Direct Testimony and Schedules
Jason T. Standing

Before the Minnesota Public Utilities Commission
State of Minnesota

In the Matter of the Application of Xcel Energy for a Route Permit for the Minnesota Energy Connection Project in Sherburne, Stearns, Kandiyohi, Wright, Meeker, Chippewa, Yellow Medicine, Renville, Redwood, and Lyon Counties in Minnesota

Docket No. E002/TL-22-132
OAH Docket No. 23-2500-39782

Direct Testimony of Jason Standing
on behalf of
Xcel Energy

September 6, 2024

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Schedules

I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND TITLE.

A. My name is Jason Standing. I am the Manager for Transmission Planning for Xcel Energy Services, Inc. (XES), the service company affiliate of Northern States Power Company-Minnesota, doing business as Xcel Energy (Xcel Energy).

Q. PLEASE DESCRIBE YOUR QUALIFICATIONS AND EXPERIENCE.

A. I obtained a B.S. in Electrical Engineering from the North Dakota State University, Fargo, North Dakota in 1999. In 2011, I obtained a Masters of Business Administration from the University of Minnesota, Minneapolis, Minnesota. I received my Professional Engineer license from the State of Minnesota in 2012.

I have worked for XES since 2004 in the transmission area. I have been in my current position since 2019. My current responsibilities include managing the Transmission Planning Department for Xcel Energy, which includes Northern States Power and Northern States Power Company-Wisconsin. I am the lead planning engineer for the Minnesota Energy Connection Project (Project or MNEC). Prior to joining XES, I was an engineer in various roles for different companies. In these various roles, I have had roles of increasing responsibility in distribution planning, system protection, substation design, field engineering, and project management. My Statement of Qualifications is provided as **Schedule 1**.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is three-fold. First, I provide updated information regarding the equipment required at the Project substations to be able to interconnect up to 1,966 megawatts (MW) of energy with delivery to the Sherco Substation point of interconnection (POI). Second, I address how the length of the 345 kilovolt (kV) transmission lines could adversely impact Project performance. Third, I discuss how line crossings create safety risks and can affect transmission system reliability.

Q. ARE YOU SPONSORING ANY PORTIONS OF THE ROUTE PERMIT APPLICATION (APPLICATION) SUBMITTED BY XCEL ENERGY FOR THE PROJECT?

A. Yes. I am sponsoring the following sections of the Application:

- 2.6 Associated Facilities
- 2.9 Design Options to Accommodate Future Expansion

Q. WHAT SCHEDULES ARE YOU SPONSORING?

A. I am sponsoring one schedule:

- Schedule 1: Statement of Qualifications

II. SUBSTATION FACILITIES

Q. AS PROPOSED, HOW MUCH ENERGY IS THE PROJECT DESIGNED TO INTERCONNECT AND DELIVER TO THE POI?

A. The Project is designed to enable the interconnection and delivery of at least 1,996 MW of energy to the Sherco POI, a substantial portion of which would be wind or solar, which is an inverter-based generation resource.

Q. HOW DOES CONNECTING AN INVERTER-BASED GENERATION RESOURCE IMPACT THE ASSOCIATED FACILITIES NEEDED FOR THE PROJECT TO PERFORM?

A. Inverter-based generation uses power electronics to convert direct current power to alternating current power so it can be synchronized with the electric transmission grid. The electric transmission grid operates at a 60 Hertz frequency and is important in maintaining system stability. Due to the length of the lines (approximately 180 miles) and the type of inverter-based resources (IBR), it is necessary to add reactive support equipment at various points on the lines to help maintain connection to the grid under various operating conditions. It is also necessary to add series compensation due to the length of the lines.

Q. WHAT OTHER CONSIDERATIONS ARE PRESENTED BY INVERTER TYPE GENERATORS?

A. As the amount of renewables on an electric grid increases, there can be system stability needs that are not provided by renewable generators. In particular, voltage stability and recovery are of particular concern for the type of wind generation planned to interconnect to MNEC and due to the length of the transmission lines. If these reliability services are not sufficient, an external fault outside the MNEC lines could cause a loss of wind generation. Based on our transmission and engineering review, these issues are likely to arise on the transmission lines and must be addressed to successfully interconnect 1,996 MW of wind to MNEC.

Q. WHAT SPECIFIC REACTIVE SUPPORT AND SERIES COMPENSATION DID XCEL ENERGY PROPOSE IN THE CERTIFICATE OF NEED APPLICATION (CN APPLICATION)?

A. Our analysis for the CN Application showed that it is necessary to add two synchronous condensers in Lyon County at the proposed Garvin Substation once the amount of wind and/or solar energy interconnected reaches approximately 1,000 MW to ensure stability on the lines. The synchronous condensers at the Garvin Substation would provide system inertia and reactive support during a fault condition on the MNEC lines. Each line would also require 40 percent series compensation, which essentially reduces the length of the lines from an electric standpoint, bringing the remote generation closer to the POI. In addition, a 150 MVA STATCOM was proposed at the voltage support substation, but additional analysis through our consulting engineers showed that STATCOMs would not be sufficient. The CN Application further noted that additional facilities may be required depending on the final generation locations, size, and specific available inverter types.[1]

Q. WHAT DOES A SYNCHRONOUS CONDENSER DO?

A. A synchronous condenser is a rotating machine that is tied to the electrical system that provides reactive support during adverse system conditions and helps with power factor correction on the system.

[1] CN Application, p. 77.

Q. At the time of the CN Application, did Xcel Energy identify an alternative means of providing the support the synchronous condensers would provide?

A. Yes. In the CN Application, Xcel Energy stated that the attributes could be provided by two 210 MW combustion turbines (CTs) near the Garvin Substation, which Xcel Energy has since proposed as a capacity resource in the E002/CN-23-212 docket.

Q. What specific facilities does Xcel Energy propose?

A. Xcel Energy proposes to construct two natural-gas-fired, simple-cycle, 210 MW CT generators in Lyon County, Minnesota (Lyon County Generating Station). The CT generators would be designed to co-combust up to 30 percent hydrogen upon initial operation and would be located near Garvin, Minnesota, adjacent to the proposed Garvin Substation associated with the Project.

Q. Did Xcel Energy conduct further analysis to determine the amount of voltage support needed at the Garvin Substation?

A. Yes.

Q. What were the results of that analysis?

A. Xcel Energy retained Electranix Corporation to complete an Electromagnetic Transient (EMT) study. This study's primary focus was to determine the operational interactions and optimal solution for the proposed replacement inverter-based generation and the reactive equipment for MNEC. The study found that a STATCOM did not provide adequate support. The EMT study recommended four 110 MVA synchronous condensers be installed at the

Garvin Substation (two on each line) and confirmed that 40 percent series compensation for each line was appropriate—higher levels would interfere with IBR. The study also confirmed that two 210 MW gas CTs with clutches that can disengage the turbine shaft could replace two of the synchronous condensers at Garvin.

III. TRANSMISSION LINE LENGTH

Q. WHAT LINE LENGTHS DID XCEL ENERGY STUDY WHEN DESIGNING THE PROJECT?

A. Xcel Energy evaluated performance of the Project up to 180 miles in length in support of the CN Application and the Application to identify the facilities necessary to deliver 1,996 MW to the POI.

Q. HOW WILL THE PROJECT PERFORM IF THE PROJECT IS LONGER THAN 180 MILES IN LENGTH?

A. For this testimony, we conducted additional analysis on a line length of up to 185 and found that the lines would be expected to perform as designed. However, at 190 miles in length our analysis demonstrated there would be stability issues at the wind farms that would cause them to trip or become damaged at the maximum allowed line series reactive compensation.

IV. LINE CROSSINGS

Q. WHAT ARE LINE CROSSINGS?

A. Line crossings are when one transmission line has to cross over another transmission line, placing the conductors of one transmission line physically over the conductors of the other transmission line.

Q. HOW DO LINE CROSSINGS IMPACT SYSTEM RELIABILITY?

A. Most significantly, there is a greater risk that the outage of one line can result in an outage of the second line at the same time, reducing system resiliency. It can also result in structural damage to both transmission lines – complicating and increasing restoration times.

Q. WHAT SAFETY CONCERNS DO CROSSED LINES PRESENT?

A. New high-voltage transmission line crossings create safety risks because under normal operating conditions, one line may need to remain energized while maintenance work is occurring on the other transmission line at the same location. Taking multiple circuits out of service can stress the remaining system components and lead to overloads and voltage issues, and potentially stability concerns should there be a contingency ("loss of") of another system element at the same time.

Q. WHAT IS CONSIDERED GOOD UTILITY PRACTICE REGARDING ROUTING NEW LINES WITH RESPECT TO EXISTING FACILITIES?

A. Because of the safety and reliability impacts of crossings, good utility practice is to minimize new line crossings when routing new high voltage transmission lines.

V.CONCLUSION

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS.

A. Our transmission analysis demonstrates that the Project can interconnect and deliver 1,996 MW of generation to the Sherco POI. I recommend that the Commission grant a route permit for the Project.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes, it does.

Jason T. Standing

SUMMARY

Degreed Electrical Engineer experienced in management in government, commercial, and utility markets. Capable of satisfying customer needs and expectations through creative engineering problem solving techniques and accurate communications.

PROFESSIONAL EXPERIENCE

Xcel Energy, Minneapolis, MN 2019-current
Manager Transmission Planning, NSP/NSPW

- Lead a team of transmission experts to develop long-term plans to ensure reliable transmission operations
- Coordination of diverse groups of contributors to develop regional and local plans
- Serve as expert witness in state permitting and regulatory process
- Develop future planning tools and processes to help with the grid of the future

Xcel Energy, Minneapolis, MN 2015-19
Principal Transmission Planning Engineer

- Lead Transmission Planning engineer for the Twin Cities area
- Responsible for training new Transmission Planning engineers
- Involved in local and regional policy with states and RTOs
- Develop computer programming skills and incorporate into Transmission Planning

Xcel Energy, Minneapolis, MN 2014-15
PROMOD Planning Engineer

- Provide Production Cost Modeling for the NSP area
- Evaluate transmission project impacts to generation
- Congestion analysis

Xcel Energy, Minneapolis, MN 2004-14
Senior Specialty Transmission Planning Engineer

- Responsible for leading and improving the Constructability I process for which all new transmission projects must be approved through
- Lead Technical expert for the Hiawatha Certificate of Need
- Lead the MISO MTEP process for NSP and NSPW areas
- Involved with neighboring and regional entities to create cost effective solutions to the regional and bulk transmission issues
- Work closely with MISO to ensure Xcel Energy's interests are being heard through multiple working groups

Wunderlich-Malec Systems, Minnetonka, MN 2002-2003
Project Manager

- Managed the design, electrical system analysis, and procurement for substation projects

- Responsible for delivering cost analysis to the customer, preparing equipment bids, while monitoring expenses
- Provided field support for the construction team to ensure that the substation was delivered on time and to the customer's satisfaction

Design Engineer

- Lead design engineer for the American Transmission Company's new 69 kV substation
- Lead engineer responsible for accurate settings of the system protection relays
- Responsible for ensuring the NEC codes were followed
- Created new drawing sets while updating old drawing sets to ensure accuracy for the customer

Sebesta Blomberg and Associates, Roseville, MN 2000-2002
Project Engineer

- Commissioning specialist whose duties included creating test sheets for various types of electrical equipment, field visits, overseeing testing specialists at the Pentagon and other commercial sites
- Design engineer who used creative problem-solving techniques to redesign customer's 230 kV and 115 kV breaker control panels.
- Developed load flow and system protection studies

Alliant Energy, Madison, WI 1999-2000
Distribution Systems Planner

- Responsible for running load flow analysis for the southern Wisconsin electrical distribution and transmission systems
- Involved in maintaining and updating existing computer models to reflect changes to the physical system
- Prepared cost analysis reports for management

EDUCATION

B.S. in Electrical Engineering, North Dakota State University, Fargo, ND 1999
MBA, University of Minnesota, Minneapolis, MN 2011
Profession Engineer Minnesota, PE 2012

COMPUTER EXPERIENCE

PSSE, PROMOD, Synergi, SKM Power Tools, Microsoft Office