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PROJECT NO. 53401

ELECTRIC WEATHER PREPAREDNESS STANDARDS – PHASE II	**§ § §**	**PUBLIC UTILITY COMMISSION OF TEXAS**

COMMENTS OF
ENVIRONMENTAL DEFENSE FUND, TEXAS CONSUMER ASSOCIATION & ALISON SILVERSTEIN CONSULTING

COMES NOW the Environmental Defense Fund, a non-profit, non-partisan, non-governmental environmental organization, the Texas Consumer Association, a non-profit advocate representing small business and individual Texas customers on pocketbook issues, and Alison Silverstein, an independent energy consultant, to offer these joint-filed Comments responding to the Commission's request for comments in Project 53401.

We find that the proposed rule will not adequately protect Texas grid reliability and resilience from extreme weather events because it:

- Does not include reliability-impacting weather events such as floods, tornadoes, hurricanes and wildfires;
- Does not recognize the ways that climate change is exacerbating extreme weather events (particularly high temperatures) today and in the future;
- Does not incorporate the climate projection analysis already available from the Texas State Climatologist;
- Does not include transmission lines as facilities within the scope of the rule;
- Neglects to raise extreme weather preparedness for black-start generation and transmission.

If these omissions and errors are not remedied in the weatherization rule, the rule could lead to additional transmission and generation investment costs that will increase electricity prices across Texas without sufficiently improving the reliability and resilience of our grid against the very real extreme weather risks we face.

<u>25.55(b) Weather Emergency Preparedness</u>

25.55(b)(11) defines a weather emergency as a "situation resulting from weather conditions that produces significant risk …that firm load must be shed…." Yet the proposed rule addresses only extreme cold and heat conditions. In fact, recent extreme weather emergencies that produce significant risk of load shed or ERCOT weather-related risks include hurricanes, urban and inland flooding from storms, coastal storm surge, tornadoes, and wildfires. All of these measures can compromise power delivery to end use customers and should be included and addressed in this rule.

Transmission lines are particularly vulnerable to failure from wildfires (which risk is increasing due to higher ambient temperatures and current drought conditions). This weatherization rule should expand transmission service provider requirements to identify lines and substations in wildfire risk areas and the consequences for ERCOT system operation if the lines were shut down proactively or lost due to active wildfires.

Recognize and require attention to future climate change-driven extreme weather risks

The Office of the Texas State Climatologist has already published a forward-looking report explaining the impacts of climate change on Texas.[1] That report states, "The average annual Texas surface temperature in 2036 is expected to be 3.0°F warmer than the 1950-1999 average and 1.8°F warmer than the 1991-2020 average. The number of 100-degree days at typical stations is expected to nearly double by 2036 compared to 2001-2020, with higher frequency of 100-degree days in urban areas."[2] The State Climatologist also warns of increasing extreme rainfall events in Texas, which could cause more severe flooding events that could compromise grid assets.

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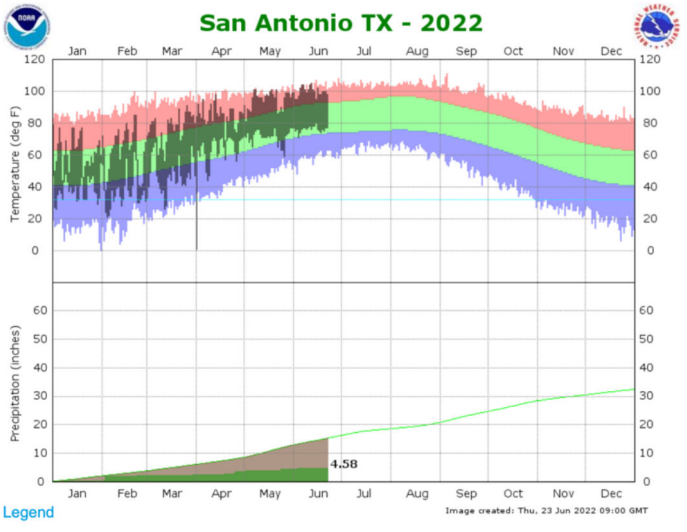
[1] Nielsen-Gammon, J., S. Holman, et al., "*Assessment of Historic and Future Trends of Extreme Weather in Texas, 1900- 2036: 2021 Update*", Document OSC-202101, Office of the State Climatologist, Texas A&M University (October 7, 2021).
[2] Nielsen-Gammon et al., p.2.

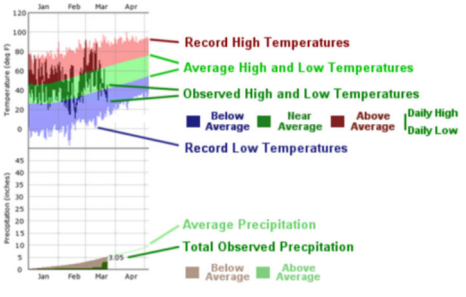
25.55(c)(1)(B) ERCOT historical weather study

The proposed rule would require generation and transmission owners to prepare facilities to meet a 95th percentile of min/max temperature (based on historical weather conditions) standard for both hot and cold weather requirements by ERCOT weather zones. However, both science and actual experience establish that historic weather conditions do not accurately reflect current and future weather conditions, as reflected in the National Weather Service temperature graph below. The actual high temperatures and drought already experienced in Texas this year and predicted for this summer have already driven ERCOT loads to unprecedented levels (above ERCOT's 2022 forecast maximum load) for extended periods of time; this would not have been anticipated and prepared for under the PUCT proposed rule.

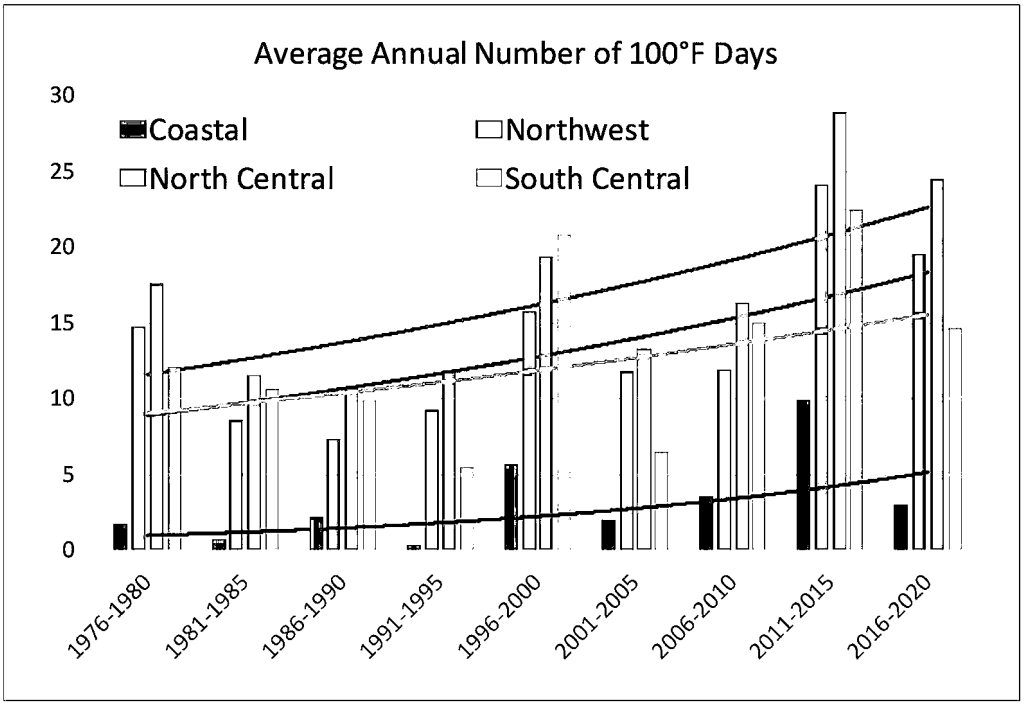
2022 Temperatures in San Antonio Area Consistently Higher than Past Years, with Precipitation Consistently Lower

Source: https://www.weather.gov/ewx/climategraphs





Additionally, the rule as drafted allows potential manipulation of historic weather data to bias temperature ranges downward, as would occur if the historical temperature study uses too long a historical period. This is made clear by the graph below from the State Climatologist's report,[3] which shows that the four Texas climate zones have experienced many more 100°F days since 1996 than in prior years. For that reason, we recommend that the historic temperatures study not allow incorporation of full year temperature data before 1996, and that the high temperature events after 1995 be supplemented with event-specific data for at least the worst five extreme weather events in each category from the historical record preceding 1996.



Summer and winter preparation temperature benchmark

The proposed rule ties weather emergency preparation measures to "the lesser of the minimum ambient temperature at which the facility has experienced sustained operations or the 95th percentile minimum average 72-hour temperature reported in ERCOT's historical weather

[3] Nielsen-Gammon et al., p.8.

study" (for winter, or the maximum temperatures for summer). Given the degree to which sustained high temperatures are driving ERCOT customer demands much higher and stressing assets, it is not obvious that the average temperature over 72 hours is the most appropriate metric to reflect generation or transmission extreme temperature challenges; consider that Winter Storm Uri featured temperatures below freezing for five days, the 2011 heat wave dragged on for months, the 1980 heat wave produced 69 100°F days at the DFW airport, and the current Texas heat wave has lifted temperatures above 100°F for nine days straight this June. These cause sustained loading levels that could stress a transformer or generator more than just the effect of extreme temperature alone. We recommend that the Commission seek expert written advice from both meteorologists and transmission and generation asset specialists about whether this metric is appropriate or whether other sustained or episodic temperature or loading metrics might serve as better benchmarks to prepare critical grid assets to perform under extreme temperatures.

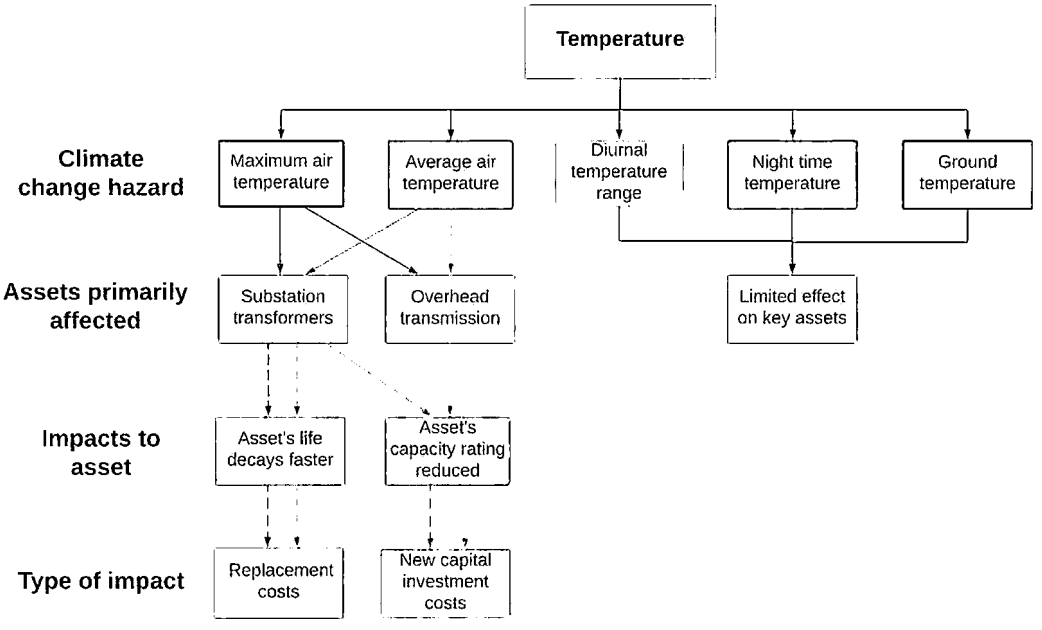
25.55(b)(9) and (f)(2) Transmission facilities

The proposed rule defines "transmission facility" as a transmission voltage element inside the fence of a substation or switching station. Yet Texas S.B.3 specifically strikes "generation" weatherization preparedness and broadens applicability to "power" weatherization preparedness; power includes transmission facilities. Full capability and continuity of transmission line operations – beyond substation equipment -- are essential to the reliable operation and full delivery capability of the ERCOT power system. Transmission lines are as vulnerable to extreme weather as transformers and should therefore be included in this rule.

The effects of extreme heat on transmission assets are well-documented. Higher temperatures increase resistance and line losses in conductors, reducing the line's carrying

capacity at the same time that higher temperatures increase customer load.[4] Bartos et al. estimate that climate change-attributable capacity reductions to transmission lines could reduce summertime transmission capacity by 1.9% to 5.8% relative to the 1990-2010 reference case.[5] High temperature-driven transmission ampacity reductions would exacerbate transmission thermal and voltage limits that tighten transmission constraints, reducing deliverability and raising congestion costs when customer demand is highest. These transmission effects are summarized in ConEdison's "Climate Change Vulnerability Study,"[6] as shown below (p.40):

Figure 18 : Temperature-related impacts on Con Edison's electric system



25.55(f)(2) Summer season preparations for a TSP

The proposed weatherization rule focuses on the capability of substation equipment to perform in extreme cold and hot conditions, because hotter temperatures reduce transformer peak

[4] Charles Fant et al., "Climate change impacts and costs to U.S. electricity transmission and distribution infrastructure," Energy Journal (January 2020), and Matthew Bartos, "Impacts of rising air temperatures on electric ampacity and peak electricity load in the United States," Environmental Research Letters (November 2016).
[5] Bartos, "Impacts of rising air temperatures on electric ampacity and peak electricity load in the United States," Environmental Research Letters (November 2016).
[6] ConEdison, "Climate Change Vulnerability Study," (December 2019).

load capacity. But higher temperatures and higher loads also reduce the expected lifespan of substation and distribution transformers.[7] The average age of transformers on the grid today is 35 years, near the end of their typical lifecycle; [8] higher loading and ambient heat cause thermal degradation to transformer oil and insulation.[9] [10] The proposed rule (in (f)(2)(A)) would require inspection and cleaning of transformer coolers, but ignores the age and condition of the transformer, the level of prior heat and loading stresses it has already experienced,[11] and whether it has sufficient lifespan and capability to continue performing under faulted or high temperature and high load conditions in the summer ahead. For these reasons, the proposed rule should be modified to consider high voltage transformer readiness for extreme heat as a function of its age, condition and remaining lifespan, not just the readiness of its cooling equipment.

In conjunction with the above requirement, the Commission should also direct the Texas transmission providers to report on their plans for spare transformers if increasing heat and load levels or some human attack causes one or more transformers to fail and require replacement.

Federal initiative on climate change analysis

On June 16, 2022, the Federal Energy Regulatory Commission issued two Notices of Proposed Rulemaking on extreme weather -- Docket No. RM22-10-000, Transmission System Planning Performance Requirements for Extreme Weather, and Docket No. RM22-16-000, One-Time Reports on Extreme Weather Vulnerability Assessments. NERC has identified extreme

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[7] Charles Fant et al., "Climate change impacts and costs to U.S. electricity transmission and distribution infrastructure," Energy Journal (January 2020).
[8] "Clinging to Power: Why Extending Transformer Life is Key," Power, (August 1, 2018).
[9] Kojiro Shimomugi et al., "How Transformers Age," T&D World, (Feb. 21, 2019)
[10] ConEd's study observes, "Increased average temperatures pose a threat to substation transformers. Within a substation, transformers are the asset most likely to be affected by projected higher temperatures since their ambient temperature design reference temperature is lower (i.e., 86°F) than that of most other assets. Higher average and maximum ambient temperatures increase the aging rate of the insulation in transformers, resulting in decreased asset life." (p.40)

weather as a top power system risk, stating that, "wide-area and long duration extreme weather events driven by climate change threaten reliability over the long term."[12] FERC recognizes that climate change is creating more frequent extreme weather events that threaten the grid and human life, and that planning practices and asset management should change to understand these threats, assess bulk power system vulnerabilities to extreme weather, and evaluate possible options to reduce the likelihood or mitigate the consequences of extreme events. The Vulnerability Assessments NOPR would require all transmission owners and providers to project future extreme weather conditions, inventory the vulnerability of all bulk power system equipment to those weather conditions, and identify mitigation measures for those assets and vulnerabilities. The Planning Performance Requirements NOPR would require NERC to modify the transmission planning reliability standard (TPL-001-5.1) to address the impacts of extreme heat and cold weather events on the reliable operation of the bulk power system.

There are several notable distinctions between the FERC NOPR and this Texas proposed rule:

- FERC acknowledges that due to climate change, historical weather is no guide to future events. FERC observes that recent events such as Winter Storm Uri and extreme heat waves have significantly increased demand and grid operating challenges, and such events appear more likely to occur with potential for widespread power outages in the future. Therefore, FERC's draft rule would require NERC and the industry to develop benchmark extreme weather event and condition planning cases based on both historical and future meteorological projections.
- The FERC NOPRs do not limit extreme weather events to heat and cold events, but also require attention to droughts, major storms, flooding and other major weather threats.
- The FERC NOPRs do not limit transmission facilities to substation assets, but explicitly include high-voltage lines in the assets to be evaluated.

The PUCT should emulate these provisions (and more) of the FERC proposals.

[12] NERC "2021 Long Term Reliability Assessment" (December 2021) at pp.5-6, cited in FERC RM22-16-000 at p7.

Black-start facilities are not addressed in the rule

The proposed rule would require that generation and transmission facilities be ready to perform at the "95th percentile maximum average 72-hour temperature reported in ERCOT's historical weather study" (for summer, or the equivalent minimum for winter).[13] We believe that this requirement is insufficient to assure the extreme weather readiness of the ERCOT generators being paid to provide black-start services or the transmission assets on the cranking path from black-start resources to the rest of the ERCOT system. Given the staggering failure of many black-start assets to remain functional during Winter Storm Uri, and the critical need to maintain reliable black-start assets and processes in the event of a full ERCOT grid collapse, we recommend that the Commission apply higher extreme weather standards and requirements for every generator and transmission asset needed for black-start service.

Conclusion

Extreme weather events are affecting Texans and increasing the risks and costs of reliable operation and resilience for every element of the ERCOT power system. While the PUCT's proposed weatherization rule is a step forward to address an important challenge, we believe that this proposed rule insufficiently addresses important grid elements that are critical to power system reliability – particularly transmission lines and black-start generation – and fails to address the dramatic increases in the number and risk in current and upcoming extreme weather events. Unless these recommendations are addressed, we fear the rule as drafted will increase power system weatherization costs to Texans without sufficiently protecting us from extreme weather threats.

[13] As in 25.55(f)(2)(B) for TSP summer preparation, or 25.55(c)(1)(B) for generator winter preparation.

Respectfully submitted,

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Alison Silverstein Consulting

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- Does not recognize the ways that climate change is exacerbating extreme weather events (particularly high temperatures) today and in the future;
- Does not incorporate the climate projection analysis already available from the Texas State Climatologist;
- Does not include transmission lines as facilities within the scope of the rule, and does not recognize the impact of both high temperatures and high loading to reduce the carrying capacity and lifespan decay impacts upon all transmission assets;
- Neglects to address and heighten extreme weather preparedness requirements for black-start generation and transmission.

If these omissions and errors are not remedied in the weatherization rule, the rule could lead to additional transmission and generation investment costs that will increase electricity prices across Texas without sufficiently improving the reliability and resilience of our grid against the very real extreme weather risks we face.

We also encourage the Commission to take note of the concerns and requirements proposed in the Federal Energy Regulatory Commission's new proposed climate change-driven extreme weather rulemakings. These proposed rules explicitly address the ways in which climate change is increasing the nature and frequency of extreme weather events and the risks that they pose for power system reliability and resilience, and propose new planning reliability standards and asset vulnerability and risk assessments. Texas could incorporate many of these proactive requirements in the present rule, to better protect all Texans from potential power system failure as our weather becomes more dangerous to our grid, health and budgets.