

Direct Testimony and Schedule  
Allen D. Krug

**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\_\_\_\_(ADK-1)

**Policy**

February 3, 2023

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## Schedule

Statement of Qualifications

Schedule 1

1 **I. INTRODUCTION AND QUALIFICATIONS**

2  
3 Q. PLEASE STATE YOUR NAME, OCCUPATION AND JOB RESPONSIBILITIES.

4 A. My name is Al Krug. I am Associate Vice President, State Regulatory Policy  
5 for Northern States Power Company – Minnesota (NSP or the Company).

6  
7 Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS AND EXPERIENCE.

8 A. I have worked for Xcel Energy since 1998, initially as a Manager of Renewable  
9 Energy and Energy Contract Coordinator. I then served as a Regulatory  
10 Consultant for a number of years before becoming Regional Vice President,  
11 Regulatory Administration in 2008. I began my current position in 2013. Prior  
12 to joining the Company, I worked for over a decade at the Minnesota  
13 Department of Commerce, first as a Statistical Analyst and later as a  
14 Supervisor in the Electric Regulatory Unit. My statement of qualifications is  
15 provided as Exhibit\_\_\_\_(ADK-1), Schedule 1.

16  
17 Q. WHAT ARE YOUR CURRENT RESPONSIBILITIES?

18 A. In my current role, I develop regulatory strategy for NSP across North  
19 Dakota, South Dakota, and Minnesota.

20  
21 Q. FOR WHOM ARE YOU TESTIFYING IN THIS PROCEEDING?

22 A. I am testifying on behalf of NSP.

23  
24 Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY IN THIS PROCEEDING?

25 A. The purpose of my testimony is to provide support and policy context for the  
26 Company’s request for an Advance Determination of Prudence (ADP) to  
27 extend the life of the single-unit, 671-megawatt (MW) Monticello Nuclear



1 Q. PLEASE PROVIDE A GENERAL OVERVIEW OF THE MONTICELLO PLANT.

2 A. The Monticello Plant is a single-unit, 671 MW, nuclear powered, boiling water  
3 reactor, electric generating station located in Monticello, Minnesota. Since it  
4 began operations in 1971, the Plant has played a critical role in the fleet of  
5 resources NSP uses to serve our customers, generating over 200 million  
6 megawatt-hours (MWh) of electricity over the past fifty-plus years. The Plant  
7 provides baseload service, operating twenty-four hours a day, seven days a  
8 week for extended periods of time to meet steady demand for electric power.  
9 The Company's Prairie Island Plant and Monticello Plant are the only  
10 generating stations in NSP's system that can provide comparable levels of  
11 consistent, reliable, carbon-free energy and capacity.

12

13 Q. HOW DOES THE MONTICELLO PLANT OPERATE?

14 A. Company witness Ms. Pamela Prochaska provides details on the technical  
15 operations of the Plant in her Direct Testimony. But in general terms, the  
16 Monticello Plant operates using a boiling water reactor, which boils water to  
17 produce steam inside the reactor vessel, which is then directed to turbine  
18 generators to produce electrical power. The steam is cooled in a condenser  
19 and returned to the reactor vessel to be boiled again.

20

21 The reactor core, which provides the heat used to boil water, is made up of  
22 nuclear fuel assemblies. Each assembly contains fuel rods, consisting of high-  
23 density ceramic uranium dioxide fuel pellets, each about the size of a thimble,  
24 stacked in a tube made of a special steel alloy called Zircaloy. A fission reaction  
25 between two particles in the fuel rods creates heat, powering the reactor core.  
26 The Company's nuclear engineers carefully monitor and control the reaction

1 within the core to provide the steady baseload power the Company's  
2 customers rely on.

3  
4 Q. HOW LONG DOES THE FUEL LAST?

5 A. Each nuclear fuel assembly provides heat over about a six-year period before  
6 its output declines to the point that it becomes ineffective. Approximately  
7 every two years, NSP shuts down the Plant to refuel one-third of the fuel in  
8 the reactor.

9  
10 Q. HOW DOES THE MONTICELLO PLANT PROVIDE VALUE TO CUSTOMERS?

11 A. The Monticello Plant offers customers cost-effective and carbon-free,  
12 generating capacity that powers hundreds of thousands of homes in the  
13 Company's service territory nearly every day of the year. The value proposition  
14 for the Plant has several components.

15  
16 *Reliable Energy*—The Monticello Plant is among the most reliable generation  
17 resources in the Company's fleet. The Plant has achieved an average capacity  
18 factor of 95 percent over the past three years. No other generation source in  
19 the Company's fleet can be depended on like its nuclear reactors because  
20 plants like Monticello are designed to run at nearly full capacity year-round  
21 while other baseload generation resources cannot because of higher marginal  
22 costs. The Monticello Plant and its sister facility at Prairie Island provide the  
23 constant baseload output that remains an important and necessary part of  
24 NSP's overall generation portfolio. Company witness Mr. Drew Siebenaler  
25 discusses the reliability benefits of the Monticello Plant in his Direct  
26 Testimony.

27

1        *Cost-Effective Resource*—The Company’s nuclear fleet can deliver carbon-free  
2        energy at a competitive cost. In fact, the Monticello Plant’s marginal cost per  
3        MWh is at its lowest point in over a decade. Over this same time period, NSP  
4        has achieved all-time-high capacity factors at the Plant, further reducing the  
5        cost per MWh. Company witness Ms. Farah Mandich discusses the  
6        Company’s resource planning and economic analysis, which shows that  
7        extending the life of the Monticello Plant provides important benefits for  
8        customers.

9  
10       *Fuel Diversity*—The Company’s nuclear facilities also provide the Company  
11       and its customers a hedge against changes in resource availability and fossil  
12       fuel prices. As demonstrated by recent price increases for other fuels due to  
13       geopolitical events and weather disruptions, NSP’s nuclear fuel prices remain  
14       less volatile and provide a consistent cost per MWh. Ms. Mandich and Mr.  
15       Siebenaler discuss the importance of fuel diversity from a resource planning  
16       and reliability perspective, respectively.

17  
18       *Clean Energy*—As discussed further by Ms. Mandich, the Monticello Plant is  
19       critical to achieving the Company’s carbon reduction initiatives, which would  
20       be significantly more challenging to accomplish without a life extension of  
21       Monticello.

22  
23    Q.    WHAT IS THE CURRENT LICENSURE STATUS OF THE MONTICELLO PLANT?

24    A.    The NRC regulates the operation of nuclear power plants. It granted the  
25       Monticello Plant its initial 40-year license in 1970, which allowed the Plant to  
26       operate until September 8, 2010. In 2006, the NRC approved a 20-year license  
27       extension, which expires on September 8, 2030. As detailed further in Ms.

1 Prochaska's and Ms. Mandich's testimony, the Company has determined that  
2 it can continue to operate the Plant safely, reliably, and economically beyond  
3 2030. Accordingly, NSP intends to file an application with the NRC to renew  
4 the operating license for the Monticello Plant for an additional 20 years. With  
5 such an extension, the Plant would be licensed until September 8, 2050.

6  
7 Q. HAS THE COMPANY MADE ANY RECENT INVESTMENTS IN THE MONTICELLO  
8 PLANT THAT WOULD CONTINUE TO PROVIDE BENEFITS TO CUSTOMERS PAST  
9 2030?

10 A. Yes. After NSP renewed the Plant's license in 2006, it invested in the Life  
11 Cycle Management/Extended Power Uprate (LCM/EPU) Program, which  
12 entailed extensive renovations to extend the Plant's operating life at an  
13 increased capacity of 671 MW. The program spanned roughly eight years and  
14 involved the replacement of hundreds of components inside the Plant. The  
15 LCM/EPU Program was particularly complex to design and implement  
16 because the improvements occurred inside an operating nuclear facility,  
17 portions of which can only be worked on during refueling outages.

18  
19 As the Company was implementing the LCM/EPU Program, the NRC issued  
20 two major orders in the wake of the Fukushima Daiichi accident that required  
21 additional modifications to the Monticello Plant. After the Company  
22 completed these projects in 2018, mandated capital expenditures have reduced  
23 substantially. Ms. Prochaska provides more details on the LCM/EPU  
24 Program and the Company's Fukushima-related modifications, and the  
25 continued value they will provide past 2030.

26

1 Q. HOW IS SAFETY REGULATED AND MAINTAINED AT THE MONTICELLO PLANT?

2 A. As noted above, the NRC regulates nuclear power production in the United  
3 States, including implementing regulations and conducting oversight to ensure  
4 the safety of operations at the Plant. With respect to spent fuel storage, the  
5 NRC oversees the design, manufacturing, and use of dry casks to ensure  
6 licensees and designers follow safety and security requirements, meet the  
7 terms of their licenses, and implement quality assurance programs. The NRC  
8 also enforces strict security requirements to protect stored fuel, including the  
9 ability to detect, assess, and respond to an intrusion.

10

11 The NRC and plant processes require continuous evaluation of plant and  
12 human performance and correction of issues as they are identified. Every two  
13 years, the NRC performs an inspection at all commercial nuclear facilities in  
14 the United States. The inspections include evaluating station processes and  
15 corrective actions for use of industry and NRC operating experience as well  
16 as the effectiveness of the stations' audits and self-assessments. In the last  
17 inspections at both Monticello and Prairie Island, the NRC determined that  
18 there was no evidence of challenges to the organization's safety-conscious  
19 work environment.

20

21 Q. HAS THE MONTICELLO PLANT RECEIVED POSITIVE EVALUATIONS FOR ITS  
22 SAFETY STANDARDS?

23 A. Yes. After completing the Fukushima-related modifications and other safety  
24 investments, the Company achieved Column 1 (best) status from the NRC  
25 Reactor Oversight Process. This exemplary safety rating underscores the  
26 tireless work NSP has done and continues to do to make the Monticello Plant  
27 one of the safest, most efficient, and reliable nuclear facilities in the country.

1 While no plant can achieve the standards of perfection imposed by NRC at all  
2 times over a plant's operational life, Monticello's stellar track record  
3 demonstrates the Company's longstanding commitment to nuclear safety.  
4

5 In addition to NRC oversight, Xcel Energy conducts a periodic Nuclear Safety  
6 Culture Assessment of our nuclear organization in accordance with industry  
7 standards. In 2022, the assessment identified no weaknesses, three negative  
8 observations, two general observations and one positive observation. The  
9 assessment team noted that the Xcel Energy Nuclear staff has a safety culture  
10 that supports all of the industry's "Traits of a Healthy Nuclear Safety Culture,"  
11 and has a healthy respect for nuclear safety and assures that nuclear safety is  
12 not compromised by production priorities.  
13

14 Q. HOW HAS THE COMPANY OPERATED THE MONTICELLO PLANT IN RECENT  
15 YEARS?

16 A. Due to its near constant operations, the Plant is one of the system's most  
17 dependable generation resources, with a capacity factor in the last six months  
18 of 2022 of nearly 100 percent. Bolstered by the Company's capital investments  
19 that I just discussed, the Plant recently completed a record 704 days of  
20 continuous operation. Combined with Prairie Island, the Monticello Plant  
21 represents nearly 30 percent of the total electric energy NSP's customers  
22 consumed, making it a critical component of the overall generation fleet now  
23 and into the future.  
24

1 Q. HAVE THE COMPANY’S CAPITAL INVESTMENTS IMPROVED THE RELIABILITY  
2 AND EFFICIENCY OF THE PLANT?

3 A. Yes. The additional capital investments allowed us to undertake substantial  
4 efforts that changed the way the Company approached plant operations,  
5 allowing it to deliver newfound benefits to customers. By working with third-  
6 party consultants with expertise in both nuclear operations and general cost  
7 containment and efficiency strategies, NSP has achieved industry leading  
8 results not only in the performance of the Plant, but also in managing the costs  
9 it invests to achieve that performance. This multi-faceted strategic outlook has  
10 resulted in a nuclear fleet that has never operated on a more consistent,  
11 efficient, and safe basis. Importantly, the Company achieved these operational  
12 results without increasing its production costs. In fact, both Operations and  
13 Maintenance and production costs have decreased in recent years.

14  
15 Q. HAS THE PLANT BEEN RECOGNIZED FOR ITS PERFORMANCE RECORD?

16 A. Yes. The Monticello Plant has been rated among the top nuclear plants in the  
17 country by the Institute of Nuclear Power Operations (INPO). In fact, the  
18 plant has received a “1” ranking for exceptional performance for over ten  
19 years, including in its most recent INPO evaluation.

20

21 **III. PROPOSED INVESTMENTS**

22

23 Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY?

24 A. This section of my testimony introduces the two major investments the  
25 Company is requesting an ADP for in this proceeding—the NRC license  
26 renewal and the ISFSI expansion. I will also briefly discuss other Aging

1 Management Programs the Company will institute in the future to maintain  
2 the Monticello Plant's excellent operational and safety record.

3  
4 **A. The SLR Application**

5 Q. WHY DOES THE MONTICELLO PLANT REQUIRE A LICENSE RENEWAL?

6 A. The Plant's license will expire on September 8, 2030. Therefore, to operate  
7 the plant past this date, the Company will need to obtain a license renewal.  
8 The proposed SLR would be the Plant's second license renewal and would  
9 extend the Plant's life from 60 to 80 years, with a new expiration date of  
10 September 8, 2050.

11  
12 Q. APART FROM THE LAST MONTICELLO SLR, HAS THE COMPANY SUBMITTED  
13 SLRS FOR OTHER NUCLEAR FACILITIES?

14 A. Yes. The Company also completed an SLR process for its Prairie Island Plant  
15 in 2014. Because the Company has already completed the SLR process for the  
16 Monticello Plant and the two units at Prairie Island, we expect that the  
17 Company's institutional expertise in the relicensing process will help expedite  
18 the process for the Monticello Plant's second SLR. Furthermore, NSP plans  
19 to study other operators as they undergo the second SLR process to help learn  
20 what issues could arise for the Monticello Plant during the relicensing.

21  
22 Q. HAS THE COMPANY FILED THE SLR APPLICATION?

23 A. Yes. The Company filed an application with the NRC on January 9, 2023 to  
24 renew the operating license for the Monticello plant for an additional 20 years.  
25 NRC rules required the SLR application to be filed no later than September 8,  
26 2025, but by submitting the SLR application earlier, NSP has minimized the  
27 potential for changing regulatory expectations to impact the project.

1  
2 Q. PLEASE DESCRIBE THE RELICENSING PROCESS AT A HIGH LEVEL.

3 A. Ms. Prochaska explains the relicensing process in more detail, including the  
4 feasibility study the Company has already conducted to analyze potential aging  
5 infrastructure at the Plant. In brief, the SLR process includes all of the  
6 requirements imposed on an initial 40-year license plus new equipment  
7 evaluations and equipment replacement frequencies to mitigate the effects of  
8 aging. The Company expects that its previous relicensing efforts will help with  
9 many of the relicensing requirements for the Monticello Plant for the second  
10 SLR. However, the needs of tomorrow differ from the needs of today and  
11 some modifications will be necessary to adopt best practices and meet future  
12 needs. Specifically, NRC now requires a compilation of Aging Management  
13 Programs (AMPs) to complete the SLR process. As part of the previous  
14 license renewal process, the Company created programs to determine whether  
15 existing equipment remains appropriate for the extended life or whether  
16 replacement was necessary. The Company expects to expand some of the  
17 AMPs during the second SLR process and will need to institute new programs  
18 to fulfil the NRC’s second SLR requirements. I discuss the AMPs further in  
19 Section III.B of my testimony.  
20

21 Q. WHAT IS THE PROJECTED BUDGET ASSOCIATED WITH THE SLR PROCESS?

22 A. NSP projects a total budget for the SLR of \$25 million. Table 1 below shows  
23 an expected breakdown of the total costs associated with the SLR application  
24 over the application preparation, submission, and consideration periods.  
25

26 **Table 1: Projected SLR Budget by Year**

27

2020	2021	2022	2023	2024	2025	2026
\$0.2M	\$4M	\$5.2M	\$6.3M	\$5.4M	\$2.6M	\$1M

1  
2 Ms. Prochaska provides further cost breakdowns of the SLR budget in her  
3 Direct Testimony.

4  
5 Q. AFTER CONSIDERING THESE RELICENSING COSTS, DOES THE MONTICELLO  
6 PLANT EXTENSION MAKE SENSE FROM AN ECONOMIC PERSPECTIVE?

7 A. Yes. The continued operation of the Monticello Plant past 2030 will ensure  
8 that it continues to provide cost-effective, carbon-free baseload generation to  
9 the system. The Company's experience with the SLR process, our past capital  
10 investments, and our efficient operation of the Plant have made Monticello  
11 an essential piece of the Company's generation portfolio past 2030. The  
12 Company's commissioned feasibility study and its own resource plan confirm  
13 that relicensing and maintaining the Plant will result in reliability and carbon-  
14 reduction benefits for customers, when compared to the 2030 retirement  
15 scenario.

16  
17 **B. Aging Management Programs**

18 Q. CAN YOU GENERALLY DESCRIBE THE COMPANY'S CURRENT AMPs?

19 A. Currently, NSP implements thirty-six separate AMPs, as well as five other  
20 programs that perform activities that will be credited as AMPs in the SLR  
21 process. The Company began implementing its AMPs for the Plant during the  
22 first SLR process. To establish the current AMPs, the Company worked with  
23 the NRC to establish programs to maintain the Plant through 2030. The  
24 current AMPs will continue as long as the Plant remains operational. Ms.  
25 Prochaska provides further details regarding the Company's current AMPs  
26 and projected expansion in her Direct Testimony.

27

1 Q. HOW MANY AMPs DOES THE COMPANY EXPECT TO ESTABLISH AS PART OF  
2 THE SECOND SLR PROCESS?

3 A. The SLR feasibility identified several existing AMPs that would need to be  
4 expanded and approximately nine new AMPs that need to be implemented.  
5 These numbers are estimates and are subject to change as NSP works with the  
6 NRC to conduct its formal Aging Management Review. These new and  
7 expanded AMPs will be implemented following NRC approval of the SLR.  
8 Ms. Prochaska provides more details regarding the anticipated AMPs in her  
9 testimony.

10

11 Q. IS IT POSSIBLE THAT THE NRC COULD ESTABLISH ADDITIONAL AMPs DURING  
12 ITS FORMAL AGING MANAGEMENT REVIEW?

13 A. Yes. The NRC could identify further Plant components and systems that  
14 would require new, unanticipated AMPs as part of the SLR process.  
15 Nonetheless, the Company remains confident that it has already identified the  
16 major program components the NRC will require to relicense the Monticello  
17 Plant.

18

19 Q. WHAT IS THE CURRENT BUDGET FOR THE EXPANSION OF EXISTING AMPs  
20 AND IMPLEMENTATION OF NEW AMPs?

21 A. As described further by Ms. Prochaska, the Company has budgeted \$2 million  
22 for expanding existing AMPs and establishing new AMPs during the project's  
23 implementation phase.

24

1           **C.     The ISFSI Expansion**

2    Q.    WHAT IS THE ISFSI?

3    A.    The ISFSI is an area at the Plant site adjacent to the reactor and turbine  
4           building where the Company stores spent fuel in canisters within modular  
5           concrete vaults. The modular concrete vaults containing the spent fuel  
6           assemblies sit on a reinforced concrete support pad. Concrete approach pads  
7           surround the support pad to allow for the placement of vaults and spent fuel  
8           canister transfer traffic. Ms. Prochaska discusses spent fuel storage at  
9           Monticello and the proposed IFSEI expansion in more detail.

10  
11   Q.    HOW MUCH FUEL IS CONTAINED IN THE ISFSI NOW?

12   A.    As of January 9, 2023 the ISFSI contains 1,830 spent fuel assemblies.  
13           Additionally, NSP stores 1,052 spent fuel assemblies in its spent fuel pool for  
14           a total of 2,882 spent fuel assemblies stored at Monticello.

15  
16   Q.    IF THE PLANT CONTINUES TO OPERATE PAST 2030, WOULD THERE BE  
17           SUFFICIENT SPACE AT THE CURRENT ISFSI FOR ADDITIONAL SPENT FUEL  
18           RODS?

19   A.    No. Additional dry storage for spent fuel rods is needed for the Plant to  
20           continue operations past 2030. However, the Company will need to plan for  
21           additional on-site storage even if the Plant begins decommissioning in 2030.  
22           As part of the decommissioning process, NSP will remove all fuel currently in  
23           the spent fuel pool inside the Plant to dry storage at the ISFSI. This process  
24           would require the Company to either expand its existing ISFSI facility during  
25           decommissioning to accommodate the fuel rods already being stored in the  
26           spent fuel pool or move fuel to an off-site facility.

27

1 Q. HAS THE COMPANY BEEN ABLE TO IDENTIFY ANY OFF-SITE FACILITIES THAT  
2 COULD ECONOMICALLY AND RELIABLY STORE OR REPROCESS ADDITIONAL  
3 SPENT FUEL?

4 A. No. NSP has determined that expanding the ISFSI facility is the most  
5 economical and reliable method for storing additional spent fuel rods. The  
6 Company analyzed four other potential options for disposal of the additional  
7 fuel rods: (1) reprocessing spent nuclear fuel, (2) contracting for additional  
8 spent fuel storage capacity at an existing offsite spent fuel storage facility, (3)  
9 contracting for additional spent fuel storage capacity at an offsite interim spent  
10 fuel storage facility in the future, and (4) the availability of a federally-  
11 sponsored permanent repository for spent fuel at Yucca Mountain. Ultimately,  
12 the Company has concluded that none of the four alternatives represent a  
13 viable strategy to support continued operation of the Monticello Plant after it  
14 exhausts its current storage capacity. Ms. Prochaska's testimony further details  
15 the Company's analysis on each of these alternative options and why ISFSI  
16 expansion is the least-cost solution for additional spent fuel storage.

17

18 Q. PLEASE PROVIDE A HIGH LEVEL OVERVIEW OF THE PROPOSED ISFSI  
19 EXPANSION PROJECT.

20 A. The Company's proposal involves the construction of a second concrete pad  
21 and modular concrete storage system within the existing ISFSI to support  
22 additional storage casks, which will store sufficient spent fuel to allow the  
23 Monticello Plant to continue operating past 2030. The largest part of the  
24 project would be the construction of a second concrete pad at the site. NSP  
25 would also purchase additional dry storage casks to hold the spent fuel rods.

26

1 Q. APART FROM THIS PROCEEDING, HAS THE COMPANY BEGUN THE  
2 REGULATORY PROCESS TO EXPAND THE ISFSI?

3 A. Yes. NSP has already applied for a certificate of need for the ISFSI expansion  
4 with the Minnesota Public Utilities Commission.<sup>1</sup> The Minnesota Department  
5 of Commerce issued a final Environmental Impact Statement (EIS) on  
6 January 13, 2023, and will hold an evidentiary hearing on April 20-21, 2023.  
7 The Administrative Law Judge’s report from the hearing is due June 30, 2023,  
8 and we anticipate an MPUC decision on the certificate of need by the end of  
9 2023.

10

11 Q. WHAT IS THE COMPANY’S ESTIMATED COST FOR THE INSTALLATION OF THE  
12 ADDITIONAL STORAGE AT THE ISFSI?

13 A. Based on studies completed in 2020, the Company estimates the installation  
14 cost of the additional storage at the ISFSI to be \$72 million. Table 2, below is a  
15 breakdown of the major component costs:

16

17 **Table 2: IFSFI Expansion Budget by Category**

18

Category	Estimated Cost
Regulatory Processes	\$2.5M
Engineering, Design, and Construction	\$9.6M
Canisters/Storage Modules/Loading	\$60M
<b>Total</b>	<b>\$72.1M</b>

19

20

21

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<sup>1</sup> *In re Application of Northern States Power Co. d/b/a Xcel Energy for a Certificate of Need for Additional Dry Cask Storage at the Monticello Nuclear Generating Plant Independent Spent Fuel Storage Installation in Wright County*, Docket No. CN-21-668 (Sept. 15, 2021).

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26

Q. DOES THE MONTICELLO PLANT ISFSI EXPANSION REPRESENT A PRUDENT INVESTMENT IN THE PLANT’S CONTINUED OPERATION PAST 2030?

A. Yes. Considering the Plant’s importance in providing reliable, baseload power for Company customers that is not subject to the same fuel price or availability concerns as other resource types, continued investment in the long-term viability of Monticello remains a prudent investment. Expanding the storage capacity of the ISFSI is necessary to keep this important resource on the system. Once the expansion is complete, the Company will have the ability to run the Plant economically and reliably at least until 2040, representing a long term hedge against volatile fuel prices and helping the Company meet its carbon reduction goals.

**IV. RESOURCE PLANNING IMPLICATIONS OF  
MONTICELLO EXTENSION**

Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY?

A. In this section, I discuss the importance of the Monticello Plant to the NSP system from a resource planning perspective, as well as the economic analysis that the Company performed on the potential Monticello Plant extension.

Q. PLEASE DESCRIBE THE MONTICELLO PLANT’S CONTRIBUTION TO THE NSP SYSTEM.

A. The Monticello Plant is a key part of the baseload backbone of the Company’s system, operating just outside of the Company’s largest load center. The Plant provides 671 MW of capacity at a very high capacity factor year-round, and is

1 among the most reliable generators in the Company's fleet. I discuss the  
2 reliability impacts of the Monticello Plant in the next section.

3  
4 Q. HOW DID THE COMPANY ANALYZE THE POTENTIAL EXTENSION OF THE  
5 MONTICELLO PLANT?

6 A. As discussed in detail by Ms. Mandich, the Company analyzed the potential  
7 extension of the Monticello Plant as part of its broader analysis of various  
8 resource portfolios in its 2020-2034 Upper Midwest Integrated Resource Plan  
9 (IRP) cycle. The Company performed additional modeling specific to the  
10 extension of the Monticello Plant.

11  
12 Q. AT A HIGH LEVEL, WHAT WERE THE RESULTS OF THE COMPANY'S ECONOMIC  
13 ANALYSIS?

14 A. The Company's resource planning analyses generally found that extending the  
15 life of the Monticello Plant (1) is cost effective from Present Value of Revenue  
16 Requirements (PVRR) perspective; (2) generates considerable savings from a  
17 present value of societal cost (PVSC) perspective when environmental  
18 externalities are considered; (3) is critical to achieving our carbon reduction  
19 goals; and (4) ensures that we maintain a robust share of firm and dispatchable  
20 generation relative to peak load across seasons. Specifically, the Company's  
21 resource plan that was ultimately approved (Alternate Plan), which includes  
22 an extension of the Monticello Plant through 2040, results in \$46 million in  
23 PVRR savings relative to a "business as usual" reference case based on the  
24 prior 2016-2030 Resource Plan.

25

1 Q. DID THE COMPANY DRAW ANY HIGH LEVEL CONCLUSIONS ABOUT THE  
2 CONTINUED OPERATION OF THE MONTICELLO PLANT FROM ITS 2019 IRP?

3 A. Yes. In general, the resource plan scenarios analyzed in which the Monticello  
4 Plant continued operation past 2030 resulted in expected savings for  
5 Company customers. Importantly, these savings were modeled with the  
6 capital investments outlined in Section III of my testimony.

7

8 Q. HOW WOULD THE COMPANY REPLACE THE MONTICELLO PLANT IF IT WAS  
9 REQUIRED TO SHUT DOWN IN 2030?

10 A. If NSP does not extend the Plant's license past 2030, the Company would  
11 need to make up the substantial levels of capacity and energy provided by the  
12 Monticello Plant to the system. The Company's IRP modeling indicated that  
13 Monticello's capacity would likely be replaced by gas combustion turbines  
14 whereas its energy value would be replaced primarily with additional wind  
15 generation and increased market purchases.

16

17 Q. HAS THE COMPANY CONDUCTED ANY SEPARATE ANALYSIS IMPLEMENTING  
18 NORTH DAKOTA PLANNING PRINCIPLES?

19 A. Yes. The Company analyzed the Alternate Plan versus a scenario in which  
20 Monticello retires in 2030 without consideration of externality values in  
21 selecting replacement resources, consistent with North Dakota law. This  
22 analysis found that the case in which Monticello is retired in 2030 has \$145  
23 million lower costs on a PVRR basis than the Alternate Plan, but results in  
24 higher emissions and leaves customers more exposed to wholesale energy  
25 markets, fuel prices, and supply volatility.

26

1 Q. PLEASE ELABORATE ON HOW EARLY RETIREMENT OF THE MONTICELLO  
2 PLANT WOULD EXPOSE CUSTOMERS TO WHOLESAL MARKET AND  
3 VOLATILITY.

4 A. The Company's analysis found that in the case where Monticello is retired in  
5 2030, the Company would be more reliant on the MISO wholesale power  
6 market to supply enough power to serve hour to hour customer load. Unlike  
7 a nuclear unit that provides near-constant baseload power, the replacement  
8 gas combustion turbines are intended to be utilized as peaking capacity, have  
9 higher marginal costs, and thus we would be more reliant on market purchases  
10 to serve NSP load. Additionally, replacing Monticello with gas combustion  
11 turbines would leave the Company more exposed to fuel price volatility and  
12 supply chain disturbances. Even though NSP does employ appropriate  
13 hedging and fuel storage practices to mitigate volatility, gas combustion  
14 turbines do not normally have firm fuel delivery contracts and may need to  
15 rely on other types of fuel security such as on-site storage of liquid fuels. While  
16 these resources are an important part of the Company's resource mix, they do  
17 not represent a one-for-one replacement strategy for nuclear capacity in terms  
18 of the risk mitigation value they provide to the system. Ms. Mandich and Mr.  
19 Siebenaler provide further context on the risks inherent in switching the  
20 Monticello Plant's capacity to gas combustion turbines.

21  
22 Q. WHAT OTHER FACTORS SHOULD THE COMMISSION CONSIDER ASIDE FROM  
23 THE MODELED COSTS OF THE PROPOSED EXTENSION?

24 A. The Monticello Plant provides important resource diversity benefits that are  
25 crucial to maintaining reliability on the NSP system. I discuss this further in  
26 the next section.

27

1 **V. RELIABILITY IMPLICATIONS OF**  
2 **MONTICELLO EXTENSION**  
3

4 Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY?

5 A. In this section, I briefly summarize the benefits of the Monticello Plant related  
6 to maintaining overall reliability on the NSP system, including the inherent  
7 reliability of nuclear generation, the importance of baseload generation, and  
8 the value of maintaining a diverse resource mix. Mr. Siebenaler’s testimony  
9 provides a more detailed explanation of the reliability implications of  
10 extending the life of the Monticello Plant.  
11

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

14 A. Combined with Prairie Island, the Monticello Plant represents nearly 30  
15 percent of the total electric energy our customers require, making it a critical  
16 component of NSP’s overall generation fleet. As discussed above, the  
17 Monticello Plant also operates nearly every day of the year at a very high  
18 capacity factor, and is less vulnerable to fuel supply issues, price volatility, and  
19 severe weather. For example, the Plant, along with the two Prairie Island units,  
20 performed at a high level throughout the 2019 polar vortex and the February  
21 2021 cold spell—operating at a 100 percent capacity factor. Even among other  
22 traditional baseload resources, the high capacity factor achieved by the  
23 Company’s nuclear fleet is unique. This combination of high output and  
24 inherent reliability makes the Monticello Plant a critical daily resource for  
25 maintaining reliability on the Company’s system.  
26

1 Q. BEYOND ITS INHERENT RELIABILITY, DOES THE MONTICELLO PLANT  
2 PROVIDE OTHER RELIABILITY BENEFITS TO THE NSP SYSTEM?

3 A. Yes. As a large, “always-on” baseload resource, the Monticello Plant provides  
4 a range of essential reliability services that support system strength and system  
5 stability. In general, this means that the Monticello Plant supports the grid’s  
6 ability to maintain stable voltages and respond to disturbances on the grid that  
7 can affect balance, frequency, or other conditions. Additionally, the location  
8 of the Plant near the Twin Cities provides important system balancing benefits  
9 by ensuring a consistent injection of power at the Company’s historic  
10 generation core near Sherburne County. Mr. Siebenaler discusses the essential  
11 reliability services provided by the Monticello Plant in more detail.

12

13 Q. IF THE MONTICELLO PLANT WERE RETIRED AND REPLACED WITH  
14 COMBUSTION TURBINES, WOULD THOSE RESOURCES PROVIDE THE SAME  
15 RELIABILITY BENEFITS?

16 A. Not entirely. While combustion turbines can provide some of the same  
17 essential reliability services as synchronous generators, these essential  
18 reliability services are only provided when the generator is operating. Because  
19 any combustion turbine that replaces the Monticello Plant would have a much  
20 lower capacity factor than the Monticello Plant, the replacement resource  
21 would be less likely to provide the same essential reliability services as the  
22 Plant. The same is true for the existing Sherco coal-fired generating units.  
23 Because those units only run during certain periods of the year or during peak  
24 periods due to economic forces, they would not be able to provide the same  
25 year-round essential reliability services as the Monticello Plant.

26

1 Q. HOW DOES MAINTAINING NUCLEAR AS PART OF A DIVERSE MIX OF  
2 GENERATING RESOURCES SUPPORT OVERALL RELIABILITY?

3 A. As discussed further by Ms. Mandich, the Company considers the attributes  
4 of different resources in its planning processes, as it is important to maintain  
5 a mix of large and small generating resources that have different operational  
6 attributes. By maintaining a diverse mix of resources including nuclear, the  
7 Company can hedge not only against fuel price volatility but also the  
8 uncertainty of technological development, future renewable pricing, and the  
9 future of renewable capacity values.

10

11

## VI. PRESENTATION OF WITNESSES

12

13 Q. WHO ARE THE DIRECT WITNESSES FOR THE COMPANY IN THIS PROCEEDING?

14 A. In addition to my Policy Testimony, the Company sponsors the following  
15 rebuttal witness:

- 16 • Ms. Pamela Prochaska, Nuclear Operations Testimony;
- 17 • Ms. Farah L. Mandich, Resource Planning Testimony; and
- 18 • Mr. Andrew W. Siebenaler, Reliability Testimony.

19

20

## VII. CONCLUSION

21

22 Q. PLEASE SUMMARIZE YOUR CONCLUSIONS.

23 A. The Company's proposed investments in the Monticello Plant to extend its  
24 life represent a prudent investment in the Company's future generation mix.  
25 Not only will it allow the Company to maximize the value from past  
26 investments made at the Plant, operating Monticello past 2030 will also  
27 provide Company customers with reliable baseload power as the system

1 continues to shift to more variable, non-dispatchable resources. This benefit  
2 will help the Company maintain reliability during winter storms and seasonal  
3 peaking events, with less reliance on market purchases or high marginal cost  
4 dispatchable generators. By maintaining Monticello as a baseload generator  
5 beyond 2030 the Company will benefit from the Plant's ability to provide low  
6 marginal cost power as it continues to develop new low-cost generation  
7 sources to replace the Plant when it eventually retires.

8

9 Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

10 A. Yes, it does.



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## ***EDUCATION***

1980 University of California, Los Angeles  
MA, Economics

1978 Queens College, City University of New York  
BA, Economics

## ***WORK EXPERIENCE***

2013-Present **Xcel Energy Services, Inc., Minneapolis MN**  
***Associate Vice President, State Regulatory Policy***

- Develop regulatory strategy for NSPM.

2008-2013 **Xcel Energy Services, Inc., Minneapolis MN**  
***Regional Vice President, Regulatory Administration***

- Coordinate regulatory compliance and strategy for NSPM.

2003-2008 **Xcel Energy Services, Inc., Denver, Colorado**  
***Regulatory Consultant***

- Develop regulatory strategy for Commercial Operations.
- Coordinate compliance activity.
- Coordinate internal and external audits of trading activity.

1998-2003 **Xcel Energy Services, Inc., Minneapolis, MN**  
***Manager Renewable Energy/Regulatory Contract Coordinator***

- Develop corporate strategies for renewable energy development.
- Represent Company at state regulatory and legislative proceedings regarding renewable energy issues.
- Negotiate purchased power contracts for renewable energy.
- Manage Energy Market's regulatory interactions with internal and external stakeholders.

1994-1998

**Minnesota Department of Commerce, St. Paul, MN**  
***Supervisor, Electric Regulatory Unit***

- Manage regulatory staff to participate in state regulatory proceedings before the Minnesota Public Utilities Commission.
- Submit expert testimony in regulatory proceedings.
- Represent the Department of Commerce before the Minnesota legislature.

1982-1994

**Minnesota Department of Commerce, St. Paul, MN**  
***Principal Statistical Analyst***

- Submit expert testimony in regulatory proceedings.
- Perform economic and statistical analysis to support regulatory and energy policy initiatives.