Texas Public Policy Foundation

FOOL ME TWICE: WHY THE TEXAS GRID IS STILL VULNERABLE TO WINTER STORMS

Part 3: How Texas Can Solve Its Winter Reliability Problem

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INTRODUCTION

This week marks the five-year anniversary of Winter Storm Uri in February 2021, and this is the final piece of a three-part series of policy briefs that describe what has happened to the ERCOT grid since 2021 and that forecast what is coming over the next five years. The first piece in this series showed that, even with the reforms enacted after Uri, the risk of prolonged outages during a 1-in-10-year winter storm is growing because the ERCOT system has added only a few GW of firm capacity over the past five years, while demand has increased by more than 20%. The second piece showed that the recent bias toward solar and storage in ERCOT is set to continue into the near future, and, because of that bias, a 1-in-10-year winter storm in 2030 could cause a full day of outages.

This final piece will outline the winter reliability benefits of reversing the bias toward intermittent resources and adding significant amounts of new reliable generation (hereafter referred to as "firming"). Because of the deep deficit in reliable capacity that Texas has been accruing and the years required for market reforms to translate into new generation, firming alone cannot address the forthcoming surge of demand between now and 2030. Therefore, the analysis will examine how adding more data centers that curtail their demand during a winter storm (hereafter called "flexible demand") can help close the reliability gap in the near term and complement market reforms in the long term.

THE WINTER RELIABILITY DEFICIT AND THE POTENTIAL BENEFITS OF MARKET REFORM

While this analysis is simply meant to show the benefits of changing the future generation mix—not to be prescriptive of policies that could achieve that outcome—recent policy changes can help provide a benchmark for what might be achievable with more aggressive policies. In December 2025, the Public Utility Commission of Texas (PUC) approved a rule to impose a reliability standard on generation that

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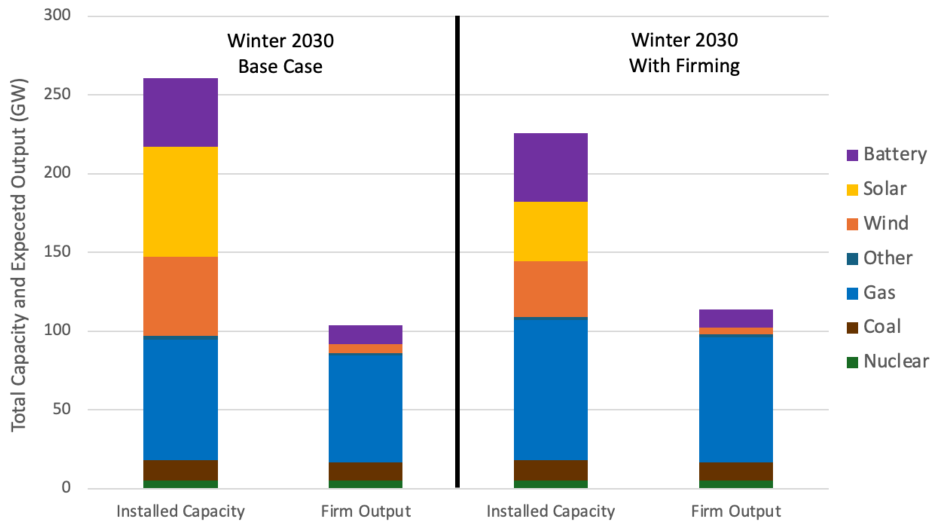
Figure 1

*2030 Winter Installed Capacity and Expected Peak Output by Fuel Source,**
Base Case Forecast vs. Forecast with Policies to Add Reliable Generation



	Base Case
Installed Capacity	260,443
Firm Output	103,802
Peak Demand	105,000
Reserve Margin	-1.1%

	With Firming
Installed Capacity	225,637
Firm Output	113,878
Peak Demand	105,000
Reserve Margin	9.4%

***Note*:** Base case data is derived from *Report on the Capacity, Demand, and Reserves (CDR) in the ERCOT Region, 2026-2030, Winter Seasonal Summary*, Electric Reliability Council of Texas, December 19, 2025 (https://www.ercot.com/files/docs/2025/12/19/CapacityDemandandReservesReport_December2025.pdf).

* Peak demand for 2030 is the author's estimate based on an assumed 2030 summer peak demand of 115 GW. Base case installed capacity is derived by adding 5 GW each of wind, solar, and energy storage to ERCOT's CDR estimates for the 2029/30 winter season and by assuming that all 10 GW of Texas Energy Fund projects are completed (ERCOT only has 3.1 GW in the CDR). Firming case installed capacity assumes solar capacity remains flat after summer 2026 (38 GW total in 2030) and that wind capacity declines by 5 GW due to the retiring of older units (35 GW in 2030). Natural gas capacity is increased by 12 GW over the base case (89 GW in 2030). Firm output estimates are derived using the same assumptions as in **Figure 1** in the first piece in this series.

enters into service beginning in 2027.[1] We estimate that if the rule is applied stringently (far more so than the penalty structure of the current rule suggests), such that it cuts new wind and solar deployments in half, it would add about 4 GW of new gas capacity to ERCOT by 2030. As a result, the winter reserve margin would increase from -1.1% to 2.1%.

A more aggressive policy—which was considered in the Texas Legislature in 2025 but was not passed[2]—would apply this requirement to all existing generation as well as new generation. **Figure 1** shows that even if this policy results in almost no growth in wind and solar capacity after 2025—cutting the total installed capacity in ERCOT in 2030 from 260 GW to 226 GW—the amount of firm capacity available to meet winter demand would increase from 104 GW to 115 GW due to the addition of 13 GW of new reliable generation.[3] This shift would bring the winter reserve margin up to 9.4%, almost back to where it stands today at 10.1%.

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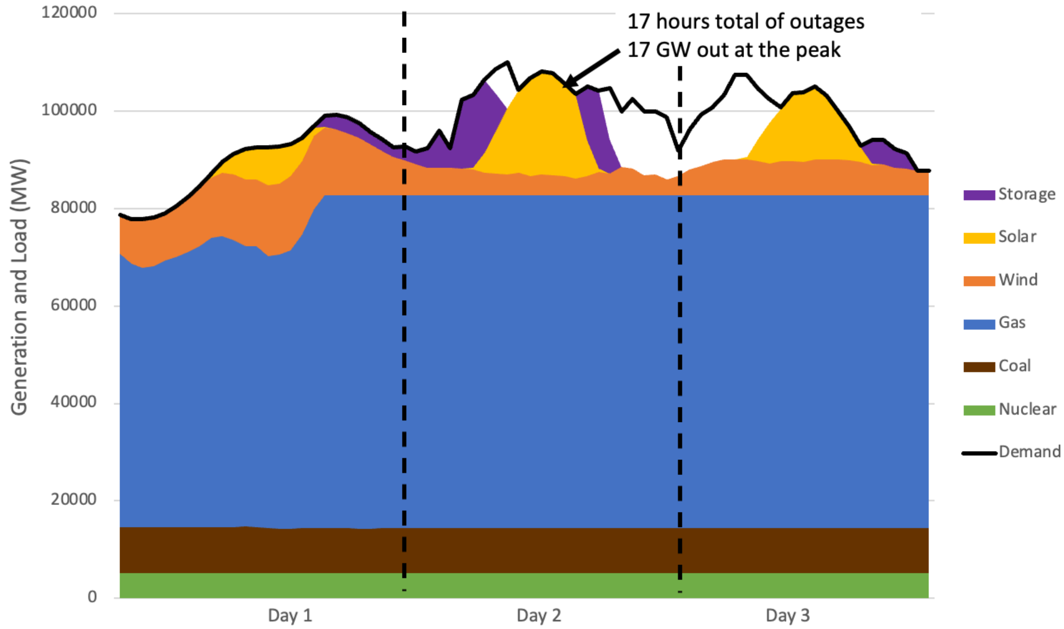
1 Public Utility Commission of Texas (PUC). (2025, December 18). *Order adopting new 16 TAC §25.65* in Project No. 58198. https://interchange.puc.texas.gov/Documents/58198_77_1567651.PDF

2 SB 715. (2025). 89th Legislative Session. Regular. https://capitol.texas.gov/tlodocs/89R/billtext/pdf/SB00715E.pdf

3 We assume that installed wind capacity declines in 2030 from 50 GW in the base case to 35 GW in the case with firming for all generation, which results in a loss of almost 2 GW of accredited wind capacity—hence why the total firm capacity only increases by 11 GW despite adding 13 GW of new gas generation.

Figure 2

Forecast Generation and Demand During a Long-Duration Winter Storm in 2030, With New Policies to Add More Reliable Generation



Note: Generation forecasts are derived by scaling the generation output in **Figure 2** in Part One of this series to match the installed capacities in **Figure 1** in this paper. The demand forecast is derived by scaling the demand profile in **Figure 2** in Part One of this series to a peak demand of 110 GW.

Another tenuous aspect of the future resource mix in ERCOT is the market's reliance on energy storage for winter resource adequacy. The firming scenario assumes energy storage continues to grow as it does in the base case, from 18 GW in 2026 to 43 GW in 2030, which means that storage comprises a larger part of the reserve capacity in 2030 than in 2026. Without storage, the 2030 reserve margin would be -1.9%. As noted in Part Two of this series, the significant amount of installed storage capacity, which is a measure of the rated *power* output of the batteries, does not translate into a significant amount of *energy* output during a winter storm when there are limited opportunities to recharge the batteries. The 43 GW of storage in our 2030 model can discharge at that rate for about 2 hours, which translates to approximately 43 GW * 2 hours = 86 GWh of energy output. This is only equivalent to the output of a single 1 GW thermal power plant for the duration of the storm: about three and a half days.

Figure 2 shows that the shift in the resource mix described in **Figure 1** would cut the amount of unserved energy during a 1-in-10-year winter storm by more than 60% compared to the 2030 base case. However, despite the reserve margin almost returning to its 2026 level, the duration of outages in 2030 is longer (17 hours vs. 12 hours), and the magnitude is greater (17 GW vs. 10 GW) than the same storm in 2026. Again, this is because a larger share of the reserve capacity is comprised of batteries. Once the batteries are exhausted about midway through the storm, the effective capacity in the system drops to the level of available gas, coal, and nuclear generation, which is far below the expected demand during this storm.

It is important to note that the generation mix in **Figures 1 and 2** includes 21 GW more natural gas capacity than the current 2026 mix (see **Table 1**). ERCOT's most recent Capacity, Demand, and Reserves report shows only 2 GW of net new gas generation being

Table 1

Installed Capacities of Generation Resources in ERCOT in 2021, 2026, 2030 Base Case Forecast, and 2030 Forecast with Policies to Add Reliable Generation, in MW

Year	2021	2026	2030 Base Case	2030 With Firming
Natural Gas	65,337	68,441	76,828	89,985
Coal	14,713	13,705	12,576	12,576
Nuclear	5,268	5,268	5,268	5,268
Wind	29,058	40,624	50,249	35,437
Solar	4,401	35,601	69,903	42,752
Storage	285	17,963	43,346	43,346
Other	1,999	2,485	2,273	2,273
Total	**121,061**	**184,087**	**260,443**	**231,637**

added before 2029,[4] and only 6.5 GW of new gas capacity is in the final stage of the planning process in the ERCOT region.[5] Therefore, the amount of additional on-grid natural gas in this model is likely the upper limit of what is physically achievable over the next four years (although the amount of off-grid gas generation supporting data centers in Texas may surpass this amount).

Another important point is that the outages shown in **Figure 2** exceed both the duration and magnitude limits laid out in the reliability standard set by the PUC in 2024.[6] To say it again: *even with* aggressive policies and an optimistic buildout of natural gas generation over the next few years, the ERCOT region will still likely fall short of the reliability standard in 2030. Additionally, the gap between demand and reliable capacity will increase the frequency of outages such that a 1-in-2-year storm, like the one Texas experienced in January 2026, could easily produce minor outages in 2030.

Therefore, the only option to maintain reliability in the near term is to reduce the growth in peak demand. **Figure 3** shows that a ~5% reduction (from 110 GW to 105 GW) in peak demand during the storm modeled in **Figure 2** would almost eliminate the period of outages, cutting it to four hours with a maximum shortfall of 12 GW. The duration and magnitude of these outages are less than those in February 2011 and would meet the reliability standard set by the PUC. A 10% reduction in peak demand would eliminate outages entirely.

Another important conclusion to draw from **Figure 3** is that the amount of short capacity covered by energy storage improves significantly as the gap between thermal capacity and demand shrinks. The batteries have more time to charge during the day and are not completely exhausted as soon as the sun sets. This model shows that batteries can be an effective complement to reliable capacity during a winter storm—akin to how they can cover the few hours after sunset during hot summer days—but they cannot fully replace that capacity.

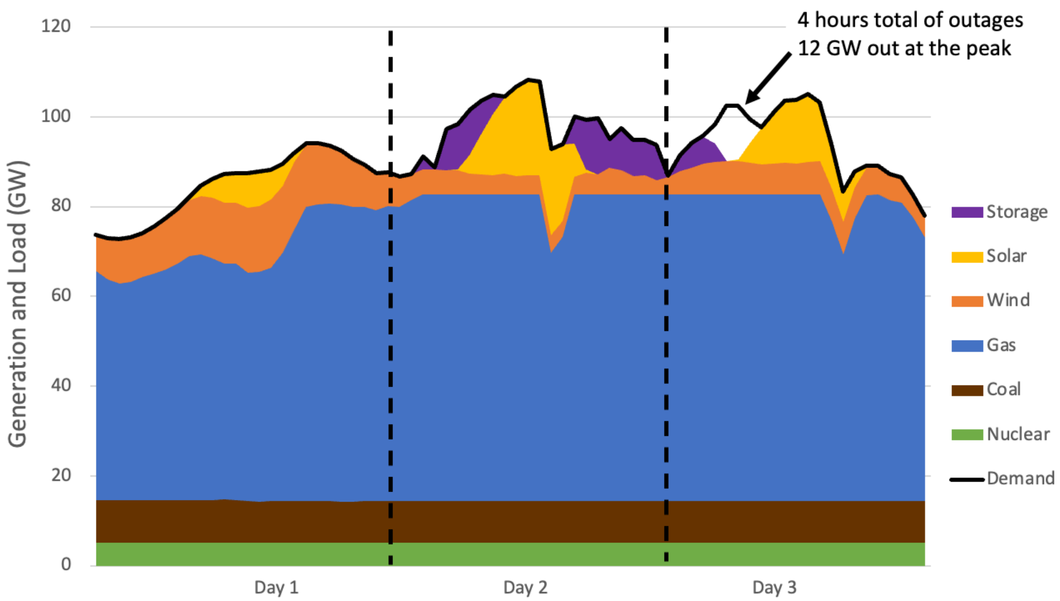
4 Electric Reliability Council of Texas (ERCOT). (2025, December 19). *Report on the Capacity, Demand, and Reserves (CDR) in the ERCOT Region, 2026-2030, Winter Seasonal Summary.* https://www.ercot.com/files/docs/2025/12/19/CapacityDemandandReservesReport_December2025.pdf

5 Electric Reliability Council of Texas (ERCOT). (2026, February 2). *GIS_Report_January2026.* https://www.ercot.com/mp/data-products/data-product-details?id=pg7-200-er. Note: The file is an Excel spreadsheet downloaded from this webpage. The number refers to the gas power plants that have an interconnection agreement in place and all planning studies completed.

6 Public Utility Commission of Texas (PUC). (2024, September 9). *Order adopting new 16 TAC §25.65* in Project No. 54584. pp. 48-49. https://interchange.puc.texas.gov/Documents/54584_106_1426419.PDF

Figure 3

Forecast Generation and Demand During a Long-Duration Winter Storm in 2030, With New Policies to Add More Reliable Generation and a 5% Reduction in Peak Demand



Note: This figure is derived by using the same initial data as in **Figure 2** and reducing demand by 5 GW for the entire period.

CONCLUSION

The data presented in these three briefs tells a consistent story about why the ERCOT grid has experienced two winter outages over the past 15 years and why (despite improvements made since 2021) it is set up to experience another winter outage soon. The energy-only market consistently optimizes for the frequent heatwaves experienced during Texas summers and not for lower-frequency winter storms that are almost impossible for electricity traders and power plant developers to plan for and price effectively. Furthermore, because the market pays a single clearing price that prioritizes low-marginal-cost resources, it strongly favors weather-dependent, short-duration resources (e.g., wind, solar, and energy storage) that produce only a small fraction of their full capacity during winter storms.

Combine this market design with tens of billions of dollars in federal subsidies,[7] and it is no wonder that over $150 billion in capital has been spent on 88 GW of new wind, solar, and storage capacity in Texas,[8] with only a fraction of that amount going toward new natural gas generation. If 25 GW of gas, coal, or nuclear capacity had been built instead of 88 GW of wind, solar, and storage, then the ERCOT region would currently have a 13% reserve margin in the summer and a 27% margin in the winter. A further 20 to 25 GW of additions over the next 4 years—which would be more feasible if the ERCOT market wasn't being saturated with wind and solar like it is now—would more than cover both summer and winter demand in 2030. If the fleet performs at the level it has during the winter storms since Uri, then Texas would have more than enough generation to survive a 1-in-10-year winter storm without outages.

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7 Bennett, B. (2024). *The siren song that never ends: Federal energy subsidies and support from 2010 to 2023*. Texas Public Policy Foundation. https://www.texaspolicy.com/wp-content/uploads/2024/10/2024-10-LP-Federal-Energy-Subsidies-BrentBennett_FINAL-1.pdf

8 American Clean Power Association (ACPA). (n.d.). *Texas state fact sheet* in "Clean power state-by-state" (webpage). Retrieved January 20, 2026, from https://cleanpower.org/facts/state-fact-sheets/

A larger grid using more efficient generation and transmission assets will lower costs for consumers and increase reliability. Only by combining these solutions to reduce both supply and demand volatility can Texas correct for the mistakes it has made during the past two decades and set itself up to succeed throughout the next two decades.

Course-correcting the aircraft carrier that is the ERCOT market will require two reforms. First, the highly uncertain revenues from future winter storms must be smoothed out and brought into the present, in the same way that we pay insurance premiums to avoid catastrophic future losses. Second, all wind and solar generators in ERCOT need to be held to a reliability standard or be paid lower prices to account for the energy-only market's failures to value the reliability differences between generators. However, reducing supply volatility in this manner cannot be done in time to meet demand growth over the next five years. Transmission is another constraint, with costs set to explode over the next decade as the grid expands to connect distant wind and solar resources with new data center demand.[9]

Another solution to these problems that can be enacted quickly while also providing long-term benefits is to reduce demand volatility by minimizing peak demand growth. If average demand grows more quickly than peak demand, prices will become less volatile, and the ERCOT market will become more hospitable to new gas and nuclear generation that can secure the grid for the next winter storm. Senate Bill 6 from the 89th Texas Legislature[10] addresses this issue by requiring loads exceeding 75 MW to disconnect from the grid during emergencies and by providing incentives for those loads to curtail before emergency conditions arise. ERCOT is also considering reforms to allow such "controllable loads" to connect to the grid faster if they do not require major transmission upgrades.[11]

While the growth of data centers in Texas presents the risk of misallocating money to the wrong kinds and quantities of generation and transmission assets, it is also an opportunity to overcome the misallocations over the past two decades by incentivizing more investment in the right kinds of reliable assets. A larger grid using more efficient generation and transmission assets will lower costs for consumers and increase reliability. Only by combining these solutions to reduce both supply and demand volatility can Texas correct for the mistakes it has made during the past two decades and set itself up to succeed throughout the next two decades. ■

9 Bennett, B., & Piracci, J. (2026). *The explosion of transmission costs in ERCOT: Causes, forecasts, and policy solutions*. Texas Public Policy Foundation. https://www.texaspolicy.com/wp-content/uploads/2026/01/2026-01-LP-Transmission-Costs-BennettPiracci.pdf

10 SB 6. Enrolled. 89th Texas Legislature. Regular. (2025). https://capitol.texas.gov/tlodocs/89R/billtext/pdf/SB00006F.pdf

11 Sharma Frank, A. (2025, November 1). *134PGRR-01 Interconnection studies reform for dispatchable loads 110125* in PGRR134: Key Documents. https://www.ercot.com/mktrules/issues/PGRR134#keydocs

ABOUT THE AUTHOR

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Dr. Bennett has an M.S.E. and Ph.D. in materials science and engineering from the University of Texas at Austin and a B.S. in physics from the University of Tulsa. His graduate research focused on advanced chemistries for utility-scale energy storage systems. Prior to joining the Foundation, Dr. Bennett worked for a startup company selling carbon nanotubes to battery manufacturers.

Dr. Bennett spent his early years in Midland, Texas surrounded by amazing energy entrepreneurs, and he has been a passionate student of energy his entire life. He now lives in Austin with his wife, Erin, and their two children, Jack and Madeleine.

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