

Wind Turbine Facts



[Austin Gae](#)

Research Associate, Energy, Climate, and Environment

Austin is a Research Associate in the Center for Energy, Climate, and Environment at The Heritage Foundation.

KEY TAKEAWAYS

For every megawatt of power capacity, a natural gas power plant requires about 1 ton of critical minerals, while...onshore wind plants require 11 tons.

Because the wind does not always blow, these turbines are running at maximum power only about 35% of the time. That is low compared with nuclear power plants.

Politicians need to reconsider support for environmentally damaging, unreliable wind power.

As swimmers enjoy the beach this summer, massive chunks of debris, including sharp fiberglass shards, have been washing ashore on the once-pristine coast of Nantucket island, Massachusetts. The culprit? A single damaged turbine blade that broke off at a nearby wind farm.

It's not the first time this has happened, and it won't be the last.

This fiasco highlights not only the physical hazards posed by wind turbines, but also their environmentally irresponsible and unreliable nature as an energy source—despite the Biden administration’s vigorous support of wind power.

Onshore wind farms require eight times the amount of critical minerals as natural gas power plants do. Offshore wind farms require 13 times as much. The staggering quantities of such materials, such as copper and rare earth metals, are environmentally damaging. Mining is vital for economic progress, but the excessive extraction required for wind turbines is out of proportion to the energy produced.

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Consider that for every megawatt of power capacity, a natural gas power plant requires about 1 ton of critical minerals, while a nuclear power plant needs 6 tons. In contrast, onshore wind plants require 11 tons, and offshore wind demands 17 tons of critical minerals—for the same megawatt of energy output.

Wind energy requires vast expanses of land. According to a study by the Breakthrough Institute, wind energy takes about 30,000 acres per terawatt-hour of electricity generation annually, whereas nuclear energy uses 18 acres. Moreover, wind energy takes six times as much space as a natural gas power plant.

The biggest U.S. onshore wind farm—the Alta Wind Energy Center—generates an estimated 3.29 TWh per year with its 582 wind turbines. But the biggest Palo Verde nuclear power plant generates 33.7 TWh annually—more than 10 times as much.

In addition, wind turbines have a disposal problem. Although some components can be recycled, used wind blades that do not fall into the sea are usually thrown into landfills. The blades, which are built for durability, use materials that are difficult to separate and recycle. As a result, the United States is projected to have about one-fifth of the world’s blade waste of over 47 million tons by 2050.

Wind turbines kill over 1 million birds a year, according to the American Bird Conservancy, and hundreds of thousands of bats, crucial in pest control. Offshore wind companies, such as Atlantic Shores and Orsted’s Ocean Winds, request permission in their environmental impact statements to harm whales, dolphins, seals and porpoises through sound waves produced.

Even if the U.S. managed to solve all these problems, one fundamental weakness will persist: the unreliability of wind power. Because the wind does not always blow, these turbines are running at maximum power only about 35% of the time. That is low compared with nuclear power plants with a capacity factor of 93% and natural gas power plants built since 2010, which run 64% of the time.

Because the wind doesn’t always blow, wind turbines disregard the fundamental principle of our grids: The supply of electricity must meet demand in real time. On calm days, wind

might generate unnecessary power; and during peak usage periods, turbines might generate nothing. When the wind stops, smaller, less-efficient natural gas power plants kick in, increasing capital investment and electricity costs.

>>> [Biden's Hypocrisy on Climate Change Is Painfully Obvious](#)

Wind energy also lacks the versatility of natural gas and oil. While natural gas and oil are integral to a wide range of applications including electricity generation, heating and transportation, wind energy is confined to only electricity generation.

Despite wind's disadvantages, it is heavily subsidized. Renewable energy sources, including wind energy, will receive an estimated \$425 billion in subsidies between 2023 and 2033 in addition to about \$200 billion in other green energy subsidies.

These subsidies are essential to wind power. In a study published on Joule, wind plants were found to have a significant decline in performance in their 10th year, just as they lose their eligibility for the production tax credit.

On a state level, wind energy has benefited immensely from renewable portfolio standards, which require a share of electricity sales to come from renewable energy sources. California aims to obtain 60% of its electricity from renewables by 2030 and 100% by 2045—although it hasn't ruled out purchasing power made by legacy fuels from other states.

Far less wind power would be built if subsidies, credits and mandates were removed. Politicians need to reconsider support for environmentally damaging, unreliable wind power.

Swimmers in Nantucket will thank them.

This piece originally appeared in The Washington Times

Retrieved November 27, 2024 from [Wind Turbines: Not Green, Not Reliable | The Heritage Foundation](#)

Harvard Study Finds Wind Turbines Will Cause More Warming In Minnesota Than

Emissions Reductions Would Avert

Written by [Isaac Orr](#) | October 6, 2020

A [2018 study](#) conducted by scientists from Harvard, published in the academic journal *Joule*, found that wind turbines cause significant local increases in surface temperatures in the areas where they are located. Wind turbines cause local temperature increases at the surface of the earth by causing air to mix throughout portions of the atmosphere, and Minnesota would be one of the states impacted most by this phenomenon.

Warming Wind Turbines

According to the study, wind turbines measuring between 100 and 150 meters (328ft to 498 ft) operating at night can pull down warmer air from as far as 1,640 feet in the air down to the surface, warming the surface of the earth, where it would impact the people, plants, and animals living near the turbines.

The study looks at what would happen if the United States tried to obtain all of its energy from wind turbines. It found the mixing of warmer air and cooler air results in a temperature increase of 0.54 degrees Celsius (0.97 degrees F) in the areas where the wind turbines would be located, as you can see in the figure below from the study. The amount of warming experienced in some regions would be even greater, as Southwestern Minnesota could see a temperature increase of 0.6-0.8 degrees C due to wind turbines, while Northeastern Minnesota would see an increase of 0.3-0.5 degrees C.

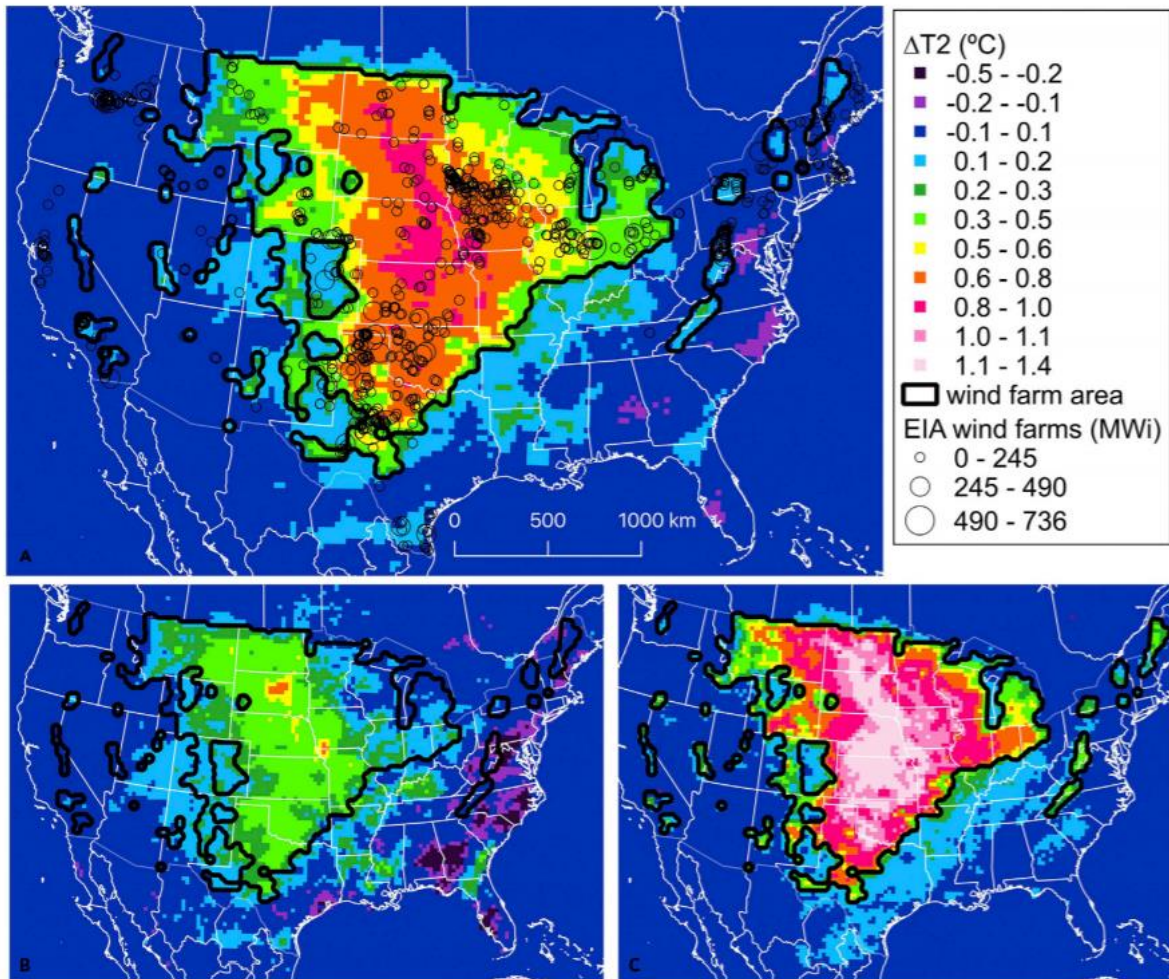


Figure 1. Temperature Response to Benchmark Wind Power Deployment (0.5 MW km⁻²)
 (A–C) Maps are 3-year mean of perturbed minus 3-year mean of control for 2-m air temperatures, showing (A) entire period, (B) daytime, and (C) nighttime. The wind farm region is outlined in black, and, for reference, presently operational wind farms are shown as open circles in (A).

Most of the warming would occur at night, according to the study:

“The wind farm region experiences warmer average temperatures (Figure 1A), with about twice the warming effect at night compared with during the day (Figures 1B and 1C). Warming was generally stronger nearer to the center of the wind farm region.”

All Energy Sources Have Impacts

This study is interesting because it acknowledges that all energy sources, whether they be coal, natural gas, wind or solar have environmental impacts. It seems to be one of the few studies that attempts to evaluate the costs of wind turbines, along with their supposed benefits, and use this cost/benefit to figure out which sources of energy have the fewest environmental

impacts. The authors claim this will be important when discussing which carbon-free sources of electricity will be used in the future, but I believe it informs our current energy decisions,.

According to the study:

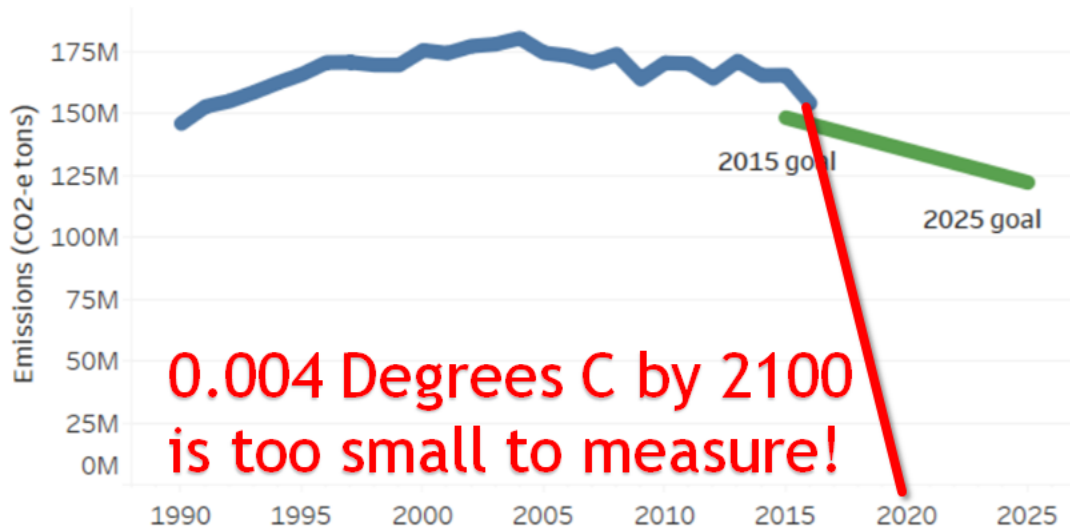
“The climatic impacts differ in (at least) two important dimensions. First, the direct climatic impact of wind power is immediate but would disappear if the turbines were removed, while the climatic benefits of reducing emissions grows with the cumulative reduction in emissions and persists for millennia. Second, the direct climatic impacts of wind power are predominantly local to the wind farm region, while the benefits of reduced emissions are global.”

In other words, **the warming impact of wind turbines is immediate, and highly localized** in the areas that are the “hosts” to the installations. The supposed benefits of reducing carbon dioxide emissions are global, not local. This means places like Minnesota will see an increase in temperature from wind turbines that exceeds amount of potential future global warming that would be averted from completely reducing Minnesota’s greenhouse gas emissions to zero.

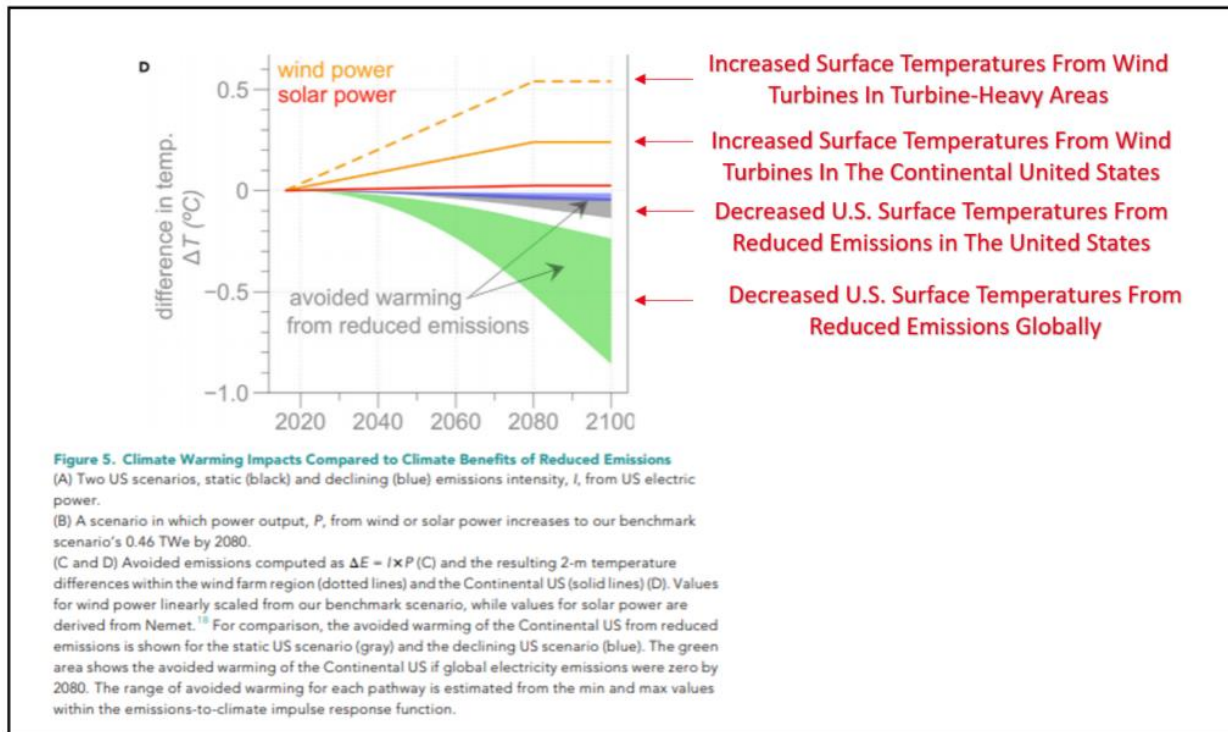
Minnesota Emissions Reductions

According to the Minnesota Pollution Control Agency, Minnesota emitted about 150 million metric tons of greenhouse gases in 2016. Using [the same logic](#) used by the Obama Administration to craft the Clean Power Plan, if we completely eliminated all of these emissions to zero, it would avert only 0.004 degrees C by 2100, which is an amount far too small to measure!

Figure 3. Minnesota's GHG emissions, 1990-2016, compared to the 2015 and 2025 goals of the Next Generation Energy Act. Although emissions are decreasing, we did not meet the 2015 emissions reduction goal.



In fact, the amount of global warming averted (0.004 degrees C) would be 138 times smaller than the warming Minnesota would incur from building out wind turbines to power all of our electricity use (0.54 degrees C), as you can see in Figure 5(d) from the study below.



The orange dotted line shows surface temperature increases in the areas with wind turbines, and the orange solid line shows the temperature impact of wind turbines on the entire continental United States. The blue and grey shaded areas show the differences in surface temperatures in the United States from reducing our national emissions.

As you can see, surface temperatures in the United States increase more due to wind turbines mixing air in the atmosphere than would be offset by reducing emissions. This is especially true in areas like Minnesota, where the wind turbines would be operating.

The only time that reduced emissions might impact surface temperatures more than the wind turbines, themselves, is if the entire world reduces their carbon dioxide emissions, but [if you believe](#) China will actually reduce their emissions, I've got a bridge to sell you.

Conclusion

In light of this study, it makes zero sense to build wind in Minnesota if our Governor truly wants to "[make sure there is still ice on that lake in January](#)," because surface temperatures will increase much more from the wind turbines than they would fall by reducing emissions. A note to the Governor, increasing surface temperatures would reduce the amount of ice on that lake in January.

Center of the American Experiment has been one of the leading organizations advocating for Minnesota to repeal its antiquated ban on new nuclear power plants. We have also been some of the strongest supporters of allowing hydroelectric power that **we already purchase** from Canada to count toward our renewable energy mandates.

If Governor Walz and liberal legislators worry about the impact of global warming on Minnesota, then they need to own up to the fact that the surface temperature impacts of wind turbines mixing air in the atmosphere will far outweigh the amount of warming that would be averted from reducing emissions and seek to legalize new nuclear, large hydro, and promote carbon capture and sequestration technologies that provide reliable electricity without carbon dioxide emissions.

In the spirit of full fairness, it should be noted that the findings of this study are based on General Circulation Models (GMS), which overestimate the amount of global warming that is observed with weather balloons and

satellites by a factor of two, so the results of this study may well be as legitimate as Governor Walz's COVID-19 models.

However, it should be noted that all of the policies renewable energy specialist interest groups try to pass in Minnesota to avert climate change are also based on GCM's, so it is highly inconsistent for them to trumpet GCM's as gospel in one instance (when it promotes something they like), and completely ignore them in another (when their findings conflict with their policy preferences).

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