

February 3, 2023

**VIA ELECTRONIC MAIL AND
FEDERAL EXPRESS**

Mr. Steven M. Kahl
Executive Director
North Dakota Public Service Commission
State Capitol Building, Department 408
600 East Boulevard
Bismarck, ND 58505-0480

Re: NORTHERN STATES POWER COMPANY
ADVANCE DETERMINATION OF PRUDENCE
MONTICELLO NUCLEAR PLANT EXTENSION
CASE NO. PU-23-_____

Dear Mr. Kahl:

Northern States Power Company, doing business as Xcel Energy (the Company), respectfully submits this Application for an Advance Determination of Prudence (ADP) for an extension of the life of the Monticello Nuclear Generating Plant beyond its current 2030 retirement date. This life extension requires investment to expand the existing spent fuel storage on-site as well as a license renewal from the Nuclear Regulatory Commission.

The Company's Application and supporting testimony contain trade secret information. In accordance with Section 69-02-09-02 of the North Dakota Administrative Code (N.D.A.C.), an Application for Trade Secret Protection is being provided along with a single copy of the trade secret version of the Application and supporting testimony in a sealed envelope marked **PROTECTED INFORMATION – PRIVATE**.

Pursuant to N.D.A.C. § 69-02-02-04, an original and seven copies of the public version of our Application are also being provided, along with the following:

- Direct testimonies of Company witnesses Mr. Allen D. Krug, Ms. Pamela Prochaska, Ms. Farah L. Mandich, and Mr. Andrew W. Siebenaler, supporting the Company's Application; and
- Verifications for the testimonies of Mr. Krug, Ms. Prochaska, Ms. Mandich and Mr. Siebenaler.

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Application for Advanced Determination of Prudence - Monticello Nuclear Plant Life Extension
Northern States Power Company
Zev Simpson, Dorsey & Whitney, LLP



Mr. Steven M. Kahl
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The Company has sent the \$175,000 filing fee required by N.D.C.C. § 49-05-16(1)(b) to the Commission under separate cover.

Please contact me at (612) 492-6129 or simpser.zev@dorsey.com if you have any questions regarding this filing.

Sincerely,

DORSEY & WHITNEY LLP

A handwritten signature in blue ink, appearing to read 'Zev Simpson', written over a horizontal line.

ZEV SIMPSON

Enclosures

- cc: Via Email – Public Version Only:
- Jack Schuh (jschuh@nd.gov)
 - Victor Schock (vschock@nd.gov)
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**BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF NORTH DAKOTA**

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

CASE NO. PU-23-_____

**APPLICATION FOR
ADVANCE DETERMINATION OF PRUDENCE**

I. INTRODUCTION

Northern States Power Company, doing business as Xcel Energy (Xcel Energy, NSP or the Company), submits to the North Dakota Public Service Commission (Commission) this Application for an Advance Determination of Prudence (ADP) for an extension of the life of the Monticello Nuclear Generating Plant (Monticello Plant or Plant) beyond its current 2030 retirement date. The Monticello Plant is a core baseload generating unit in our fleet, providing electricity twenty-four hours a day, seven days a week for extended periods of time to meet steady demand for electric power. Since it began operations in 1971, the single-unit, 671 megawatt (MW) Plant has generated over 200 million megawatt-hours (MWh) of electricity, and together with the Prairie Island nuclear plant represents nearly 30 percent of the total electric energy our customers require today. No other generating facilities in the Company's portfolio can provide such consistent, reliable, carbon-free energy and capacity. For this reason, the Company is requesting an ADP to extend the life of the Plant for an additional 20-year period.

Over the last 15 years, the Company has undertaken several major capital projects at the Monticello Plant to increase its capacity and improve the safety and efficiency of the Plant. With these investments, the Company was able to replace nearly all of the systems that support the reactor and power generation equipment at the Plant, resulting in a state-of-the-art facility that achieves industry-leading results in terms of safety, Plant performance, and management of the Company's costs to achieve that performance. As a result, the Company was able to increase the capacity factor, or operating time, of the Plant while decreasing both Operations and Maintenance (O&M) and production costs. The Monticello Plant achieved a 98 percent capacity factor in 2022, and combined with Prairie Island, the Company's nuclear fleet is second in the nation in terms of capacity factor at 94.4 percent. The Monticello Plant's increased availability provides

substantial customer benefits given the fixed costs associated with nuclear fuel, during a period in which high inflation and severe weather events are causing fuel prices to rise.

Given the investments the Company has already made to modernize the Monticello Plant and the critical role it plays in providing consistent baseload generation and reliability to the NSP system, it is prudent to extend the life of the Plant. Among other things, in order to extend the life of the Plant, the Company will need to obtain a license renewal to operate the plant past its current Nuclear Regulatory Commission (NRC) license expiration on September 8, 2030. The Subsequent License Renewal (SLR) from the NRC would be the Plant's second license renewal and would extend the Plant's life from 60 to 80 years, with a new expiration date of September 8, 2050. Additionally, the existing dry storage for spent fuel rods at the Independent Spent Fuel Storage Installation (ISFSI) facility at the Plant will be fully subscribed by 2030 and needs to be expanded. In fact, even if the Plant does not obtain an NRC license renewal and begins decommissioning in 2030, the existing ISFSI will need to be expanded as part of decommissioning to accommodate all of the spent fuel on site. Together, the SLR and ISFSI projects, along with the Company's expansion of its Aging Management Programs (AMPs), are necessary investments for the continued operation of the Monticello Plant. Continuing to operate the Plant beyond 2030 will also require continued capital investments in future years as part of the Company's AMPs, as described herein. Making these investments will ensure that the Monticello Plant will continue to provide important reliability and resource diversity benefits as the NSP System continues to transition to more variable renewable generating resources in the future.

In consideration of the above, we request that the Commission approve an ADP for a 20-year extension of the life of the Monticello Plant.

In support of the Company's Application, NSP provides the following Direct Testimony:

- Policy Testimony – Mr. Allen D. Krug
- Nuclear Operations Testimony – Ms. Pamela Prochaska
- Resource Planning Testimony – Ms. Farah L. Mandich
- Reliability Testimony – Mr. Andrew W. Siebenaler

The remainder of this Application addresses the following:

- Compliance Matters;
- Facility Description;
- Recent Investments in the Monticello Plant;
- Current Safety and Operations Record;

- Proposed License Renewal;
- Proposed Spent Fuel Storage Expansion;
- Economic Analysis;
- Prudence of the Monticello Plant Extension; and
- Conclusion.

II. COMPLIANCE MATTERS

A. Description of Applicant

Xcel Energy is a Minnesota corporation duly authorized to conduct business in the State of North Dakota as a foreign corporation. The Company conducts business in the State of North Dakota as a public utility subject to the jurisdiction and regulation of the Commission pursuant to Title 49 of the North Dakota Century Code (N.D.C.C.). The name and address of Xcel Energy is:

Northern States Power Company, a Minnesota corporation
414 Nicollet Mall
Minneapolis, Minnesota 55401

Xcel Energy also operates in North Dakota from the following address:

Northern States Power Company
2302 Great Northern Drive
Fargo, North Dakota 58102

The Company's Certificate of Incorporation with amendments and Certificate of Authority were filed with the Commission on September 30, 2009, and October 12, 2009, respectively, in Case No. PU-09-664. Current Certificates of Good Standing issued by the North Dakota and Minnesota Secretaries of State were filed in the same case on January 10, 2023, and are incorporated herein by reference.

Xcel Energy has service territory in five upper Midwest states including North Dakota. The Company presently serves approximately 94,500 retail electric customers in and around Fargo, Grand Forks, and Minot, North Dakota, and owns approximately 1,450 conductor miles of transmission and 3,810 conductor miles of electric distribution lines in North Dakota.

B. Communication and Service

The Company respectfully requests that the following persons be placed on the Commission's official service list for all official communications in this case:

Alex J. Nisbet
Regulatory Policy Specialist
Xcel Energy
2302 Great Northern Drive
Fargo, North Dakota 58102
Alex.J.Nisbet@xcelenergy.com

Regulatory Records
Records Specialist
Xcel Energy
414 Nicollet Mall
Minneapolis, Minnesota 55401
regulatory.records@xcelenergy.com

C. Standard of Review

North Dakota Century Code section 49-05-16(1)(d) authorizes the Commission to issue an ADP if it “determines that the resource addition is prudent.” This standard is similar to the “honestly and prudently invested” standard that the Commission uses for ratemaking.¹ The general prudence standard calls for determining whether the utility action was reasonable at the time it was taken under all relevant circumstances.² Under Section 49-05-16(1), the Commission may issue an order approving the prudence of a proposed project if four conditions are met:

- a. The public utility files with its application a projection of costs to the date of the anticipated commercial operation of the resource addition;
- b. The public utility files with its application a fee in the amount of one hundred seventy-five thousand dollars;
- c. The commission provides notice and holds a hearing, if appropriate, in accordance with section 49-02-02; and
- d. The commission determines that the resource addition is prudent. For facilities located or to be located in this state the commission, in determining whether the resource addition is prudent, shall consider the benefits of having the resource addition located in this state.

D. Authority for Relief Requested

North Dakota Century Code section 49-05-16 allows a public utility, at the utility’s discretion, to seek an ADP from the Commission for any intended resource addition. The statute defines a “resource addition” as “construction, modification, purchase, or lease of an energy conversion facility, renewable energy facility, demand response

¹ See N.D.C.C. § 49-06-02.

² See Charles F. Philips, Jr., *The Regulation of Public Utilities – Theory and Practice* at 292 (Public Utility Reports 1988); see also David J. Muchow & William A. Mogel, *Energy Law and Transactions* at § 4.02[3][b] (2009).

system, transmission facility, or a contract to acquire energy, capacity or demand response for the purpose of providing electric service.”

In the Settlement Agreement in the Company’s 2007 rate case, Case No. PU-07-776, the Company agreed to file an application for an ADP for all proposed “new construction, rehabilitation, or acquisition” of generating resources above 50 MW.³ This commitment was further refined in Case No. PU-12-59, in which NSP committed to filing ADP applications for “the types of resource additions contemplated in the 2007 rate case settlement” within fourteen days of seeking similar approvals from the Minnesota Public Utilities Commission (MPUC).⁴

The extension of the Monticello Plant’s life via relicensing and adding additional spent fuel storage does not constitute “new construction, rehabilitation, or acquisition” of a generating resource. For this reason, the Company was not *obligated* to file this ADP Application under the 2007 rate case Settlement Agreement or the Commitment Letter in Case No. PU-12-59, notwithstanding the fact that the Company filed a Certificate of Need application for the ISFSI expansion with the MPUC.⁵ However, the proposed Monticello Plant extension and the associated investments do constitute a “modification” of the Plant under N.D.C.C. § 49-05-16, therefore the Company is *authorized* to file this ADP application at its discretion.

III. DESCRIPTION AND PURPOSE OF FILING

A. Facility Description

The Monticello Plant is a single-unit, 671 MW, nuclear powered, boiling water reactor, electric generating station located in Monticello, Minnesota. Since it began operations in 1971, the Plant has played a critical role in the fleet of resources NSP uses to serve its customers, generating over 200 million megawatt-hours (MWh) of electricity over the past fifty-plus years. The Plant is a baseload resource that operates at a very high capacity factor twenty-four hours a day, seven days a week for extended periods of time to meet steady demand for electric power. The Monticello Plant and Prairie Island nuclear plant are the only generating stations in NSP’s system that can provide comparable levels of consistent, reliable, carbon-free energy and capacity. Image 1 below shows an overview of the Monticello Plant and its associated facilities.

³ *N. States Power Co. Elec. Rate Increase Application*, Case No. PU-07-776, ORDER ADOPTING SETTLEMENT AGREEMENT at 6 of attached Settlement Agreement (Dec. 31, 2008).

⁴ *N. States Power Co. Advance Prudence – Geronimo Wind Application*, Case No. PU-12-59, LETTER OF COMMITMENT (Nov. 5, 2012).

⁵ *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*, MPUC Docket No. CN-21-668 (filed Sept. 15, 2021).

Image 1: The Monticello Nuclear Generating Plant



The Monticello Plant operates using a boiling water reactor, which boils water to produce steam inside the reactor vessel, which is then directed to turbine generators to produce electrical power. The steam is cooled in a condenser and returned to the reactor vessel to be boiled again. The reactor core, which provides the heat used to boil water, is made up of nuclear fuel assemblies. Each assembly contains fuel rods, and a fission reaction between two particles in the fuel rods creates heat, powering the reactor core. The Company's nuclear engineers carefully monitor and control the reaction within the core to provide the steady baseload power the Company's customers rely on. Each nuclear fuel assembly provides heat over about a six-year period before its output declines to the point that it becomes ineffective. Approximately every two years, NSP shuts down the Plant to refuel one-third of the fuel in the reactor.

The fuel assemblies that are removed during an outage are the spent fuel. Initially, the spent fuel is removed to the spent fuel pool within the reactor building, where it is stored temporarily for cooling. Eventually, the Company transfers the spent fuel to the ISFSI, adjacent to the reactor and turbine building. The Company stores spent fuel in the ISFSI in canisters in dry, modular concrete vaults. The modular concrete vaults containing the spent fuel assemblies sit on a reinforced concrete support pad. Concrete approach pads surround the support pad to allow for the placement of vaults and spent fuel canister transfer traffic. Image 2 below shows the Monticello Plant; the ISFSI is the fenced-in area in the foreground, with the existing storage modules on the right side of the fenced-in area.

Image 2: Monticello Plant and Existing ISFSI Facilities



Company witness Ms. Pamela Prochaska provides more details regarding the history and operations of the Monticello Plant in her Direct Testimony.

B. Recent Investments in the Monticello Plant

The Company has undertaken several major capital projects at the Monticello Plant in the last 15 years to keep the plant operating at a high capacity factor and low marginal cost, including the Life Cycle Management/Extended Power Uprate (LCM/EPU) Program and the Fukushima-related modifications the Company made to improve safety in extreme conditions as required by NRC. Together, these investments have made the Monticello Plant an industry leader in safety and efficiency.

1. Life Cycle Management/Extended Power Uprate Program

In connection with the 2006 NRC license renewal for the Monticello Plant, the Company undertook a complex project known as the LCM/EPU to prepare Monticello for its extended operating life at an increased capacity of 671 MW—a 71 MW increase from its historical capacity of 600 MW. The Program spanned roughly eight years and involved the replacement of hundreds of components inside the plant. Ultimately, through the LCM/EPU Program NSP replaced nearly all of the systems that support the reactor and power generation equipment. The LCM/EPU Program was particularly complex to design and implement because the improvements occurred inside an

operating nuclear facility, portions of which can only be worked on during refueling outages every two years.

The entire LCM/EPU program comprised forty separate work orders or individual projects, but the following ten major projects comprised the vast majority of the Program's scope:

- High-Pressure Turbine Replacement and Low-Pressure Turbine Modifications;
- Power Range Neutron Monitoring System Replacement;
- Condensate Demineralizer System Replacement;
- Main Transformer Upgrades;
- Feedwater Heaters Replacement;
- Reactor Feed Pumps and Motors Replacement;
- Condensate Pumps and Motors Replacement;
- Upgrade of the four-kV Electrical Distribution System to 13.8 kV; and
- NRC Licensing.

The LCM/EPU modifications and improvements to the Plant all came online by 2013. As a result of this project, the Monticello Plant's systems are safer and more reliable. Additionally, the modifications the Company made to the Plant during the LCM/EPU program will continue to provide benefits throughout the useful life of the Plant, including beyond 2030 if the Plant is extended. As discussed by Ms. Prochaska, many of the LCM/EPU upgrades will also provide ancillary benefits by reducing the cost of aging mitigation measures NRC may impose as a result of the next relicensing process. By implementing the LCM/EPU Program, the Company has planned for the long-term future of the Monticello Plant and created a generation facility that can provide cost-effective power at lower operational margins well past its current license expiration date.

2. *Fukushima-Related Modifications*

In the wake of the Fukushima Daiichi accident in October 2011, the NRC issued two major orders that required modifications to the Monticello Plant. In general, these orders require that nuclear utilities install certain equipment to mitigate an external event beyond the Plant's original emergency reinforcement design. The Company

subsequently undertook the following major capital projects in conjunction with NRC's regulatory guidance:

- Installation of enhanced Spent Fuel Pool Instrumentation;
- Installation of modifications to the electrical and mechanical systems to augment plant cooling capability;
- Creation of a program for procedures to integrate changes to plant capabilities with existing plant methods;
- Implementation of Regulatory Affairs support to integrate with NRC oversight;
- Enhancement of Emergency Preparation capabilities to effectively respond to an incident beyond design basis; and
- New management oversight and coordination of the Company's response to the NRC Orders.

The Company implemented these projects between 2014 and 2018. Several of the requirements increased the amount of back-up equipment at the Plant and included the construction of a new building to help ensure vital equipment is protected from environmental hazards. The modifications also included the construction of regional response centers to assist plants in promptly providing pre-staged, off-site equipment to the site on short notice. The Monticello Plant successfully completed its Fukushima-related modifications in less time and at lower cost than the industry norm.

Like the LCM/EPU program, the Plant's Fukushima-related modifications have substantially improved the Plant's safety and efficiency and implemented programs that allow the Plant to be even more reliable during weather-related emergencies. Because NRC did make substantial changes to its regulations in the wake of the Fukushima incident, the Company also implemented several administrative and programmatic changes that have allowed it to streamline parts of the relicensing process for the Monticello Plant. These improvements to the Plant will extend beyond the current retirement date, and the Company expects to leverage the administrative and programmatic efficiencies when it undertakes the next SLR process.

C. Current Safety and Operations Record

Following the substantial investments the Company has made over the last 15 years, the Monticello Plant remains a key part of the backbone of the NSP system operating just outside of the Company's largest load center. 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 Midcontinent Independent System Operator (MISO) grid. And due to the recent investments the Company has made in the Plant, it is operating more safely and efficiently than ever before.

1. Safety Record

Due in part to the recent investments in the Monticello Plant discussed above, the Monticello Plant operates at the highest levels of nuclear safety standards, as demonstrated by its operational record and by independent assessments performed by industry organizations and peers. The NRC Reactor Oversight Process classifies U.S. nuclear reactors into various “Columns,” which range from 1 (best) to 5 (worst). Currently, the Company has the only nuclear fleet in the industry where all units have achieved “exemplary” industry status, and all units are within NRC Column 1 Status, without any NRC Safety Culture Concerns. As part of this NRC oversight, the Company’s nuclear fleet also has had all “green” performance indicators from the NRC, without any cross cutting issues raised by NRC or significant operating events. While no plant can achieve the standards of perfection imposed by NRC at all times over a plant’s operational life, Monticello’s stellar track record demonstrates the Company’s longstanding commitment to nuclear safety. In fact, the Company’s nuclear plants were recognized as one of the highest performing fleets in the country according to its nuclear industry peer group.

2. Current Operating Efficiency

Due to its near constant operations, the Plant is one of the system’s most dependable generation resources, with an average capacity factor of 95 percent over the last three years, including nearly 100 percent for the last six months of 2022. This reflects the strong performance at the Plant based on the capital investments and operational improvements the Company made over the past fifteen years. Importantly, the Plant’s increased availability provides substantial customer benefits given the fixed costs associated with nuclear fuel during this period of high inflation.

The recent capital investments through the LCM/EPU program and Fukushima-related modifications changed the way the Company approached plant operations, allowing it to deliver additional benefits to customers. By working with third-party consultants with expertise in both nuclear operations and general cost containment and efficiency strategies, NSP has achieved industry-leading results not only in the performance of the Plant, but also in managing the costs it invests to achieve that performance. In fact, both O&M and production costs have decreased in recent years. In terms of production costs per MWh, the Company achieved a nearly 30% percent decrease between 2015 and 2021, resulting in the lowest production costs at the Plant since NSP implemented the LCM/EPU Program.

The last scheduled Monticello Re-Fueling Outage (RFO) began on April 17, 2021. This outage occurred 704 days after the previous RFO and set a record breaker to breaker generation run for the Plant and the Company’s nuclear fleet. The total length of the 2021 RFO was thirty-three days, and startup commenced on May 20, 2021. The last forced outage was January 24, 2022, and lasted three days. The Company scheduled this shutdown to address a high energy steam leak on a drain line pressure boundary valve. The Company found no nuclear safety issues during the scheduled RFO or in the forced outage. Due to these efficient and rare shutdowns, the Monticello Plant, along with Prairie Island, is currently industry leading in breaker to breaker runs and has been rated “exemplary” compared to industry peers over the last 10 years. Given the updates and improvements to the Plant that have been made in the last 15 years, the Company’s customers can expect to continue to enjoy low-cost, clean, and reliable power for years to come should the Plant’s life be extended.

3. Reliability Benefits of Monticello

The Monticello Plant’s strong operating record and efficiency provides substantial reliability benefits to the NSP system and to customers. As discussed above, 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. Additionally, nuclear plants, including the Monticello Plant, have a strong operating history year round, and are not subject to day to day volatility in fuel prices or potential fuel supply disruptions caused by weather events. Nuclear plants are built to withstand extreme weather, including even the most extreme weather events such as floods, tornados, and earthquakes. To that end, the Company’s three nuclear units performed extremely well throughout both the 2019 polar vortex and the February 2021 cold spell—operating at 100 percent capacity factor. Because the Monticello Plant can have up to six years of fuel on site, it is not subject to fuel supply disruptions or pipeline limitations in the winter like other resources. Particularly in light of the shift to more variable resources on the system, generation resource diversity is important to maintaining the robustness and resiliency of the NSP System. The resource attributes provided by the “always on,” baseload nature of the Monticello Plant provide important and cost-effective reliability benefits to the NSP system.

As a large synchronous generator, the Monticello Plant provides a range of essential reliability services that support system strength and system stability. In general, this means that the Monticello Plant supports the grid’s ability to maintain stable voltages and respond to disturbances on the grid that can affect balance, frequency, or other conditions. Additionally, the location of the Plant near the Twin Cities provides important system balancing benefits by ensuring a consistent injection of power at the

Company's historic generation core near Sherburne County. This is particularly important during times when marginal prices in MISO are low, and 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. Company Witness Mr. Drew Siebenaler discusses the reliability advantages of nuclear generation generally and the Monticello Plant specifically in his Direct Testimony.

As discussed further below, if the Monticello Plant ceases operation in 2030, under North Dakota planning principles its capacity would be replaced by CTs. Although they are both synchronous generators and receive similar capacity accreditation, CTs provide less of a reliability benefit than nuclear units. In general, CTs are subject to more fuel price and availability volatility than nuclear units. Whereas nuclear units have physical fuel in the plant that allows them to operate for long durations of time without additional exposure to fuel prices for each incremental MWh produced, natural gas is more subject to daily and monthly price swings and availability constraints. The Company does employ appropriate hedging and fuel storage strategies to mitigate that volatility and CTs are an important part of the Company's overall portfolio; however, in comparison to baseload nuclear, CTs do not typically have firm fuel contracts and thus may rely on other types of fuel security (on-site storage of fuel oil or liquefied natural gas). In any case, firm fuel contracts or reliance on higher cost fuels for backup exposes CTs to higher potential upside costs of operation than nuclear units. Additionally, replacement CTs would not provide the same balancing benefits as the Monticello Plant, because if energy prices are low enough to cause large levels of wind energy flows from the south, the CTs would not be dispatched and those would not be able to push back on those power flows.

D. Proposed License Renewal

1. Background and Need

The NRC regulates the operation of nuclear power plants in the United States. It granted the Monticello Plant its initial 40-year license in 1970, which allowed the Plant to operate until September 8, 2010. In 2006, NRC approved a 20-year license extension, which expires on September 8, 2030. The Company has determined that it can continue to operate the Plant safely, reliably, and economically beyond 2030, and as discussed below the Monticello Plant is a key part of the Company's resource plan through 2040. Given the significant recent investments that the Company has made into making the Monticello Plant an industry-leading nuclear unit, as well as the critical role that the Plant plays in providing baseload capacity and reliability to the NSP system, the Company intends to file an application with NRC to renew the operating license for the Monticello Plant for an additional 20 years. With such an extension, the Plant would be licensed until September 8, 2050.

Application for an SLR is not uncommon within the industry. Most nuclear plants have already renewed their operating license once and over half of the nation's nuclear power plants will need to obtain a second license extension by 2040. This process, referred to as a Subsequent License Renewal, allows a plant to operate between sixty to eighty years from the date the plant initially received its license. Five stations around the country will need to obtain an extension by 2030 for continued operation. Seven other stations have already applied for SLRs and three of those stations have already received NRC approval. Three other stations have also formally announced their intention to submit SLR applications.

The SLR process includes all of the requirements imposed on an initial 40-year license plus new equipment evaluations and equipment replacement frequencies to mitigate the effects of aging. In response to recent events like Fukushima, the NRC has redefined safe operations for nuclear plants and updated the relicensing requirements, for example by requiring additional AMPs as described below. Fortunately, the investments the Company made over the last decade plus will significantly mitigate the scope of future investments NSP will need to make to relicense the Plant. Additionally, in preparation for potentially undergoing the SLR process for the Monticello Plant, the Company commissioned a Feasibility Study which determined that an SLR should be technically viable (i.e., nothing was identified that would cause the NRC to deny the SLR), and financially prudent. Specifically, the Feasibility Study identified no fatal flaws, technical issues, or environmental concerns that would hold up the SLR process or prevent the operation of the Plant during the 20-year SLR extension period. Significantly, the study suggested that the implementation of existing programs along with previous capital expenditures such as the LCM/EPU Program and other recent initiatives indicated a culture that remains highly supportive of long-term safe operations at the Monticello Plant. Upon completion of the Feasibility Study, the Company decided to continue with the SLR application development.

The Company expects that its previous experience with completion of the SLR process for Monticello in 2006 and Prairie Island in 2014 will help it navigate many of the relicensing requirements for the Monticello Plant for the second SLR. Additionally, the Company will use lessons learned from the three SLR applications that have already been approved to help ensure the Monticello Plant's application is completed and reviewed in a timely and predictable manner.

2. *Expansion of AMPs*

Even considering the significant investments the Company has made in the Monticello Plant in recent years, management of a 50-plus year old facility requires constant vigilance to ensure ongoing safety of operations. To this end, the Company implements 36 active AMPs at the Monticello Plant, as well as five other programs that perform

activities that will be credited as AMPs for purposes of the SLR. In general, these AMPs manage aging effects for certain mechanical, electrical, and structural components in the Plant, to ensure the functions that operators rely on are properly maintained. All of the existing AMPs were implemented in 2010, following the NRC's approval of the Company's initial license renewal. The Company mostly recently reviewed the effectiveness of its AMPs in late 2019 and early 2020, finding that the AMPs were effective in managing age-related degradation at the Plant. However, the Feasibility Study discussed above identified several AMPs that would need to be expanded and nine new AMPs that would need to be implemented in order to receive a second license renewal through 2050. Most of the existing programs that need to be expanded entail inspections of various infrastructure within the Plant, including piping, cabling, welding, and bolting. A total of approximately 19 AMPs will require inspections in the period after license renewal is granted but before the new license period begins in 2030. The nine new AMPs that will need to be implemented in order to obtain an SLR include additional inspections and testing based on the age of certain components in the Plant. Similar to above, these AMPs will need to be implemented prior to the beginning of the new license period. It is also possible that the NRC could identify additional AMPs during the relicensing process, but the Company believes that its Feasibility Study identifies the major AMPs that NRC will require to relicense the Plant. As described below, the Company has budgeted \$2 million for expanding existing AMPs and establishing new AMPs during the project implementation phase. Beyond the implementation phase, the new and expanded AMPs will require additional O&M spend to implement the AMPs on an ongoing basis.

3. Relicensing Timeline and Budget

The Company filed an application with the NRC on January 9, 2023 to renew the operating license for the Monticello plant for an additional 20 years. NRC rules required the SLR application to be filed no later than September 8, 2025, but NSP filed the SLR application earlier in an effort to minimize the potential for changing regulatory expectations to impact the project. The Company projects a total budget for the SLR of \$25 million. This Monticello SLR budget is less than Prairie Island Plant's initial license renewal project cost of approximately \$30 million and consistent with the Monticello Plant's initial license renewal project (completed in 2006) cost of approximately \$22 million. This reflects the efficiencies and institutional knowledge discussed above in terms of navigating the SLR process. Tables 1-3 below show breakdowns of the \$25 million Monticello SLR budget by year, cost category, and project phase, respectively.

Table 1: Monticello SLR Budget by Year

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

Table 2: Monticello SLR Budget by Categories of Costs

Vendor Contract Support Fees	\$10M
NRC Fees	\$7M
NSP Personnel	\$7M
Contingency Fund for Unforeseen Project Costs	\$1M

Table 3: Monticello SLR Budget by Project Phase

Study and Application Development	\$10M
NRC Review and RAI Support	\$12M
Project Implementation	\$2M
Contingency Fund for Unforeseen Project Costs	\$1M

The budget was developed based on the Plant’s initial license renewal projects, benchmarking other nuclear plants projects, and leveraging the Company’s main contract vendor’s experience. The NRC fees are estimated based on NRC’s published estimated review hours of other nuclear plant SLR applications and the standard NRC billing rate. NSP reached out to other utilities in the process of license renewal in 2019 to benchmark project costs. While other utilities would not share their actual costs, they confirmed Monticello Plant’s \$25 million SLR estimate aligns with the rest of the industry.

E. Spent Fuel Storage Expansion

1. Background and Need

The existing spent fuel storage capacity of the ISFSI will need to be expanded in order to keep the Plant running beyond 2030. As of January 2023, 1,052 spent fuel assemblies are stored in the spent fuel pool and 1,830 are stored in the ISFSI, for a total of 2,882 spent fuel assemblies stored at Monticello. The ISFSI does not currently have sufficient storage capacity to accommodate the additional spent fuel assemblies that will be created

by continued operation of the plant beyond 2030. Because the Company does plan to relicense and operate the Monticello Plant past 2030, the Company needs to install additional ISFSI storage capacity.

The Company analyzed four other potential options for disposal of additional spent fuel beyond 2030: (1) reprocessing spent fuel, (2) contracting for spent fuel storage at an existing offsite facility, (3) contracting for spent fuel storage at an interim spent fuel storage facility in the future, and (4) a federally-sponsored permanent repository for spent fuel at Yucca Mountain, Nevada. As discussed in detail by Ms. Prochaska, the Company determined that none of the four alternatives represent a viable strategy today to support continued operation of the Monticello Plant after it exhausts its current storage capacity. For this reason, the Company has concluded that expanding the ISFSI facility is the most economical and reliable method for storing additional spent fuel.

The ISFSI expansion project will involve the construction of a second concrete pad and modular concrete storage system within the existing fenced-in ISFSI footprint to support additional storage casks, which will store sufficient spent fuel to allow the Monticello Plant to continue operating beyond 2030. The largest part of the project would be the construction of a second concrete pad at the site. In anticipation of a potential future expansion, the soil under the area where additional storage could be added was already removed and replaced with engineered soil that can support the weight of an additional pad and storage modules. The Company would also purchase additional dry storage casks to hold the spent fuel rods. Depending on the technology selected for the casks, either new horizontal storage modules will be placed on the new pad or loaded vertical concrete storage casks will be added. No maintenance is required on the canisters or storage modules themselves.

2. *Project Timeline and Budget*

In anticipation of timely relicensing and extending the life of the Plant consistent with the Company's resource plan, the Company has already begun the regulatory process in Minnesota to expand its ISFSI facilities. The Company applied for a certificate of need for additional ISFSI storage at the Monticello Plant with the MPUC on September 1, 2021.⁶ The Minnesota Department of Commerce issued a final Environmental Impact Statement (EIS) on January 13, 2023, and will hold an evidentiary hearing on April 20-21, 2023. The Administrative Law Judge's report from the hearing is due June 30, 2023, and we anticipate an MPUC decision on the certificate of need by the end of 2023.

⁶ *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).

If the certificate of need is approved by the MPUC, the Company plans to use a competitive procurement process to select the cask vendor and technology for the ISFSI expansion. Regardless of the vendor chosen, the technology will be licensed by the NRC and will consist of welded, sealed canisters for confinement, stored in an overpack (typically concrete construction), that will provide additional radiation shielding and protection from external hazards.

Based on studies completed in 2020, the Company estimates the installation cost of the additional storage at the ISFSI to be \$72 million. This budget would provide enough additional ISFSI storage to operate the Monticello Plant through 2040. The following is a breakdown of the major component costs:

Table 4: Estimated Costs of ISFSI Expansion by Category

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

As discussed in Part IV below, these costs were incorporated in the Company’s economic modeling of the Monticello expansion when the Company was considering the potential extension of the Monticello Plant in its most recent resource planning cycle.

IV. ECONOMIC ANALYSIS

In considering whether to extend the life of the Plant beyond 2030, the Company analyzed the potential extension of the Monticello Plant as part of its broader analysis of various resource portfolios in its 2020-2034 Upper Midwest Integrated Resource Plan (IRP) cycle, and also conducted a separate economic analysis specific to the Monticello Plant extension. These analyses are discussed below and in detail in the Direct Testimony of Ms. Mandich.

A. Resource Planning Analysis

In the most recent IRP cycle, the Company developed fifteen different scenarios with varying combinations and timing of baseload unit retirements and compared them to a Reference Scenario based on the prior (2016-2030) Resource Plan. The Company performed several different rounds of analysis of these different baseload scenarios over

the course of the IRP cycle. In general, the Company's resource planning analyses found that extending the life of the Monticello Plant: (1) is cost effective from Present Value of Revenue Requirements (PVRR) perspective, (2) generates considerable savings from a present value of societal cost (PVSC) perspective when environmental externalities are considered, (3) is critical to achieving the Xcel Energy's carbon reduction goals, and (4) ensures that the Company maintains a robust share of firm and dispatchable generation relative to peak load across seasons.

Significantly, the Company's resource planning analyses found that the only future resource portfolios in which the Company could meet its goal to reduce carbon emissions by 80 percent from 2005 levels by 2030 are those in which the Monticello Plant is extended, either individually or in conjunction with the Prairie Island plant. The Company's ultimately-approved resource plan, the "Alternate Plan," includes an extension of the Monticello Plant through 2040 and results in \$46 million in PVRR savings relative to a Reference Case based on the prior 2016-2030 Resource Plan. Additionally, the Company's analysis found that the Alternate Plan maintains reliability and mitigates risk by including sufficient firm dispatchable generation to cover a substantial portion of customer load, particularly in the winter.

The Alternate Plan was approved by the MPUC in a written order issued April 15, 2022.⁷

B. Monticello-Specific Analysis

In addition to the IRP analyses described above, the Company conducted a separate analysis specific to the Monticello Plant extension, comparing the Alternate Plan with a replacement case in which the Monticello Plant retires at its currently scheduled date without consideration of externality values in selecting replacement resources. The purpose of this analysis was to isolate the impacts of the Monticello Plant extension and determine whether an alternative is available under North Dakota planning principles that better balances cost, environmental, and risk/reliability objectives.

This analysis found that the Alternate Plan (in which the Monticello Plant is extended through 2040) best aligns with the Company's goals to provide reliable, clean, cost-effective power while managing volatility and risk. Under North Dakota planning principles, the model will choose to add approximately 750 MW of gas-fired combustion turbines (CTs) in 2030, to meet capacity needs, alongside approximately 750 MW of additional wind resources and 200 MW of solar resources throughout the planning period, relative to the Alternate Plan. This retirement scenario would result in savings of approximately \$145 million PVRR relative to the Alternate Plan, but does

⁷ *In the Matter of the 2020–2034 Upper Midwest Integrated Resource Plan of Northern States Power Company d/b/a Xcel Energy*, MPUC Docket No. E-002/RP-19-368, ORDER APPROVING PLAN WITH MODIFICATIONS AND ESTABLISHING REQUIREMENTS FOR FUTURE FILINGS (April 15, 2022).

not achieve the same level of ongoing carbon reduction and leaves customers more exposed to wholesale market purchases and fuel price and supply volatility.

As shown in Table 5 below, if gas and market energy prices are higher than the Company forecasted in its base analyses, the case in which Monticello retires in 2030 and is replaced primarily with CTs and wind is more costly. If market and fuel prices are substantially lower than our base forecast, it appears more economically beneficial to replace Monticello with those alternate resources.

Table 5: Fuel and Market Price Sensitivity Results

<i>\$2020 millions</i>	Alternate Plan – ND Scenario <i>(as presented in IRP)</i>	Monticello Replacement <i>(fully optimized replacement)</i>	Delta <i>(Monticello Replacement, minus Alternate Plan – ND Scenario)</i>
Base Case	34,955	34,810	(145)
High Fuel and Market Prices	35,738	35,882	144
Low Fuel and Market Prices	34,441	34,085	(355)

Table 5 demonstrates that the economic modeling results for the Monticello replacement, if it is retired in 2030, are very sensitive to commodity price forecasts. This makes more qualitative considerations such as the reliability and resource diversity benefits discussed above even more important to evaluate in this case.

V. PRUDENCE OF THE MONTICELLO PLANT EXTENSION

The Monticello Plant has served as a steady baseload resource for NSP customers for more than 50 years. Despite this long operating history, the Company’s recent investments have resulted in a full refurbishment of the Plant, to the point that it is now an industry leader in terms of operating efficiency, capacity factor, and safety. An extension of the life of the Plant through 2040 will allow the Company to fully leverage the investments that it has already made in the facility and will ensure that the Plant continues to provide cost-effective, carbon-free baseload generation, particularly as the system shifts to more variable, non-dispatchable resources. This will help the Company maintain reliability on the system year round, and particularly during winter storms and seasonal peaking events, with less reliance on market purchases or high marginal cost dispatchable generators. The Company’s experience with the NRC relicensing process, the recent capital investments, and the increasingly efficient operation of the Plant have all made Monticello an essential piece of the Company’s generation portfolio past 2030. Therefore, the Company’s proposed extension of the facility is prudent and an ADP should be granted.

| VI. CONCLUSION

For all the reasons set forth above, Xcel Energy respectfully requests the Commission grant an ADP for the Company's proposed investments to extend the life of the Monticello Plant through 2040.

Dated: February 3, 2023

Northern States Power Company

Respectfully submitted,

/s/ Christopher J. Shaw _____

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