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Executive Summary

- ***Southwest Power Pool***: SPP is one of seven independent system operators (ISO) and regional transmission organizations (RTO) in the United States. We are a nonprofit corporation with a diverse membership of 95 companies, and on their behalf we manage a network of more than 65,000 miles of high-voltage transmission lines and dispatch nearly 800 generators across a 546,000-square mile footprint stretching from Louisiana to the Canadian border. We are designated by FERC to ensure the reliability of the nation's electric grid, direct construction of transmission upgrades, and facilitate the purchase and sale of electricity in a wholesale energy market.
- ***History of Success***: SPP has successfully coordinated the electric reliability since 1941, largely on the strength of our relationships with stakeholders. SPP received FERC's RTO designation in 2004, grew our footprint from eight to 14 states between 2009 and 2015 and expanded our duties to include real-time and next-day energy markets and a consolidated Balancing Authority.
- ***Value of SPP's Markets***: SPP's Integrated Marketplace is the mechanism through which we facilitate the sale and purchase of electricity to ensure cost-effective electric reliability throughout our region. Our market is the product of more than two decades of development and refinement and is subject to oversight by the ISO/RTOs themselves, independent market monitors, and FERC. For the last five years the cost of energy in the SPP region has been among the lowest in the nation. In its first year of operation, SPP's markets delivered $380 million in net savings to our members and their customers, paying for themselves in just four months. They now provide market participants nearly $500 million in benefits annually, and to date they have reduced the cost of electricity by more than $1.25 billion in our region.
- ***Renewable Energy:*** SPP has overcome significant operational challenges and proved experts' assumptions false by successfully integrating substantial amounts of wind power into our system. Wind is now the second most prevalent fuel source in the SPP region, making up over 25 percent of our energy generated this year, behind only coal, and serves continually more and more of our load without any undesirable impacts to reliability.
- ***Challenges of Wind Integration:*** Rapid and substantial integration of wind comes with challenges, such as dramatic swings in wind output upward of 10,000 MW in less than 24 hours, and significant and sudden loss of wind generation due to icing and uncertainties inherent to wind forecasting.
- ***Markets and transmission as enabling resources:*** Successful integration of wind and other renewable and variable energy resources is dependent on enabling transmission infrastructure, consolidated balancing authorities, and effective market processes. High levels of wind and other variable energy resources could not be reliably dispatched without sufficient transmission to move energy from where it's generated to where it's needed, and our markets facilitate the real-time dispatch of variable and other generation resources to ensure reliable, affordable power for more than 17 million people in SPP's region.

Good morning. Let me begin by thanking Chairman Upton, Ranking Member Rush, and the members of the Energy and Power Subcommittee of the House Committee on Energy and Commerce for inviting me to testify before you this morning. My name is Nick Brown. I am the president and CEO of Little Rock, Arkansas-based Southwest Power Pool (SPP): the Federal Energy Regulatory Commission (FERC)-designated Regional Transmission Organization for all or part of 14 states including much of the Midwest. I also serve as the current chair of the ISO/RTO Council (IRC).

SPP is one of seven independent system operators (ISO) and regional transmission organizations (RTO) in the United States. Among other responsibilities, we are designated by FERC to ensure the reliability of the nation's electric grid, direct the construction of transmission upgrades, and facilitate the purchase and sale of electricity in a wholesale energy market, and we do so for two-thirds of the U.S. We are a nonprofit corporation with a diverse membership of 95 companies, and on their behalf we manage a network of more than 65,000 miles of high-voltage transmission lines and dispatch nearly 800 generators across a 546,000-square mile footprint stretching from Louisiana to the Canadian border. Our membership includes independent transmission companies, independent power producers, marketers, municipals, state and federal agencies, electric cooperatives, and investor owned utilities. Additionally, we provide contract services to the Southwestern Power Administration, a federal agency.

SPP has coordinated the reliability of the bulk electric grid for over 75 years. We formed in 1941 when eleven regional power companies pooled their resources to keep Arkansas' Jones Mill aluminum plant powered around the clock in support of critical, national defense needs during World War II. From then until our incorporation in 1994 and based entirely on the strength of our relationships with stakeholders, we facilitated interstate commerce, wrote standards to ensure

nationwide reliability, and ensured the lights stayed on across our footprint. Our tariff, responsibilities, and staff size have grown significantly, but our values and commitment to serving our members have remained the same.

SPP received FERC's RTO designation in 2004 and our footprint expanded into Nebraska in 2009 and to the Canadian border in 2015 with the addition of the Integrated System, which includes the Upper Great Plains Region of the Western Area Power Administration, a federal agency under the U.S. Department of Energy. Each milestone is evidence of our commitment to doing the right thing for the right reason in the right way. That we've accomplished these things while also expanding our footprint from eight to 14 states and our duties to include real-time and next-day energy markets and a consolidated Balancing Authority is proof our strategy works.

We and our peers are among the most highly regulated businesses in the U.S., subject to regulation and audits by FERC and required to operate strictly under a FERC-approved tariff. We are likewise regulated and audited by NERC, the reliability compliance enforcement authority, and as part of the Energy Policy Act of 2005, NERC has the authority to fine us more than $1 million dollars per day per compliance violation.

As SPP works diligently to ensure the supply of the most reliable and cost-efficient electric power for our entire region, we create value for our members through our expertise and the economies of scale afforded by our business model. Major services included in SPP membership include facilitation of a rigorous, proven stakeholder process; reliability coordination; tariff administration, scheduling and transmission settlements; reserve sharing; transmission system planning and coordination; operation of our Integrated Marketplace, including market settlements and congestion hedging; operations training; and compliance monitoring. SPP membership reduces members' requirements associated with Balancing Authority, Transmission

Service Provider, Planning Coordinator, and Reliability Coordinator functions. As SPP assumes administration of these services and compliance responsibilities, costs that would otherwise incurred by individual entities or associated with third-party provision of these services decrease or are eliminated.

SPP's regional approach to transmission planning optimizes the existing transmission system while determining the best opportunities for transmission expansion needed to ensure reliability, make SPP's markets more efficient, and meet public policy objectives. SPP and its stakeholders have long considered a robust transmission grid to be a prerequisite to reliable, efficient operations. It was not until 2016, though, that we first published transmission infrastructure's value to our region.

Whereas previous studies projected the expected future value of transmission construction based on available forecast data, the 2016 Value of Transmission study undertaken by SPP used actual historical operating data obtained during the first year of operation of SPP's Integrated Marketplace to document transmission value already realized. In addition to fuel cost savings, the study used metrics accepted by the industry to quantify other benefits associated with the transmission expansion upgrades, including reliability and resource adequacy benefits, generation-capacity cost savings, reduced transmission losses, increased wheeling revenues and public policy benefits associated with more optimal wind development facilitated by the transmission upgrades. The net present value of all quantified benefits is expected to exceed $16.6 billion over a 40-year period, resulting in a benefit-cost ratio of at least 3.5-to-1. This means the investments are expected to produce more than $3.50 in overall benefits for every $1 in transmission-related costs.

SPP's Integrated Marketplace is the mechanism through which we facilitate the sale and purchase of electricity to ensure cost-effective electric reliability throughout our region. It does not include a capacity market, and it is agnostic to fuel sources. Market algorithms dispatch the most reliable and least cost generation to meet demand. When we launched the Integrated Marketplace in 2014, arguably the biggest and most impactful single effort in our organization's history, we did so on time and under budget with the highest degree of quality. Along with our fellow ISO/RTOs across the U.S., our markets are the product of more than two decades of development and refinement. They are subject to a comprehensive structural and behavioral regulatory framework that includes oversight by the ISO/RTOs themselves, independent market monitors, and FERC. I urge great care to anyone considering changes to proven market rules.

The Integrated Marketplace has provided our members and their customers' tremendous value. For the last five years, from 2012-2016, the cost of energy in the SPP region has consistently been among the lowest in the nation, considering both ISO/RTO markets and other wholesale trading locations. In its first year of operation, SPP's markets delivered $380 million in net savings to our members and their customers, paying for themselves in just four months. Analysis has shown their continued value: they now provide market participants nearly $500 million in benefits annually. To date, SPP's Integrated Marketplace has reduced the cost of electricity by more than $1.25 billion in our region.

Savings from SPP's markets and transmission planning efforts make up just a portion of the overall value we afford our members. These and other services, including reliability coordination, training, and more, provide net benefits to our members in excess of $1.7 billion annually at a benefit-to-cost ratio of 11- to-1.

Today, we continue to demonstrate the successful evolution of our organization, evidenced particularly by our maturation of our cyber security practices and the effective management of a grid that's increasingly proliferated with renewable generation sources. SPP acknowledges the risk of a cyber attack as one of our top corporate risks, and with the other North American ISO/RTOs we support our collective resiliency efforts and the advancement of the cybersecurity posture of the power grid. We have and will continue to partner with state, local, regional, provincial and federal governments in Canada and the United States, NERC, the Electric Sector Coordinating Council, utilities, and academia to stay ahead of continuously advancing threats.

SPP collaborates with organizations including NERC's Electricity Information Sharing Analysis Center (E-ISAC) and local, state, regional, provincial and federal agencies in Canada and the United States, including Public Safety Canada, the FBI and Homeland Security, to ensure all ISOs/RTOs are secure and prepared to act in a cyber emergency. NERC biannually directs coast-to-coast GridEx drills which give all utilities the opportunity to coordinate responses to simulated cyber and physical attacks on electric and other critical infrastructures across North America. (GridEx is planned and executed with input from local, state, regional, provincial and federal government agencies in Canada and the United States, including the FBI and Homeland Security on the federal level and appropriate state and local agencies with which ISOs/RTOs coordinate on cybersecurity matters, as well as ISACs and supply chain organizations.) On a more frequent basis, individual ISOs/RTOs are routinely involved in regional, provincial or statewide exercises conducted throughout North America, thus ensuring opportunities for organizations to verify their readiness to respond to and recover from cyber and physical attacks.

Regarding renewable energy, it bears noting that the areas of our nation with the greatest potential for wind energy fall predominantly within SPP's footprint. In 2016 particularly, we

overcame significant operational challenges and proved many experts' assumptions false by successfully integrating substantial amounts of wind power into our system. It was assumed a decade ago, when wind comprised less than one percent of SPP's generation mix, that an ISO/RTO could never serve more than 20 to 30 percent of its load reliably with a variable resource like wind. Today, it's the second most-prevalent fuel source in the SPP region, making up over 25 percent of our energy generated this year, behind only coal, and serves continually more and more of our load without any undesirable impacts to reliability.

Installed wind-generation capacity increased in 2016 alone by more than 30 percent: from 12,000 MW to more than 16,000 MW. And we anticipate an additional 1,000 MW of wind generation to come online this year. As a result, and thanks to the continued maturation of SPP's market processes and the expertise of its operations staff, we are able to serve an ever-increasing percentage of our total load with wind. SPP's maximum simultaneous wind-generation peak rose from 9,948 MW in 2015 to 13,342 MW in February of this year. Also, wind penetration, the amount of total load served by wind at a given time, has increased from a 38 percent peak in 2015 to 54 percent in April of this year, setting a new ISO/RTO record for North America.

Such rapid and substantial integration of wind into our system comes with many challenges, including dramatic swings in wind output upward of 10,000 MW in less than 24 hours, and significant and sudden loss of wind generation due to icing and uncertainties inherent to wind forecasting. SPP also experienced an increase in congestion and congested flowgates with additional wind during the year: at high wind levels the SPP transmission system experiences approximately double the number of congested flowgates compared to periods with moderate levels of wind. Despite these challenges, SPP's staff works diligently to mitigate impacts and stay ahead of contingencies that could threaten the reliability of the system, and efforts like our

forward looking 2016 Variable Integration Study clarify SPP's operational focus to keep the lights on today and in the future.

Successful integration of wind and other renewable and variable energy resources is dependent on enabling transmission infrastructure, consolidated balancing authorities, and effective market processes. Such high levels of wind and other variable energy resources could not be reliably dispatched without sufficient transmission to move energy from where it's generated to where it's needed. Additionally, state regulators across the SPP region, like those that participate in the SPP Regional State Committee, deserve much credit for thinking regionally with regard to cost allocation and seeing the value in our continued evolution. A robust transmission system enables our markets to facilitate the real-time dispatch of variable and other generation resources to ensure reliable and affordable power for the 17 million people who we serve.

Thank you for giving me the opportunity to provide you an update on SPP and its markets. I look forward to your questions.