Impact of increased wind resources in the ERCOT region

Since 2000, installed wind capacity in the ERCOT region has increased from just over 100 MW to more than 22,000 MW as of July 2019. West Texas has the largest amount of installed wind capacity in the ERCOT region – 12,000 MW – and the remaining capacity is spread across the Panhandle (4,000 MW), coastal (2,800 MW), north (1,500 MW) and south (1,800 MW) load zones. There is nearly 80,000 MW of installed capacity in ERCOT.

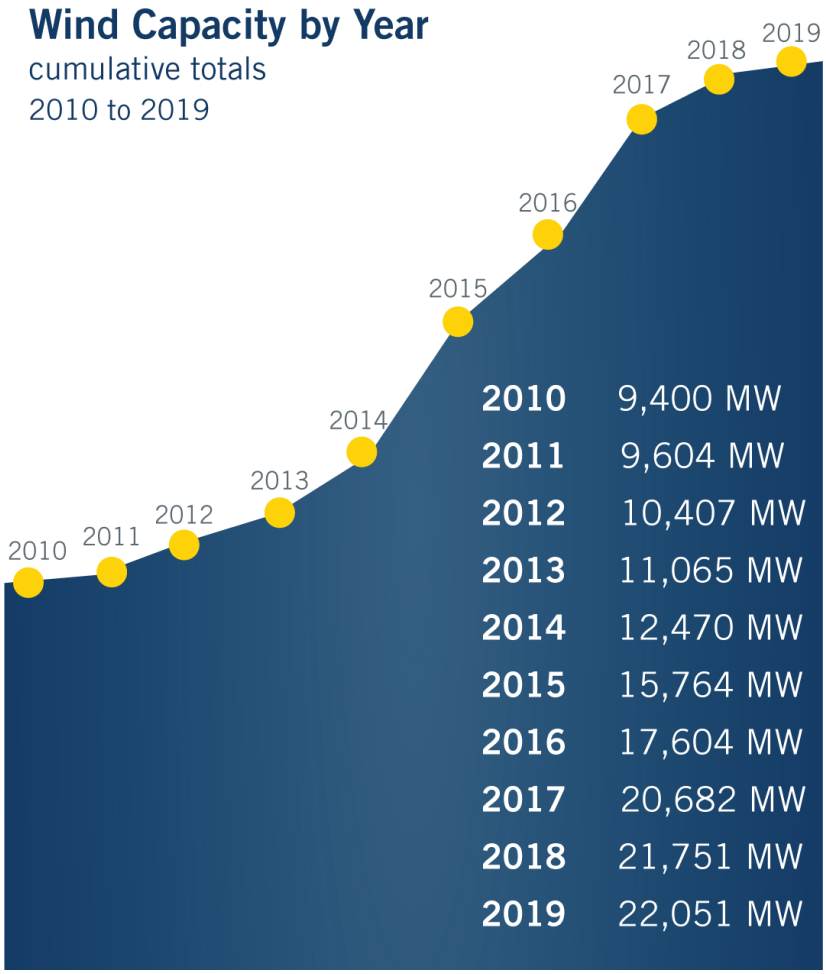
Wind records (as of July 2019)**:**

- **Instantaneous wind record** – 19,672 MW on Jan. 21, 2019 at 7:19 p.m.
- **Wind penetration record** – 56% on Jan. 19, 2019 at 3:10 a.m.

New challenges and opportunities

The changing resource mix in the ERCOT region has presented unique challenges for grid operators. In response, ERCOT has evolved its technical requirements and market rules, as well as developed new analytical and monitoring tools, to manage a diverse resource mix while maintaining system reliability and market efficiency.

The grid operator procures operational reserves called Ancillary Services to ensure reserve capacity is available to address variability that cannot be covered by the five-minute energy market. ERCOT continues to focus on evolving its Ancillary Services to ensure the grid operator remains efficient, technology-neutral and takes advantage of the capabilities of newer resources.



Renewable forecasting accuracy improves with new tools and increased experience

With a significant amount of renewable power in the ERCOT region, the grid operator devotes considerable time and resources to continually improve the performance of both wind and solar power forecasting. Improved forecasting, in general, has the potential to reduce the amount of operational reserves needed to ensure a reliable electric system.

ERCOT currently uses two wind forecasting vendors and one solar forecast vendor to ensure the grid operators receive the most accurate forecast data. This checks-and-balances system helps improve the reliability and flexibility of the forecast process. In 2018, ERCOT also added intra-hour wind forecasting to help grid operators better prepare for potential ramps in wind generation at every five-minute interval, which aligns with ERCOT's system dispatch intervals.

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Pricing impacts in the ERCOT wholesale market

Generally speaking, system-wide prices in the ERCOT wholesale market tend to be lower when more wind generation is being produced. When there are no reliability or operational considerations, the ERCOT market generally uses the lowest-cost resources to meet consumer demand. Since wind (and solar) resources do not incur any fuel costs when producing electricity, they typically bid into the ERCOT market at lower prices relative to other resources that must pay for the fuel used to generate power.

For wind developers, federal tax credits also are a contributing factor, even allowing the wind resources to make offers at negative prices. However, low and/or negative bids are not limited to any particular resource, and it is not uncommon for thermal generators to submit negative prices to decrease their chances of being dispatched below their desired or capable levels.

The current ERCOT market protocol related to prices allows generators to bid as low as negative $250/MWh and as high as $9,000/MWh. Market Participants may propose changes to the existing protocol – through a Nodal Protocol Revision Request – if there is a desire to limit the prices.

Negative pricing

Market prices tend to go negative when there is low consumer demand and the thermal generators that have chosen to remain online cannot be backed down further to allow the available, lower-cost wind generation to serve consumer demand. In situations like this, some wind generators will be curtailed to balance generation with load. In these cases, since wind is the marginal generation, it sets the market price, which may be low or negative. In 2018, system-wide negative pricing occurred during 40 hours.

Wind contributions during summer peak periods

The final summer Seasonal Assessment of Resource Adequacy Report (SARA) released in May 2019 forecasts wind to contribute around 4,500 during summer peak demand periods. Wind output ranged from 3,000 MW to 6,000 MW during peak demand intervals during summer 2018.

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