

Texas Power Outages Revealed Supply Vulnerabilities¹

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Abstract

The Texas power shortages of February 2021 were caused by an extremely cold spell in a system that is customarily prepared to handle extreme hot summers but not adequately winterized. Despite attempts by some politicians to blame wind, it was mostly thermal plants that failed.

The extensive power supply shortages of mid-February in Texas and neighboring states have been the subject of much heated debate and multiple inquiries including an assessment of the events leading to the long blackouts and high prices that lasted for nearly a week. With power out for so long in so many parts of Texas, water and sewage systems could not function adding to the frustrations of millions of affected citizens left in the cold and dark for days. Once some degree of *normalcy* was restored, the extent of financial damage became apparent with a few customers on real-time price options getting utility bills in thousands of dollars they could not afford and a number of retailers and co-ops declaring bankruptcy.

Not surprisingly, there have been political ramifications for the governor, the **Public Utility Commission of Texas (PUCT)**, and the grid operator – which had to explain why there was in fact no “R” in the **Electric Reliability Council of Texas (ERCOT)**. There have been on-going debate as the lawmakers debate how best to fix what seems to be a broken system – making sure that there will be adequate supply to serve the load during future extreme weather events.

Among the options to consider there was renewed debate about the wisdom of operating the Texas grid essentially as an electric island – deliberately achieved by politicians who did not wish the Lone Star State to be governed by the bureaucrats at the **Federal Energy Regulatory Commission (FERC)** in Washington, DC. At the height of the crisis, ERCOT could not rely on neighboring states – many of whom were also suffering from power shortage of their own – to cover its shortfall.

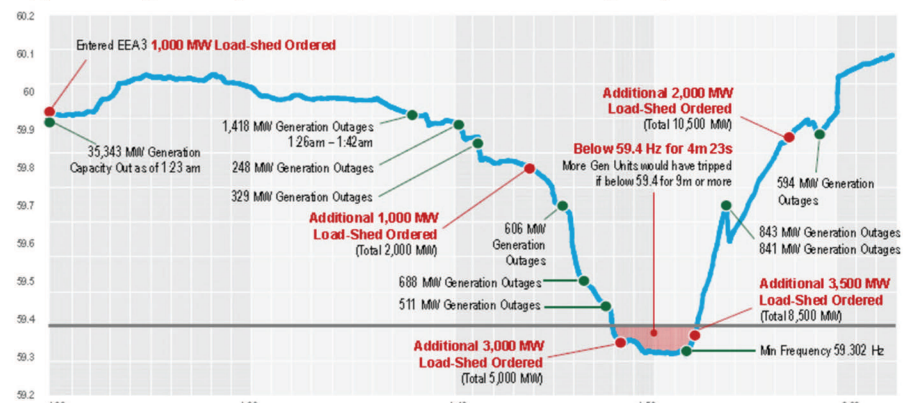
As wholesale prices spiked to the maximum allowed \$9,000/MWh and stayed there continuously for

a good part of 4 days, it became clear that **energy only markets** even with high bid prices do *not* provide sufficient incentives to generators to supply power during an unusual cold spell such as this. While generators missed the opportunity to make a bundle of money – because of equipment failures and/or inadequate gas supplies – there were no penalties for *not* supplying power when it was needed. Everyone wanted to know what kind of market is that – where generators can make heaps of money if they can deliver but suffer no consequences if they don’t? Perhaps ERCOT needs some scheme that obliges the generators and/or retailers to supply the forecasted demand – perhaps a **resource adequacy** scheme?

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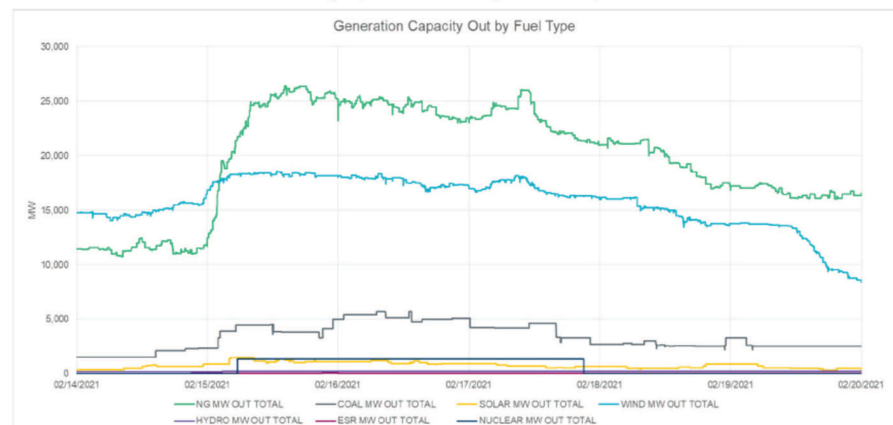
Supplies falling woefully short of demand in midst of freezing temperatures in Texas



Source: Review of Feb 2021 extreme cold weather event – ERCOT presentation, 24 Feb 2021

As it turned out, ERCOT was way off in projecting demand – mostly because such extended cold spells

Don't blame wind for the shortages; it was mostly thermal plants that failed to deliver



Source: Review of Feb 2021 extreme cold weather event – ERCOT presentation, 24 Feb 2021

are unusual in Texas. Everyone, politicians included, learned that when it gets very cold, water freezes, as does everything else that is exposed to the elements – pumps, pipes, valves, wind turbine blades, etc. And if the power to the gas supply system is cut off, no gas or cooling water can get to the power plants to make electricity. And if there is no electricity, the water supply and the sewage systems stop operating, and so on. At the height of the crisis, Texas Senator **Ted Cruz** decided that the best way to address the peoples’ suffering was to take a vacation in Cancun, Mexico. That did not go too well once his constituents learned where he was.

While a lot of technical details are being analyzed and debated, the basics boils down to not being adequately prepared for an extended cold spell of the magnitude that engulfed much of the US in mid February. Ma pats of the world routinely manage much colder temperatures for weeks without a hiccup. But Texas, one might say, is much better prepared to handle hot summers – something that happens virtually every summer – than cold winters – something that historically has happened roughly once a decade. With the increased penetration of heat pumps and other types of electrical heating, winter peaks in Texas have risen fast then the summer peaks. In fact in February 2021, the peak demand – had the system been able to meet it – would have probably exceeded 75 GW, in line with historical summer peaks.

In this context, wind turbines in Denmark and Germany continue to operate with temperatures sensors and de-icing equipment. Texas, like many of its neighboring states, *could have* – and in retrospect *should have* – made the necessary investments to *winterize* to avoid the worst of what happened. A prior cold spell in 2011 should have made this clear, but the lessons were not properly implemented.

Following the outages, Texas politicians, regulators and the grid operator have faced the fury of millions left without power and water for days. Among the vexing problems is the grid operator’s “inappropriate” pricing that cost the market **\$16 billion** over the course of 32 hours, according to **Potomac Economics**, ERCOT’s **independent market monitor (IMM)**.

During the chaos of the crisis, the wholesale price of power was allowed to hit its **\$9,000/MWh market cap** and stay high for 32 hours longer than would have been appropriate (visual). The IMM says ERCOT should have lowered the price immediately after load shed instructions had ended on the evening of Feb 17 rather than allowing them to stay high through the morning of Feb 19.

Subsequently, the IMM has recommended that the

PUCT direct ERCOT to “correct” the error to avoid “the inappropriate pricing intervention that occurred” and to prevent “substantial adverse economic effects.”

Arthur D’Andrea, who took over as the chair of the commission following the resignation of former chair **DeAnn Walker**, said this would cause more trouble than it solves. He was subsequently fired as was ERCOT’s CEO **Bill Magness** who was dismissed by ERCOT’s board. In the meantime multiple investigations are taking place to minimize the political and financial damage and move forward before the summer’s sizzling temperatures test the reliability of the grid once again.

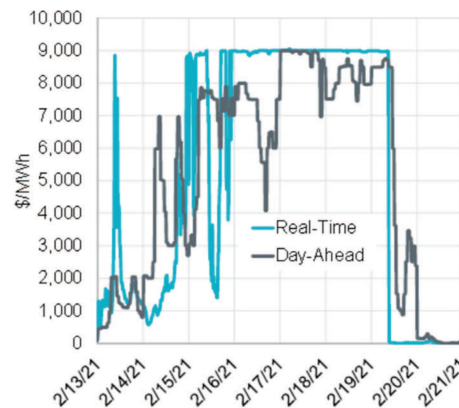
As is usual for any infrastructure investment, it is a matter of balancing the costs versus the benefits. In Texas, the costs of not being adequately prepared have become obvious. Now it is up to the politicians and the regulators to decide if they can afford a repeat of the same either during an extreme summer heat or another unusual cold spell.

Since mid Feb, there has been a flood of articles, opinion pieces, webinars, etc. on the causes of the accident and what can be done to avoid future occurrences including a preliminary report released by ERCOT on 24 Feb and a good summary by the **National Regulatory Research Institute (NRRI)**. Most point to the inadequate *winterization* of the entire energy infrastructure, not just the electricity sector but also the critical gas and water supply.

Not surprisingly, some Texas politicians tried to blame the accident on the unreliability of wind and other renewable, pointing to their variability. The evidence clearly suggests that it was mostly, if not entirely, the thermal power plants, both fossil fueled and nuclear, that failed to supply the unusually high heating loads.

Another factor is that as the climate changes, all indications point to more frequent and more extreme weather events. What used to be considered 50-year floods, droughts, hot or cold extremes are now appearing with alarming regularity. During the mid-Aug 2020 rolling blackouts in California, for example, the

Wholesale prices spiked to \$9,000/MWh and stayed there for a very long time



Average system-wide pricing around the event relative to other historical periods (in \$/MWh)

Date Range	Real-Time	Day-Ahead
2/14/21		
2/19/21	\$6,579.59	\$6,612.23
January '21	\$20.79	\$21.36
February '20	\$18.27	\$17.74

This data is using the ERCOT Hub Average 345-kV Hub prices

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temperatures in the state on average were around 10F *above* normal. In mid-Feb in Texas, they were on average around 50F *below* normal. As part of the effort to avoid such devastating shortages in the future, it seems that we have to adjust to new normals.

References

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Footnotes

¹ An early version of this article appeared in the April 2021 issue of *EEnergy Informer*, available at <http://www.eenergyinformer.com>



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