

# Wind and Solar Power: Perfect When Paired in Texas

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**A**s wind and solar power generation becomes more competitive economically relative to conventional coal and natural gas generation, states will likely increase their dependence on such renewable sources. Texas gets about 19 percent of its electricity from renewables, which, though they can't be depleted, offer limited capacity to produce power at any given time.

Wind production accounted for roughly 94 percent of Texas' renewable electricity, or 75 million megawatt hours (MWh) in 2018. The total is equivalent to the electricity needed to power 7.2 million households, based on the average annual national consumption rate.

Solar generation was significantly less than wind, with 3 million MWh in 2018, but sufficient to rank Texas fifth in the U.S. in solar production by state.

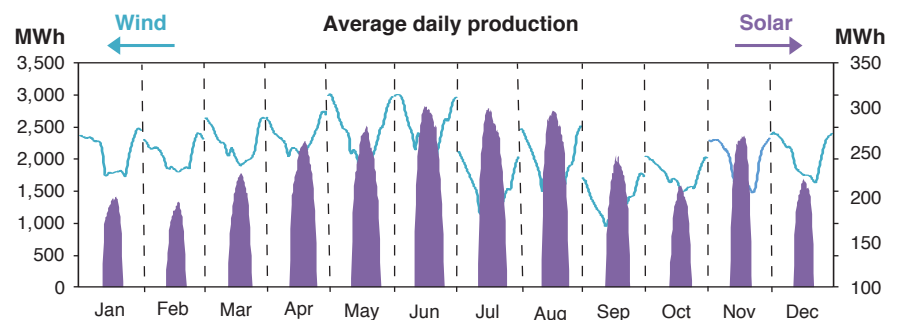
## Problem of Reliability

Simply put, wind power is generated only when it is windy; solar power requires sunny days. Businesses and residents depend on electricity regardless of the weather conditions and are accustomed to conventional sources reliably producing enough electricity to meet demand.

One way to overcome the reliability issue is to create geographically dispersed renewable electric grids. International studies have found that the electricity production of wind turbines separated by 20 miles or more is relatively unaffected by sudden weather fluctuations.<sup>1</sup> Thus, relatively small-scale weather events won't shut down larger renewable grids.

Diversity across renewable sources is also key to smoothing out power generation. Regional studies suggest that lulls in wind energy production in Texas are correlated with peaks in solar

**CHART 1** Complementary Wind, Solar Energy Help Stabilize Production



NOTE: The series depicts average daily electricity production for each month, in megawatt hours (MWh) of the ERCOT grid, in 15-minute intervals from midnight to midnight during 2018.

SOURCE: Electric Reliability Council of Texas (ERCOT).

energy production, and vice versa, on an annual and daily basis.<sup>2</sup> This is evident in the average daily patterns of production throughout the year; wind generation surges as solar generation tapers off in the evenings (*Chart 1*).

Additionally, wind and solar complement each other seasonally, with lulls in summer wind production coinciding with increases in solar production.

Because solar production in the state is much smaller in scale than wind, the peaks in solar generation at current levels only partially offset the daytime drop in wind generation. The average range in wind generation within a day was about 900 megawatts in 2018, while for solar it was about 250 megawatts. Thus, solar made up only 27 percent of the drop in wind-generated electricity.

## Renewables Stepping Up

While the combination of wind and solar shows the potential to supply the grid a consistent source of energy, the need for reliability suggests that the mix of production sources should change throughout the day.

The Electric Reliability Council of Texas, which manages 90 percent of the Texas electrical grid, estimated

that over the next 10–15 years, natural-gas-based generation will remain the primary source of electricity to the Texas grid. The council also predicts that older coal and gas facilities will be replaced by wind, solar and increasingly efficient gas power production.

Additionally, battery storage plants can augment renewable power generation, storing excess solar and wind energy and releasing it to the grid to meet periodic gaps between demand and production. A planned 495-megawatt battery storage system is expected to increase Texas' battery storage capacity fivefold, to 584 megawatts in 2021.

## Notes

<sup>1</sup> "Response to 'Burden of Proof: A Comprehensive Review of the Feasibility of 100% Renewable-Electricity Systems,'" by Tom W. Brown et al., *Renewable and Sustainable Energy Reviews*, vol. 92, September 2018, pp. 834–47, [www.sciencedirect.com/science/article/pii/S1364032118303307](http://www.sciencedirect.com/science/article/pii/S1364032118303307).

<sup>2</sup> "Assessing Solar and Wind Complementarity in Texas," by Joanna H. Slusarewicz and Daniel S. Cohan, *Renewables: Wind, Water, and Solar*, November 2018, <https://link.springer.com/article/10.1186/s40807-018-0054-3>.