Direct Testimony and Schedule
Pamela Prochaska

Before the Minnesota Public Utilities Commission
State of Minnesota

In the Matter of the Application of Northern States Power Company d/b/a Xcel Energy for a Certificate of Need for Additional Dry Cask Storage at the Prairie Island Nuclear Generating Plant Independent Spent Fuel Storage Installation

Docket No. E002/CN-24-68
Exhibit___(PP-1)

Nuclear Policy and Operations

February 10, 2025

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Schedule

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND TITLE.

A. My name is Pamela Prochaska. I am the General Manager, Nuclear Fleet Operations for Northern States Power Company, d/b/a Xcel Energy (Xcel Energy or the Company).

Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS AND EXPERIENCE.

A. I oversee Nuclear Policy and Business Strategic Planning for Xcel Energy. My career with Xcel Energy began more than 35 years ago in the operations department of the Prairie Island Nuclear Plant. After 10 years in operations, I spent time in various plant positions including project management, regulatory, communications and training.

I then moved out of the operations side and served as the Community and Government Relations Manager for Southeast Minnesota. About seven years ago I came back to nuclear as Director of Nuclear Policy and Strategy for Xcel Energy, where I continue to interface with governmental and industry organizations at all levels that enact, implement and influence policies that impact Xcel Energy's nuclear power plants and spent nuclear fuel storage. My team is currently leading the state filings to extend the Company's existing nuclear fleet.

I am a graduate of the University of Minnesota Duluth, where I earned a Bachelor of Science in Mathematics and Secondary Math Education.

Q. WHAT ARE YOUR CURRENT RESPONSIBILITIES?

A. I am responsible for government relations and regulatory filings with regard to Xcel Energy's fleet of nuclear power reactors. My statement of qualifications is provided as Exhibit___(PP-1), Schedule 1.

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

A. I provide a nuclear policy and nuclear operations perspective regarding the Company's plans for extending the life of the Prairie Island Nuclear Generating Plant (Prairie Island Plant or the Plant) through 2053/54, including explanations of the proposed project (Project) to add to the existing Independent Spent Fuel Storage Installation (ISFSI) that is the subject of this Certificate of Need Application (Application), and the Subsequent License Renewal (SLR) Application for the Plant that Xcel Energy will submit to the Nuclear Regulatory Commission (NRC) in late 2026. Together, these two investments, along with the Company's expansion of its Aging Management Programs (AMPs), represent a significant investment in the continued safe and efficient operation of the Prairie Island Plant. My testimony also provides historical context about the Prairie Island Plant and its importance to the Company's generation fleet.

Q. DO YOU ALSO SPONSOR ANY SECTIONS OF THE COMPANY'S APPLICATION, FILED ON FEBRUARY 7, 2024 IN THIS DOCKET?

A. I am sponsoring the following Application sections:

- Sections 1.2 and 1.3 – containing an overview of the Prairie Island Plant and the Company's dry spent fuel storage proposal
- Section 3.4 – Nuclear Regulatory Commission
- Sections 4.1.2-4.1.4 – Reliability, Safety and Efficiency
- Section 4.2.1 – Storage Alternatives

- Chapter 8 – Nuclear Waste, Disposal Facility; Description
- Section 9.1 – Storage Alternatives
- Chapter 10 – Historical and Forecast Data
- Section 12.7 – Heat Rejection
- Section 13.7 – Heat Rejection Reduction Methods

Q. HOW DOES YOUR TESTIMONY RELATE TO THE DIRECT TESTIMONY PROVIDED BY COMPANY WITNESSES ALLEN KRUG AND CHRISTOPHER SHAW?

A. My testimony is largely focused on the Plant itself and the projects associated with keeping it in operation through 2053/54. I briefly discuss the importance of the Plant to the broader Xcel Energy System, but those topics are addressed in more depth by Company witnesses Allen Krug and Christopher Shaw.

Q. DO YOU BELIEVE THAT EXTENDING THE LIFE OF THE PRAIRIE ISLAND PLANT WILL PROVIDE SUBSTANTIAL BENEFITS TO MINNESOTA CUSTOMERS?

A. Yes. The Prairie Island Plant is a critical source of baseload power for the Company and provides consistent, clean, and reliable power nearly every day of the year for all Xcel Energy customers, including those in Minnesota. The Company has invested substantially in the continued viability of its nuclear fleet over the past 15 years. As witness Shaw explains in his testimony, the Company identified the continued operation of the Prairie Island Plant past 2033/34 as part of its proposed portfolio in its 2024-2040 Upper Midwest Integrated Resource Plan (2024 IRP).

In 2011, NRC approved the Prairie Island Plant's first 20-year license extension. The Company has already undergone the relicensing process for both the Prairie

Island Plant and the Company's Monticello Nuclear Generating Plant. And in early 2023, the Company filed another SLR for the Monticello Plant, which was approved by the NRC on December 30, 2024. That experience gives the Company some familiarity with the relicensing process. The investments the Company has made over the last decade will reduce the Company's costs associated with relicensing because it has reduced the number of age-related replacements needed to run the Plant past 2033/34. Of course, continued operation of the Plant will require ongoing capital additions, as would be the case for any generating facility kept in operation. However, many of the age-related investments and improvements Xcel Energy made during the first license renewal will continue to operate safely and efficiently past 2033/34, and thus the Company is not expecting that it will need to make substantial additional investment solely to extend the Plant's life.

Extending the life of the Prairie Island Plant will allow the Company to continue using the Plant to provide clean, reliable, and efficient power for our customers. Importantly, the Company has already made substantial investments to safely operate the Plant past 2033/34.

Q. PLEASE DESCRIBE HOW YOUR TESTIMONY IS ORGANIZED.

A. I present my testimony in the following sections:

- *Section II* provides an overview of the Prairie Island Plant, including a discussion of how the Plant operates, its current operating efficiency, and the Plant's safety record.
- *Section III* discusses the ISFSI Expansion Project (the Project) and why it will be necessary for the continued operation of the Plant. It explains the nature of the Project, describes the steps the Company has taken already

to plan for the additional storage, discusses possible alternatives that the Company considered, and presents a projected budget for the remainder of the Project.

- *Section IV* briefly discusses heat rejection.
- *Section V* discusses the SLR process that the Company will need to undertake to operate the Plant past 2033/34.
- *Section VI* concludes the testimony by reiterating the benefits to Minnesota customers of extending the Prairie Island Plant's life.

II. OVERVIEW OF THE PRAIRIE ISLAND PLANT

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

A. In this section, I provide an introduction to the Prairie Island Plant. I start by providing a general overview of the Plant, how it operates, its value for customers, both today and looking to the future, and its current regulatory status.

A. General Overview

Q. PLEASE PROVIDE A GENERAL OVERVIEW OF THE PRAIRIE ISLAND PLANT.

A. The Prairie Island Plant is a dual-unit, approximately 1,100-megawatt (MW), nuclear powered, electric generating station using two pressurized water reactors, located in Red Wing, Minnesota. For over 50 years, the Plant has played a critical role in the fleet of generating resources Xcel Energy uses to serve Minnesota customers, generating over 400 million megawatt-hours (MWh) of carbon-free electricity over its life. The Plant provides base load service; meaning it can operate at full capacity for 24 hours a day, seven days a week for extended periods of time to meet the ongoing, steady- or base-demand

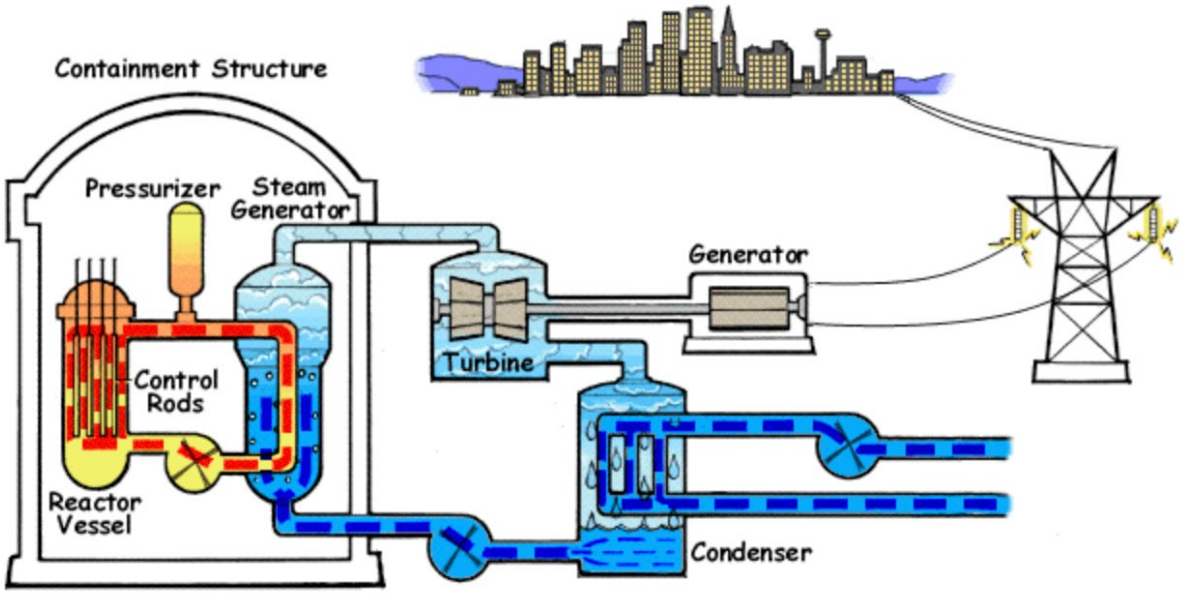
for electric power. The Prairie Island Plant and the Monticello Plant are the only generating stations in the Company's system that provide this level of consistent, reliable, carbon-free energy and capacity.

Q. IN GENERAL, HOW DOES THE PRAIRIE ISLAND PLANT OPERATE?

A. In a pressurized water reactor, such as those at the Prairie Island Plant, pressurized water carries the heat generated by the reactors to the steam generators to produce steam, which is then directed to turbine generators to produce electrical power. The steam is cooled in a condenser and returned to the steam generators.

The reactor cores, which provide the heat that generates the steam in the steam generators, are made up of nuclear fuel assemblies. The cooling water in the reactor core is force-circulated by electrically powered recirculating pumps. Emergency cooling water to the core is supplied by other pumps, which can be powered by onsite diesel generators. Auxiliary feedwater pumps powered by auxiliary steam provide emergency cooling to the steam generators, which also act as a heat sink for the reactor. Figure 1 below is a schematic diagram depicting the major components of a nuclear power electric generating plant using a pressurized water reactor.

Figure 1
Pressurized Water Reactor Plant

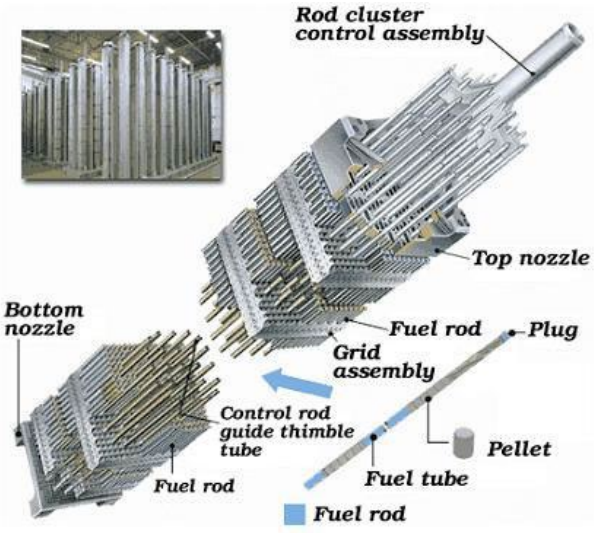


Q. WHAT SORT OF FUEL IS USED IN THE REACTOR CORE AT THE PRAIRIE ISLAND PLANT?

A. The reactor core is made up of 121 fuel assemblies. Each fuel assembly is arranged in a square with 14 rod locations per side. This arrangement provides a total of 196 rod locations per assembly. Of the 196 rod locations, 179 locations are occupied by fuel rods, 16 locations are occupied by control rods which are used to control power, and the remaining location is occupied by incore nuclear instrumentation which monitors power. Each fuel assembly contains a top nozzle, a bottom nozzle and seven grid assemblies. Fuel rods consist of high-density ceramic uranium dioxide fuel pellets, each about the size of a thimble, stacked in a tube made of a special alloy called Zircaloy. The air in the filled tube is evacuated, helium (an inert gas) is backfilled, and the fuel rod is sealed by welding in Zircaloy plugs at each end. Fuel assemblies also contain spacers, springs, and other components. A Zircaloy guide thimble holds the top and

bottom nozzles in place and provides guide channels for the insertion and withdrawal of the control rods. The guide thimble also permits control of coolant flow, and provides mechanical support and protection during fuel handling operations. Fuel rods are supported axially and laterally by seven grid assemblies spaced at set intervals. The grid assemblies allow axial thermal expansion of the fuel rods without causing fuel distortion. Figure 2 below depicts a typical fuel assembly used at the Plant.

Figure 2
Fuel Assembly



Q. HOW DOES THE FUEL CREATE HEAT?

A. A fission reaction between two particles creates heat. A neutron collides with a Uranium-235 atom in a fuel pellet. That extra neutron creates unstable Uranium-235 isotopes, which split almost instantly. The splitting of Uranium-235 atoms, or fission, produces heat, and also produces neutrons, which continue the process by colliding with other Uranium-235 atoms. This process results in a chain reaction. Nuclear engineers carefully monitor and control the

reaction within the core. To temper the reaction, control rods absorb excess neutrons.

Q. HOW LONG DOES THE FUEL LAST?

A. Each nuclear fuel assembly provides heat over about a four-to-six-year period before its output declines to the point that it becomes ineffective. Approximately every two years, the Company shuts down each reactor for refueling. Prairie Island Units 1 and 2 are refueled in alternate years. During each refueling operation, approximately 40 percent of the fuel assemblies in the reactor core are replaced with new assemblies. As I describe further in Section III, spent fuel is initially placed into the Spent Fuel Pool and then is later transferred to dry fuel storage (DFS) systems and the ISFSI for longer-term storage.

Q. WHAT IS THE VALUE PROPOSITION OF THE PRAIRIE ISLAND PLANT FROM A CUSTOMER PERSPECTIVE?

A. As witness Krug also discusses, the Prairie Island Plant offers customers reliable, cost-effective, carbon-free, generating capacity that powers hundreds of thousands of homes in the Company's service territory nearly every day of the year. It also provides fuel diversity to the Company's generation portfolio, offering a hedge against changes in resource availability and fossil fuel prices.

Q. WHAT IS THE CURRENT LICENSURE STATUS OF THE PRAIRIE ISLAND PLANT?

A. The NRC regulates the operation of nuclear power plants. It granted the Prairie Island Plant its initial 40-year license in 1973/74, which allowed Unit 1 to operate until August 9, 2013 and Unit 2 to operate until October 29, 2014. In 2011, the NRC approved 20-year license extensions, which expire on August 9,

2033 and October 29, 2034. The Company has determined that it can continue to operate the Plant safely, reliably, and economically beyond 2033/34. Xcel Energy plans to file an application with the NRC in 2026 to renew the operating licenses for the Prairie Island Plant for an additional 20 years. With such an extension, the Plant would be licensed until 2053/54.

Q. SINCE THE PRAIRIE ISLAND PLANT HAS ALREADY EXTENDED ITS LICENSE PAST THE INITIAL 40-YEAR PERIOD, WILL NRC IMPOSE ANY ADDITIONAL REGULATORY REQUIREMENTS ON THE PLANT TO FURTHER EXTEND THE LIFE OF THE PLANT?

A. Yes. Section IV of my testimony outlines the requirements for extended licenses, including all of the requirements imposed during the first 40 years of operation along with the additional equipment evaluations and equipment replacement frequencies required to mitigate the effects of aging past the initial licensing period.

Q. CAN YOU BRIEFLY DESCRIBE THE WORK THE COMPANY HAS DONE TO POSITION THE PRAIRIE ISLAND PLANT FOR RELICENSING?

A. Xcel Energy has done significant work at the Plant over the past license extension that has delivered results for our customers and that positions the Plant to be a critical component of our energy supply mix past 2033/34. That work has resulted in replacement of large assets and upgrade of control systems that support the reactor and power generation equipment. Some of the major projects undertaken on both units include:

- Baffle Former and Clevis Bolt Replacements,
- Reactor Vessel Head Replacement,
- Feedwater Digital Control System Upgrade,

- Generator Replacement,
- Low Pressure Turbine Replacements,
- Main and Auxiliary Generator Transformer Replacements,
- Breaker Replacements,
- Cooling Water Pipe Replacement,
- Cooling Tower Rebuilds,
- Reactor Coolant Pump replacements/rebuilds,
- Various other pump and motor rebuilds and replacements,
- Fire Prevention and Mitigation Improvements,
- Control Room Control Modules System Upgrade,
- Nuclear Instrumentation System Upgrade,
- Prior to the previous initial license extension period, steam generators were replaced,
- Upgrade of plant monitoring system,
- Security upgrades.

With this work, the Company has planned for the long-term future of the Prairie Island Plant and created a generation facility that can provide cost-effective power well past its current license expiration date. These efforts have improved the Plant's safety and efficiency and allow the Plant to be even more reliable during weather-related emergencies.

B. Current Operating Efficiency

Q. DO YOU CONSIDER THE PLANT A CRITICAL COMPONENT OF THE COMPANY'S GENERATION FLEET?

A. Yes. The Prairie Island Plant continues to provide critical and reliable baseload capacity for the Company's customers. In fact, the Plant is one of the system's most dependable generation resources, with a combined 2022 unit capacity factor of approximately 96 percent and 90 percent over the past five years between 2019 and 2023. The Monticello Plant and Prairie Island Plant combined comprise nearly 40 percent of the carbon-free generation and 30 percent of the total electricity generation in the Upper Midwest, making the Prairie Island Plant a critical component of the overall generation fleet now and into the future.

Q. WHAT ARE THE COMPANY'S PRIORITIES FOR THE PLANT?

A. Our top priority is operating at the industry's highest standards for safety and reliability. We also recognize that we must achieve these priorities while operating our plants, including the Prairie Island Plant, at a competitive cost, and we have been on a journey of continuous improvement to drive strong performance and manage cost—all while maintaining our greatest focus on safety and reliability. We do this by fostering a continuous learning environment that promotes safe and prudent operations, continually raising operational performance towards standards of excellence, promoting accountability for strong financial stewardship, and demonstrating leadership within the nuclear industry and the communities we serve. In 2023, our fleet achieved its seventh year in a row of production costs below $32/MWh, which represents over a 19 percent decline from 2014. We have reduced our annual O&M costs relative to 2014 by over $89 million, which represents a 25 percent improvement compared to 2014 results, and marks the ninth straight year of O&M expenses being less than 2014 expenses. In terms of production costs per MWh, the Company achieved a nearly 30 percent decrease between 2015 and 2021.

Q. CURRENTLY, WHAT IS THE PRAIRIE ISLAND PLANT'S CAPACITY FACTOR?

A. The capacity factor, or operating time, for the Prairie Island Plant has been at an average of 90 percent for the past five years from 2019 through 2023. This reflects the strong performance at the Plant based on the capital investments and operational improvements the Company made over the past decade.

Q. WHAT DOES THE COMPANY ANTICIPATE WITH RESPECT TO O&M AND PRODUCTION COSTS FOR THE NEXT SEVERAL YEARS?

A. The Company cannot completely predict the Plant's operating costs into the future, but in our current rate case, we do anticipate an increase in O&M over the next few years. We anticipate that the predicted level of expenditure will ensure that the Plant will continue to run safely and efficiently, so that the Company's customers can expect to enjoy low-cost, clean, and reliable power for years to come should the Plant's life be extended.

Q. ARE THERE OTHER BENEFITS OF THE PRAIRIE ISLAND PLANT AND ITS ROLE IN THE COMPANY'S OVERALL PORTFOLIO THAT SHOULD BE CONSIDERED IN THIS PROCEEDING?

A. Yes. Traditionally, nuclear plants have been considered must-run baseload power and have been run continually at maximum power except during outages. However, the Company has recently prioritized developing a flexible power operations strategy that allows its nuclear facilities, including the Prairie Island Plant, to reduce power output during periods when other resources are providing large amounts of low-cost energy relative to customer demand such that it would be economically beneficial to run baseload resources at lower levels. The Company has developed operational strategies for its nuclear plants that allow them to maneuver from full output to a level of reduced output.

Currently, Xcel Energy can safely and efficiently reduce up to 284 MWe of nuclear capacity in a day, with the Prairie Island Plant accounting for approximately 150 MWe of reduced capacity, in response to market conditions.

C. The Prairie Island Plant's Safety Record and Additional Advantages of Nuclear Generation

Q. WHO REGULATES SAFETY REQUIREMENTS APPLICABLE TO NUCLEAR FACILITIES?

A. The NRC regulates nuclear power production in the United States to make it one of the safest forms of power production. The Institute of Nuclear Power Operations (INPO) is an independent nonprofit organization that monitors and evaluates industry and worldwide nuclear plant and human performance. INPO's mission is to promote the highest levels of safety and reliability in commercial nuclear plant operation. Even outside the industry at large, the Company has made it a priority to be an industry leader in safety at both of its nuclear facilities.

Q. IS THE COMPANY ACHIEVING INDUSTRY SAFETY STANDARDS FOR ITS CONTINUED OPERATION?

A. Yes. The NRC Reactor Oversight Process classifies U.S. nuclear reactors into various "Columns," which range from 1 (best) to 5 (worst). Currently, all units remain in NRC Column 1[1] status with all green performance indicators, without any NRC Safety Culture Concerns. While all plants have occasional issues that drop performance to a level somewhat below the NRC's exacting standards, the

[1] Per NRC Reactor Oversight Process (ROP): Column I means that performance indicators and inspection findings all fall in baseline expected ranges (very low significance). This reflects that the licensee takes responsibility for addressing these minor problems and the NRC continues with its normal inspections. This is the highest graded performance out of Columns I – V.

Prairie Island Plant's track record demonstrates the Company's longstanding commitment to nuclear safety.

Q. HOW WILL THE COMPANY ENSURE THAT THE PLANT CONTINUES TO OPERATE IN ACCORDANCE WITH NUCLEAR SAFETY STANDARDS?

A. NRC and plant processes require continued evaluation of plant and human performance and correction of issues as they are identified. Every two years, the NRC performs a Problem Identification and Resolution (PI&R) Inspection at all commercial nuclear facilities in the United States. The inspections include evaluating station processes and corrective actions for use of industry and NRC operating experience as well as the effectiveness of the stations' audits and self-assessments. In the last inspections at both the Prairie Island Plant and the Monticello Plant, the NRC determined that there was no evidence of challenges to the organization's safety-conscious work environment.

Additionally, Xcel Energy conducts a Nuclear Safety Culture Assessment of our Nuclear organizations at Prairie Island, Monticello, and Corporate with the support of industry peers every couple of years. This assessment is performed in accordance with INPO 12-012, "Traits of a Healthy Nuclear Safety Culture." The team reviews results of the Nuclear Safety Culture Panel assessments that are performed quarterly, they interview employees at all levels of the organization, they evaluate the Company's corrective action program, and they observe meetings throughout the assessment. In 2024, the assessment team noted that the Xcel Energy Nuclear staff has a safety culture that supports all of the INPO "Traits of a Healthy Nuclear Safety Culture," has a healthy respect for nuclear safety, and assures that nuclear safety is not compromised by production priorities. These two examples are just two of many ways the

Company works with the federal government and industry oversight to ensure operation at the highest levels of nuclear safety continue throughout the license of the Plant.

Q. DOES THE COMPANY ANTICIPATE ANY HEALTH AND SAFETY RISKS ASSOCIATED WITH THE CONSTRUCTION OF THE ISFSI?

A. Considering that the Prairie Island Plant is an industrial facility, health and safety impacts to workers could occur. These non-radiological risks include typical industrial-related injuries, including falls, burns, and machinery injuries. The Company's safety programs, however, reduce the impact of these industrial hazards. Importantly, construction of a second ISFSI pad and the placement of additional spent fuel canisters are not anticipated to increase risks or introduce new risks to plant personnel that are not managed by these safety programs.

Q. DOES THE NRC ALSO REGULATE THE SAFETY OF ISFSI FACILITIES?

A. Yes. The NRC oversees the design, manufacturing, and use of DFS systems. This oversight ensures licensees and designers are following safety and security requirements, meeting the terms of their licenses, and implementing quality assurance programs. NRC enforces strict security requirements to protect stored fuel. Security has multiple layers, including the ability to detect, assess, and respond to an intrusion. While the specific requirements for each facility's security plans are not publicly available, the NRC's general security requirements for ISFSIs are in 10 CFR Part 73.

Q. ARE THERE OTHER FACTORS RELEVANT TO THE CONTINUED USEFULNESS OF THE PRAIRIE ISLAND PLANT?

A. Yes. As witness Shaw also discusses, the continued operation of the Prairie Island Plant helps the Company maintain a healthy ratio of firm capacity to peak demand during the 2030 through 2040 time period. If the Plant did not keep operating in that period, the Company would likely rely on incremental gas or other, as-yet to be developed, dispatchable resources to provide firm capacity. Alternatively, the Company would have to rely more heavily on variable or use-limited resources supported by the MISO market. The Plant also provides clean carbon-free energy, making it a valuable resource to meet the Company's emission reduction goals. I would also note that the Plant is particularly valuable during extreme weather events.

Q. HOW DOES THE PRAIRIE ISLAND PLANT PERFORM IN EXTREME WEATHER CONDITIONS?

A. During extreme weather, the reliability of nuclear generation, and its continued inclusion in the Company's diverse resource mix, has become especially important. Most recently, our nuclear fleet operated reliably during the summer of 2024, one of the hottest summers on record. In 2022, our nuclear fleet operated at 96 percent capacity factor while working with power marketing to flexibly operate the nuclear plants 14 times to allow for more renewable generation on the grid. To further emphasize this reliability value, our nuclear fleet operated at 100 percent capacity during a massive winter storm in December of 2022 that crossed the Dakotas, Minnesota, and Wisconsin. While this historic winter storm created crushing winter conditions including blizzards and record cold temperatures across the majority of the United States and parts of Canada, our nuclear plants continued to provide the necessary electricity to our customers to keep them warm during this heavy, intense winter storm.

Two main reasons account for nuclear generation's resiliency. First, nuclear facilities' on-site fuel supplies allow the plants to run when other energy resources are interrupted by extreme weather or fuel supply shortages. Second, nuclear plants are built to withstand extreme weather, from even the most severe weather events such as floods, tornados, and earthquakes. Considering the increased frequency of extreme weather events in recent years, it remains critical that the Company maintain a diverse generation mix that helps the Company meet its obligation to provide reliable electric service in all conditions. The Prairie Island Plant is an important part of that portfolio and a key contributor to the Company's ability to fulfill its service obligations.

III. THE INDEPENDENT SPENT FUEL STORAGE INSTALLATION EXPANSION PROJECT

Q. PLEASE SUMMARIZE THIS SECTION OF YOUR TESTIMONY.

A. In this section of my testimony, I describe how the Company stores spent fuel at the Prairie Island Plant, and I provide a high-level description of the expansion project and the Company's projected budget for the work.

Q. WHAT IS SPENT FUEL?

A. As I discussed in Section II, the nuclear fuel assemblies in the reactor core provide sufficient heat for about four to six years, and the Company conducts a refueling outage for each unit at the Plant approximately every two years, with outages of Units 1 and 2 occurring in alternating years. During a typical refueling outage, the Company shuts down either Unit 1 or 2 of the Plant and replaces approximately 40 percent of the fuel assemblies. The fuel assemblies that are removed are the spent fuel and are initially transferred to the spent fuel pool.

A. The Spent Fuel Pool

Q. WHAT IS THE SPENT FUEL POOL?

A. The spent fuel pool is a water-filled repository located within the fuel pool enclosure in the auxiliary building at the Plant. It is filled with storage racks that hold spent fuel assemblies and other irradiated reactor components. The water in the pool has a depth of 37 feet, nine inches. The pool is equipped with redundant cooling systems to remove the heat that the assemblies continue to generate and filtration systems that maintain the pool water chemistry and remove suspended particles. In addition to its cooling function, the water in the pool also provides shielding from radiation.

Q. HOW MANY SPENT FUEL ASSEMBLIES CAN THE POOL HOLD?

A. The NRC operating license for the Plant allows for storage of up to 1,386 spent fuel assemblies in the current spent fuel storage rack configuration. To facilitate plant evolutions, four additional storage racks, with a combined capacity of 196 assemblies, may be temporarily installed in the cask lay down area to provide a total of 1,582 storage locations. Because 18 of the storage locations are occupied by fuel rods from 36 consolidated assemblies and 58 locations hold other materials, including spent fuel assembly components from the consolidated assemblies, individual fuel rods, and other irradiated reactor instrumentation and hardware, there are 1,310 locations available for long-term spent nuclear fuel assembly storage within the spent fuel pool.

Q. IS SPENT FUEL KEPT IN THE SPENT FUEL POOL INDEFINITELY?

A. No. The Company eventually transfers spent fuel assemblies to the ISFSI for storage in DFS systems.

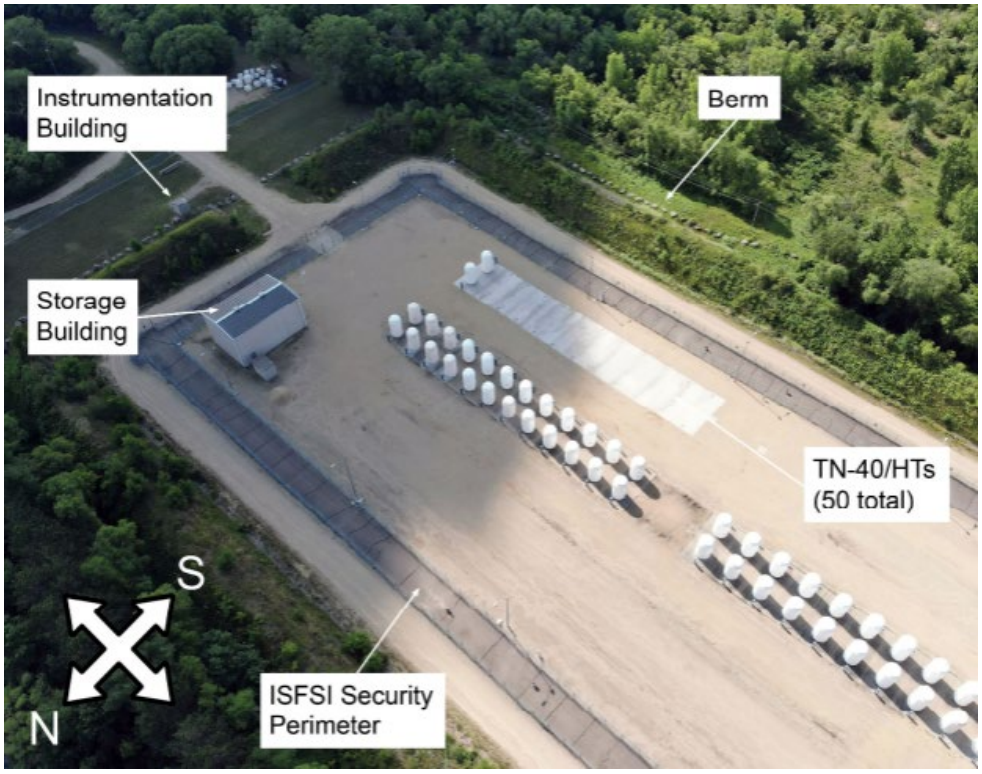
B. The ISFSI

Q. WHAT IS THE ISFSI?

A. The ISFSI is an area of the Plant located to the west of the Plant's cooling towers where the Company stores spent fuel in DFS systems. The ISFSI is approximately 720 feet long and 340 feet wide, approximately 5-1/2 acres in size. The tallest structures in the ISFSI are 40-foot-tall light poles. Two fences surround the facility with a monitored, clear zone in between. The DFS systems 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. The side and the storage vaults are monitored with cameras, other security devices, and temperature sensors. Figure 3 below shows an aerial view of the ISFSI; the ISFSI is fenced-in and surrounded by an earthen berm that provides additional radiation shielding. The DFS systems currently located in the ISFSI are TN-40/40HT DFS systems. Beginning in 2026, however, and most likely through the term of any license extensions if granted, the Company will use a welded DFS system (welded canister system)[2] at the Plant.

[2] The Commission approved the Company's request for a change in PINGP DFS technology in August 2022. The final order was issued October 5, 2022 (Docket No. E-002/CN-08-510).

Figure 3
Prairie Island Plant Aerial View Dry Spent Fuel Storage Facility



Q. HOW ARE SPENT FUEL ASSEMBLIES TRANSFERRED TO THE ISFSI?

A. The transfer is a multi-stage process taking approximately one week. First, a steel canister within a steel transfer cask is placed into the spent fuel pool. Then, the spent fuel assemblies are placed into the canister, and the transfer cask containing the canister is removed from the pool. Next, the canister is dried out, air is removed and replaced with helium, and the canister is welded shut. Finally, the transfer cask is transported to the ISFSI, where the canister is removed from the transfer cask and placed inside the storage module. as depicted in Figure 4 below.

Figure 4
Horizontal Canister System in Use at Monticello and Which Will be Used at Prairie Island

Q. HOW MUCH FUEL HAS THE PLANT USED SINCE IT BEGAN OPERATION?

A. As of January 17, 2025, 3,061 spent fuel assemblies have been discharged from the Plant's reactors. 981 spent fuel assemblies are currently stored in the spent fuel pool and 2,080 spent fuel assemblies are stored in the ISFSI.

Q. IF THE PLANT CONTINUES TO OPERATE PAST 2033/34, WOULD THERE BE SUFFICIENT SPACE AT THE CURRENT ISFSI FOR SPENT FUEL?

A. No. Additional dry storage for spent fuel rods will be necessary for the Plant to continue operations beyond 2033/34.

C. The Proposed Expansion Project

Q. PLEASE PROVIDE AN OVERVIEW OF THE PROPOSED ISFSI EXPANSION PROJECT.

A. As currently proposed, the ISFSI Expansion Project involves the construction

of a fourth (and potentially a fifth) concrete pad and modular concrete storage system within the existing ISFSI to support additional DFS systems, which will store sufficient spent fuel to allow the Prairie Island Plant to continue operating past 2033/34. As discussed in Section 8.8 of the Application, assuming approval to continue operation through 2053/54, Xcel Energy estimates that approximately 1,200 additional spent fuel assemblies would be discharged from the Plant's reactor, compared to ceasing operation of the Plant in 2033/34. The Project provides for the necessary additional storage capacity for those assemblies.

Currently, the ISFSI contains three concrete pads. A crucial aspect of the Project is the construction of a fourth (and potentially a fifth) concrete pad. The Company would build this pad within the secure boundaries of the current ISFSI, as it previously sized the facility footprint to allow for additional storage capacity without changing the outer dimensions of the ISFSI. 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. A new concrete pad (or pads) will need to be constructed to support the additional casks. New horizontal storage modules will be placed on the new pad or pads. No maintenance is required on the storage modules themselves.

Additional DFS systems would also be purchased to store the fuel rods. The exact number of DFS systems needed will be determined by the specific amount of nuclear fuel required to run the Plant for the remainder of its useful life, how much fuel is loaded each cycle, and the capacity of the casks eventually selected. The Company estimates that it will need approximately 34 additional DFS systems to continue operation through 2053/54.

Q. WOULD THE ADDITIONAL DFS SYSTEMS BE THE SAME AS THOSE ALREADY PRESENT AT THE ISFSI?

A. No. In 2022, the Commission approved the Company's request to change the DFS System technology in use at the Plant. Since that approval, the Company has entered into a contract with Orano TN Americas LLC to use the NUHOMS EOS37PTH DFS system through the end of the current operating license. If the SLR and ISFSI expansion are granted by the NRC and the Commission respectively, it is anticipated that this technology will be used through the extended license period. In this type of system, the spent fuel assemblies are loaded into a metal canister with welded lids that provide a leak-tight containment of the spent fuel. After the interior of the canisters are dried of any water and filled with helium, they are placed in a horizontal concrete overpack.

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

A. The Company has estimated the installation cost of the additional storage at the ISFSI to be $173.8 million, in 2020 dollars. Table 1 below is a breakdown of the major component costs:

Table 1

Major Component Costs – ISFSI Additional Storage

Category	Estimated Cost (2020 Dollars)
Regulatory Processes	$3.5M
Engineering, Design, and Construction	$9.4M
Canisters/Storage Modules/Loading	$160.9M
Total	**$173.8M**

D. Storage Alternatives

Q. WHAT ALTERNATIVES TO THE COMPANY'S PROPOSED ISFSI EXPANSION DID XCEL ENERGY CONSIDER?

A. The Company examined four off-site storage possibilities for spent nuclear fuel which would obviate the need for the ISFSI expansion: (1) reprocessing spent nuclear fuel, (2) contracting for additional spent fuel storage capacity at an existing offsite spent fuel storage facility, (3) contracting for additional spent fuel storage capacity at an offsite interim spent fuel storage facility in the future, and (4) the availability of a federally-sponsored permanent repository for spent fuel. In addition, the DOE is currently managing a Consent Based Siting Program in which consortiums are being awarded grants with the purpose of educating communities throughout the country and beginning a narrative on what consent looks like for interim and permanent spent fuel storage. Ultimately, the Company has concluded that none of the four alternatives represent a viable strategy today to support continued operation of the Prairie Island Plant after it exhausts its current storage capacity. Below, I provide an overview of each alternative and explain why the Company determined they were not viable options.

1. Reprocessing Spent Nuclear Fuel

Reprocessing is a method of recovering unused uranium and plutonium from used nuclear fuel and recycling it for use in new reactor fuel. Reprocessing does not result in elimination of all nuclear wastes and radioactivity, but it does reduce the volume of high-level waste that must be stored. When electric power companies first considered using nuclear energy to generate electricity, they assumed that when the nuclear fuel was used up or "spent," it would be recycled so that useful fuel could be extracted and used again. Approximately 96 percent

of spent fuel from nuclear plants in the United States is uranium that could potentially be reprocessed into usable fuel for electricity generation.

In 1977, President Jimmy Carter, concerned about the possibility of nuclear proliferation, banned commercial reprocessing by private companies. As a result, the two private reprocessing facilities then under final construction never came into operation. Although the Federal Government eventually lifted the ban, no private companies have invested in constructing and operating reprocessing facilities. Uncertainty as to whether political leaders and regulators would actually allow for the operation of commercial reprocessing and the economics of reprocessing (as compared to creating new fuel) have hampered the development of reprocessing in the United States. Therefore, reprocessing is not a viable alternative to expanding the ISFSI at the Plant.

2. Existing Off-Site Storage Facilities

The only facility storing spent fuel on a contract basis from commercial nuclear power reactors is the General Electric Morris facility in Morris, Illinois. The Company shipped 1,058 spent fuel assemblies from the Monticello Plant to the Morris facility in the 1980s, where they are currently stored under contract. However, the General Electric Morris facility is no longer accepting additional spent fuel from commercial nuclear power plants and is not a viable alternative to expanding the ISFSI at the Plant.

3. Private Centralized Interim Storage

In 1997, the Company pursued an interim spent fuel storage project in Utah as part of the Private Fuel Storage (PFS) consortium. PFS proposed to build an interim spent fuel storage facility on the West Central Utah reservation of the

Skull Valley Band of Goshute Indians. The project was eventually licensed by the NRC in 2006, but during the lengthy licensing period, many of the utilities participating in the PFS consortium constructed onsite dry storage facilities, which significantly lessened the interest and commitment to using the facility. Significant obstacles to reviving this facility remain, including United States Department of the Interior's approval of the land lease and grant of right-of-way and compliance with NRC licensing conditions. The Company does not believe that the PFS proposal is a viable alternative to ISFSI expansion and its license will expire in February 2026.

A centralized interim storage project is licensed by the NRC for a site located in Andrews County, Texas, adjacent to Waste Control Specialists' (WCS) existing low-level radioactive waste and hazardous waste storage and disposal facilities. In a March 13, 2018 statement, WCS and Orano USA (formerly Areva Nuclear Materials) announced their intention to form a joint venture, Interim Storage Partners, to license the facility. The NRC Staff issued a draft Environmental Impact Statement (EIS) and issued a license to the facility to store spent fuel nuclear fuel.[3] The Fifth Circuit Court of Appeals, however, ruled that the NRC lacked authority to issue the license. The Supreme Court has accepted review of this case in 2025, but no decision has yet been issued. Due to the ongoing legal issues and time that would be required for construction if the license is reinstated, this facility is not considered a viable option for the Prairie Island Plant at this time.

[3] *Interim Storage Partners, LLC; WCS Consol. Interim Storage Facility*, Issuance of Materials License and Record of Decision, 86 Fed. Reg. 51,926 (Sept. 17, 2021).

Holtec International has proposed the HI-STORE Centralized Interim Storage Facility for a site located in southeastern New Mexico. Holtec filed an application with the NRC for this facility in March 2017. While the NRC granted the license for this facility in 2023, the Fifth Circuit, acting in accordance with its decision on the Interim Storage Partners license, vacated Holtec's license. Similar to the Interim Storage Partner facility, legal obstacles and significant work remain before this facility could become operational, and it is not considered a viable option at this time.

4. Permanent Off-Site Storage

The application to license the Yucca Mountain permanent repository remains pending before the NRC, following the unsuccessful attempt by the Obama Administration to terminate the proceeding and withdraw the application. The NRC Staff's technical and environmental reviews have been essentially completed, but the adjudicatory hearings on the application before NRC Atomic Safety and Licensing Board remain suspended. Given the lack of progress in licensing over the past many years, Yucca Mountain is not considered a viable option at this time.

IV. HEAT REJECTION

Q. WHAT IS THE ANTICIPATED HEAT LOAD ASSOCIATED WITH THE CANISTERS THAT WILL BE USED AT THE EXPANDED ISFSI?

A. Dry cask storage systems are passive with no active heat rejection required. By the time they are placed in the casks, the used fuel assemblies have decayed sufficiently such that natural conduction and convection is sufficient to remove the heat generated by the assemblies. The DFS systems that will be

used at the Plant are licensed by the NRC, and current NRC-licensed DFS systems are designed and licensed for heat loading of 20-47 kW per cask.

Q. WILL ANY HEAT REJECTION REDUCTION METHODS BE PUT IN PLACE IN THE EXPANDED ISFSI?

A. No, because the heat load associated with the DFS systems will have no adverse impact on the local environment.

V. THE SUBSEQUENT LICENSE RENEWAL PROCESS

Q. PLEASE SUMMARIZE THIS SECTION OF YOUR TESTIMONY.

A. In this section of my testimony, I outline the general Subsequent License Renewal (SLR) process, AMPs that will accompany the SLR process, and the Company's prior use of the SLR process for both its Prairie Island and Monticello Plants.

Q. WILL the COMPANY NEED TO COMPLETE A RELICENSING PROCESS TO OPERATE THE PRAIRIE ISLAND PLANT PAST 2030?

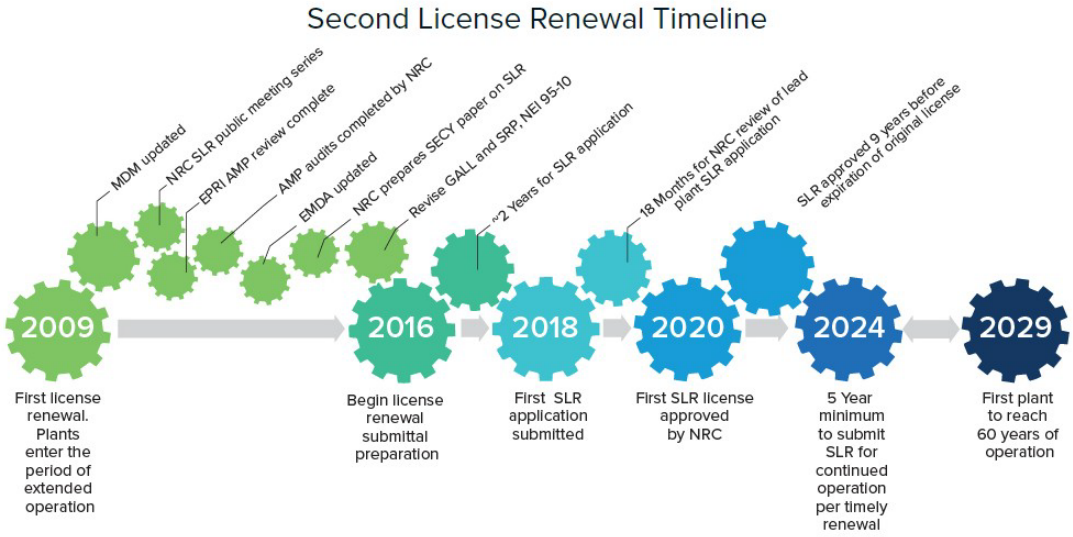
A. Yes. The Company will need to complete a SLR process with the NRC to operate the Plant beyond 2033/34.

Q. WHY DOES THE PRAIRIE ISLAND PLANT REQUIRE A LICENSE RENEWAL?

A As I have previously noted, the Plant's license is set to expire on August 9, 2033 for Unit 1 and October 29, 2034 for Unit 2. The NRC grants 20-year license extensions in accordance with Title 10 of the Code of Federal Regulations (CFR) Part 54. The Prairie Island Plant's original operating license was set to expire in 1973/74, but the NRC granted the Plant its initial license renewal in

2011 for an additional 20 years, extending the license to 2033/34. The proposed SLR would be the plant's second license renewal and would extend the Plant's life from 60 years to 80 years, with a new expiration date of August 9, 2053 and October 29, 2054. Figure 5 below, which is from the Nuclear Energy Institute (NEI), shows the general SLR process.

Figure 5
Second License Renewal Timeline



Q. DO OTHER NUCLEAR OPERATORS PLAN TO APPLY FOR A SECOND LICENSE EXTENSION FOR A NUCLEAR GENERATING FACILITY?

A. Yes. 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. Five stations will need to obtain an extension by 2030 for continued operation.

Eleven other stations have applied for SLRs and five of those stations have already received NRC approval, including the Monticello Plant, which received approval December 30, 2024. Nineteen stations have also formally announced their intention to submit SLR applications.

Q. HAS THE COMPANY EVER SUBMITTED LICENSE EXTENSIONS FOR OTHER NUCLEAR FACILITIES?

A. Yes. The Company completed an initial license renewal process for its Prairie Island Plant in 2011. The Company also completed an initial license renewal for the Monticello Plant in 2006, which extended that plant's license to 2030, and recently completed the SLR process, extending the Monticello Plant's license until 2050. Notably, the Company was able to process the Monticello SLR through the application review process efficiently, i.e. with the fewest required person-hour resources as documented in NRC SECY[4] paper SECY-24-0026 and SECY-24-0026A. Lessons learned from Monticello and other utility SLR applications are incorporated into the development of the Prairie Island Plant SLR application such that efficiencies can be realized. We expect that the Company's institutional expertise in the relicensing process will help expedite the process for the Prairie Island Plant's SLR.

Q. WHEN DOES XCEL ENERGY NEED TO FILE THE SLR APPLICATION TO COMPLY WITH FEDERAL REGULATIONS?

A. To comply with NRC timely renewal application rules, the deadline for SLR application would be August 9, 2028 for Unit 1 and October 29, 2029 for Unit 2.

[4] The primary decision-making tool of the NRC, otherwise called SECY papers because they are designated by the Office of the Secretary, are written issue papers the NRC staff submits to the Commission to inform them about policy, rulemaking, and adjudicatory matters.

However, the Company plans to file its SLR application for both Units in late 2026. The Company anticipates receiving an approved SLR application in 2028 because the NRC review process typically occurs over an 18 to 24 month period. This timeline ensures the Company can address any required outage inspections during the four years prior to the operating period of subsequent license renewal.

Q. PLEASE EXPLAIN THE RELICENSING PROCESS.

A. Requirements for extended licenses include all of the requirements imposed during the first 40 years of operation and also include new equipment evaluations and equipment replacement frequencies to mitigate the effects of aging. Fortunately, the investments the Company made over the last decade plus will significantly mitigate the scope of future investments Xcel Energy will need to make to relicense the Plant. Nonetheless, the needs of tomorrow differ from the needs of today and may require some modifications to the Prairie Island Plant to adopt best practice and meet future needs.

Q. WILL ANY MAJOR CAPITAL PROJECTS BE NEEDED TO SUPPORT OPERATION OF THE PLANT PAST THE END OF ITS CURRENT LICENSE?

A. The only significant capital project currently identified as being necessary to run the Plant past 2033/34 will be the ISFSI expansion project discussed in Section III of my testimony.

Q. WILL THE COMPANY IMPLEMENT NEW OR EXPANDED AMPS AS PART OF THIS PROCESS?

A. Yes. Xcel Energy already implements a number of AMPs at the Prairie Island Plant that grew out of the initial license renewal process, as well as other existing

programs that perform activities that will be credited as AMPs for the SLR. These AMPs manage aging effects for applicable passive and long-lived mechanical, electrical, and structural components to ensure component intended functions are maintained. Intended functions are those functions that operators rely upon during and following design-basis events or other specific safety analyses. The Company expects that most of the existing AMPs will only require minor changes to achieve full compliance with NRC guidance. The Company may also implement new AMPs. Final determination will be through the SLR application development process.

Q. HAS THE COMPANY EXPLORED ALTERNATIVES TO RELICENSING THE PRAIRIE ISLAND PLANT?

A. Yes. As outlined in witness Shaw's testimony, the Company has explored other resource alternatives for meeting a capacity deficit if the Prairie Island Plant was taken offline in 2033/34. My understanding is that eliminating the Plant from the Company's resource portfolio would result in an overall power supply portfolio that is less diverse, less reliable, and that would have a higher carbon intensity and more exposure to fuel price volatility.

Q. DOES THE ISFSI EXPANSION, ALLOWING FOR CONTINUED OPERATION OF THE PRAIRIE ISLAND PLANT PAST 2033/34, RESULT IN COST-EFFECTIVE ENERGY GENERATION FOR XCEL ENERGY CUSTOMERS?

A. Yes. As discussed in witness Shaw's testimony, the Company has identified the continued operation of the Prairie Island Plant as a cost-effective generation resource past 2033/34. The Company's experience with the SLR process, its past capital investments, and its efficient operation of the Prairie Island Plant

demonstrate that the Plant remains a viable and essential piece of the Company's generation portfolio past 2033/34.

VI. CONCLUSION

Q. DO YOU HAVE ANY FINAL COMMENTS?

A. Yes. The Prairie Island Plant is a safe, reliable, and efficiently operated generation facility. It plays an important role in the Xcel Energy System. The Company's customers, including those in Minnesota, will benefit if it continues to operate until at least 2053/54.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes.

Pamela Prochaska
Director, Nuclear Fleet Operations
Xcel Energy, 414 Nicollet Mall, Minneapolis, MN 55401

B.S, Mathematics, University of Minnesota, 1989

Xcel Energy, Minneapolis, MN
Director, Nuclear Fleet Operations Strategy & Policy, 2017 – 2023

- Recommend nuclear policy strategies and direction, including regulatory cost recovery mechanisms, for existing and advanced nuclear operations.
- Develop policy positions for senior management related to regulatory and legislative initiatives at federal and state levels that will impact Xcel Energy's nuclear operations.
- Lead the state filings to extend operations and ensure positive regulatory treatment of the existing Xcel Energy nuclear fleet.
- Drive industry leadership to develop and implement a comprehensive used fuel strategy and solution.

Xcel Energy, Red Wing, MN
Community Relations and Economic Development Manager, 2008 – 2017

- Build and enhance positive relationships with the communities and customers served in Southern Minnesota. Face of Xcel Energy and the connection between local government and our company operations. Manage company positions and testimony before local government units.
- Inform local communities of company direction, objectives and vision and enhance community health by assisting and participating in economic development organizations.
- Provide strategic direction and leadership on company construction, distribution, and transmission projects throughout SE Minnesota.

Prairie Island Nuclear Plant, Xcel Energy, Welch, MN
Employee Concerns Manager, 2005 – 2008

- Provide interface between federal regulator, Nuclear Regulatory Commission (NRC), and Company to implement the employee concern program successfully and effectively at our nuclear plants.
- Responsible to support safe operation while providing technical, leadership and communication skills that assist and coach executive site leadership.
- Foster plant culture that allows for any safety concern to be heard. Member of plant leadership team reporting to site vice president and contribute to overall strategic direction of plant.

Communications and External Relations Manager, 2001 – 2005

- Responsible for development and implementation of all external and internal communication strategies while operating under the Nuclear Management Company (NMC).

Project Manager, 1999 – 2001

- Perform duties as directed by Site Vice President. Led site initiatives on low value work reduction, drive to excellence, employee engagement, business plan development, and process efficiencies.

Community Relations, (Temp Assignment as needed–kept Operations qualifications), 1994 – 1998

- Functioned as Nuclear Generation liaison on both technical and policy issues.
- Worked routinely with many internal departments such as Legal, Communications, Regulatory Affairs, Federal Affairs, State & Metro Affairs, and Investor Relations and represented the company as nuclear spokesperson to the Public Utilities Commission, state legislature, media interviews and community events such as public debates and NSP Speakers Bureau engagements.

Operations, 1989 – 1999

- Involved with all aspects of day-to-day technical operations of the Prairie Island nuclear plant

PUBLICATIONS

MPUC. Docket No. E002/CN-08-510, "Request for Change in Spent-Fuel Storage Technology Prairie Island Fuel Storage." **P. Gorman Prochaska**, contributor. St. Paul, MN: Minnesota Public Utilities Commission. 2021.

https://efiling.web.commerce.state.mn.us/edockets, Document ID 20214-173680-01, April 30, 2021.

MPUC. Docket No. E002/CN-21-668, "Certificate of Need for Additional Dry Cask Storage at the Monticello Nuclear Generating Plant Independent Spent Fuel Storage Installation." **P. Gorman Prochaska**, contributor. St. Paul, MN: Minnesota Public Utilities Commission. 2021.

https://efiling.web.commerce.state.mn.us/edockets, Document ID 20219-177630-01 through -10.