BEFORE THE CORPORATION COMMISSION OF OKLAHOMA

IN THE MATTER OF THE APPLICATION OF	)	
OKLAHOMA GAS AND ELECTRIC COMPANY	)	
FOR AN ORDER OF THE COMMISSION	)	
AUTHORIZING APPLICANT TO MODIFY ITS	)	CAUSE NO. PUD 201700496
RATES, CHARGES, AND TARIFFS FOR RETAIL	)	
ELECTRIC SERVICE IN OKLAHOMA	)	

Direct Testimony

of

Lanny Nickell

Vice President of Engineering for the Southwest Power Pool, Inc.

on behalf of

Oklahoma Gas and Electric Company

January 16, 2018

Q. **Please state your name, your employer, position and business address.**

A. My name is Lanny Nickell. I am the Vice President of Engineering for Southwest Power Pool, Inc. ("SPP") and am testifying on behalf of Oklahoma Gas and Electric Company ("OG&E" or "Company"). My business address is 201 Worthen Drive, Little Rock, Arkansas 72223.

Q. **Briefly summarize your education and professional background in the electric utility industry.**

A. I earned a Bachelor's Degree in Electrical Engineering from the University of Tulsa. Prior to being named Vice President, Engineering, I served as SPP's Vice President, Operations and, before that, in various management and engineering roles within the Operations Department. Prior to joining SPP in 1997, I served in various engineering roles with Public Service Company of Oklahoma and Central and South West Services. I have served on numerous SPP and North American Electric Reliability Corporation ("NERC") committees working to develop and effectuate regional and national transmission operations, planning, and market development policies.

Q. **What are your responsibilities as Vice President of Engineering for SPP?**

A. I am directly responsible for providing strategic and tactical leadership to SPP's Engineering department necessary to ensure successful completion of goals and essential functions assigned to that group, including the development of transmission expansion plans that ensure reliable and efficient usage of a regional transmission grid covering all or parts of fourteen states. I also oversee the coordination, tracking, and monitoring of approved transmission expansion projects, the performance of technical studies necessary to process requests for interconnection of generation resources and requests for long-term transmission service, and the provision of engineering support as necessary for members, customers, and regulators.

Q. **Please describe SPP.**

A. SPP is a Federal Energy Regulatory Commission ("FERC") approved Regional Transmission Organization ("RTO"). It is an Arkansas non-profit corporation with its principal place of business in Little Rock, Arkansas. SPP currently has 95 members in fourteen states with a service territory of more than 575,000 square-miles. SPP's members include 16 investor-owned utilities, 14 municipal systems, 20 generation and transmission cooperatives, 8 state agencies, 14 independent power producers, 12 power marketers, 10 independent transmission companies, and 1 federal agency.

SPP, in its role as an RTO, currently administers transmission service over 60,944 miles of transmission lines covering portions of Arkansas, Iowa, Kansas, Louisiana, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming. These services include reliability coordination, tariff administration, regional scheduling, transmission expansion planning, market operations, compliance, and training.

Q. **What is SPP's relationship to OG&E?**

A. OG&E is a transmission owning member of SPP.

Q. **Have you previously testified before this Commission?**

A. Yes, I submitted written testimony in Cause No. PUD 201300217.

Q. **Why are you submitting testimony in this docket?**

A. OG&E had previously submitted testimony in both Oklahoma and Arkansas regarding the reliability benefits of replacing the retiring steam units at the Mustang generating station with quick start combustion turbines ("CTs"). OG&E asked that I prepare testimony to provide independent validation of those benefits by (i) discussing SPP's use of quick start CTs in its reliable operation of the transmission system and (ii) citing to recent studies that show how critical it is to have continued generation (especially quick start CTs) at the Mustang site.

Q. **What is the purpose of your testimony?**

A. My testimony will discuss and explain studies conducted by SPP that show that generation at the Mustang site and especially quick-start CTs at that site provide unique reliability benefits to the transmission system. I will also testify why those benefits are important to SPP and to customers in Oklahoma.

Q. **What is your understanding of OG&E's plan for the Mustang generating station?**

A. My understanding is that OG&E is in the process of replacing the capacity of the existing steam units at the Mustang generation site with natural gas-fired, quick-starting CTs.

Q. **Does SPP use quick-start CTs to ensure reliable operation of the transmission system?**

A. Yes. SPP typically relies on quick-start resources to maintain grid reliability during unforeseen operating circumstances, including rapid loss of generation or higher than expected increases in load. SPP requires that quick-start resources necessary to provide sufficient contingency reserves be capable of being applied in time to meet NERC's Disturbance Control Standard requirements.[1] Quick-start resources are useful in facilitating reliable integration of increased levels of renewable generation and its associated volatility, due to their ability to quickly inject real and reactive power into the system.

Q. **Do quick-start CTs and renewable generation, such as wind and solar, complement one another?**

A. Yes. CTs complement variable renewable resources because they typically can be started, synchronized and capable of injecting a substantive amount of energy (including voltage support), within ten (10) minutes of notification. As the output of variable resources rapidly decreases or increases, quick-start CTs can quickly be started, stopped, and re-dispatched to balance these sudden changes in energy. Furthermore, as imports into areas

[1] NERC's Disturbance Control Standard (BAL-002) requires that a Balancing Authority return its post-contingency control performance to pre-contingency measurements within 15 minutes.

of relative high-load intensity suddenly increase, nearby quick-start CTs can provide reactive support to those areas as needed to maintain proper system voltages.

Q. **Has SPP conducted any studies that show the potential benefits of generation at the Mustang site?**

A. Yes. SPP recently conducted the 2017 Variable Generation Integration Study ("VIS"), attached as Direct Exhibit LN-1, which evaluated wind penetration levels at 45% and 60%. The study showed that even at wind generation levels below those that SPP has recently experienced,[2] voltage collapse and system overloads could occur, under certain credible circumstances, without generation at the Mustang site. As I mentioned above, quick-start CTs, such as the ones planned for the Mustang site, can be utilized quickly to balance sudden changes in energy and would be necessary to alleviate certain of the voltage collapse scenarios studied in the VIS.

Q. **Could you please explain how this study was conducted and the results which led to your conclusion above?**

A. The 2017 VIS analyzed various aspects of SPP transmission system performance for the years 2017 and 2021 under 45% and 60% wind penetration levels. The VIS included assessments of transient stability, voltage stability, system frequency behavior, and ramping capability.

Results from the voltage stability analysis demonstrated that generation at the Mustang site would effectively resolve a number of system overloads and provide voltage support during times of high energy transfers from wind generation across SPP. The purpose of this analysis was to determine the point at which wind penetration or transfer levels caused voltage instability under various operating scenarios, some of which included transmission outages that would typically exist during the time of year studied. The analysis indicated that voltage collapse could occur in a number of different areas of SPP, primarily southern Oklahoma, which includes Oklahoma City, southwestern New

[2] SPP experienced a wind penetration record when over 54% of its load was served by wind generation on March 19, 2017.

Mexico and northwestern North Dakota. Depending on the year modeled and outage conditions studied, voltage instability was observed at wind penetration levels ranging from 45% to 63.3%. During the analysis, if studied transfers caused transmission system overloads, generation would be redispatched to mitigate those overloads. The analysis showed that generation at the Mustang site is needed to effectively mitigate a real-time overload on the Cimarron-Draper 345 kV line. It also demonstrated that the CTs at the Mustang site are needed to mitigate voltage instability in various parts of Oklahoma, including Oklahoma City, after loss of the Tatonga-Matthewson 345 kV line during periods of high wind generation transfers and low load. The analysis reflected that in these conditions a large amount of thermal generation would have been cycled off-line and not available to effectively deal with energy reliability issues resulting from wind transfers and unexpected system outages. Turning on quick-start CTs in the Oklahoma City area would allow for additional voltage support plus provide congestion relief on the 345kV network in western Oklahoma where a significant amount of wind generation is located.

After Mustang generation was turned on and dispatched in the voltage stability analysis, it provided voltage support and congestion relief for the western Oklahoma and Oklahoma City areas. The VIS analytical results demonstrate the value that generation at the Mustang site can provide by resolving system overloads and providing voltage support during any number of plausible operating conditions. That value increases with quick-start CTs due to quicker start-up and ramp rates, especially during conditions where thermal units would not be on-line.

Q. **Why is it important for OG&E to have reactive support at the Mustang site when maintaining the reliability of the system?**

A. A system's ability to operate within acceptable voltage limits is the best indicator of the sufficiency of the reactive support capability of that system. As the system load continues to grow and more power is imported, due to both the SPP Integrated Marketplace and production from an ever increasing number of remote wind facilities, even more local reactive support is going to be required. With SPP's recent wind penetration levels exceeding 54%, generation at the Mustang site has already provided an effective

mitigation of reliability threats in the Oklahoma City area.[3] Given expected future increases in wind penetration, the Mustang CTs are expected to provide SPP improved capability, through provision of voltage and power support, to offset increasing reliability risks in the Oklahoma City area. As discussed by OG&E Witness Greg McAuley, the new Mustang CTs will be capable of supplying greater amounts of reactive power than the old Mustang steam units.

Q. **Did SPP conduct any additional studies?**

A. Yes. SPP also performed single contingency ("N-1") analyses for the summer and winter peak conditions expected during 2018 and 2021. Similar to the VIS, this analysis also demonstrated that generation at the Mustang site is useful in preventing and reducing thermal overloads on area transmission facilities. If generation facilities at Mustang are retired and not replaced, transmission overloads during first contingency conditions (N-1) would likely be observed in SPP's transmission planning studies and may require that SPP direct construction of transmission upgrades in accordance with its Open Access Transmission Tariff ("OATT").

Q. **How do customers in Oklahoma benefit from the Mustang CTs?**

A. Oklahoma customers benefit from the Mustang CTs because they improve SPP's ability to maintain real-time system reliability while enabling increased production from a growing supply of renewable resources, particularly those located west of the Oklahoma City area. The ability to reliably increase renewable resource production because quick-start resources are available, such as those proposed at the Mustang site, will reduce energy costs to all customers participating in the SPP market, including those in Oklahoma. Without the Mustang CTs, SPP would likely have to rely on less effective alternatives to resolve voltage and thermal issues in and around the Oklahoma City area. System voltage degradation in the Oklahoma City area, if not addressed quickly with effective local resources, could rapidly propagate and expose other areas throughout the SPP region, to

[3] Over a 12-month period ending May of 2017, SPP manually committed Mustang generation a total of 35 times for a period of 334 hours in order to resolve relevant local reliability issues.

potential loss of load. Further, additional transmission upgrades could be necessary to help mitigate these reliability and congestion issues. If construction of transmission upgrades are required, all or a portion of the Annual Transmission Revenue Requirements for those upgrades would be added to SPP's zonal transmission rates, including OG&E's, in accordance with the SPP OATT, causing Oklahoma ratepayers to bear some of those costs.

Q. **Do you have any additional thoughts?**

A. Yes. The availability of generation at the Mustang site is critical to reliable system operations in the Oklahoma City area. The generation OG&E has chosen, fast-start CTs, provides a valuable reliability tool to more quickly respond to system loading and voltages in the largest load center of Oklahoma.

I believe the need for and the reliability benefit of quick-start CTs will grow as the amount of wind capacity in SPP grows. Nearly 17,000 MW of installed wind nameplate capacity, representing nearly 20% of SPP's capacity mix, is currently operating in the SPP Balancing Authority Area footprint and participating in the SPP Integrated Marketplace. An additional 4,500 MWs of wind generation capacity is currently on schedule to be installed on the SPP system by the end of 2018, with over 30,000 MWs of additional wind nameplate capacity currently being studied in SPP's generator interconnection study queue. Properly located quick-start CTs will improve SPP's ability to reliably manage the amount of wind growth that SPP could continue to see in its footprint.

Q. **Does this conclude your testimony?**

A. Yes, it does.

2017 VARIABLE GENERATION INTEGRATION STUDY

January 5, 2017

Operations and Planning Engineering

Powertech

SPP Southwest Power Pool