Congested transmission lines cause renewable power to go to waste in Texas

Enlarge / The sun sets behind power transmission lines in Texas on July 11, 2022.

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As a massive heat dome engulfed much of Texas in 100°-plus weather throughout the second half of June, breaking temperature records throughout South and West Texas, renewable energy output also set new records. Renewable's contribution to the Texas grid reached an all-time high on June 28, when 41.6 percent of the electricity on the grid was coming from wind and solar power during peak hours.

With demand for electricity also setting a record in late June, the grid operated by the Electric Reliability Council of Texas, or ERCOT, has so far held up to the challenge. But summer is only beginning, and Texans are already enduring high electric bills.

John Nielsen-Gammon, the Texas state climatologist at Texas A&M University, said he expected the extreme heat to continue in the coming months and noted that the highest temperatures

in the eastern half of the state typically come in late July and August.

Texas consumes more energy than any other state and has also connected the most renewable energy resources to the grid, with 773 additional megawatts of solar projects added in June. Yet despite the record contributions from renewables, experts say the grid's efficiency is diminished by a strained transmission infrastructure that can't handle the full load that renewable energy can deliver.

The official notes from a June 20 ERCOT board meeting said the grid operator expects "export constraints from Panhandle, West Texas and areas of the Rio Grande Valley during high wind conditions" for the rest of the summer. That same day the meeting was taking place, Texans were being asked to conserve energy as the gap between supply and demand narrowed in the crippling heat.

"Depending on weather conditions and generation output, we could see tight grid conditions periodically this summer," a spokesperson for the grid operator told Inside Climate News. "ERCOT will continue to monitor conditions and keep Texans informed."

Ed Hirs, an energy economist and lecturer at the University of Houston, noted that more transmission lines and battery installations are coming to Texas in a flurry of new construction and will help stabilize the grid. But they "cannot come online fast enough" to replace retiring coal and natural gas plants that are near the end of their life spans or no longer profitable, he said.

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A report released last month by the nonprofit advocacy group Americans for a Clean Energy Grid gave ERCOT a D+ on transmission planning and development, a grade that was about average for the nation's regional grids but well below those

in the Midwest and California.

The report describes an “almost doubling of congestion” on the ERCOT grid from 2020 to 2021 and estimated the value of energy that could not reach Texas consumers due to crowded transmission lines in 2022 at $2.8 billion.

“Greater congestion equates to higher energy delivery costs and limits the opportunity for desired generation resources to add power to the grid,” the report said.

“Curtailment,” a constraint for renewables

Transmission lines are like the highways of an electrical grid: When energy production is high, all of the lanes fill up. When that congestion occurs, a portion of the electricity coming from renewable sources is wasted because it can’t reach businesses, households, and other consumers that need it. This is called curtailment.

Elise Caplan, vice president of regulatory affairs at the American Council for Renewable Energy, said that lines running from West Texas to population centers further east were the most congested, periodically forcing wind and solar power companies to ”stop generating even though they are fully capable of doing it.”

“If you’re not generating, you’re not getting paid for that electricity,” Caplan said.

The economic burden on solar and wind industries could get worse before it gets better. In Texas, up to 5 percent of renewable generation is currently curtailed, according to a 2022 study by the Energy Systems Integration Group that used ERCOT’s own data analysis, but 20 to 28 percent could be curtailed by 2030.

Despite the shortage in transmission capacity, the share of renewables in ERCOT’s fuel mix has been steadily rising over the past decade as coal’s contribution has gone down and natural gas and nuclear have remained relatively steady.

On June 28, when wind and solar generation set a new record, Joshua Rhodes, a research scientist at the University of Texas at Austin and nonresident fellow at Columbia University, pointed out on Twitter that the record could have been even higher if not for limited transmission capacity.

Although real-time curtailment data is hard to come by, Rhodes said in an interview, he would “look for negative pricing out in West Texas” and “solar not producing as much as it’s forecasted to” as indicators that operators are curtailing renewable energy.

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