Subcommittee on Oversight and Investigations
Hearing on
"Power Struggle: Examining the 2021 Texas Grid Failure"
March 24, 2021

Mr. James Robb, President and Chief Executive Officer, North American Reliability Corporation

The Honorable Diana DeGette (D-CO)

1. **In your March 24, 2021 testimony before the Subcommittee, you stated that "there are multiple policies at multiple levels that need to be rethought" with regards to how we regulate and oversee natural gas used for electricity generation.**

    a. **What policies on the federal, state, or local level need to be reexamined in your opinion?**

As discussed in testimony, natural gas is essential to a reliable transition of the grid. Interdependencies between the electricity and natural gas sectors will continue to grow as the grid evolves further. Policymakers should consider measures to assure natural gas supply for electricity generation to support the Reliable Operation[1] of the bulk power system, particularly during periods of extreme conditions or scarcity. This could include policies such as providing incentives for generator performance, mandating that generators contract for firm transportation or demonstrate the ability to use dual fuel, or the designation of generators as critical infrastructure that would not have natural gas supplies cut in the event of emergencies. As electric-dependent compressor stations, well heads and processing plants are critical assets vital to the Reliable Operation of the bulk power system, mandating/regulating appropriate levels of winterization which may include back-up generation, can mitigate the risks posed by the interdependencies between these two critical infrastructures. In addition, as discussed below, Congress or industry organizations could consider a reliability regime for the natural gas sector supporting reliability, security and resilience of the bulk electric system.

    b. **Are new or modified authorities needed to ensure consistent natural gas supply for electricity generation, particularly during extreme weather events? If so, what new authorities would you recommend?**

[1] In the NERC Glossary, "Reliable Operation" is defined as, "Operating the elements of the Bulk-Power System within equipment and electric system thermal, voltage, and stability limits so that instability, uncontrolled separation, or cascading failures of such system will not occur as a result of a sudden disturbance, including a cybersecurity incident, or unanticipated failure of system elements."

Currently there are no standards – of a mandatory or non-mandatory nature – specifically focused on ensuring reliable natural gas supply to support bulk power system reliability. In the electricity sector, reliability standards require NERC registered entities to analyze their systems and prepare for the single most severe contingency. Presently the natural gas industry does not provide for standards around the performance reliability of well-head gas, gathering and processing facilities, compressor stations, or pipelines. A regulatory organization could addresses these reliability functions for the natural gas sector through mandatory and enforceable standards. Alternatively, existing trade organizations and/or standards entities could provide similar mandatory and enforceable standards. The NERC model has been highly successful in providing industry-driven mandatory and enforceable standards that assure Bulk Power System Reliability, Security and Resilience. This model could be replicated in the natural gas arena, with an eye on mitigating the mutual risks that come from the interdependency of these two critical infrastructures.

The Honorable Kathy Castor (D-FL)

1. **Mr. Robb, could you provide more context on what information the North American Electric Reliability Corporation (NERC) is using to incorporate climate impacts into its planning for reliability? What are the sources of climate data, how is NERC determining how to apply that data? Which climate science experts are being consulted?**

NERC's independent reliability assessments and technical analysis of bulk power system (BPS) issues are important contributors to our understanding of reliability risk of all types, which inform appropriate mitigations. As discussed in testimony, NERC's seasonal, periodic, and special assessments have identified particular regions of North America where reliability risk is heightened due to the potential for extreme weather events. In short, NERC's technical work informs industry and policymakers on key risks, including from extreme weather, and are incorporated into guidance, lessons learned, or new or enhanced Reliability Standards.

Among other objectives, reliability standards are designed to broadly support BPS resilience, including for extreme weather. NERC Reliability Standards work together to establish a portfolio of performance-based outcome, risk reduction, and capability standards designed to support reliability. As discussed in testimony, NERC is currently developing enhancements to three reliability standards addressing cold weather risk.

Several reliability standards relate to the BPS's capability to withstand disturbances in anticipation of potential events, manage the system after an event, and/or prepare to restore or rebound after an event. For example, NERC has developed the following:

• Reliability Standard TPL-001-4, Transmission System Planning Performance Requirements: providing planning performance requirements in anticipation of potential events, including

studying extreme events, which include the loss of a large gas pipeline, wildfires, and extreme weather;

• Reliability Standard EOP-004-3, Event Reporting: requiring that entities report disturbances and events threatening reliability;

• Reliability Standard EOP-005-2, System Restoration from Blackstart Resources: including requirements pertaining to preparation for system restoration from Blackstart resources after an event, including developing a pre-defined restoration plan and verifying through analysis of actual events, a combination of steady state and dynamic simulations, or testing that its restoration plan accomplishes its intended function;

• Reliability Standard EOP-006-2, System Restoration Coordination: requiring that plans and personnel be prepared to support system restoration after an event;

• Reliability Standard EOP-011-1, Emergency Operations: requiring operating plans to mitigate emergencies;

Comments filed with FERC in 2018 provide additional detail on how Reliability Standards and other NERC programs support resilience of the BPS. These comments are posted here.

The Honorable Michael C. Burgess (R-TX)

1. **Do federal grid reliability standards apply to the Electric Reliability Council of Texas (ERCOT)?**

Yes.

2. **NERC recently announced it will finalize its cold weather reliability standards by June 2021; please share any preliminary information you may have on these standards.**

Recognizing the importance of finalizing the cold weather standards, there have been a number of recent developments directed toward accelerating the process. On March 22, 2021, NERC's Board of Trustees exercised its authority to expedite completion of the standards by June 2021. In accordance with this directive, NERC's Standards Committee acted to reduce the formal comment period from 45 days to 25 days. The 25-day comment and 10-day ballot period closed on April 26, 2021. The standards development process remains on track, and NERC expects to submit the proposed standards to NERC's Board of Trustees in June 2021. Following board review and approval, the proposed standards will be filed with FERC as soon as possible thereafter.

3. **Why weren't these standards finalized earlier?**

NERC first addressed cold weather planning through a reliability guideline in 2012. Reliability guidelines have the advantage of addressing certain risks where quick action is desirable, or those risks that are categorized as high impact, low frequency or rare. Important factors evolved since the guideline was developed and updated, including the 2014 and 2018 cold weather events which demonstrated that these events could no longer be treated as rare. Further, in the past decade, the generation fleet has transformed to one that is more sensitive to weather with extreme temperatures. For these reasons, NERC initiated new cold weather requirements in September 2019.

4. **Was Texas the only part of the country to experience power outages due to the extreme weather of the week of February 15, 2021?**

While the scale in Texas was especially dramatic, extreme winter weather also caused significant forced outages and load shedding in states throughout the central part of the country from North Dakota to Louisiana. To maintain system stability, the Midcontinent Independent System Operator (MISO) ordered 1,430 MW of load shedding on February 16, affecting citizens from southern Louisiana, Arkansas, Mississippi, east Texas, and Illinois. MISO reported a peak of 59,322 MW of generation was unavailable throughout the entire balancing authority area on February 14. This includes 8,081 MW that was weather related. The Southwest Power Pool service area experienced 3,443 MW of load shedding and the loss of 25,000 MW of generation across a range of resources. Outages occurred in Arkansas, Louisiana, Texas, Oklahoma, Kansas, Missouri, Nebraska, North Dakota and South Dakota. This crisis shows the increased vulnerability of the electric supply system to an extreme common condition that spans electric systems.

5. **Would more interconnection between ERCOT and either the Eastern or the Western grids have totally prevented blackouts within ERCOT, despite those areas also experiencing blackouts?**

A more interconnected system could provide additional options to deliver power to Texas. Yet the potential of more interconnections to mitigate issues in Texas would depend upon how the system is designed to support these areas, and the availability of resources to serve load in Texas when needed during emergency conditions that also affected neighboring states.

6. **Is ERCOT uniquely vulnerable to extreme weather events compared to other regional transmission organizations or independent system operators throughout the country?**

Extreme weather can affect reliable operation of the bulk power system in any region of the country. As discussed in Question 7, ERCOT is among several regions that are particularly vulnerable to this risk.

7. **Are any electric grids around the country invulnerable to extreme weather events?**

NERC's *2020/2021 Winter Reliability Assessment* analyzed severe weather scenarios that incorporated generation outages under peak load conditions. NERC noted particular reliability risk in areas within MISO, the Canadian Maritimes, Texas, the Rocky Mountain Reserve Group and the Northwest Power Pool.

8. What more can be done to improve the reliability of our nation's electric grids?

A highly reliable and secure bulk power system is the core of NERC's mission. While the totality of NERC's work describes our efforts to improve reliability, the key challenge for addressing reliability risk requires a keen focus on three major trends that are fundamentally transforming the bulk power system and challenging our historic reliability paradigm.

First, the system is **decarbonizing** rapidly and this evolution is altering the operational characteristics of the grid which must be addressed to assure reliability. Policies, economics, and market designs are resulting in significant retirements of traditional generation. New investment is increasingly focused on developing carbon-free generation with variable production profiles. And in this resource mix, natural gas-fired generation is becoming ever more critical for both "bulk energy" to serve load and "balancing energy" to support the integration of variable resources.

Second, the grid is becoming more **distributed**. The improved economics of solar is a key example. These smaller scale resources have been deployed on both the bulk electric and distribution systems, and in many cases reside behind the meter. This trend requires attention to how distributed resources affect reliable operation of the BPS, including the need for operators to have visibility into these resources.

And third, the system is becoming increasingly **digitized** through smart meters and digital control systems. These investments greatly enhance operational awareness and efficiency, but at the cost of heightened exposure to cybersecurity risk.

9. Recent grid reliability issues in recent years have occurred due to environmental factors, but human activity also pose a risk to the electric grid. How vulnerable is the electric grid to physical and cyber-attacks?

Myriad security challenges face our nation's energy infrastructure. Among the greatest threats are nation-state and other sophisticated actors, insider threats, and protecting a system that is becoming increasingly digitized through smart meters and digital control systems.

The supply chain compromise discovered in December 2020 conducted by a sophisticated advanced persistent threat reinforced that basic tenants and principles enshrined in the NERC CIP standards, and underscored the need for agile coordination and information sharing. The specific techniques and tactics used by adversaries remained similar to previous years, but their unique deployments and targeting shifted, highlighting a greater focus on supply chains.

Another challenge is phishing, which exploits human fallibility and trust to gain an initial foothold into targeted systems. Phishing continues to be widely used because it continues to

deliver results for adversaries, and the most advanced examples of targeted spear phishing are practically indistinguishable from legitimate email traffic.

For insider threats, recruiting a willing or coerced insider to facilitate access is a highly effective (but riskier to the adversary) tactic. Employees, subcontractors, and other business affiliates have good access to the targeted organization and are often knowledgeable about sensitive, non-public systems of particular value. Insider threats are unwittingly facilitated by lax organizational security cultures.

What has becoming increasingly apparent, as we look forward to the grid of the future, system design must not only consider cyber-security, it must be designed to provide robust cyber-security, rather than bolted on as an afterthought. NERC is working with industry, IEEE, DOE, and INL to develop models and simulation tools that will enable a stronger cyber defense for the grid of the future.

10. Are electric grids in American more vulnerable to threats derived from the environment factors or from aggressive human actions?

Extreme weather and cyber risks are fundamentally different. Both could have significant impacts. Empirically, disturbances and outages on the bulk power system caused by extreme weather are well-documented. These impacts are usually limited in scope and duration, however the rare events in Texas demonstrate widespread human impacts of long-term outages, including interdependencies with other lifeline services. While there has been no loss of load in the United States due to a cyber attack, sophisticated actors are working aggressively to disrupt the nation's critical infrastructure. Because a broad attack on the bulk power system could have grave consequences for well-being and national security, continuous vigilance is required, with a keen understanding that cyber risks are persistent and continuously evolving.