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Kansas Corporation Commission
/S/ Susan K. Duffy

BEFORE THE STATE CORPORATION COMMISSION

OF THE STATE OF KANSAS

DIRECT TESTIMONY

OF

LISA M. BARTON

AMERICAN ELECTRIC POWER SERVICE CORPORATION

ON BEHALF OF PRAIRIE WIND TRANSMISSION, LLC

DOCKET NO. 08-PWTE-1022-COC

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND POSITION.

A. My name is Lisa M. Barton. My business address is 700 Morrison Road, Gahanna, Ohio 43230-6642. I am currently Vice President Transmission Strategy and Business Development, for American Electric Power Service Corporation (AEPSC), and an officer of several of AEP's affiliates. I am also President of Electric Transmission America (ETA) and a member of the Board of Members of Prairie Wind Transmission, LLC (Prairie Wind).

Q. WHAT ARE YOUR PRINCIPAL AREAS OF RESPONSIBILITY?

A. As Vice President of Transmission Strategy and Business Development for American Electric Power (AEP), I am responsible for developing and executing transmission strategy and business plans for AEP. My responsibilities include business planning and analysis, transmission strategy, transmission development and oversight of AEP's interface with its corporate partners. Prior to my present position, I was the Managing Director-Transmission and Director-Transmission Planning for AEP. As the Director-Transmission Planning, I was responsible for managing activities related to assessing and maintaining the adequacy of AEP's 11 state transmission network which serves more than 5 million people.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND, PROFESSIONAL QUALIFICATIONS, AND BUSINESS EXPERIENCE.

A. I earned a bachelor's degree in electrical engineering in 1987 from Worcester Polytechnic Institute in Worcester, MA and a Juris Doctorate degree in 1993 from Suffolk University Law School in Boston, MA. I am a member of the New Hampshire and Massachusetts state bar associations.

I joined AEP from Northeast Utilities in Berlin CT, where I was the Manager of Transmission Regulations and Compliance. I have over twenty years experience in the energy field. During my tenure in the industry I have held various positions in engineering, rates and regulatory affairs, marketing, legal and energy consulting.

II. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF THIS TESTIMONY?

A. In this filing, Prairie Wind is requesting approval for a certificate of public convenience under K.S.A. 66-131. Prairie Wind seeks a certificate under this provision so that it can provide service as an electric transmission utility in Kansas. My testimony will describe the Prairie Wind Project and the technology advances that will be part of the project. I will also discuss the reasons that AEP decided to participate in the Prairie Wind joint venture.

Q. PLEASE DESCRIBE THE TRANSMISSION PROJECT PROPOSED BY PRAIRIE WIND.

A. As Mr. Harrison testified, as its first project, Prairie Wind intends to construct 765 kV transmission facilities in two segments. The first segment will run from Wichita to Medicine Lodge to Spearville and the second 765 kV segment from Medicine Lodge south-southwest to the Kansas-Oklahoma border. This proposed 765 kV transmission project is the subject of this Application.

Q. WHAT IS THE PURPOSE OF THIS VENTURE AND AEP'S ROLE?

A. Prairie Wind's business purpose will be to acquire, construct, own and operate transmission facilities in SPP and Kansas. Prairie Wind has been created for the sole purpose of becoming a regulated electric utility and a transmission service provider under the terms of the KCC rules, and applicable SPP requirements. The venture partners are planning to use the expertise and financial resources of their companies to make significant investments toward the Prairie Wind Project. AEP's role will be to provide expertise for constructing, operating and maintaining 765 kV transmission facilities for this project as an owner of ETA as well as its other obligations under the contractual agreements of Prairie Wind. Both AEP and Westar Energy are transmission-owning utilities in SPP and Westar Energy is a public utility in Kansas.

Q. HOW WILL THE PRAIRIE WIND PROJECT BENEFIT CONSUMERS?

A. Consumers will benefit from reliability improvements to the Kansas and SPP electrical grid. Kansas and the SPP region are in need of substantial additional transmission lines and associated facilities to meet the growing electric demand of this region. The grid improvements afforded by the project will facilitate interconnection and delivery for new generation, which will enhance power supply competition and give consumers access to lower cost electricity. The proposed Prairie Wind Project also provides the potential to reduce existing transmission constraints resulting in lower congestion costs within the SPP energy imbalance services market.

Furthermore, there is broad recognition within SPP of the need for new transmission facilities to interconnect renewable energy wind farms, as well as to strengthen the bulk transmission capability of the Kansas and SPP electrical grid. The proposed 765 kV facilities will provide needed additional capacity to move power from the wind farms located in remote areas to load centers and will help facilitate the development of wind generation in the State of Kansas. Increased wind generation will result in lower air emissions because the wind turbines will generate electricity with no emissions and reduce the need for generation using traditional coal and natural gas-fired power plants. Also, because 765 kV facilities have substantially lower line losses than lower voltage facilities, construction of 765 kV transmission will reduce the energy needed to supply such line losses, thereby potentially mitigating the need to add new traditional generating plants for some period of time. Finally, the construction of the proposed transmission project along with the development of new wind generation will result in a substantial increase in economic development within Kansas and the SPP region as a whole.

Q. WHAT ARE THE BENEFITS ASSOCIATED WITH USE OF 765 KV TECHNOLOGIES OVER OTHER VOLTAGE CLASSES?

A. The higher the voltage, the lower the resistance path for electricity to flow. 765 kV transmission is the most efficient alternating current (AC) transmission voltage class in the country and is capable of transmitting large amounts of power over large distances. Use of a 765 kV system can enable the interconnection of large generation resources and transmit the power in a highly efficient manner while using a minimum amount of right of way. Fundamentally, the higher the voltage, the more electricity that can be transmitted over longer distances with fewer losses.

The increased capacity provided by the 765 kV facilities is expected to reduce transmission constraints significantly and improve reliability in the region facilitating the import and export of power to and from the Westar control area and Kansas. Because the facilities will add substantial transmission capacity and remove transmission constraints, it will support economic dispatch of generation in the region as well as off-system sales and purchases, all of which will benefit customers in the SPP region and provide new suppliers access to markets. The proposed 765 kV facilities will also provide needed additional capacity to move power from wind farms located in remote areas to load centers and help facilitate the development of wind generation in the state of Kansas.

Additionally, increased wind generation will result in lower air emissions because such assets will generate electricity with no emissions and reduce the need for generation using traditional coal and natural gas fired assets. Also, because 765 kV facilities have substantially lower losses than lower voltage facilities, construction of 765 kV transmission will reduce air emissions and can forestall the need to add new generation and upgrades to the underlying lower voltage network for some period of time. The construction of the project along with the development of wind generation will result in a substantial increase in economic development for the region.

Finally, 765 kV construction has numerous advantages over 345 kV construction. It would take six single-circuit 345 kV lines to provide the transmission capacity of a single 765 kV line. Consequently, the right-of-way requirements for 345 kV construction to provide capacity equivalent to that provided by a single 765 kV line are much higher. With fewer transmission lines and less right-of-way necessary, the reduced impact of 765 kV transmission on the landscape is significant. Moreover, a typical double-circuit 345 kV structure is actually taller than a 765 kV tower.

Q. WHAT EXPERIENCE DOES PRAIRIE WIND HAVE WITH 765 KV TRANSMISSION?

A. AEP, one of the ETA partners, owns and operates more than 2,100 miles of 765 kV transmission and has more experience constructing, operating and maintaining 765 kV transmission facilities than any other utility in the United States. AEP's most recent large scale 765 kV project, completed in June 2006, utilized new innovative tower and conductor configurations, and traversed the mountainous terrain of Virginia and West Virginia. ETA and Westar Energy have the transmission experience and capability to complete this challenging project. Together, ETA and Westar Energy offer a solid combination of technical and practical capabilities to safely and efficiently complete and then operate and maintain this important Kansas and SPP regional transmission expansion project.

III. BACKGROUND

Q. WHAT FACTORS HAVE INFLUENCED THE NEED FOR THE SIGNIFICANT INCREASES IN TRANSMISSION INVESTMENTS IN KANSAS AND THE SPP REGION?

A. With the issuance by the Federal Energy Regulatory Commission (FERC) of its Orders 888 and 889, the nature of how the transmission system is used has changed dramatically. Historically utilities designed and operated their transmission systems for the benefit of local customers. As Regional Transmission Organizations (RTOs) were formed, transmission planning began to synergistically consider the needs of larger areas. The SPP RTO is one of the newer RTOs in the country, FERC approved SPP as a Regional Transmission Organization in 2004. In the SPP region, generators and other transmission customers make transmission service requests to SPP to facilitate power deliveries depending on market conditions and customers' needs.

The existing SPP system is in need of strengthening and significant reinforcements. Today, the SPP transmission system relies on a taxed network of lower voltage transmission facilities that are not able to meet the long-term needs of the SPP region. This is highlighted by that fact that over the past several years, the available transfer capability calculated by the SPP RTO in many parts of the SPP transmission footprint are fully utilized. To address these needs, SPP has identified a growing number of projects needed to support system needs through SPP's Transmission Expansion Plan (STEP). The most recent STEP report, covering the 2008-2017 period, identified the need for $2.2 billion of investments throughout the SPP footprint for new or upgraded transmission facilities to meet the transmission needs of regional customers. SPP conducts studies to identify the transmission system upgrades needed in the SPP footprint to accommodate reliability, transmission service, and interconnection requests. Ultimately, the transmission-owning utilities are required to build transmission upgrades to accommodate these regional transmission service needs, as the facilities in each SPP zone are now planned and used to meet regional demands.

Q. ARE THERE OTHER FACTORS DRIVING THE NEED FOR NEW TRANSMISSION FACILITIES IN SPP?

A. Yes. In recognition that the needs of the SPP system are evolving and the capabilities of the SPP system need to be enhanced, the SPP Board of Directors has directed SPP to review economic transmission expansion plans to determine how transmission can be used to deliver lower cost energy to customers in the SPP region. SPP has identified several potential extra-high voltage (EHV) projects that could be built to meet this initiative. The SPP region has within its reach access to a tremendous amount of wind energy resources. As electric demand increases and fossil resources become more costly, the potential provided by wind generation is only limited by the ability to deliver this energy through a robust and efficient transmission network.

Q. WHEN INSTALLING NEW HIGH VOLTAGE TRANSMISSION FACILITIES, IS THERE A NEED TO MAKE IMPROVEMENTS TO THE UNDERLYING GRID?

A. The improvements that are necessary to integrate new facilities regardless of the EHV voltage level are very case specific. As Prairie Wind moves forward with developing the final scope and routing of the facilities, specific improvements that may be necessary will be identified and scoped.

Q. WHY WAS 765 KV SELECTED AS THE VOLTAGE FOR THE PROPOSED PRAIRIE WIND PROJECT?

A. SPP proposed 765 kV facilities for the proposed project in its final EHV Overlay Study report. SPP arrived at this determination, in part, because power transmission at 765 kV has several important advantages compared with lower voltage transmission. The 765 kV technology selected for application in this project represents the highest voltage alternating current (AC) class in commercial operation in North America and provides the greatest transmission capacity and operating flexibility. This project, much like the 765 kV system pioneered by AEP, will form a high-capacity transmission "backbone" overlaying and strengthening existing systems. It will also enhance regional reliability and efficiency.

Q. PLEASE DESCRIBE THE ADVANTAGES OF 765 KV TRANSMISSION.

A. First, a single 765 kV line can carry substantially more power than a similarly situated 345 kV line. To assess the load-carrying ability, or loadability, of high-voltage transmission facilities, engineers commonly use the concept of Surge Impedance Loading (SIL). SIL, a loading level at which the facilities attains reactive power self-sufficiency, is a convenient "yardstick" for measuring relative loadabilities of long lines operating at different nominal voltages. Using the SIL concept, six single-circuit 345 kV lines or three double-circuit 345 kV lines, built with bundled conductors (SIL = 390 MW for each 345 kV circuit), are required to achieve the loadability of a single 765 kV line (SIL = 2,400 MW). Thus, the use of 765 kV facilities instead of numerous lower voltage lines reduces the amount of right-of-way (ROW) needed resulting in a lesser environmental impact as discussed in more detail below.

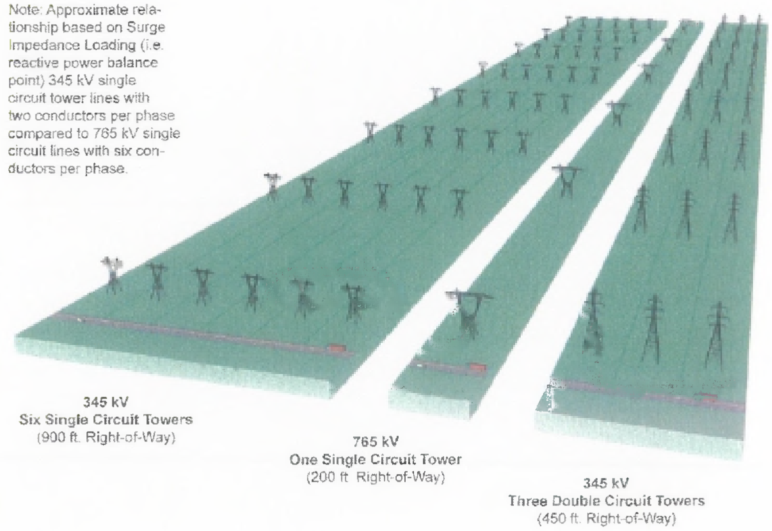
Second, experience indicates that transmission systems designed for 765 kV operation are inherently more reliable than those operating at lower voltage levels. With up to six conductors per phase, 765 kV facilities are free of thermal overload risk, even under severe operating conditions. Moreover, outage statistics show that 765 kV circuits, on average, experience significantly fewer forced outages than their 345 kV counterparts, and there have been no multi-phase faults recorded at 765 kV in normal operation, short of rare occurrences of structure failure. This performance record suggests a lesser likelihood and severity of disruptions at 765 kV.

Third, the higher operating voltage and large thermal capacity of 765 kV offer an added advantage of markedly improved transmission efficiency relative to 345 kV. 765 kV facilities incur only about one-half of the power losses of the six-circuit 345 kV alternative, both carrying the same amount of power. Also, by unloading the underlying system, which has higher resistance, overall transmission system losses are reduced. Furthermore, AEP's current 765 kV design featuring six conductors per phase offers a 40% improvement in reducing transmission line losses over the initial, four-conductor per phase design introduced by AEP in 1969. With average transmission line losses typically in the three to four percent range, AEP has achieved a line loss profile for its newer 765 kV design that is below 0.75 percent.

Often, one of the most sensitive issues in siting modern-day transmission facilities is impact on the landscape and the environment. When comparing the impacts of 765 kV and 345 kV construction, 765 kV clearly has numerous advantages. One 765 kV line requires a 200 foot ROW corridor while six single-circuit 345 kV lines would require six separate 150 foot ROW corridors. Clearly, the ROW requirements for 345 kV construction (900 feet for six single circuits or 450 feet for three double circuits) are much greater than for a single 765 kV circuit (200 feet) to move the equivalent amount of power (see Figure 1 below). With fewer transmission lines and lesser ROW needs, the reduced impact of 765 kV transmission on the landscape and the environment is significant. Moreover, a typical double-circuit 345 kV structure is actually taller (about 170 feet) than a 765 kV structure (about 130 feet) thus resulting in a more aesthetically pleasing layout.

Current per-mile costs of a 765 kV line and a double-circuit 345 kV line are approximately $2.6 million and $1.5 million, respectively (assuming 2006 dollars and average terrain). With three double-circuit 345 kV lines required to match the loadability of a single 765 kV line, an equivalent cost for 345 kV construction is $4.5 million per mile.

Figure 1 – Relative ROW Requirements of 345 kV and 765 kV



Q. ARE THERE ANY OTHER REASONS WHY 765 KV IS A SUPERIOR CHOICE?

A. Yes. A 765 kV transmission grid unloads underlying lower voltage systems and relieves constraints on those systems, thus providing significantly greater operational flexibility to perform maintenance, mitigate the effects of unplanned system contingencies, accommodate additional load, and site new generation. Also, 765 kV transmission provides a margin for operating uncertainties inherent in competitive electricity markets such as the SPP energy imbalance services market.

The robust qualities of 765 kV transmission are perhaps best illustrated by the blackout experience in the eastern U.S. and Canada that occurred on August 14, 2003. On that day, a large segment of the interconnected grid in the eastern U.S. and Canada collapsed in a cascade that affected service to some 50 million people. It is notable that the cascade was effectively stopped at the "doorsteps" of AEP's 765 kV transmission system, which remained intact. The final U.S.-Canada Power System Outage Task Force report noted that: "Higher voltage lines and more densely networked lines, such as the 500 kV system in PJM and the 765 kV system in AEP, are better able to absorb voltage and current swings and thus serve as a barrier to the spread of a cascade."[1]

Q. WHY DID AEP DEVELOP 765 KV TRANSMISSION?

A. The AEP east transmission system serves an area of the Midwest which is geographically large, with a population that is located in load pockets across that territory. The decision to develop and implement a 765 kV transmission overlay in the 1960s was founded in AEP's philosophy that a strong transmission system is essential to provide efficient, reliable and flexible transmission infrastructure to meet the ever growing demands of electricity consumers. Reliable and efficient integrated operation requires that the resources of all power plants be available, without transmission constraints, to all parts of the system under a wide range of operating conditions and possible future scenarios. The AEP 765 kV transmission system provided a robust backbone transmission

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[1] U.S.-Canada Power System Outage Task Force, "Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations," pages 75 and 77, April 2004. A copy of this report can be found at https://reports.energy.gov/BlackoutFinal-Web.pdf.

infrastructure to enable the most economical and environmentally attractive generating resources to supply the ever-increasing demand for electricity under a wide range of operating and market conditions.

During the nearly four decades of 765 kV transmission operation by AEP, this highly successful network has grown to over 2,100 miles of 765 kV lines and two dozen major substations, integrating key generating plants with load centers throughout the AEP system and providing interconnections with neighboring EHV systems.

AEP has accumulated a wealth of experience in planning, designing, engineering, constructing and operating its 765 kV transmission network. This experience is notable for many technical challenges that have been addressed as the network matured, including audible noise emitted from phase conductors during rain, unequal phase voltages and currents, protection system challenges, limited availability of system and equipment status information for operating decisions, occasional faults on critical facilities, and voltage and reactive control issues on the system. These challenges led to changes in the existing technologies and development of new technologies, which will be deployed in the Prairie Wind Project.

IV. ADVANCED TECHNOLOGIES

Q. PLEASE DESCRIBE THE ADVANCED TECHNOLOGIES PLANNED WITH THE PRAIRIE WIND PROJECT.

A. A key objective of the Prairie Wind joint venture is to make the Prairie Wind Project the most reliable, powerful, efficient, and environmentally sensitive design achievable in the timeframe needed by SPP. Prairie Wind will employ advanced 765 kV technologies to achieve the full potential of this proposed transmission project. The Prairie Wind Project will utilize individual phase controls and other modern technologies to maximize power-carrying capacity and reliability that will establish the standards and benchmarks for interstate transmission. These technologies include: 1) advanced conductor design; 2) phase and shield wire transposition; 3) fiber-optic shield wires; 4) wide-area monitoring and control; 5) remote station equipment diagnostics and security; 6) independent phase operation; and 7) switchable shunt reactors.

Q. PLEASE PROVIDE A BRIEF OVERVIEW OF THE BENEFITS ASSOCIATED WITH THE PROPOSED 765 KV PRAIRIE WIND PROJECT.

A. The use of 765 kV technology will improve the reliability and robustness of the Kansas and SPP grid, while reducing the use of ROW and improved line performance for 765 kV over lower voltage transmission alternatives. The technologies planned for implementation for the Prairie Wind Project will create other substantial benefits such as: reducing system losses and air emissions, improved reliability, lower costs, grid access for renewable energy generation resources, greater access for Kansas generators to markets outside of Kansas and a substantial increase in economic development within Kansas and the SPP region.

V. SUMMARY

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS.

A. The Prairie Wind Project will significantly improve reliability, lower system losses, and will help mitigate congestion costs in Kansas and the SPP region, benefiting customers in Kansas and the overall SPP footprint. Prairie Wind will bring needed transmission investment to the SPP market and support Kansas' renewable and infrastructure goals. Prairie Wind will be able to draw upon the collective resources and individual strengths of each of its members for planning, building and operating transmission assets in Kansas. Prairie Wind will provide a synergistic vehicle to finance and construct such needed improvements promptly and efficiently, enhancing the State's ability to meet its renewable energy goals, as well as other transmission infrastructure goals. ETA and Westar Energy are ready to make significant investments of both capital and resources in order to improve the reliability and operational performance of the SPP transmission network through the Prairie Wind Project.

Q. THANK YOU.