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 Monticello Nuclear Generating Plant Independent Spent Fuel Storage Installation in Wright County

Docket No. E002/CN-21-668
Exhibit___(PP-1)

Nuclear Policy and Operations

March 1, 2023

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Schedule

I. INTRODUCTION

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

A. My name is Pamela Prochaska. I am the Director, Nuclear Regulatory Policy & Strategy for Xcel Energy. In this role, I am responsible for government relations and regulatory filings with regard to Xcel Energy's fleet of nuclear power reactors. Exhibit___(PP-1), Schedule 1 summarizes my qualifications.

Q. FOR WHOM ARE YOU TESTIFYING?

A. I am testifying on behalf of Northern States Power Company, d/b/a Xcel Energy (Xcel Energy or the Company).

Q. WHAT IS THE PURPOSE OF YOUR 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 Monticello Nuclear Generating Plant (Monticello Plant or the Plant) through 2040, 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, and the Subsequent License Renewal (SLR) Application for the Plant that Xcel Energy submitted to the Nuclear Regulatory Commission (NRC) on January 9, 2023. Together, these two investments, along with the Company's expansion of its Aging Management Programs (AMPs), represent a $97 million investment in the continued safe and efficient operation of the Monticello Plant. My testimony also provides historical context about the Monticello Plant and its importance to the Company's generation fleet.

Q. DO YOU ALSO SPONSOR ANY SECTIONS OF THE COMPANY'S CERTIFICATE OF NEED APPLICATION, FILED ON SEPTEMBER 1, 2021 IN THIS DOCKET?

A. Yes. I am sponsoring:

- Sections 1.2 and 1.3, containing an overview of the Monticello Plant and the Company's dry spent fuel storage proposal
- Section 3.4, NRC Certificate of Compliance
- Section 4.2.1, Storage Alternatives
- Chapter 8, Nuclear Waste, Disposal Facility; Description
- Section 9.1, Storage Alternatives
- Chapter 10, Historical and Forecast Data.

Q. HOW DOES YOUR TESTIMONY RELATE TO THE DIRECT TESTIMONY PROVIDED BY COMPANY WITNESSES MR. ALLEN KRUG AND MS. FARAH MANDICH?

A. My testimony is largely focused on the Plant itself and the projects associated with keeping it in operation through 2040. 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 Mr. Allen Krug and Ms. Farah Mandich.

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

A. Yes. The Monticello 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, which has resulted in one of the safest, most reliable, and cost-effective nuclear fleets in the country. As Ms. Mandich explains in her testimony, the Company identified the continued operation of the Monticello

Plant past 2030 as part of its approved portfolio in its 2019-2034 Upper Midwest Resource Plan.

In 2006, NRC approved the Monticello Plant's first 20-year license extension. The Company has already undergone the relicensing process for the Monticello Plant and the Company's Prairie Island Nuclear Generating Plant. 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 2030. 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 2030, 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 Monticello 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 2030.

Q. PLEASE DESCRIBE HOW YOUR TESTIMONY IS ORGANIZED.

A. I present my testimony in the following sections:

- Section II provides an overview of the Monticello Plant, including a discussion of how the Plant operates, its current operating efficiency, and the Plant's sterling 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 the Subsequent License Renewal (SLR) process that the Company will need to undertake to operate the Plant past 2030.
- Section V concludes the testimony by reiterating the benefits to Minnesota customers of extending the Monticello Plant's life.

II. OVERVIEW OF THE MONTICELLO PLANT

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

A. In this section, I provide an introduction to the Monticello 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. As I discuss, the Company's work has made the Monticello Plant a leader in safety and efficiency within the nuclear power industry.

A. General Overview

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

A. The Monticello Plant is a single-unit, 671-megawatt (MW), nuclear powered, boiling water reactor, electric generating station located in Monticello, 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,

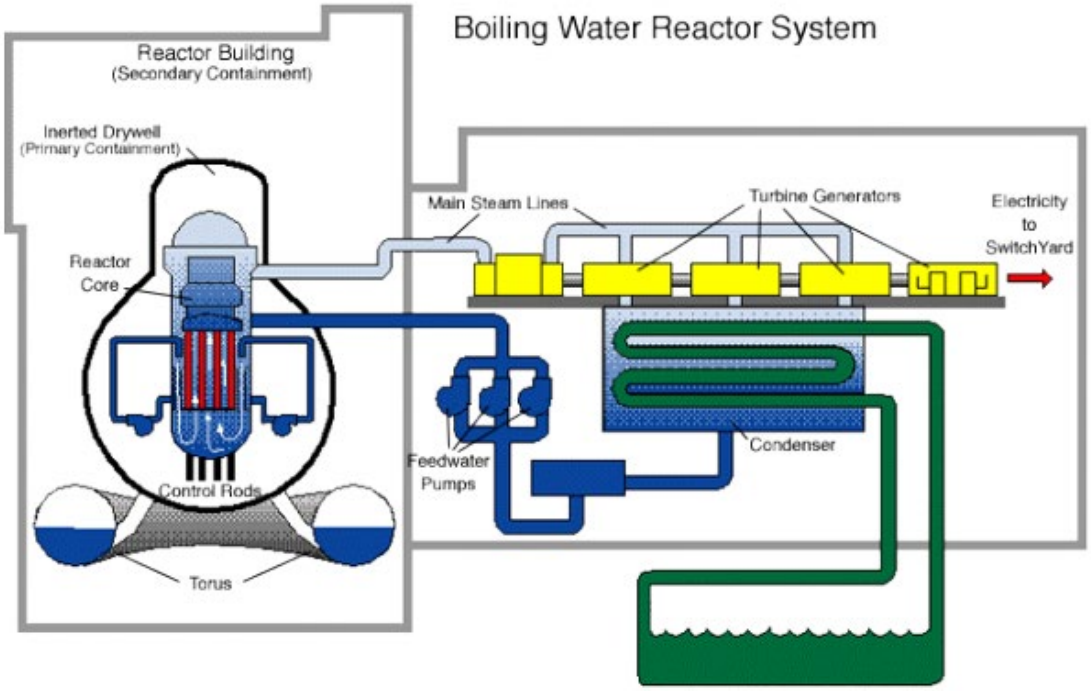
generating over 200 million megawatt-hours (MWh) of carbon-free electricity over its life. The Plant provides base load service; meaning it can operate at full capacity for 24 hours a day, seven days a week for extended periods of time to meet the ongoing, steady- or base-demand for electric power. The Monticello Plant and the Prairie Island Plant are the only generating stations in the Company's system that provide this level of consistent, reliable, carbon-free energy and capacity.

The Company has operated the Plant efficiently, while also protecting the health and safety of the public, Company employees, and the environment. Along with the Prairie Island Plant, the Monticello Plant is among the top-rated nuclear plants in the country as measured by the Institute of Nuclear Power Operations (INPO).

Q. IN GENERAL, HOW DOES THE MONTICELLO PLANT OPERATE?

A. In a boiling water reactor, such as the Monticello Plant, a nuclear reaction in the reactor core generates heat, which boils water to produce steam inside the reactor vessel, which in turn is 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 cooling water is force-circulated by electrically powered feedwater pumps. Emergency cooling water is supplied by other pumps, which can be powered by onsite diesel generators or auxiliary steam from the reactor vessel. Figure PP-1 below is a schematic diagram depicting the major components of a nuclear power electric generating plant using a boiling water reactor.

Figure PP-1

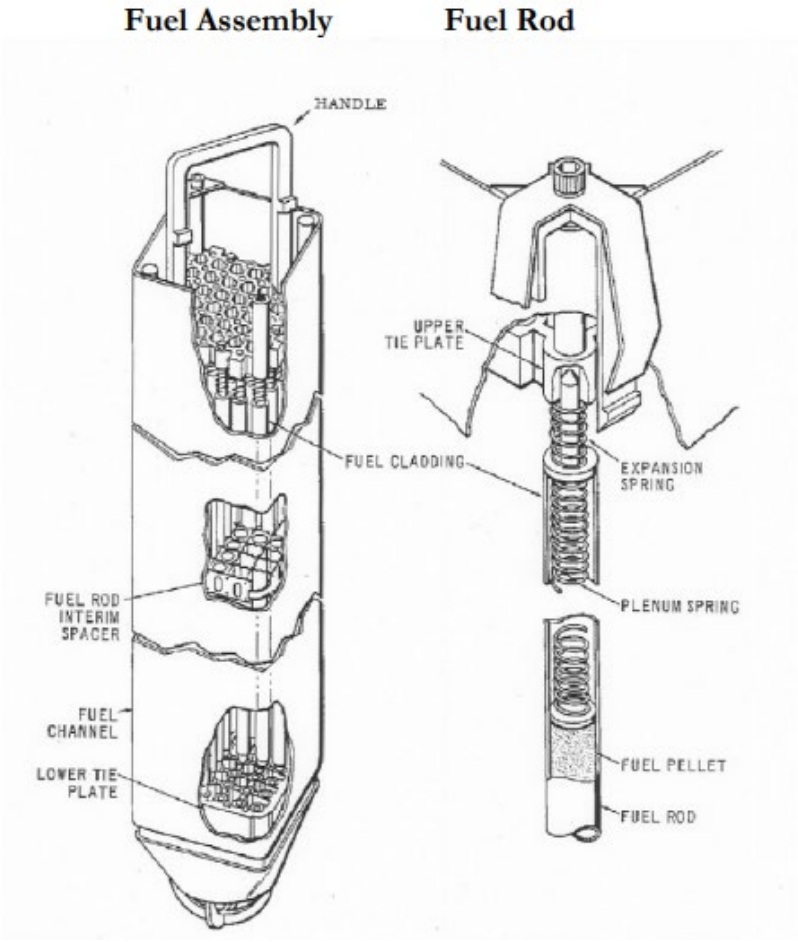


Q. WHAT SORT OF FUEL IS USED IN THE REACTOR CORE AT THE MONTICELLO PLANT?

A. The reactor core, which provides the heat used to boil water, is made up of 484 fuel assemblies, arranged in 121 cells, each containing four fuel assemblies and a control blade. Each fuel assembly contains fuel rods, part-length fuel rods, and water rods. 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. Part length rods are fuel rods that extend to an intermediate point in the assembly. Water rods are hollow Zircaloy tubes with several holes located at each end to facilitate water flow through the assembly. Fuel assemblies also contain spacers, springs and other components. A Zircaloy channel encloses

the fuel bundle. The channel provides guidance and a bearing surface for the control rod, permits control of coolant flow, and provides mechanical support and protection during fuel handling operations. Figure PP-2 below depicts a typical fuel assembly used at the Plant.

Figure PP-2



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 six-year period before its output declines to the point that it becomes ineffective. Approximately every two years, the Company shuts down the Plant to refuel the reactor. During each refueling operation, approximately one-third 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 cask containers and the ISFSI for longer-term storage.

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

A. As Mr. Krug also discusses, the Monticello 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 MONTICELLO PLANT?

A. The NRC regulates the operation of nuclear power plants. 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. Xcel Energy filed an application with the NRC on January 9, 2023 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.

Q. SINCE THE 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 MONTICELLO PLANT FOR RELICENSING?

A. Xcel Energy has done significant work at the Plant over the past several years that has delivered results for our customers and that positions the Plant to be a critical component of our energy supply mix past 2030. That work has resulted in replacement of nearly all of the systems that support the reactor and power generation equipment. Some of the major projects undertaken include:

- High-Pressure Turbine Replacement and Low-Pressure Turbine Modifications
- Main Transformer Upgrades
- Reactor Feed Pumps and Motors Replacement
- Upgrade of the four-kV Electrical Distribution System to 13.8 kV

- 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.

With this work, 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. These efforts have substantially improved the Plant's safety and efficiency and allow the Plant to be even more reliable during weather-related emergencies. In addition, the Company implemented several administrative and programmatic changes that have allowed it to streamline parts of the relicensing process for the Monticello Plant. The Company expects to realize these efficiencies when it undergoes the NRC's relicensing process in the next few years.

B. Current Operating Efficiency

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

A. Yes. The Monticello 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 2022 capacity factor of approximately 98 percent, and the Plant recently completed a record 704 days of continuous operation. The Monticello Plant and Prairie Island Nuclear Generating Plant combined comprise more than half of the Company's existing carbon-free generation and approximately 30 percent of the total electric energy Xcel Energy's customers in the Upper Midwest consumed in 2022, making the

Monticello Plant a critical component of the overall generation fleet now and into the future.

Q. HOW HAS THE COMPANY ACHIEVED THESE RESULTS AT THE PLANT?

A. Over the past several years, the Company has undertaken substantial efforts, including those I highlighted above, that have changed the way Xcel Energy approaches plant operations, allowing us to deliver newfound benefits to customers. By working with third-party consultants with expertise in both nuclear operations and general cost containment and efficiency strategies, the Company 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 Operations and Maintenance (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. The multi-faceted strategic outlook the Company is taking with respect to its nuclear operations has resulted in a nuclear fleet that has never operated on a more consistent, efficient, and safe basis.

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

A. The Capacity Factor, or operating time, for the Monticello Plant has been at an average of 95 percent for the past three years. This reflects the strong performance at the Plant based on the capital investments and operational improvements the Company made over the past decade. Importantly, the Plant's increased availability provides substantial customer benefits given the fixed costs associated with nuclear fuel during this period of high inflation. Contributing to these capacity factors were improved performance refueling outages, which were completed on time and on budget. Combined with Prairie

Island, the Company is one of the top nuclear fleets in the nation for Capacity Factor at 96.5 percent in 2022.

Q. HAS THE COMPANY RECENTLY IMPLEMENTED ANY OTHER INDUSTRY EFFICIENCY MEASURES?

A. Yes. The Company consistently reviews and, where practical, implements industry efficiency innovations. Xcel Energy's most recent adoption of an industry efficient innovation is the implementation of the "Transform the Maintaining the Plant Organization" efficiency opportunity as described in NEI Efficiency Bulletin 17-23. The efficiency bulletin moves technical resources from engineering to the "Maintain" organization, enabling a unified decision-making strategy for keeping equipment reliable. This model promotes working within the design of existing plans to achieve operational and safety goals rather than making modifications to plants, which in turn leads to greater operational efficiencies while lowering spending. The Company leads the industry on that initiative, and we are being benchmarked by other utilities on our work in this area. Our implementation of this model is one of the factors that led us to achieve exemplary status.

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

A. Yes. The Monticello Plant has been rated exemplary compared to industry peers for over ten years. The most recent INPO evaluation for the Plant occurred on September 12-16, 2022. The Company received a repeat exemplary rating.

Q. DOES THE COMPANY ANTICIPATE THAT O&M AND PRODUCTION COSTS WILL REMAIN LOW FOR THE NEXT SEVERAL YEARS?

A. While the Company cannot completely predict the Plant's operating costs into the future, we anticipate 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 MONTICELLO 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 Monticello 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 Monticello Plant accounting for 137 MWe of reduced capacity, in response to market conditions.

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

Q. WHO REGULATES SAFETY CONCERNS FOR NUCLEAR FACILITIES?

A. The NRC regulates nuclear power production in the United States to make it one of the safest forms of power production. 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-LEADING 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, Xcel Energy has the only nuclear fleet in the industry where all units have earned exemplary industry status – all units remain in NRC Column 1 Status with all green performance indicators, without any NRC Safety Culture Concerns. 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. While no plant can achieve the standards of perfection imposed by NRC at all times over a plant's operational life, the Monticello Plant'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 and have received the Minnesota Governor's annual safety award 18 times since 2000.

Q. HOW WILL THE COMPANY ENSURE THAT THE PLANT CONTINUES TO OPERATE AT THE HIGHEST LEVELS OF 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 Monticello Plant and the Prairie Island 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 Monticello, Prairie Island, 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 2022, 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 Monticello 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 dry casks. 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 dry cask storage are in 10 CFR Part 73.

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

A. Yes. As Ms. Mandich also discusses, the continued operation of the Monticello 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 MONTICELLO PLANT PERFORM IN EXTREME WEATHER CONDITIONS?

A. During major winter storms, the reliability of nuclear generation, and its continued inclusion in the Company's diverse resource mix, has become especially important. For example, the Company's nuclear units performed at a high capacity and low marginal cost throughout the 2019 polar vortex and the February 2021 cold spell (also known as Winter Storm Uri).

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 Monticello 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 Monticello Plant, and I provide a high-level description of the expansion project and the Company's projected budget for the work.

A. Spent Fuel Storage

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 six years, and the Company conducts refueling outages approximately every two years during which it shuts down the Plant and replaces approximately one-third of the fuel assemblies. The fuel assemblies that are removed during an outage are the spent fuel. Initially, they are removed to the spent fuel pool.

Q. WHAT IS THE SPENT FUEL POOL?

A. The spent fuel pool is a water-filled repository located on the refueling floor in the Plant's reactor building. 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 2,217 spent fuel assemblies in the current spent fuel storage rack configuration. Eight of the licensed storage spaces cannot be used because they did not meet quality control specifications after their manufacture. That leaves 2,209 storage spaces.

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 dry, concrete storage modules.

B. The ISFSI

Q. WHAT IS THE ISFSI?

A. The ISFSI is an area of the Plant adjacent to the reactor and turbine building where the Company stores spent fuel in canisters within modular concrete vaults. The ISFSI is approximately 460 feet long and 200 feet wide, approximately 3-1/2 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 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. The side and the storage vaults are monitored with cameras, other security devices, and temperature sensors. Image PP-3 below shows the Plant; the ISFSI is the fenced-in area in the foreground.

Image PP-3: Monticello Plant and Existing ISFSI Facilities

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

A. The transfer is a multi-stage process taking approximately five days. 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. The Monticello Plant uses a horizontal canister system as depicted in Image PP-4 below.

Image PP-4: Horizontal Canister System in Use at Monticello

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

A. As of January 9, 2023, 3,940 spent fuel assemblies have been discharged from the Plant's reactor. 1,052 spent fuel assemblies are currently stored in the spent fuel pool and 1,830 spent fuel assemblies are stored in the ISFSI, for a total of 2,882 stored at Monticello. In addition, in the 1980s 1,058 spent fuel assemblies were shipped to a General Electric storage pool in Morris, Illinois; however, that facility is no longer receiving additional storage.

Q. IF THE PLANT CONTINUES TO OPERATE PAST 2030, 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 2030.

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 second concrete pad and modular concrete storage system within the existing ISFSI to support additional storage casks, which will store sufficient spent fuel to allow the Monticello Plant to continue operating past 2030. As discussed in Section 8.5 of the Application, assuming approval to continue operation through 2040, Xcel Energy estimates that approximately 800 additional spent fuel assemblies would be discharged from the Plant's reactor, compared to ceasing operation of the Plant in 2030. The Project provides for the necessary additional storage capacity for those assemblies.

Currently, the ISFSI contains a single concrete pad. A crucial aspect of the Project is the construction of a second 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 will need to be constructed to support the additional casks. 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.

Additional casks would also be purchased to store the fuel rods. The exact number of casks 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. Although the Company estimates that it will need approximately 14 additional storage casks, the storage facility and second support pad will be able to accommodate another 36 vaults of the existing design without having to change the security perimeter. The extra space can be used for the existing technology or a different welded canister system, depending on which is selected.

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

A. The Company has not selected a specific cask vendor or technology. Instead, it plans to use a competitive procurement process to select the cask vendor and technology. However, 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 protecting the sealed canister from external hazards.

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

A. Based on studies completed in 2020, the Company has estimated the installation cost of the additional storage at the ISFSI to be $72.1 million, in 2020 dollars. Table PP-7 below is a breakdown of the major component costs:

Table PP-7

Category	Estimated Cost (2020 Dollars)
Regulatory Processes	$2.5M
Engineering, Design, and Construction	$9.6M
Canisters/Storage Modules/Loading	$60.0M
Total	**$72.1M**

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. 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 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 Monticello 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

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.[1] However, significant work remains before this facility could become operational, including negotiations with the Department of Energy or other entities that hold title to spent fuel for the facility's business model to begin construction, operate and eventual decommissioning of the site. Considering the extended timeline for the construction of the facility, it is not considered a viable option for the Monticello Plant at this time.

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. The NRC published its final EIS for the Holtec facility in July 2022. In the final EIS, NRC Staff recommended issuing the license, subject to a safety review, but a licensing decision is not expected until end of March 2023. Similar to the Andrews

[1] *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).

facility, significant work remains 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. 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.

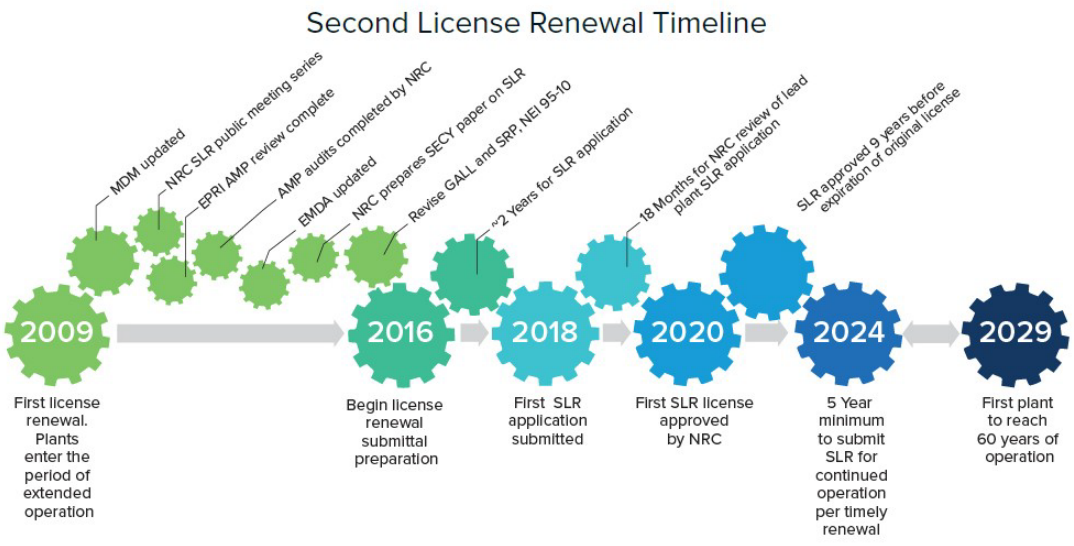
Q. WILL the COMPANY NEED TO COMPLETE A RELICENSING PROCESS TO OPERATE THE PLANT PAST 2030?

A. Yes. The Company will need to complete a SLR process with the NRC to operate the Plant beyond September 8, 2030.

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

A As I have previously noted, the Plant's license is set to expire on September 8, 2030. The NRC grants 20-year license extensions in accordance with Title 10 of the Code of Federal Regulations (CFR) Part 54. The Monticello Plant's original operating license was set to expire in 2010, but the NRC granted the Plant its initial license renewal in 2006 for an additional 20 years, extending the license to September 8, 2030. 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 September 8, 2050. Image PP-2 below, which is from NEI, shows the general SLR process.

Image PP-2: 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. This process, referred to as a Subsequent License Renewal, allows a plant to operate between 60 to 80 years from the date the plant initially received its license. Five stations will need to obtain an extension by 2030 for continued operation.

Seven other stations have 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.

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

A. Yes. The Company also completed an initial license renewal process for its Prairie Island Plant in 2014. Under the renewed licenses, Prairie Island Unit 1 remains operational through August 9, 2033 and Prairie Island Unit 2 remains operational though October 29, 2034. Because the Company has already completed the license renewal process for three separate nuclear units, we expect that the Company's institutional expertise in the relicensing process will help expedite the process for the Monticello 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 September 8, 2025. However, the Company filed its SLR

application on January 9, 2023. The Company anticipates receiving an approved SLR application in 2025 because the NRC review process typically occurs over an 18 to 24 month period.

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 Monticello 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 identified as being necessary to run the Plant past 2030 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 Monticello 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. However, the Company may also implement new AMPs .

Q. HOW LONG DOES THE COMPANY ANTICIPATE THE SLR PROCESS TO TAKE?

A. The SLR application was submitted to the NRC on January 9, 2023. The NRC requires approximately 24 months to review a license renewal or subsequent license renewal application. We anticipate that a decision will be made by the NRC on our SLR application by the end of 2024.

Q. HAS THE COMPANY EXPLORED ALTERNATIVES TO RELICENSING THE MONTICELLO PLANT?

A. Yes. As outlined in Ms. Mandich's testimony, the Company has explored other resource alternatives for meeting a capacity deficit if the Monticello Plant was taken offline in 2030. 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 MONTICELLO PLANT PAST 2030, RESULT IN COST-EFFECTIVE ENERGY GENERATION FOR XCEL ENERGY CUSTOMERS?

A. Yes. As discussed in Ms. Mandich's testimony, the Company has identified the continued operation of the Monticello Plant as a cost-effective generation resource past 2030. The Company's experience with the SLR process, its past

capital investments, and its efficient operation of the Monticello Plant have made this resource an essential piece of the Company's generation portfolio past 2030.

V. CONCLUSION

Q. DO YOU HAVE ANY FINAL COMMENTS?

A. Yes. The Monticello 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 2040.

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.