Direct Testimony and Schedule
Andrew W. Siebenaler

STATE OF NORTH DAKOTA
BEFORE THE
NORTH DAKOTA PUBLIC SERVICE COMMISSION

In the Matter of the Application of Northern States Power Company for an Advance Determination of Prudence for the Monticello Nuclear Generating Plant Life Extension

Case No. PU-23-____

Exhibit___(AWS-1)

Reliability

February 3, 2023

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Schedule

I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND TITLE.

A. My name is Drew Siebenaler. I am the Manager of Regional Transmission Planning for Xcel Energy Services, Inc. (Xcel Energy), which supports the Xcel Energy operating companies, including Northern States Power Company-Minnesota (NSP or the Company). The Company provides electric service to customers in Minnesota, North Dakota, and South Dakota. The Company's affiliate, Northern States Power, a Wisconsin corporation (NSPW), provides electric service to customers in Wisconsin and Michigan. The Company and NSPW, together under the Interchange Agreement, own and operate the five-state integrated Upper Midwest Northern States Power Company system (NSP System).

Q. PLEASE DESCRIBE YOUR QUALIFICATIONS AND EXPERIENCE.

A. I have worked for Xcel Energy since March 2015 in the area of Regional Transmission Planning. I have been in my current position since July 2019.

Prior to joining Xcel Energy, I was a Transmission Planning Engineer at the Midcontinent Area Power Pool Corporation (MAPPCOR). In this role, I performed regional transmission planning analyses on behalf of the members of the Midcontinent Area Power Pool (MAPP), focusing on system reliability in accordance with North American Electric Reliability Corporation (NERC) transmission planning and modeling standards. My statement of qualifications is provided as Exhibit___(AWS-1), Schedule 1.

Q. WHAT ARE YOUR CURRENT RESPONSIBILITIES?

A. In my current role, I oversee a team of engineers and policy experts involved in the development of transmission planning policy and regional transmission plans in the Midcontinent Independent System Operator (MISO) and Southwest Power Pool (SPP) Regional Transmission Organizations (RTOs), and the WestConnect Order 1000 Transmission Planning organization.

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

A. The purpose of my testimony is to discuss the reliability benefits of the Company's proposal to extend the life of the Monticello Nuclear Generating Plant (Monticello Plant or the Plant) through at least 2040, as well as the system reliability implications of allowing the Plant to retire in 2030. As a baseload, "always on" resource, the Monticello Plant provides critical reliability and system balancing benefits to the NSP System as well as the broader MISO grid. The Plant has a strong operating record and is not subject to day to day volatility in fuel prices or potential fuel supply disruptions caused by weather events. In particular, the high capacity factor and accredited capacity of the Plant, with predictable and planned fuel outages, helps the Company maintain reliable operations and meet our obligations to MISO. Extending the Monticello Plant at least through 2040 will ensure that the important services it provides are maintained on the NSP System.

Q. WHAT IS THE COMPANY REQUESTING IN THIS ADP?

A. The Monticello Plant will exhaust its current on-site spent fuel storage capacity in 2030. Absent the additional spent fuel storage that the Company is planning, the Plant would need to close in 2030, and Xcel Energy would need to replace the substantial capacity and energy the Monticello Plant provides to

the NSP System with other resources. For this reason, the Company is requesting an ADP for its proposal to invest in additional storage and federal licensing to extend the life of the Plant to at least 2040. Further details regarding the specific investments proposed are provided in the Direct Testimony of Company witness Ms. Pamela Prochaska.

II. RELIABILITY BENEFITS OF THE MONTICELLO PLANT

Q. PLEASE PROVIDE A BRIEF OVERVIEW OF THE MONTICELLO PLANT'S CONTRIBUTION TO THE NSP SYSTEM.

A. The Monticello Plant is a key part of the baseload backbone of the NSP System operating out of the Becker/Monticello area of Minnesota, just outside the Company's largest load center of the Twin Cities. The Plant provides our system with 671 megawatts (MW) of capacity and produces energy 24 hours a day, seven days a week for extended periods of time in between refueling maintenance outages. Combined with the Prairie Island nuclear plant, the Monticello Plant represents nearly 30% of the total electric energy (and 48% of the carbon-free energy) our customers used in 2020, making it a critical component of our overall generation fleet. Ms. Prochaska provides more detail regarding the operations of the Monticello Plant in her Direct Testimony.

Q. HOW DOES THE MONTICELLO PLANT SUPPORT RELIABILITY ON THE NSP SYSTEM?

A. The Monticello Plant runs at a very high capacity factor year-round, and is among the most reliable generators in the Company's fleet. Monticello has operated at an average capacity factor of 95 percent over the last three years,

including a record-setting 98.7% in 2020, a non-refueling year. The Plant recently completed a record 704 days of continuous operation prior to its most recent scheduled refueling outage in April 2021. Nuclear plants are also far less susceptible to fuel price volatility or supply disruptions when compared to other traditional baseload resources. Overall, as a baseload resource that is nearly always running at full capacity, the Monticello Plant provides an important reliability backstop for the NSP System, regardless of geopolitical events or potential weather disruptions.

Q. DO OTHER TYPES OF TRADITIONAL BASELOAD RESOURCES OPERATE AT THE SAME HIGH CAPACITY FACTOR AS NUCLEAR?

A. No. Nuclear is unique within the Company's generation fleet because the plants are designed to run at nearly full capacity year-round, while other baseload resources are not. Other traditional baseload resources such as coal, run-of-river hydro, and biomass do not and cannot achieve the same consistently high capacity factors as our nuclear fleet. The Company's remaining coal-fired generation, for example, is typically only dispatched during certain periods of time or peak events due primarily to economic forces.

Q. DOES MONTICELLO SUPPORT SYSTEM RELIABILITY AND RESILIENCY DURING SEVERE WEATHER AND PEAK EVENTS?

A. Yes. Nuclear plants, including the Monticello Plant, have a strong operating history year round. For example, our three nuclear units performed extremely well throughout both the 2019 polar vortex and the February 2021 cold spell—operating at 100 percent capacity factor. As discussed by Ms. Prochaska, the Monticello plant can have up to six years of fuel on site and thus is not subject

to fuel supply disruptions or pipeline limitations in the winter like other baseload resources. In particular, gas plants in the Upper Midwest can be susceptible to fuel disruptions in the winter due to gas being diverted to serve home heating or even due to fuel disruptions far afield, as SPP experienced during Winter Storm Uri. As I discuss in Section III below, this is an additional risk that the Company would be taking on if it retired the Monticello Plant on schedule and replaced its capacity with CTs.

Q. ASIDE FROM PEAK EVENTS, HOW DOES MAINTAINING NUCLEAR AS PART OF A DIVERSE MIX OF GENERATION RESOURCES ENHANCE RELIABILITY?

A. In general, generation resource diversity is important to maintaining the robustness and resiliency of the NSP System, particularly as we continue to bring more variable resources onto the system. Variable resources such as wind and solar provide zero-carbon energy and low or zero marginal cost, but because they are variable rather than firm, other resources on the grid must be able to accommodate fluctuation in their output as it occurs and ensure energy and capacity adequacy every hour of every day. In the context of this transition, our nuclear fleet provides a wide range of "essential reliability services" to ensure system strength and system stability.

Q. WHAT ARE ESSENTIAL RELIABILITY SERVICES?

A. System strength and system stability are two related – but distinct – aspects of essential reliability services that work together to ensure the grid can detect and respond to periodic disturbances that may otherwise cause outages or other voltage disturbances. System strength refers to the grid's ability to maintain stable voltages, and for grid control systems to be able to detect differences between normal and abnormal conditions in the event of a grid

disturbance. The stronger a system is, the more quickly and capably it can respond to – and mitigate – a destabilizing event. Controlling voltages on the grid at all locations, at all times, to acceptable levels is essential for power quality and reliability.

System stability refers to the grid's ability to respond to these disturbances to maintain balance; it includes factors such as frequency regulation, spinning reserve, and inertial response capabilities. Frequency regulation refers to how grid assets respond to rapid changes continuously occurring on the grid and ensure that the energy produced on the system precisely matches customer usage at all times. Spinning reserve is a generator's capacity that is available but remains available/unloaded, so that it can be used to provide extra generation if needed to meet customer needs. Inertia is an attribute of generators with large, spinning rotors that helps the system "ride through" disturbances to the grid that, without inertia, would impact reliability.

Q. DOES THE MONTICELLO PLANT SUPPORT SYSTEM STRENGTH?

A. Yes. As a synchronous generator, the Monticello Plant provides system strengthening voltage control by providing a consistent and smooth voltage signal that is required for reliably transferring power and withstanding system events that would negatively impact system reliability in the absence of such system strength. This is a product of the synchronous operation that is physically coupled to the grid. As long as the Monticello Plant is operating, it will contribute to system strength as a byproduct of that energy production. Unlike other baseload resources, the Monticello Plant's high capacity factor and dependable operating history ensure this contribution to system strength is being provided in nearly all hours of the year.

Q. DOES THE LOCATION OF THE MONTICELLO PLANT IMPACT SYSTEM BALANCING?

A. Yes, the injection of baseload power at Monticello keeps the NSP System balanced. For example, when marginal prices in MISO are low, large amounts of wind energy are pushing onto the system from south and west of the Twin Cities. In order to keep the system balanced, it is important to maintain the continuous injection of power from the Becker/Monticello area to push back on these flows from the south. These counterflows ensure power flowing on transmission facilities into the Twin Cities from the south and west remain within their limits and avoid increased curtailment of wind resources to maintain reliability as well as financial impacts from higher congestion levels.

III. RELIABILITY IMPLICATIONS OF RETIRING THE MONTICELLO PLANT IN 2030

Q. IF THE MONTICELLO PLANT WERE TO RETIRE IN 2030, WHAT TYPES OF RESOURCES WOULD REPLACE IT?

A. I am not an expert in Resource Planning, but as discussed by Ms. Mandich, if left to optimize the most cost-effective replacement resources, the capacity expansion model would select 750 MW of gas-fired combustion turbines (CTs) to replace Monticello's capacity if the Plant were to retire in 2030.

Q. WOULD REPLACEMENT CTS PROVIDE THE SAME ESSENTIAL RELIABILITY SERVICES AS THE MONTICELLO PLANT?

A. Combustion turbines and the Monticello Plant, both being synchronous resources, would provide some of the same essential reliability services. These would vary in magnitude and capability depending on the type, size,

technology and configuration of the CT. The most impactful difference is when those services would be available. According to the EIA, the available capacity of CTs online today have significantly lower capacity factors than the Monticello Plant, with this fleet of CTs rarely exceeding even a 20% monthly capacity factor in the years 2020-2022.[1] Since synchronous generation provides essential reliability services only when operating, a CT replacement is significantly less likely to be available to provide such services when they are needed as compared to the always-on characteristics of the Monticello Plant.

Q. WOULD THE EXISTING SHERCO COAL UNITS, IF THEY WERE TO REMAIN ONLINE, BE ABLE TO PROVIDE THE SAME ESSENTIAL RELIABILITY SERVICES AS THE MONTICELLO PLANT?

A. While the existing coal units at Sherco would provide some of the same essential reliability services, and typically have a higher capacity factor than CTs, those units are lacking for the same reasons as CTs. Typically, the coal units are dispatched when market prices are high enough to make operations economic. As a result these services are provided during less of the year than the Monticello Plant. In addition, the grid has developed to operate reliably utilizing the services provided by the combination of the Monticello and Sherco units. Regardless of parallels between the services provided by the two resources, the grid would have to be redesigned to account for these services only being provided by one of these resources.

[1] U.S. Energy Information Administration, Electric Power Monthly, Table 6.07.A, Capacity Factors for Utility Scale Generators Primarily Using Fossil Fuels (Accessed Jan. 16, 2023). *Available at:* https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=table_6_07_a

Q. COULD THE EXISTING SHERCO COAL UNITS OR REPLACEMENT CTS ON THE SHERCO SITE PROVIDE THE SYSTEM BALANCING BENEFITS OF MONTICELLO THAT YOU DISCUSSED EARLIER?

A. No. The existing Sherco coal units or any replacement CT would not provide the same system balancing benefits I discussed above because if energy prices are low enough to cause large levels of wind energy flows from the south, the coal units and CTs would not be dispatched and those would not be able to push back on those power flows. This is a product of the unique topography of the NSP System and the central role of the Becker/Monticello area as a generation center dating back multiple decades.

Q. HOW WOULD RETIREMENT OF THE MONTICELLO PLANT IN 2030 IMPACT THE BROADER MISO GRID?

A. In terms of system reliability as would be analyzed in a MISO Attachment Y request, a Monticello Plant retirement would contribute to strain on transmission facilities outside of the Company's service territory. When combined with other retirements, this contribution from Monticello could lead to system conditions that require mitigations to avoid reliability concerns. Expanding that view to include system operations, MISO wholesale energy market impacts and transmission expansion plans, the retirement of Monticello would materially impact the reliability, resilience and cost of service found within the greater MISO system today. From the operations perspective, retirement of the Monticello plant further reduces overall system strength and inertia, both of which are attributes of reliable system operation. Shifting to the MISO wholesale energy market, the reduction of counterflows and consistent power production resulting from the retirement of the Monticello Plant would lead to increased congestion costs, curtailment

occurrences and increase market price variability. Finally, with respect to impacting transmission expansion plans, the MISO Long Range Transmission Plan (LRTP) effort assumes the Monticello Plant stays online beyond the study period, which ends on December 31, 2039 and could extend further into the future as additional long-range analyses are performed. Replacement of the energy and services provided by the Monticello Plant would represent a material change to the LRTP effort, likely creating additional need for transmission expansion than what has been identified to date. When looked at holistically, the retirement of the Monticello Plant would result in material impacts to the broader MISO system and result in increased costs to maintain the attributes already provided by the Monticello Plant remaining in service.

Q. WOULD RETIREMENT OF THE MONTICELLO PLANT IN 2030 IMPACT TRANSMISSION CONGESTION?

A. Yes. As noted above, because the Monticello Plant would likely be replaced by CTs for the capacity and wind generation for the energy lost if it were to retire in 2030, we would expect transmission congestion to worsen if Monticello retires in 2030. This additional wind capacity would place additional strain on existing constraints that limit the movement of wind energy to the Twin Cities metro form the south and west, while counterflows coming from the north would be less, and in turn less capable of keeping power flows to within facility limits.

Q. DOES THE MONTICELLO PLANT PROVIDE HEDGE VALUE FROM A TRANSMISSION PERSPECTIVE?

A. Yes. According to MISO "An Auction Revenue Right is a Market Participant's entitlement to a share of revenue generated in annual [Financial Transmission

Rights] auctions. A Market Participant's firm historical usage of MISO's transmission system determines its share, and depending upon the FTR auction clearing price of an ARR path, the share could result in revenue or a charge." Given the high usage produce by the operation of the Monticello Plant to serve NSP customers on a consistent path, the Monticello plant offers a consistent opportunity in terms of hedging.

IV. CONCLUSION

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

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF NORTH DAKOTA

NORTHERN STATES POWER COMPANY
ADVANCE DETERMINATION OF PRUDENCE
MONTICELLO NUCLEAR PLANT LIFE EXTENSION
APPLICATION

CASE NO. PU-23-___

VERIFICATION

STATE OF MINNESOTA)
) SS.
COUNTY OF HENNEPIN)

Andrew W. Siebenaler, being first duly sworn on oath, deposes and says that he is the Manager of Regional Transmission Planning for Applicant Northern States Power Company, a Minnesota corporation, in the above-captioned matter, that the testimony submitted in the above-captioned matter under his name was prepared under his direction, that he knows the contents thereof, and that the same is true and correct to the best of his knowledge and belief.

Andrew W. Siebenaler

Subscribed and sworn to before me on this 31 day of January, 2023

Teresa Hansberry
Notary Public
My Commission expires: 01/31/2027

TERESA LYNN HANSBERRY
NOTARY PUBLIC
MINNESOTA
My Commission Expires Jan. 31, 2027

	Andrew Siebenaler **Xcel Energy** **Manager – Regional Transmission Planning and Analytics** 414 Nicollet Mall, Minneapolis MN, 55401
Experience	**Apprentice Electrician** Electric, Fire & Security, Inver Grove Heights, MN *June 2005 –August 2008* Installation and Maintenance of electrical appliances and fixtures, ensuring compliance with all federal, state and local electrical requirements Locate and repair aging or malfunctioning electrical equipment
	Plant Maintenance Engineer Intern Hormel Foods, Osceola, IA *May 2012 – August 2012* Supervise plant maintenance staff and coordinate maintenance project efforts Assist senior engineering staff in development and implementation of plant improvement projects Develop and implement data driven maintenance programs for cooling system
	Transmission Planning Engineer II MAPPCOR, Roseville, MN *December 2012 – March 2015* Analyze the transmission system in compliance with federal, state and local transmission planning standards including steady state, dynamic stability and probabilistic studies. Ensure the compliance with NERC transmission planning standards Develop automated processes to reduce the time required for processing and review of transmission planning studies

	Senior Engineer – Regional Transmission Planning Xcel Energy, Minneapolis, MN *March 2015 – July 2019* Serve as expert witness in state permitting and regulatory processes Participation in all aspects of Regional Transmission Organization planning processes Develop policies and procedures to be implemented in company and Regional Transmission Organization processes Provide transmission expertise in development of long-term plans
	Manager – Regional Transmission Planning and Analytics Xcel Energy, Minneapolis, MN *July 2019 – Present* Lead a team of experts in regional transmission policy and market-focused planning Serve as expert witness in state permitting and regulatory processes Developmental and educational efforts to advance policies and procedures at the company and Regional Transmission Organization level Coordinate inclusion of transmission expertise in development of long-term plans
Education	**Bachelor of Science, Electrical and Computer Engineering** University of Minnesota - Duluth, Duluth, MN December 2012 **Technical Diploma – Electrical Construction and Maintenance** Dunwoody College of Technology, Minneapolis, MN June 2007