BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

In the Matter of the Transmission Permit for the Big Stone South to Ellendale Project

EL13-028

DIRECT TESTIMONY OF DANNY FREDERICK

BACKGROUND OF WITNESS

Q. Please state your name, current employer, and business address.

A. My name is Danny Joe Frederick. I work for POWER Engineers, Inc. ("POWER"). My business address is 555 Briarwood Circle, Suite 205, Ann Arbor, Michigan 48108.

Q. What is your current position with POWER?

A. Project Engineer II.

Q. What are your duties and responsibilities in that position?

A. As a Project Engineer, I am responsible for technical aspects of transmission line design projects. This includes structure spotting, structure design, foundation design, material and construction specifications, construction observation and inspection, and cost estimating.

Q. What is your educational background?

A. I received a Bachelor of Science degree in civil engineering from the University of Missouri in 2002.

Q. Do you have any professional licenses?

A. I am a professional engineer registered in Missouri.

Q. Before becoming a project engineer, what other positions did you hold at POWER?

A. I worked as a design engineer at POWER from 2002 to 2007.

Q. What did you do in that position?

A. As a Design Engineer, I assisted project engineers and project managers with transmission line design tasks. These tasks included foundation design, wood and steel structure design, project estimating, preparation of material and construction specifications, transmission

line hardware selection, preparation of structure and material drawings, construction support, and onsite construction observation.

Q. Have you been involved with the Big-Stone South to Ellendale 345kV transmission line project ("the Project")?

A. Yes, I have been extensively involved with the Project.

Q. What has your role been within the Project?

A. I have been the Project Engineer leading the preliminary engineering design efforts and providing engineering review during routing and permit application preparation. During the preliminary design efforts, I was responsible for evaluating the proposed route for the Project from an engineering and constructability perspective. While working on the preliminary engineering design, I drove the entire preferred route of the line. I also have completed a structure study, which was provided to the Owners to assist them in selecting the structures for the Project. I am continuing to work on the preliminary design of the project. I also have been working on determining the preliminary structure (pole) spotting that indicates the tentative structure locations on the Project. As proposed changes of the routes have been reviewed by the Project, I have participated in the review of those proposed changes from an engineering standpoint.

Q. Other than this Project, do you have any other experience working on transmission line projects?

A. Yes. I have worked on transmission line projects for the previous 12 years. I have prepared construction specifications, provided engineering support to issues that arise during construction, and have been an onsite resident engineer that provided construction engineering support on other transmission line projects.

Q. What is Exhibit 14?

A. This is my curriculum vitae.

Q. Is this true and accurate?

A. Yes.

BACKGROUND OF POWER

Q. What is the background of POWER?

A. POWER is an employee-owned consulting engineering firm specializing in energy, facilities, communications and environmental services. It was founded in 1976, in Hailey, Idaho. Services to the electric utility industry have been a core service provided by POWER since its beginning.

Q. Where are POWER's offices located?

A. In addition to its headquarters in Hailey, Idaho, POWER Engineers has offices located in the following states and international locations:

Arizona – Phoenix

California – Anaheim, Sacramento, and San Diego

Colorado – Denver

Florida – Orlando

Georgia – Atlanta

Hawaii - Hilo

Idaho – Boise, Hailey (HQ)

Kansas – Kansas City

Maine - Freeport

Massachusetts - Boston

Michigan – Ann Arbor

Minnesota – Minneapolis

Missouri – St. Louis

Montana – Billings

New Jersey – Hamilton

New York - Syracuse

Ohio – Akron, Cincinnati

Oregon - Portland

South Carolina – Fort Mill

Tennessee - Knoxville

Texas – Austin, Fort Worth, and Houston

Washington – Clarkston, Plover, Seattle, Tacoma, and Vancouver

Wisconsin – Green Bay, Madison, Plover

International offices in Manchester and Gatwick, United Kingdom, and Johannesburg, South Africa

Q. How many employees does POWER currently have?

A. POWER has 1,863 active employees.

Q. How are the employees divided within POWER?

A. The business groups within POWER Engineers and the number of employees in each group are:

Power Delivery – 1,056

Operations – 180

Facilities – 220

Communications – 34

Resource & Asset Management – 216

Federal – 32

Generation – 125

Q. What group do you work for?

A. I work in the Power Delivery group.

Q. How many professional engineers work in POWER's Power Delivery group?

A. POWER employs 355 registered professional engineers with approximately 230 registered professional engineers in the Power Delivery Group.

Q. What experience does POWER have in the design and construction of transmission lines?

A. POWER has been involved in the design and construction of transmission lines since its beginning in 1976. Since 2008, we have been involved in the design and construction of over 7,000 miles of 345 kV and 500 kV transmission lines, split approximately 50/50 between the two voltages. For voltages below 345 kV, we also have thousands of miles of design and construction experience. Examples of recent projects or clients and approximate mileages include:

CREZ (Competitive Renewable Energy Zone) Projects = 600 miles of 345kV

NEEWS (New England East-West Solutions) = 100 miles of 345kV

MPRP (Maine Power Reliability Program) = 150 miles of 345 kV

CapX 2020 = 300 miles of 345kV

Nebraska Public Power District = 150 miles of 345kV

POWER'S ROLE IN THE PROJECT

Q. What is POWER's role in the Project?

A. The Project contracted with POWER to provide overall project coordination and preliminary engineering for the Project. The preliminary engineering is in support of obtaining the permits required for the project and includes routing, public involvement and preliminary design.

Q. What has POWER done to date in regard to the Project?

In addition to coordination with the owners Otter Tail Power Company (OTP) and Montana Dakota Utilities (MDU) and the Project's various consultants, POWER is providing engineering support for the preparation of the route permit applications in North Dakota and South Dakota. POWER has also determined the preliminary line location and preliminary structure locations for the transmission line.

Q. What will be POWER's role if the Project is constructed?

A. POWER's role in the construction of the Project has not been determined by the Applicants.

Q. In performing its work on the Project, did POWER perform any engineering studies?

A. Yes. I prepared a structure (pole) study. Additionally, Jon Leman at POWER was responsible for the production of electrical studies relating to the conductors (lines) on the Project, as well as the effects of electrical fields, magnetic fields, and corona.

Q. Have you reviewed these studies and their findings?

A. Yes, I have reviewed all of these studies.

Q. Are these studies the type of information relied upon by engineers providing engineering services on transmission line projects?

A. Yes, the studies are the type of common information gathered and relied upon by engineers in our field.

Q. What were the conclusions of these studies?

A. The structure study estimated the installed cost of H-frame structures, monopole tangent structures, guyed deadend structures and self supporting deadend structures. Regarding the corona and field study and the conductor study, Jon Leman will testify about those studies.

Q. Have you reviewed the Exhibit 1 and 1A, which is the Application, as amended, filed with Commission?

A. Yes.

Q. To what sections of the Application does your testimony relate?

A. Sections 22 and 23 of the Application.

TRANSMISSION FACILITY LAYOUT AND CONSTRUCTION

Q. Are you familiar on the anticipated plans as to the proposed construction of the transmission line?

A. Yes.

Q. What is the current status of the engineering design of the transmission line?

A. Preliminary structure (or pole) spotting has been completed, the conductor (or power line) has been selected, a structure family is in development, and the design criteria is in development.

Q. What has been done in regarding to designing the transmission line structures and facilities?

A. The structure family is in development. Structures are expected to be monopole, delta configuration tangents and light angles, and vertical configuration large angles and deadends. Typical foundations will be concrete drilled piers with anchor bolts to attach the structures.

Q. What will the structures look like?

A. If you go to Appendix H of the Application, this will show you what the typical structure is expected to look like.

Q. Why was the monopole structure selected?

A. Monopole structures were selected due to their small foundation footprint and low impact to landowners.

Q. How does the cost of the monopole compare to the cost of the other structures?

A. Monopole structures were compared to direct embed H-frame structures. When span lengths are factored in, monopole structures cost approximately 40% more than H-frame structures.

Q. Does the monopole provide any advantages to the landowner?

A. Monopole structures have an overall smaller foundation footprint than H-frame or lattice tower structures. Monopole structures also allow for longer spans than H-frames and lattice towers when used on the same right-of-way.

Q. What surveying has been done of the route from engineering prospective?

A. At this time, the land surveying has been limited to surveying on public rights-of-way. An aerial survey was completed along the preferred route of the transmission line.

Q. When will final engineering surveying be done?

A. Final engineering surveying is anticipated to start in March 2016 in preparation for construction.

Q. Explain the process for constructing the structures (poles).

A. The construction process is described in Section 22.0 of the Application. Generally, for the structures, the construction process requires several steps. First, the structure locations will be determined through surveys. Then, the foundations will be excavated and placed. Next, the structures themselves will be assembled near the foundations. Finally, the structures will be lifted into place and bolted to the foundation.

Q. How will the conductors be installed?

A. Conductors will either be installed by pulling a rope along the ground between structures or by aerial construction using helicopters to pull the rope between the structures. Typical construction involves first pulling a rope between the structures and using the rope to pull in a steel cable which is then used to pull in the conductor. It is unknown at this point if helicopters will be used.

Q. What is the span length between structures?

A. Span lengths will vary depending on the terrain and features specific to each location but they are expected to be approximately 700 to 1,200 feet.

Q. Will the transmission line be buried underground?

A. No portion of the transmission line will be placed underground, with the exception of copper or copper-clad ground rods and ground wire.

Q. Why not?

A. At this voltage, placing the line underground would not be an economical choice as the cost can be 15-20 times more expensive than the cost of conventional overhead transmission. Maintenance and repair issues can take much longer to repair than overhead transmission lines due to accessibility and material availability.

Q. Do you anticipate any construction challenges?

A. Although river crossings and existing line crossings always present unique challenges due to access and outages, the Project is equipped to handle these challenges.

Q. What measures will be undertaken during construction to mitigate damage to the land?

A. To minimize the impact of construction, the Project will employ best management practices (BMPs) as stated in Section 22.2.1 of the Application.

Q. What measures will be undertaken by the Project to restore the land after construction?

A. As indicated in Section 22.3 of the Application, the Project intends to restore any disturbed areas consistent with agreements negotiated with the landowner. Unless otherwise agreed to by the landowner, all construction material and debris will be removed from the site once construction is complete. Post-construction reclamation activities include dismantling temporary facilities, employing appropriate erosion control measures, and reseeding areas disturbed by construction.

Q. How will the structures be maintained after construction completed?

A. Section 22.4 of the Application addresses the maintenance procedures. As indicated in that section, the transmission line will be regularly inspected for maintenance and repairs, and if necessary, they will be made. Access for maintenance will typically be limited to the right of way.

ENGINEERING CONSIDERATIONS

Q. Describe your view from engineering standpoint as to the proposed line's reliability?

A. The routing and design of the transmission line follows many of the same procedures and criteria used for other lines of the same size and function that have been in service for decades. The transmission line structures will be designed to withstand weather loads that are typical for the area in which the line is located. The structures will be designed to meet the National Electric Safety Code (NESC) strength requirements and will also be designed to withstand 200 year return period weather events for extreme wind and concurrent wind and ice. A 200 year return period weather event is a weather event that statistically has a 0.5% chance of occurring during any one year.

Q. Describe your view from an engineering standpoint as the safety of the proposed line?

A. The transmission line will be designed to meet or exceed all applicable safety standards, including the NESC. The structure designs will be similar to structures that have been in service for many years and have a proven track record of safety.

Q. Do you foresee any issues relating to tree clearing during construction?

A. No, we do not anticipate any issues related to tree clearing during construction. The project attempted to avoid tree row wind breaks but where it was unavoidable, crossings were made near perpendicular to minimize the quantity of trees to be cut.

Q. Is someone else testifying about any issues relating to electrical fields, magnetic fields, and stray voltage from the transmission line?

A. Yes, the testimony of Jon Leman is addressing those topics.

Q. What about the effects of the transmission line on farming equipment and GPS units, whose testimony addresses those issues?

A. Jon Leman.

LANDOWER ISSUES

Q. Have landowners raised any other engineering related concerns about the Project?

A. Yes, landowners have raised some concerns. Regarding engineering concerns, the issues generally relate to GPS interference, health concerns regarding electric and magnetic fields, and structure spotting in general. Again, John Leman is testifying about GPS interference, and the health concerns regarding electric and magnetic fields.

Q. What has the project done to address landowner concerns about structure locations?

A. Structure spotting issues are being considered in discussions between the landowners and right-of-way agents and through our structure spotting process. The Project continues to work with landowners in an effort to address the landowners' concerns.

ENGINEERING OPINIONS

Q. At this time do you perceive any significant challenges in constructing and operating and maintain the proposed line from an engineering prospective?

A. There are challenges with every project but I do not feel that this Project presents any challenges that we cannot handle.

Q. From an engineering perspective, do you have an opinion regarding whether the construction, operation, and maintenance of the transmission line will cause serious damage to any landowner's property, or the health and safety of the landowners?

A. Yes, I have an opinion.

Q. What is that opinion?

A. The Project will not cause serious damage to landowner's property or the health and safety of landowners.

Q. From an engineering perspective, do you have an opinion regarding whether the the construction and operation of the line to be a serious threat to the environment or the inhabitants or future inhabitants of where the line is anticipated to be constructed?

A. Yes, I have an option.

Q. What is your opinion?

A. The construction and operation will not pose a serious threat to the environment or the inhabitants where the line is anticipated to be construction.

Q. Are you aware as a result of your studies and investigation of the Project that the construction and operation of the line will unduly interfere with any development of the region?

A. No, it will not.

Q. Does this complete your direct testimony?

A. Yes, it does.