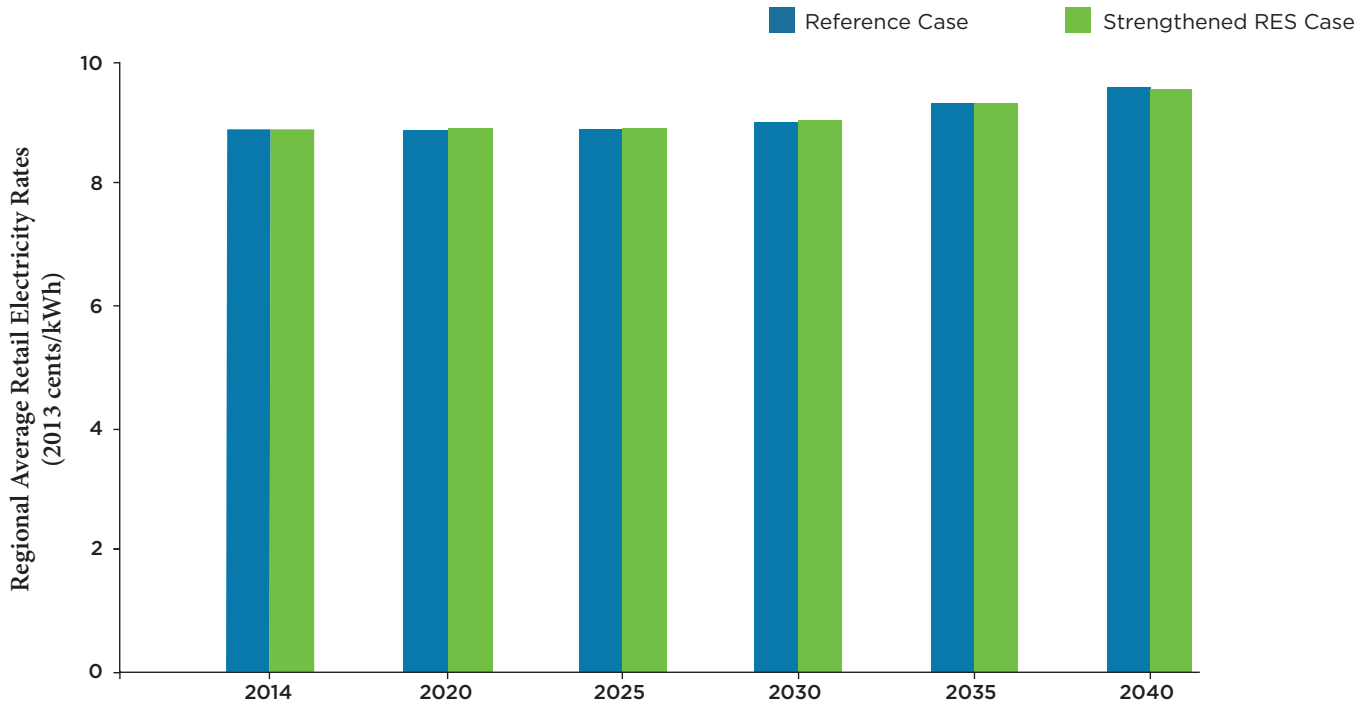
In contrast, the majority of renewable energy used to meet the 2007 RES comes from in-state resources, helping to reduce the state's reliance on electricity imports. This shift has a variety of benefits, including keeping Minnesota dollars local and reducing the state's dependence on fossil fuels.

Strengthening Minnesota's RES to 40 percent renewable energy by 2030 significantly reduces the state's reliance on out-of-state imports while broadening the state's electricity generation mix (Figure 4). Under the Strengthened RES case, Minnesota's wind energy generation increases more than 110 percent from 2020 to 2030, compared with just 15 percent under the Reference case. This increase under the strengthened RES means that wind power provides nearly 31 percent of Minnesota's electricity demand in 2030.

The combination of Minnesota's current 1.5 percent solar standard and the strengthened RES also leads to a significant increase in utility-scale solar to meet electricity demand. By 2030, utility-scale solar generation under the Strengthened RES case fulfills 1.3 percent of the state's electricity demand, compared with 0.8 percent under the Reference case.[10]

This growth in renewable energy helps Minnesota reduce its reliance on electricity imports from out of state. Under the Strengthened RES case, electricity imports decline each year compared with the Reference case, and by 2030 Minnesota is a net exporter of electricity.

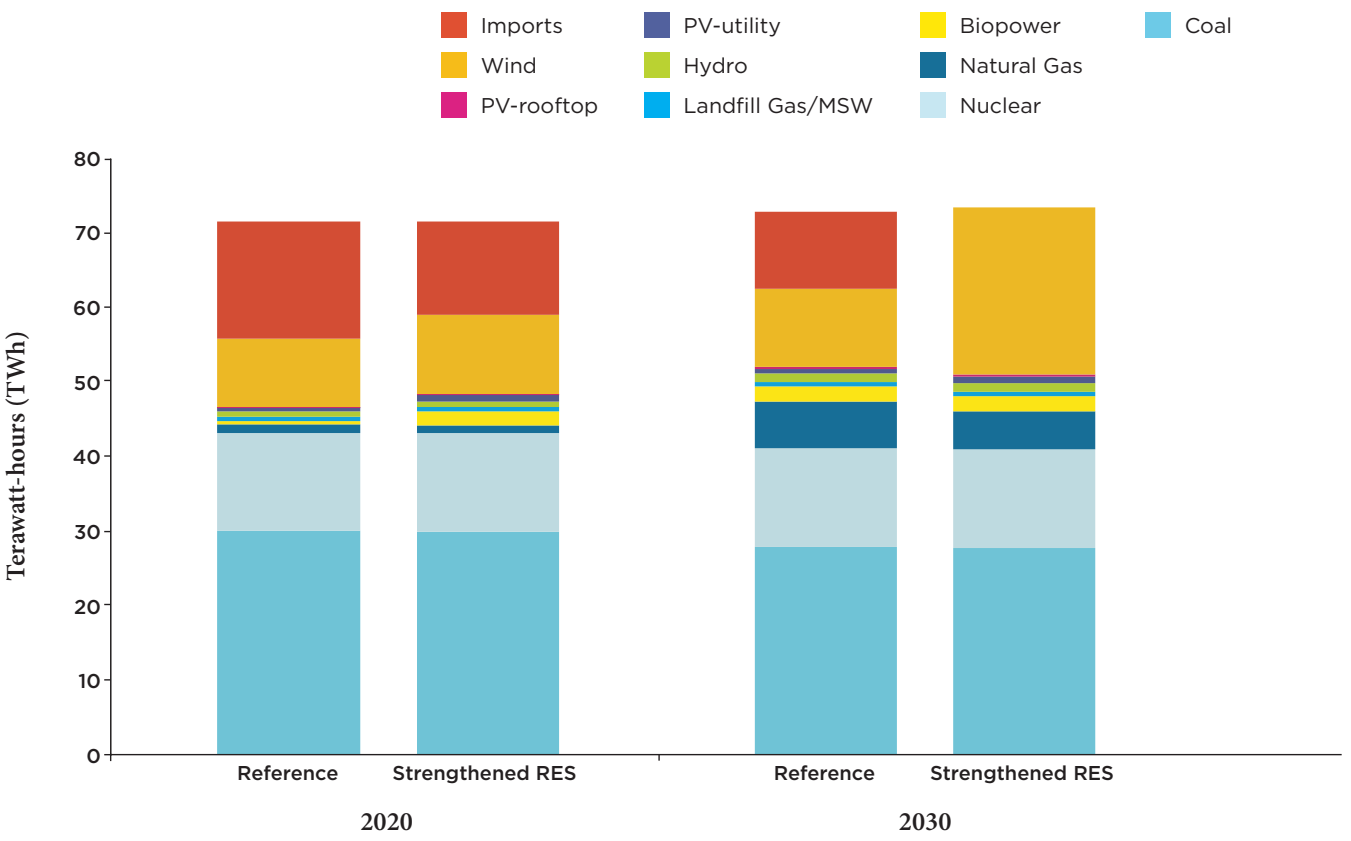
FIGURE 3. A Strengthened RES Has a Minimal Impact on Electricity Rates



Minnesota can achieve an RES of 40 percent by 2030 while keeping electricity rates affordable for consumers, according to our modeling. Electricity prices are virtually the same under the Reference case and the Strengthened RES case. This occurs because the costs of renewable energy continue to decline even as those of other options rise.

10 *The remainder of the 40 percent by 2030 RES is met with a combination of biomass, small-scale distributed solar systems, and out-of-state renewable energy resources. Small-scale distributed solar systems also help investor-owned utilities meet the remainder of state's 1.5 percent solar standard. Utilities must obtain 10 percent of the required amount of solar from small systems with a capacity of fewer than 20 kW.*

FIGURE 4. Renewable Energy Diversifies the Electricity Mix While Reducing Imports



By strengthening its commitment to renewable energy, the state can continue to diversify its electricity mix while curbing dependence on natural gas and out-of-state resources. Landfill gas/MSW refers to gas captured from municipal solid waste or electricity generated from trash incineration.

Ramping up renewable energy would also help the state reduce its growing reliance on natural gas, with its attendant economic and climate risks. The use of natural gas to produce electricity in Minnesota rose by 250 percent from 2000 to 2010 (MDOC 2012). While natural gas still accounts for a modest share of the state's electricity generation, further increasing reliance on that resource is risky. Limits on the gas pipeline infrastructure could curb its supply and raise its cost (MDOC 2012). Natural gas prices also have a history of volatility, putting consumers at risk (EIA 2014c).

Under the Strengthened RES case, natural gas generation in Minnesota is 17 percent lower than under the Reference case. By reducing its dependence on natural gas, Minnesota's renewable energy provides a valuable hedge against rising and potentially volatile natural gas prices.

Our analysis also shows that Minnesota can maintain a sufficient electricity supply every hour of the year while achieving an RES of 40 percent by 2030. These findings complement those of a study performed by GE Energy Consulting and overseen by the Minnesota Department of Commerce—with input from various stakeholders, including

Strengthening Minnesota's RES to 40 percent renewable energy by 2030 significantly reduces the state's reliance on out-of-state imports while broadening the state's electricity.

utilities, transmission operators, and government agencies—of the feasibility of deriving 40 percent of the state's electricity mix from renewables while maintaining reliability. That study confirms that the region's transmission system is robust enough to ensure the reliable delivery of electricity to Minnesota consumers under such a standard. The report concludes that under an RES of 40 percent by 2030, and given minimal upgrades to the region's transmission system, "the system can be successfully operated for all hours of the year with no un-served load, no reserve violations and minimal curtailment of renewable energy" (MDOC 2014).

Curbing Minnesota's Coal Dependence

While Minnesota has made significant progress in reducing its reliance on coal-fired electricity, coal continues to account for more than 40 percent of the state's generation, with impacts on the state's economy, public health, and the environment:

- **An economic drain on Minnesota.** The state's power producers used nearly $2.5 billion in ratepayer funds—an average of almost $450 million each year—to import coal from other states from 2008 to 2012 (UCS 2014; EIA 2013).[11]
- **A primary source of costly air pollution.** Coal plants are responsible for more than 90 percent of the nitrous oxides (NO_X) and sulfur dioxide (SO_2) emitted by the state's electricity sector (MPCA 2013). These pollutants worsen asthma and cause chronic respiratory diseases, and also produce acid rain, harming the environment. Economists at the University of Minnesota estimate that air pollution—particularly from coal-fired power plants—costs the state $800 million annually, largely because of impacts on cardiovascular and respiratory health (MEQB 2014).
- **A significant contributor to climate change.** Coal is also the leading source of CO_2 pollution from the state's electricity sector, adding about 30 million tons to the atmosphere each year (EIA 2014b).

Flooding is just one of the negative effects of climate change brought about by coal emissions. Morehouse Park in Owatonna, MN, experienced significant flooding in June 2014.

11 Minnesota would likely have spent even more to import coal in 2012, except that the state's largest coal-fired power plant—Xcel Energy's 900-MW Sherburne County Unit 3—was offline in 2012. It restarted in October 2013.

Minnesota's climate is already getting warmer and wetter, and extreme storm events are occurring more often, because of rising levels of CO_2 in the atmosphere. The warming trend in Minnesota and other north central states since 1980 is the steepest and most intense in the continental United States (MPCA 2013).

Strong evidence shows that Minnesota is already experiencing impacts from climate change. A recent assessment highlighted more flooding, air pollution, insect-borne diseases, and extreme heat as among these effects. These changes will have lasting impacts on the state's economic vitality and public health as well as native ecosystems. Damages in Minnesota related to climate change are now estimated to exceed $1.2 billion annually (MDOH 2014).

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Because of these impacts, regulatory and political momentum to reduce global warming emissions—especially from Minnesota's fleet of coal-fired power plants—is growing. When the legislature enacted the state's current RES in 2007, it also established long-term goals for reducing carbon emissions. And in July 2014, Governor Mark Dayton challenged business and energy policy leaders to develop a plan to eliminate coal from Minnesota's energy mix.

From 2014 to 2030, under both the Reference and Strengthened RES cases, Minnesota's coal-based generation decreases by about 15 percent, as some 880 MW of the state's dirtiest and least-efficient coal plants go out of service. This drop occurs because the state's aging coal fleet is increasingly uncompetitive compared with renewable energy and natural gas, especially as regulators require stronger pollution control measures to protect public health (Cleetus et al. 2012).

However, in-state coal generation continues to provide 38 percent of Minnesota's electricity in 2030 under both scenarios.[12] The remaining plants produce nearly 30 million tons of CO_2 emissions—essentially unchanged from today's levels. Thus coal generation will continue to dominate Minnesota's power supply and emissions profile. Significantly reducing those emissions will take broader policy action beyond a strengthened RES.

One such policy is the first-ever limit on CO_2 emissions from existing U.S. power plants, recently proposed by the U.S. Environmental Protection Agency (EPA). The EPA's Clean Power Plan would cut carbon emissions from existing power plants by 30 percent below 2005 levels by 2030. Set to be finalized in 2015, the plan establishes state-specific targets for reducing CO_2 emissions, and requires states to craft compliance plans. The EPA's draft rule gives states broad flexibility in achieving the required cuts by improving the efficiency of coal plants, producing more electricity from natural gas, tapping renewable energy resources, and investing in energy efficiency. The proposed rule also encourages states to reduce compliance costs through multi-state partnerships.

While not leading directly to significant coal plant retirements or deep cuts in Minnesota's CO_2 emissions, a strengthened RES is a critical component of a clean energy future for the state. Under the EPA's formula for measuring compliance with its proposed CO_2 reduction targets, the increased renewable energy generation from a RES of 40 percent by 2030, combined with already planned coal plant retirements and a strong commitment to energy efficiency, positions Minnesota to comply with the proposed rule and potentially go even further in cost-effectively reducing CO_2 emissions. Expanded renewable energy generation will also help replace electricity from coal-fired power plants that may retire or reduce output to enable the state to fully comply with the EPA's targets.

Generating more electricity from renewable energy also allows Minnesota to minimize less attractive options for reducing CO_2 emissions, such as an overreliance on natural gas or costly investments to upgrade older power plants. In sum, by increasing its commitment to renewable energy, Minnesota will have more flexibility in crafting a cost-effective plan to significantly reduce CO_2 emissions while maintaining a robust in-state electricity supply.

12 *Because the coal plants retiring under both cases are Minnesota's dirtiest, SO_2 emissions decline by about 43 percent and NO_x emissions by about 11 percent. However, the overall amount of electricity produced from coal—and therefore CO_2 emissions—remain largely unchanged because Minnesota's remaining coal plants operate more frequently to offset the lost generation from plants taken out of service.*

BOX 2.

Efficiency and Renewables: A One-Two Punch for a Clean Energy Future

Improving the energy efficiency of homes and businesses is one of the quickest and most affordable ways to reduce dependence on fossil fuels. Combining energy efficiency with greater investments in renewable energy makes a powerful and sensible one-two punch as Minnesota transitions to a clean energy future.

Minnesota has a long history of policies that support energy efficiency, complementing its strong track record on renewable energy. As far back as 1980, the state's Conservation Improvement Program required utilities to design and implement cost-effective programs for improving customers' energy efficiency. These efforts culminated in a 2007 law that requires utilities to use such programs to reduce electricity use by 1.5 percent each year. Known as an energy efficiency resource standard, the law includes a robust test requiring the programs to be cost-effective for participants, ratepayers, and utilities.

As of 2012, investor-owned utilities in Minnesota were either fully complying with or exceeding this standard. In so doing, they avoided the need for some 2,000 MW of new generation capacity while also avoiding 70 million tons of CO_2 emissions from 1998 to 2010 (CEE 2013). And these emissions reductions have come at a net savings, meaning that investing in energy efficiency is cheaper than generating the equivalent amount of electricity (CEE 2013). Energy efficiency programs also create jobs: more than 60 percent of people employed in Minnesota's clean energy sectors—9,600 of 15,000—work in the energy efficiency sector (Melville et al. 2014).

Raising the state's energy efficiency standard from 1.5 percent to 2 percent—subject to the same cost-effectiveness test—would bolster Minnesota's position as a regional leader in energy efficiency and drive added cost-effective investments in this important resource. By combining a strong RES with an equally strong energy efficiency standard, Minnesota will be well on its way to a truly clean, reliable, and sustainable energy future.

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In 2012, after making significant energy efficiency improvements, the First Unitarian Society in Minneapolis, MN, won the ENERGY STAR Battle of the Buildings competition in the House of Worship category. Many of the improvements were made with little or no cost to the congregation.

Conclusions and Policy Recommendations

Given the success so far of the state's transition to clean energy and the results of our analysis, Minnesota should strengthen its RES to 40 percent by 2030. This path offers significant economic, health, and environmental benefits while diversifying the state's electricity mix, keeping rates affordable, and positioning the state to cost-effectively achieve significant reductions in CO_2 emissions from the power sector.

Minnesota should also pursue several complementary actions to ensure a swift transition to a low-carbon, clean energy economy:

- **Develop a strong plan for implementing the state's component of the EPA's Clean Power Plan.** In so doing, the state should prioritize renewable energy and energy efficiency to maximize cost-effective CO_2 reductions. Multistate partnerships to achieve those reductions—which the EPA's plan encourages—can make those efforts even more cost effective, and the state should explore them.
- **Strengthen the state's commitment to energy efficiency.** Minnesota should require utilities to reduce electricity demand by 2 percent annually by 2020—ramping up from the state's current energy efficiency resource

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In 2012, Gibbs Dairy, in southeastern Minnesota, installed 166 solar panels that are expected to supply the farm with 30 percent of its electricity needs annually.

standard of 1.5 percent. This will hasten Minnesota's transition to a clean energy economy and make it even more affordable (Box 2).

- **Continue developing a plan for going beyond 40 percent renewable energy by 2030.** Identifying investments that will ensure reliable transmission and distribution of electricity while enabling even more renewable energy will position the state to continue its transition to a truly clean and sustainable energy future.

Minnesota is well-poised to retain its national leadership in clean energy development. With appropriate policies, robust planning, and committed leaders, Minnesota's energy future is bright.

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