**UNITED STATES OF AMERICA**

**BEFORE THE**

**FEDERAL ENERGY REGULATORY COMMISSION**

**North American Electric Reliability ) Docket No. AD25-7-000**

**Corporation )**

**North American Electric Reliability Corporation**

**Pre-Conference Comments**

**commissioner-led technical conference, June 4-5, 2025,**

**“meeting the Challenge of Resource Adequacy in Regional Transmission Organization and Independent System Operator Regions”**

The North American Electric Reliability Corporation (“NERC”) appreciates the Federal Energy Regulatory Commission (“FERC” of “Commission”) for holding this technical conference examining the challenge of resource adequacy in regional transmission organization and independent system operator regions. This technical conference is important, as growth projections of electric demand have reached heights unseen in decades, disrupting resource adequacy plans across North America. Independent System Operators (“ISO”) and Regional Transmission Organizations (“RTO”) play a critical role to ensure sufficient resources are available for two-thirds of North America. NERC applauds the leadership and dedicated teams at ISOs and RTOs who have implemented market mechanisms and expansion planning processes over the years, providing tangible benefits to millions of people by balancing efficiency, cost-savings, and system resource adequacy objectives critical to reliability. But ISO/RTO regions, and in the vertically integrated and state regulated areas as well, the previous approaches to developing resource adequacy are increasingly challenged to maintain sufficient amounts of resources with sufficient essential reliability services to meet customer energy reliability expectations. For years we have been *managing the pace of change in the resource mix,* and now the challenges that go along with that transition have been **pressurized by rapidly escalating forecast load growth**. As difficult as it is to manage grid reliability with a resource mix that is evolving and containing vastly different reliability attributes, we must now do so while simultaneously growing and expanding our resources and transmission network. Speculation around the pace of additional new data center loads and the effects of economic and industrial development along with electrification policies impacting transportation and building further charge the atmosphere around expansion planning. The change requires all stakeholders to tune their resource planning and transmission development processes for the era of growth and that match the increasingly “energy-limited” characteristics of the generation fleet.

Mounting resource adequacy challenges are elevating the risk profile across a broad swath of North America, leaving few areas untouched. NERC’s recent *Long-Term Reliability Assessment*, seasonal reliability assessments, and the *Interregional Transfer Capability Study*, highlight resource adequacy concerns in every ISO/RTO area at one point or another. (Note that similar challenges are being faced in non-ISO/RTO regions, but since this conference is intended to focus on the organized markets, these observations are confined to the market regions.) Highlights from these assessment findings illuminate the issues conference participants are grappling with and can serve to frame discussions over the next two days:

* First, while disorderly generator retirements have led NERC’s list of resource adequacy concerns for several years, resulting in projected energy shortfall risks dating back to 2018, **rapid load growth across North America and an uncertain outlook for resource additions results in even greater urgency to the need to carefully manage generator retirements.** In the most recent LTRA, the risk of future capacity shortfalls has grown to now include PJM, among other market areas such as MISO, where the resource projections and market signals are not securing needed capacity. Capacity shortfalls from generator retirements and insufficient resource growth to meet demand are a risk that all ISO/RTOs can face.
* Second, several ISO/RTO areas appear to be resource adequate through the narrow lens of capacity, **yet future energy shortfalls are looming because the resource mix is not supported with the right levels of dispatchable generation with secure fuel to balance supply and demand fluctuations.** Seasonal risk scenarios point to energy shortfalls in SPP during a range of conditions that can occur simultaneously with periods of low wind output, such as higher generator forced or planned outages, during solar down-ramps. Shortfall risks grow even more serious when the abnormal weather patterns extend across even wider areas impacting the availability of transfers from neighbors, as they did in the June 2023 rare low wind and/or low solar period known in Germany as the “Dunkelflaute.” High solar PV areas including ERCOT and CAISO face energy risk periods with evening solar ramps and wind variability requiring a build-out of flexible battery storage and gas-fired generation.
* Third, as more historically summer-peaking systems become dual or winter peaking, **our resource adequacy approach needs to focus on the unique reliability risks associated with winter weather**. Natural gas fuel delivery to generators in New England and New York is threatened during extreme cold temperatures due to the interstate pipeline system operating at maximum capacity, serving heating and electric generator needs, or when these pipelines experience loss of flow from wellhead freeze-offs, compressor station reductions, and processing plant shutdowns. And as seen in four of the past five winters, severe polar vortex events have extended across much of North America, causing regional demand for electricity and heating fuel to soar, exposing generation and fuel infrastructure in temperate areas to freezing conditions. This is exacerbated by polices encouraging the use of heat pumps which can result in spiking electricity demand if electric resistance heating is used as the backup heat source. The congressionally mandated *Interregional Transfer Capability Study* provided a unique look at the adequacy of the Bulk-Power System early into the next decade. This study found many of the gravest energy shortfalls are associated with the kind of weather conditions experienced in Winter Storms Uri and Elliott. Further complicating winter loads is the realization that the peak hour is typically early in the morning, limiting the efficacy of solar to help meet winter peaks.
* Finally, the **energy adequacy of the Bulk-Power System has become inextricably tied to the reliability, resilience, and security of the natural gas infrastructure.** This is true not just in winter, but at times throughout the year as the natural gas-fired generators do the heavy lifting, with support from storage, providing frequency and frequency response, ramping, voltage support, all toward meeting high demand while balancing variability in wind and solar. On August 2, 2024, natural gas-fired power generation in the U.S. set a new supply record of 7 million MWh, making up almost half of the electricity generated that day. The decline of coal-fired generation and the need for flexible generation to balance solar and wind resources make gas-fired generation and fuel supplies indispensable to reliability. Further, as gas generation is the marginal source of electric power, it is reasonable to expect that peak gas demand for generation will grow substantially while average demand may be flat or decline due to renewable generation expansion. This will create significant challenges developing new gas infrastructure and/or storage to meet increasingly spikey gas demand for power.

NERC is encouraged by changes that are underway in some of the ISO/RTO markets to address the resource adequacy risks during this era of growth and grid transformation. To maximize effectiveness, market mechanisms used to procure resources must align with energy risks that are present today and are intensifying in the future. This shift to providing energy adequacy should involve these key principles:

* **Probabilistic and scenario-based risk assessment.** Energy must be available all hours, across seasons, and under stress conditions such as extreme weather or fuel supply interruptions. Market operators will need to effectively assess the risk of energy shortfalls. Doing so will require probabilistic studies and risk scenario analysis. It will also make use of energy metrics and criteria, such as those identified in the NERC-National Academy of Engineering workshop report *Evolving Planning Criteria for a Sustainable Power Grid*. Modernizing resource adequacy criteria by supplementing it with energy-based metrics is an important component that states and provinces should consider as part of their regulatory obligations. Recent enhancements in Texas showcase the value these metrics bring to represent potential resource deficiencies.
* **Risk-informed market procurement.** Procuring resources for a fixed reserve margin target in a single peak season falls short of providing assurance that energy needs throughout the year are adequately addressed. Informed by probabilistic risk assessments, markets must appropriately procure resources to address identified risks. That is, critical stress periods may not occur on peak and energy availability and assurance may be unknown. Therefore, clear signals that procure resources considering all critical periods, with potential incentives to strengthen energy availability, are critical for market and reliability alignment. Further, ensuring incentives are in place so generating resources are ready to withstand projected extreme weather events may require Reliability Standards and/or market reform. Intrinsic to this is the need to value the contribution of energy-limited resources during the risk periods. When valuing resources in markets, historical resource performance for wind and solar is a poor substitute for probabilistic modeling of resource capability.
* **Value all required reliability attributes.** To ensure the future resource mix can provide the essential reliability services (ramping, frequency and frequency response, voltage support, etc.) to the grid and enable the flexibility operators need to balance supply and demand in real-time, procurement mechanisms need to value reliability attributes correctly. Innovative products to ensure resources for frequency response and flexible ramping capability are needed for the transforming grid. Fuel assurance should be valued in the market when fuel supply risks could threaten reliability, especially in winter.
* **Set an agreed design basis for the future grid.** Historically, the grid has been generally planned to a 1 event in 10 years standard. This was appropriate in the past when the economy was largely “metal building” and resilient to energy interruptions, and the generator fleet consisted of assets with well-known and understood availability risks. “1 in 10” translated easily into stochastic reserve margins and mapped well to energy supply risk. Today, we need much deeper insight into both capacity availability AND fuel supply risks, and a better understanding of the frequency, duration, and scale of events. This will require stronger modeling of fuel and capacity performance to assess reliability risk. The industry should align around a common set of “design basis” parameters as highlighted in the workshop NERC conducted last year with the National Academy of Engineering.

Markets must be redesigned to ensure energy—not just capacity—is available when it matters most. In addition to supplying needed energy, there must be sufficient generating resources with the characteristics and attributes able to provide essential reliability services needed for the reliable operation of the Bulk-Power System.

NERC is optimistic about the potential contributions from this two-day technical conference. The panel sessions will enable constructive dialogue on what the ISO/RTOs, regulators, and stakeholders can do to address difficult resource adequacy challenges that we face together. Nearly 400 million North Americans, most of whom are served by ISOs and RTOs, are counting on us to find solutions to the pressing reliability issues in this era of sustained and rapid growth.

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