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CHAIR SINEMA, RANKING MEMBER LANKFORD, AND MEMBERS OF THE SUBCOMMITTEE, thank you for the opportunity to participate in this hearing concerning the impact of weather events and other challenges that affect our bulk power system. My name is Lanny Nickell, and I am the Executive Vice President and Chief Operating Officer of Southwest Power Pool, Inc. (SPP) headquartered in Little Rock, Arkansas. SPP is one of seven U.S. Regional Transmission Organizations (RTO) and Independent System Operators (ISO) granted authority by the Federal Energy Regulatory Commission (FERC) to ensure the affordable and reliable delivery of electricity in our 14-state region. As an RTO, SPP's responsibilities include acting as a Reliability Coordinator, Balancing Authority and Market Administrator, roles which are all described in Appendix A of this document. I am testifying before you today regarding our experience managing electric reliability pursuant to these responsibilities during the historic winter weather event of February 2021. I will share with you our organization's observations related to the root causes of the storm's impact on electric reliability and pricing, the lessons we and our member utilities learned from our experiences, and some of the steps we are taking to mitigate and respond more effectively to future grid emergencies.

IMPACTS OF WINTER STORM URI ON THE SPP REGION

In February 2021, winter storm Uri had widespread impacts across North America. The states in SPP's region were particularly hard-hit and experienced the coldest temperatures in the nation during the period from February 14-16. Figure 1 below illustrates the overlap between SPP's service territory and the storm's most severe impacts. Many locations across our service territory, from North Dakota to the Texas panhandle, experienced record-low temperatures for days on end. As consumers' use of electricity and natural gas increased in response to the cold, power producers simultaneously faced fuel-supply issues and equipment malfunctions,

transmission system equipment approached unsafe operating limits, and the overall reliability of the bulk electric system was severely tested.

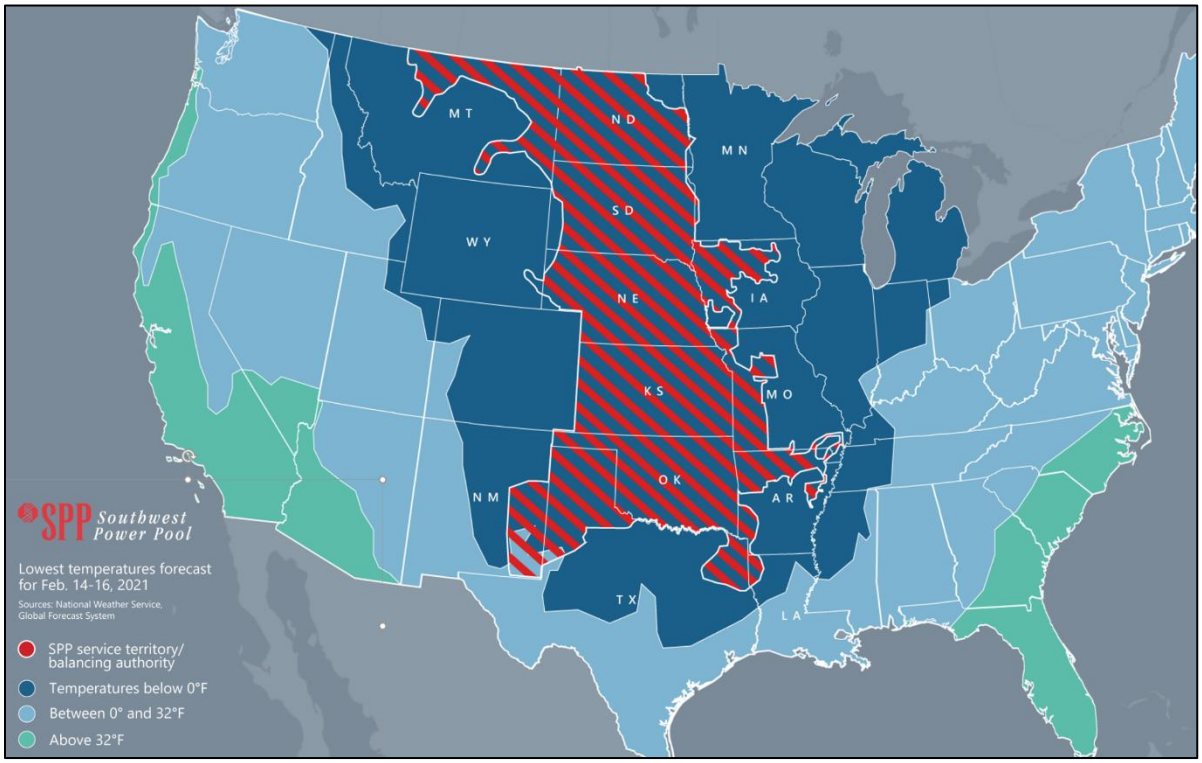

Figure 1: Based on data from the National Weather Service, this map illustrates that the entirety of the SPP service territory was affected by the coldest temperatures in the nation during the period February 14-16, 2021.

Despite the challenges of managing record wintertime electricity use, generation unavailability, fuel-supply issues, transmission congestion and historically high energy costs, SPP kept the lights on across its region throughout the winter storm, with two brief exceptions. SPP directed its transmission operators (TOP) to curtail electricity use by temporarily interrupting their customers' electric service twice: once to lessen regional energy consumption by 1.5% for 50 minutes on February 15 and again to lessen it by 3.25% to 6.5% for a little more than three hours on February 16. Underscoring the historic significance of the February 2021 winter weather

event, these interruptions marked the first times in our organization's 80-year history that SPP has called for region-wide curtailments.

SPP'S COMPREHENSIVE REVIEW OF THE WINTER WEATHER EVENT

On March 2, SPP's board of directors directed a comprehensive review of our and our stakeholders' response to the February storm. With input from SPP staff and representatives of our member utilities and state utility commissions throughout our region, the review analyzed operational, financial, communications and other aspects of the events of February 14-20. The review's stated goal was to identify how the organization could learn, adapt and be better prepared for future extreme threats to reliability, and it yielded seven key observations regarding the root causes of the winter storm's impact, SPP's response and its preparedness to respond to future reliability events. Our key observations were:

1. The unavailability of generation, driven mostly by lack of fuel, was the largest contributing factor to the severity of the winter weather event's impacts[1] and was exacerbated by record wintertime energy consumption[2] and an inability to sustain energy imports from neighboring regions[3]. This root cause drives the need to develop policies that improve fuel assurance and resource adequacy (i.e., the degree to which grid operators like SPP can be certain generation will be available to serve demand when it is

[1] Up to approximately 59,000 megawatts (MW) of nameplate generating capacity in SPP was unavailable to meet demand during the week of the event. When generation was most needed on February 16, about 30,000 MW of generating capacity was unavailable due to forced outages. The largest single cause of these forced generation outages was attributed to fuel-supply issues, causing nearly 47% of the outages and affecting over 13,000 MW of gas generation.

[2] SPP set a new winter peak load of 43,661 MW the morning of February 15 and likely would have reached a wintertime peak of 47,000 MW if not for conservation and curtailments.

[3] Reductions in imports were due to transmission congestion and tightening supply conditions in neighboring areas. Between 2,000 and 2,500 MW of imports were quickly reduced on both February 15 and 16, contributing to SPP's need to shed load each day.

needed). It also highlights the need to further assess how SPP will ensure its ability to reliably operate the grid with continually increasing amounts of intermittent and variable energy resources (i.e., wind and solar resources). Finally, better coordination and communication between the gas and electric industries would facilitate more effective emergency preparation and response activities.

2. Extremely high natural gas prices were the primary driver of record-high wholesale energy offers in SPP's market that exceeded the FERC-required offer cap of $1,000/megawatt-hour (MWh) for the first time in the market's history. On February 15, SPP's market price reached an all-time high of $4,274.96/MWh in the day-ahead market. By comparison, the average price of energy in SPP's day-ahead market for the entire year of 2020 was $17.69/MWh. Natural gas markets are not subject to price or offer caps, while electricity markets like SPP's are. Gas industry policies should assure supply and transportation are reliably and affordably available to enable the operation of generating assets during extreme events.

3. The rapid spike in SPP's market prices resulted in an immediate concern about liquidity of market participants and created an exponential increase in short-term credit exposure.[4] This issue demonstrates a need to improve our credit policies invoked during extreme pricing conditions and to clarify SPP's tariff requirements regarding credit-related authorities and responsibilities.

4. Relationships and interconnections with neighboring systems were critical. Usually a net exporter of energy, SPP relied significantly on imported energy to serve load during

[4] SPP sought and received a waiver from FERC extending the cure period for load serving entities to satisfy calls for financial security.

much of the winter event, with net amounts exceeding 6,000 megawatts (MW) at times. This emphasizes the value these relationships and robust transmission interconnections provide during emergency events. SPP had to curtail electricity usage when transmission constraints on neighboring systems forced reductions in energy imports, which demonstrates the need and opportunity to strengthen those interconnections.

5. The SPP transmission system was highly congested at times during the event with limitations that prevented full use of generation available in certain locations.[5] This issue contributed to SPP's need to curtail electricity usage through use of its established load-shed procedures and raised questions about the appropriateness of regionally allocating load-shed responsibilities when transmission constraints are being observed.

6. Early preparation, timely decisions and effective communication and coordination with SPP utilities and neighboring systems helped minimize the winter storm's impact on reliability.[6] Early communication of a public appeal for conservation contributed to reduced demand on February 15, reducing the amount of controlled service interruptions required. Effective communication of and prompt response to load-shed instructions likewise mitigated the risk of uncontrolled cascading blackouts.

7. SPP's stakeholders indicated general satisfaction with SPP's emergency communications, information sharing and credibility related to the winter storm response, although some

[5] SPP experienced 54 transmission constraints at the time load shedding began February 16 that resulted in nearly 1,900 MW of generation being reduced to maintain reliable energy flows on those facilities.
[6] FERC and the North American Electric Reliability Corporation's September 23, 2021 preliminary findings of the grid operations during the February 2021 winter weather event found that SPP and the other Reliability Coordinators "coordinated and communicated well with each other."

areas of improvement were identified, particularly in those related to end-use customer awareness.

As part of our review, SPP staff and stakeholders evaluated hundreds of potential process changes, system enhancements, new and amended policies, further assessments, and other potential solutions meant either to address the root causes of the February 2021 event's impact on the SPP system or to better enable SPP and its stakeholders to respond to future extreme system events. Ultimately, we arrived at a group of 22 actions, policy changes and further assessments related to improved fuel assurance, resource planning and availability, emergency response, market design, operator tools, transmission planning, credit practices, and communications. Work is now underway to implement each of these recommended improvements, and SPP staff will provide status reports to our board of directors at public, quarterly meetings.

FUEL ASSURANCE

As noted above, the electric industry is dependent on our nation's gas pipeline system to transport and supply natural gas. In February, the extreme cold that affected our region led to natural gas procurement and deliverability issues. Generator operators lacked access to natural gas because of both gas production issues attributed to wellhead freeze-offs and an increase in consumer demand for natural gas to heat homes. It is important to note that the electric industry does not have the ability, nor should it have the responsibility, to ensure a reliable, resilient and affordable natural gas supply. It is incumbent upon the natural gas industry to make the changes necessary to improve reliable, affordable supply and transportation of natural gas during extreme weather events. It is imperative that regulators and legislators understand the limitations of the electric industry in improving natural gas supply and transportation. Any new requirements to

improve natural gas supply and transportation need to be imposed upon the gas industry and not the electric industry if this situation is to be improved.

SPP has made several improvements related to gas-electric coordination in the past five years. In 2015, FERC issued Order No. 809, "Coordination of the Scheduling Processes of Interstate Natural Gas Pipelines and Public Utilities." In response to the order, in October 2016, SPP shortened its day-ahead market timeline and shifted its closing and posting times to better align with standard gas industry procedures. In May 2020, SPP reduced its day-ahead market timeline by another hour. And between 2016 and 2018, SPP coordinated with market participants to increase awareness of the need for additional detail in outage reporting, particularly fuel issues. SPP recently implemented a multiday commitment and pricing forecast, which should provide generation-owning market participants with additional information related to generation needs. SPP continues to seek opportunities for gaining efficiencies that better align the day-ahead market with the gas day. Since the February winter weather event, we have also welcomed our first gas-production company, Continental Resources, as a member of our RTO, and will welcome our first gas pipeline company, Southern Star, as a member before the end of the year. These partnerships represent new opportunities for the electric and gas industries to more closely collaborate in the interest of reliability and economics than we have historically.

RESOURCE PLANNING AND AVAILABILITY

The 2021 winter weather event also highlighted weaknesses of the components of the supply-side of the grid. Every type of generation (e.g., natural gas, coal, wind, etc.) experienced stress and outages to some degree. The event struck during a time of tremendous change in the nature of energy and capacity being planned and supplied in our region. These changes will continue, and considered alongside generator performance issues observed during this winter's event, this

underscores the need to further assess SPP's ability to reliably operate the system with the increased use of intermittent resources and further reduction of base-load resources. As our resource mix is expected to continue to evolve, the way resource adequacy has been determined in the past does not appear adequate to meet the needs of the future.

TRANSMISSION PLANNING

The electric utility industry depends on adequate transmission infrastructure to deliver power. Transmission will also play a critical role in mitigating the impact of future extreme weather events, as it can enhance resilience and could mitigate the need to implement load-shed procedures. Although severe congestion was experienced at times during the 2021 winter weather event, investments of approximately $10 billion over the last 15 years to upgrade the SPP transmission system allowed SPP to more fully utilize available generating resources. SPP also relied on the transmission network that extends outside its own region to import significant amounts of energy from its neighbors. Electric transmission infrastructure, both within and outside SPP, proved critical and beneficial in avoiding longer controlled interruptions of service.

In assessing future transmission needs, our industry must increasingly consider the potential impacts of severe events and the value additional transmission infrastructure can add by providing increased resilience. This is why we continuously look for ways to improve transmission planning study processes that evaluate the amount of transmission capacity needed during normal and emergency conditions.

CONCLUSIONS

SPP's staff and stakeholders have characterized the events of February 14-20 as the most operationally challenging week we have faced in our organization's 80-year history. We are

proud of how we worked together to minimize the impacts of this storm to the nearly 18 million people who live in the SPP region. We are indebted to our partners in responding to this event: member utilities, neighboring systems, and millions of people who voluntarily made sacrifices to conserve energy in the interest of the greater good. Our decisions on February 15 and 16 to curtail power, in accordance with North American Electric Reliability Corporation (NERC) standards, were made as last resorts and marked the first time SPP has ever had to direct controlled interruptions of service to our entire region. We did so only after exhausting every other option, including bringing emergency generation online and importing power from neighboring regions and in response to ever-changing system conditions that can quickly deteriorate in an instant without appropriate intervention. We understand the critical role reliable electricity plays in peoples' everyday lives, and that to go without it, especially in a prolonged period of extreme cold, puts lives and livelihoods at risk. After months of review and analysis, we stand by our decisions, because the alternative would have been far worse, and had we not deliberately lessened our regional electricity use, we could have faced cascading outages that were longer, more widespread, and more costly in terms of both lives and economics.

Many of the factors that contributed to the severity of the February storm's impacts were externalities that SPP could not control: low temperatures, the duration of the storm, fuel supply issues and prices set by gas providers, for instance. Similarly, SPP and its stakeholders will almost inevitably face other crises that arise from circumstances they cannot prevent, whether they result from natural disasters, mechanical failures or acts of terrorism. These conclusions and the findings of our comprehensive review all suggest that while SPP and its members performed well, there is room for improvement in our organization, region and industry. SPP is now shifting from a posture of retrospective analysis of the February event to one of preparation for our next

challenges. Nearly 100 unique initiatives are now underway to implement the recommendations that our comprehensive review produced. We encourage others in our industry to follow suit, applaud those who've already done so, and commit to working together to ensure we are all equipped to effectively manage future crises.

APPENDIX A: SPP'S ROLES IN ASSURING ELECTRIC RELIABILITY

SPP serves in a number of capacities related to the coordination of the regional power grid. Those most relevant to the February 2021 winter weather event are its roles as a regional transmission organization (RTO), reliability coordinator, balancing authority and market administrator.

SPP AS AN RTO: As an RTO, SPP is granted specific responsibilities by the Federal Energy Regulatory Commission (FERC). Rates, terms and conditions by which SPP oversees the regional power grid and coordinates with its member utilities are defined in a FERC-approved tariff. 106 member utilities in 14 states are members of the SPP RTO, meaning they have placed their power plants and extra high-voltage transmission facilities under SPP's functional control. RTO membership is voluntary, though the member roster has steadily grown since SPP became an RTO in 2004 because of the value the organization provides: enhanced reliability and cost savings as compared to the status quo of utilities operating on their own.

SPP AS A RELIABILITY COORDINATOR: As a reliability coordinator (RC), SPP functions like an air traffic controller for electricity. Air traffic controllers do not own skies, planes or airports they coordinate. Similarly, SPP does not own power plants, transmission lines or electricity, but it directs these and other components of the bulk power system to ensure electricity is delivered safely and affordably from where it is generated to where it is used in real time. RC activities are governed by the North American Electric Reliability Corporation (NERC), who enforces standards related to the reliable operation of the country's bulk electric system. (For more information on the standards most relevant to the winter event, see the Applicable Standards and Regulations section.)

SPP staffs a 24/7 control room and backup facility from which it maintains constant communication with member utilities. RC staff constantly plan for contingencies and operate from an N-minus-one posture, meaning they work to keep the grid ready to respond to the next worst contingency such as the loss of our largest generating unit. SPP keeps operating reserves online equivalent to one-and-a-half times its region's largest generating unit. This means it keeps enough generation online to meet real-time demand and enough "spinning" and ready to flow onto the grid immediately if committed generation becomes unavailable.

SPP AS A BALANCING AUTHORITY: The nation's power grid comprises three interconnections: Eastern, Western and the Electric Reliability Council of Texas (ERCOT). Each is a single massive, highly interconnected network of generators, transmission lines and substations that feed power to local distribution networks that serve homes and businesses. Disturbances anywhere on one of these networks are felt across the entire interconnection. The SPP RTO is part of the Eastern Interconnection.

As a balancing authority (BA), SPP keeps real-time production and consumption of electricity in balance. It does this for its entire 14-state balancing authority area. Other entities serve as the BAs in other regions, big and small, across the country. Production and consumption of electricity must be kept nearly perfectly in balance to prevent equipment failures and the potential for large-scale, cascading outages. In the absence of utility-scale energy storage devices like batteries, electricity is produced, transported, delivered and consumed nearly simultaneously. Damage to the grid can occur if either more or less energy is produced than is needed at that time. SPP forecasts demand (also called load) in five-minute increments, and sends signals every four seconds to more than 800 generators in its BA area to ensure they are

collectively producing just enough power to meet demand without overloading lines or damaging equipment.

SPP AS A MARKET ADMINISTRATOR: SPP facilitates a wholesale electricity market that automates selection of the cheapest available energy to serve load minute-by-minute. SPP's market is fuel-agnostic, meaning it does not favor any particular fuel type over another but treats coal the same as wind, natural gas the same as nuclear power, etc. The market only takes into account the price at which generators offer energy into the market, and it picks the least-cost power available to meet demand, taking into account operating characteristics such as lead times (the amount of time it takes a generator to spin up from inactivity), minimum run-times, etc.

SPP's is a day-ahead market, meaning it commits generation a day in advance. As the region nears real-time, intraday market processes make additional commitments every five minutes to ensure the right amount of generation is online as weather patterns, electricity use and other factors vary from forecasts.

Like its tariff, SPP's market design is approved by FERC, and its administration is overseen by an independent market monitor that watches to ensure the market operates fairly and without undue influence by any single participant or group of like-minded participants. SPP is a not-for-profit organization, registered as a 501(c)(6) in the state of Arkansas. As a market administrator, it facilitates the sale and purchase of power through its market, and SPP administers the process by which those transactions are invoiced and settled, but it does not profit from these activities. SPP is completely funded by a FERC-approved administrative fee assessed to our members and market participants based on their use of our services.

In summary, SPP is authorized and regulated by FERC to carry out certain responsibilities related to the reliable operation of the regional power grid. It is required to comply with enforceable NERC standards, and its staff works around the clock every day to ensure energy production and consumption are held in balance while planning against contingencies that could threaten reliability. SPP's market helps do this by committing the least-cost generation that is available to serve load.