



Winter storms wreak havoc on ERCOT grid

By Patrick Milligan

The severe winter weather bearing down on much of the U.S. has not spared Texas, leading to the worst blackouts the state has experienced in decades. Widespread rotating outages affecting at least 2.5 million customers started late on Sunday night (2/14/21), and as of time of publishing on mid-day Monday, have only worsened. It is possible that power may not be fully restored for at least another day, if not longer. While more information will come out in upcoming days and weeks, ICF makes the following initial observations:

- **The magnitude of supply shortage is massive:** Load shed occurs when supply cannot keep up with demand. Because of market incentives and other planning measures, when gaps occur, they are usually small. From 7am through noon (and ongoing presently) however, ERCOT has lost 20–25 GW of load¹, or around 1/3 of the system.
- **Thermal outages, rather than renewables, are the main supply gap:** Around 20 GW of generation is on outage as of mid-day. Total wind output is slightly below expectations, but the main supply issue is lack of available thermal generation (both gas and coal) due to freezing conditions.
- **The weather has caused major issues in gas markets, affecting power:** Gas production in Texas dropped at least 16% due to well freeze-offs and shutdown of processing plants due to cold weather. Spot gas prices soared to \$100–200/MMBtu, and generators without firm contracts may have difficulty sourcing adequate supply.

¹ ERCOT indicated in a notice that up to 10.5GW of load is being shed; the exact time of this reporting is unknown. However, the gap between the day-ahead load forecast and actual load being served has been as high as 25GW, and is worsening at time of publication.

- **Demand is far above the worst-case planning scenario:** ERCOT’s Extreme Peak Load scenario anticipated demand up to 67.2 GW, but the day-ahead load forecast for 8am Monday was 74.5 GW. ERCOT’s Extreme Peak forecast was based on 2011 winter weather, which resulted in emergency operations but not widespread load shedding.

A comparison of the current situation vs ERCOT’s expectations for winter are shown below.

Capacity, GW	Expected Forecast	Extreme/Contingency Forecast	Actual Conditions (8am CST 2/15/21)
Peak Load	57.7	67.2	74.5
Resource Outages	8.6	14.0	26.6
Wind Output	7.1	1.8	4.5
Solar Output	0.3	[0]	0
Total Generating Capacity	73.1	68.6	53.4
Remaining Reserve Capacity	16.2	1.4	-21.1
Operational Conclusion	Normal operations	Emergency measures	Widespread outages

Source for values under Expected and Extreme Forecasts: ERCOT SARA Winter 2020/21. Notes: No contingency forecast given for solar. ERCOT’s worst combined contingency forecast uses high demand and high outage, but no adjustment for wind (wind contingency is shown as a separate case). Total generating capacity at 8am roughly estimated as actual load plus 2 GW of operating reserves. Peak load under “actual” is the day-ahead load forecast.

The situation continues to be dynamic and ICF expects major repercussions in upcoming days. The following is a partial list of possible outcomes/consequences:

- **Power producers and/or retail electric companies could face serious losses:** Units with contracts for firm delivery of power, such as heat-rate call options (HRCOs), fixed-volume hedges or power purchase agreements (PPAs), or other obligations such as day-ahead energy or AS obligations may face massive losses if unable to generate in real time. With so many units on outage, and renewables under-producing, the exposure to real-time power may be much higher than usual. Retailers with exposure to spot power prices could also face major losses.
- **Some power generators may earn very high returns:** On the other hand, generators with merchant exposure and able to sell power could earn huge returns. Peaker net margin, an indicator of total scarcity pricing, could easily hit the \$300/kW threshold at which point the power price cap is cut from \$9,000/MWh to \$2,000/MWh.
- **The magnitude of the event could prompt structural changes in the power market:** ERCOT does not have any mechanism to enforce a minimum planning reserve margin as do most other major power markets. Partially as a result, ERCOT has had extremely low reserve margins for the past several years. Among skeptics of ERCOT’s approach, a common quip was “ERCOT is one

blackout away from a capacity market”. Such a blackout may have arrived. On the other hand, the weather is being described as unprecedented – and ERCOT estimated its winter reserve margin at 43.2%: well more than typical enforced minimums (15–20%). A capacity market may not have helped in this case.

- **At a minimum, ERCOT planning will need to change:** As shown in the preceding table, the magnitude of the forecast error was massive. While ERCOT’s forecasts are largely indicative since they lack a capacity market mechanism, nevertheless many observers reference ERCOT’s forecasts for their own planning purposes. The miss echoes recent summer blackouts in CAISO, mentioned in our whitepaper – [California's blackout signals a need for enhanced reliability planning](#), which similarly had a connection with poor planning and estimation of reserve levels.
- **Beyond ERCOT, federal policy changes may be on the table:** MISO, SPP, and other areas have also experienced blackouts amidst dangerous weather conditions. Measures targeted at grid hardening, resilience, climate adaptation, etc. may result.

ICF continues to monitor the situation and will post regular updates and further analysis.

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