CHAPTER 1: INTRODUCTION

1.1 OVERVIEW

Xcel Energy (the Company) submits this Application for a certificate of need (CN) to the Minnesota Public Utilities Commission (Commission) for additional spent nuclear fuel storage at our Prairie Island nuclear-powered electric generating plant, to allow the continued operation of one of our largest and most reliable baseload sources of carbon-free electricity. The grant of this CN will allow for the operation of Unit 1 beyond 2033 and Unit 2 beyond 2034. If this CN is approved, the Prairie Island Plant can continue to provide cost-effective, reliable, and environmentally responsible baseload electricity to our customers and help the Company and the State of Minnesota reach its carbon reduction goals.

The increased storage sought in this Application would be accommodated by adding dry spent fuel storage casks within the existing Independent Spent Fuel Storage Installation (ISFSI) at the Prairie Island Plant (the Project). The Project is necessary to allow the Plant to continue operating until 2053 for Unit 1 and 2054 for Unit 2. The proposed additional storage satisfies the requirements of Minnesota Statutes (Minn. Stat.) § 216B.243 and meets the criteria established by the Commission in Minnesota Rule (Minn. R.) 7855.0120, which governs the granting of a CN. The proposed project satisfies the CN requirements for the following reasons:

1) The additional storage is needed to ensure future adequacy, reliability, safety and efficiency of the energy supply to the Company's customers. The Prairie Island Plant has been, and can continue to be, an important part of the Upper Midwest's carbon-free power supply, providing a highly reliable source of baseload power to Minnesota and the region and maintaining the diversity of the Company's fleet. Moreover, the Plant provides critical capacity and carbon-free baseload energy while maintaining safety and affordability. For example, between 2019 and 2023, we have consistently maintained production costs at $31.25 per megawatt-hour (MWh) or less, which is a decrease of more than 20 percent when compared to 2013 production costs. The overall costs of the nuclear power from the Plant compares favorably to other zero-carbon resources while providing highly reliable baseload power. Without additional spent fuel storage capacity, the Plant would be forced to close at the end of its existing operating licenses in 2033/2034.

2) A more reasonable and prudent alternative than the Project has not been identified and demonstrated – either for spent fuel storage or for the power

and energy supply provided by the Plant. The Company analyzed replacing Prairie Island's 1,100 megawatts of power and approximately 9 million megawatt-hours of annual energy production with various combinations of alternative resources, including increased renewable energy resources, storage, combustion turbines and market purchases. These alternatives are not more reasonable and prudent when considering their associated costs, environmental impacts, and reliability and market risks. Similarly, additional spent fuel storage capacity at the Plant reasonably and prudently allows its continued operation, when compared to alternatives currently available.

3) The consequences of granting a CN are more favorable to society than the consequences of denying one. Continued operation of the Plant will result in a reliable, reasonably priced, carbon-free supply of needed baseload electric power and will support the local economy by providing hundreds of well-paying jobs and substantial tax base.[1] In addition, the Project will be constructed within the existing ISFSI footprint, minimizing environmental impacts.

4) The additional storage will comply with relevant local, state and federal policies, rules and regulations. In particular, the Plant and ISFSI are designed, operated and monitored in strict compliance with all requirements set forth by the United States Nuclear Regulatory Commission.

1.2 THE PRAIRIE ISLAND POWER PLANT

For 50 years, the Prairie Island Plant has played a critical role in the fleet of generating resources the Company has available to serve customers, generating over 400 million MWh of zero carbon energy, which translates to over 405 million tons of avoided carbon emissions.[2] The Prairie Island Plant is a two-unit, nuclear powered, pressurized water reactor, electric generating plant located in Red Wing, Minnesota. Each reactor produces on average a nominal value of 550 megawatts of electrical power. The Plant provides baseload service; that is, it primarily operates at full capacity 24 hours a day, 7 days a week for extended periods of time and is used to meet the ongoing base demand for electrical power. Furthermore, in the past decade we have experienced some of the longest runs of uninterrupted operation in the history of our nuclear fleet, including a record-setting 670 days at Prairie Island Unit 1 from 2018 to 2020, and a record-setting run of 704 days on Unit 2 from 2019 to 2021. The efficiency of

[1] A new comprehensive cost-benefit analysis of continued operation of the Plant through 2053/2054, which will include potential environmental and economic impacts to the neighboring communities, will be filed in the following months to supplement the 2024 IRP, Docket No. E002/RP-24-67 and this CN application pursuant to MPUC order in Docket No. E002/RP-19-368.
[2] This data is from Nuclear Energy Institute (NEI, 2022).

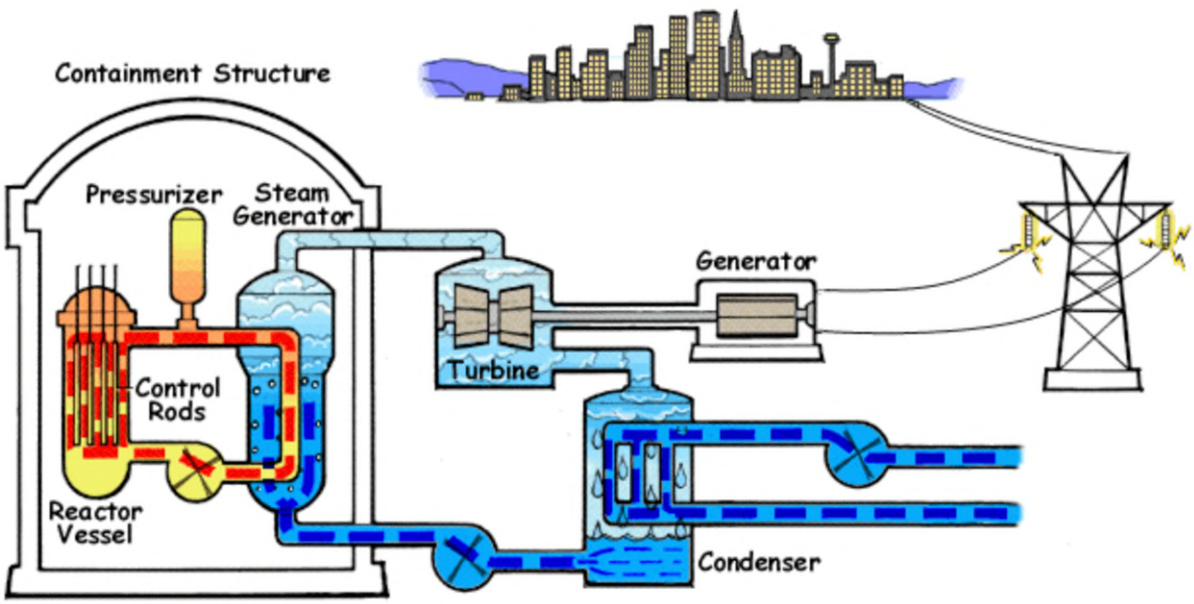
our refueling outages, which are run with the goal of maximizing equipment maintenance while minimizing downtime, contributes to these long operation runs. If there are no major equipment modifications, inspections, or replacements, an outage duration is typically 30 days or less. For example, Prairie Island's Unit 2 achieved 27- and 29-day refueling outages in 2019 and 2021, respectively, and Prairie Island's Unit 1 achieved 28- and 27-day refueling outages in 2020 and 2022, respectively. The Plant's consistent online performance and efficient outages both contribute to the Plant's and the nuclear fleet's high capacity factors. In 2022, our nuclear fleet operated at just over a 96 percent capacity factor. Prairie Island Plant Units 1 and 2 combined operated at 95.7 percent capacity factor. No other resource in our fleet can provide this type of consistent, reliable, carbon-free energy and capacity. Combined with Monticello Plant, Prairie Island Plant generated nearly 30 percent of the total electric energy (and approximately 40 percent of the carbon-free energy) our customers consumed in 2022.

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

The U.S. Nuclear Regulatory Commission (NRC) regulates the operation of nuclear power plants. In August 1973, the NRC granted the first Prairie Island unit its initial 40-year operating license. The second unit operating license was issued in October 1974. In 2011, the NRC approved a 20-year license extension for the Plant; the current operating licenses expire in September 2033 and October 2034. The Company has examined the feasibility of continuing to operate the Plant and concludes that it can continue to operate safely, reliably, and economically beyond the term of the current operating license. Our customers' power supply will be more economical, reliable, and have fewer air quality and greenhouse gas emission impacts if the Plant continues to be part of our fleet of generating resources. Accordingly, in 2026, we intend to file an application with the NRC to renew the operating license for the Prairie Island Plant. The NRC regulations provide for a 20-year renewal of an existing operating license.

The Prairie Island Plant has two pressurized water reactors that utilize 121 fuel assemblies in the core. Figure 1-1 is a schematic drawing of the major components of a nuclear power electric generating plant that utilizes a pressurized water reactor design.

Figure 1-1
Pressurized Water Reactor



The Plant is shut down approximately every two years to refuel. Currently, during each refueling outage, an average of 56 spent fuel assemblies are removed from the reactor and replaced with new assemblies. The spent fuel assemblies are temporarily stored in the spent fuel pool located within the Plant. The entire inventory of spent nuclear fuel produced during the Plant's 50 years of operation is stored in two locations: (1) the Plant's spent fuel pool; and (2) the existing ISFSI.

1.3 SPENT FUEL STORAGE AT PRAIRIE ISLAND

Although the federal government is legally and contractually required to dispose of spent fuel generated at nuclear power plants in the United States, it has not yet met this obligation. As a result, the Company has continually explored alternatives for additional spent fuel storage capacity because the Plant provides value to our customers, including affordability, reliability, and environmental benefits. In 1991, Xcel Energy (then Northern States Power) filed an application for a CN for dry cask storage to provide additional spent fuel storage capacity at the Prairie Island Plant. The application requested approval to place up to 48 spent fuel canisters at an ISFSI to be constructed at the Prairie Island Plant site, which would allow the Plant to continue operating beyond 1995.

The CN issued in 1992 initially authorized only 17 TN-40 casks with the order making it clear that "the facility is not designed for permanent storage and cannot function in that role" due to the obligation of the U.S. Department of Energy (DOE) to establish a permanent geological repository and accept spent nuclear fuel for final disposal. The 17-cask limit was subsequently raised to 64 casks via Commission and legislative action.

Since 1995, the Company has loaded spent fuel casks at the ISFSI, which has allowed for continued operation of the Plant while providing safe and cost-effective storage of spent nuclear fuel until the federal government develops a permanent storage solution. Similar safe storage of spent nuclear fuel is now provided by 68 other ISFSIs operating in 37 states across the country.

1.3.1 Current ISFSI Storage in Support of Existing Operating License

The Company now proposes to add additional storage casks to the existing ISFSI to support the Plant's operation beyond 2033. In order to do so, we must first obtain a CN from the Commission, as set forth in Minn. Stat. § 116C.83 and 216B.243. The procedures and criteria for a CN are set forth in Minn. Stat. § 216B.243 and in Minn. R. Chapters 7855 and 7829. This Application provides the information required by statute and rule, and the Company respectfully requests that the Commission grant the Company a CN for additional dry spent nuclear fuel storage at the Prairie Island Plant's ISFSI, sufficient to allow the Plant to continue operating through 2053 and 2054.

The additional casks would be placed within the existing ISFSI footprint, which consists of a lighted area, approximately 720 feet long and 340 feet wide, roughly 5.5 acres in size, located west of Prairie Island Plant cooling towers as shown in Figure 1-2 below. The tallest structures are the light poles that are approximately 40 feet tall. Two fences surround the facility with a monitored, clear zone between the two fences.

Within the storage area, spent fuel is currently stored in 50 vertical bolted-lid casks (TransNuclear America LLC models TN-40 and 40HTs) that sit on three reinforced concrete support pads. Five additional TN-40HTs will be loaded and installed in the ISFSI between 2024 and 2025. Ten new technology DFS systems are anticipated to be loaded and installed in the ISFSI in 2026. The new DFS systems hold 37 spent fuel assemblies as opposed to the existing TN-40/40HTs which hold 40. The Plant is currently authorized for 64 DFS systems to be stored in ISFSI to support the current operating license through 2033/2034, however due to the new technology and associated change in spent fuel assembly capacity, we will have a total of 65 DFS systems stored in the ISFSI to support our current operating license. The amount of

spent fuel stored in the 65 DFS systems will be equivalent to the same as the amount that would have been stored in 64 TN-40/40HTs.[3]

Figure 1-2
Storage Site Location

1.3.2 Proposal for Expanded ISFSI Storage in Support of License Extension

As discussed in Chapter 8, Nuclear Waste, Disposal Facility, Description, we propose to use a Dry Fuel Storage (DFS) system that is licensed by the NRC for both storage and transportation. The Project involves construction of a fourth and potentially a fifth pad within the existing ISFSI to support the additional storage systems.

[3] Xcel recently signed a contract with Orano (Orano - TN Americas) in November 2023 to store future spent fuel assemblies in the NUHOMS EOS37PTH welded canisters starting in 2026. The change in technology was authorized by the MNPUC in August 2022 for the Company to use an NRC-approved spent nuclear fuel storage system certified for dual-use as storage and transportation under 10 CFR § 72.212(b). The application and decision is filed under Docket No. E002/CN-08-510 along with the Company's request for proposal (RFP) evaluation criteria and results.

Figure 1-2 is an aerial photo showing potential locations for future concrete pads. We estimate that approximately 34 DFS systems (to store approximately 1,200 spent fuel assemblies) will be required to support a 20-year life extension from 2033/2034 to 2053/2054. The exact number of DFS systems needed will be determined by several factors, including the specific amount of nuclear fuel required to run an additional 20 years, which is determined by how much fuel is loaded each cycle; inventory management of the spent fuel pool, and the capacity of the DFS system technology employed. There are several designs certified by the NRC that we have evaluated for use for the additional storage. These are further discussed in Chapter 9, Alternatives. Through a competitive bidding process, the Company awarded a contract to Orano TN Americas LLC to use the NUclear HOrizontal Modular System (NUHOMS) EOS 37PTH DFS system through the end of current license (EOCL) at the Plant. Should the Company receive authorization to expand the ISFSI in support of an additional 20 years of operation, it is anticipated that the Company will continue to use this technology during the period of subsequent license renewal (SLR). The Orano TN Americas EOS37PTH DFS system is NRC-approved technology and consists of a welded, sealed canister for confinement that is then stored in an overpack (in this case a horizontal concrete storage module) which will provide additional radiation shielding and protect the sealed canister from external hazards. For transportation offsite, the canisters would be transferred to shipping overpacks licensed by the NRC without the need to move the fuel to a new container.

Figure 1-2
Aerial Photo Showing the Dry Spent Fuel Storage Facility and Potential Future Storage Pad Locations

1.3.3. Conclusion

As set forth in the remainder of this Application, the Project will allow for the continued operation of the Plant, so that it can continue providing safe, reliable, and affordable carbon-free energy to our customers. Further, the Company's analysis, as detailed in the remaining chapters, shows that this extended operation of the Plant is also in the best interest of the State, our local communities and other stakeholders.

CHAPTER 2: GENERAL INFORMATION (MINN. R. 7855.0230)

Each application shall include the following general information:

A. the applicant's complete name and address, telephone number, and standard industrial classification codes;

Northern States Power Company d/b/a Xcel Energy
414 Nicollet Mall, Minneapolis, Minnesota 55401
(612) 330-5500
SIC Code: 4911

B. the complete name, title, address, and telephone number of the official or agent to be contacted concerning the applicant's filing;

Bria E. Shea
Regional Vice President, Regulatory Planning and Policy
414 Nicollet Mall—401 7th Floor
Minneapolis, Minnesota 55401
(612) 330-6064
bria.e.shea@xcelenergy.com

C. a brief description of the nature of the applicant's business and of the products that are manufactured, produced, or processed, or of the services rendered;

Xcel Energy is a public utility that generates, transmits, distributes, and sells electrical power to its residential and business customers within service territories assigned by state regulators in parts of Minnesota, Wisconsin, South Dakota, North Dakota, and the upper peninsula of Michigan.

D. a brief description of the proposed facility and its planned use;

Xcel Energy proposes to increase spent nuclear fuel storage capacity at its Prairie Island Nuclear Generating Plant in Red Wing, Minnesota by adding approximately 34 additional spent fuel storage systems at the Plant's existing storage facility, or rather enough casks to store 20 additional operating years of used fuel assemblies. Currently, 50 spent nuclear fuel storage casks are in use at Prairie Island arranged in rows on a concrete pad within the storage facility, with 14 additional casks authorized to allow operation to the end of the current Nuclear Regulatory Commission (NRC) license. Additional storage is needed so that the Plant can continue to operate beyond 2033 for Unit 1 and 2034 for Unit 2. Our application seeks approval from the Minnesota Public Utilities

Commission (Commission) for a Certificate of Need (CN) to expand the existing spent nuclear fuel storage facility and to allow the Plant to continue to operate beyond those dates. This additional storage can be accommodated within the footprint of the existing facility already in use. As described in the Company's pending 2024-2040 Upper Midwest Integrated Resource Plan filed with the Commission on February 1, 2024 in Docket No. E002/RP-24-67, the Company's preferred plan includes a 20-year extension of the operation of the Prairie Island Plant that would allow it to operate through 2053 and 2054. Operation beyond 2033 and 2034 will also require NRC approval in the form of a Subsequent License Renewal pursuant to 10 CFR 50.54. The Company plans to seek that approval from the NRC in 2026.

E. the total fee for the application as prescribed by part 7855.0210 and the amount of the fee submitted with the application;

Minn. R. 7855.0210, Subpart I.E. establishes a fee of "$20,000 plus such additional fees as are reasonably necessary for completion of the evaluation of need" for a CN for spent nuclear fuel storage. The rule states that 50 percent of the fee should accompany the application and the remaining 50 percent should follow in 90 days.

For efficiency, one check for $20,000 accompanies this application, rather than two separate checks 90 days apart. It is our understanding that the Commission's Staff will determine the amount and timing of additional fees and request additional payments as this proceeding moves forward.

F. the signatures and titles of the applicant's officers or executives authorized to sign the application, and the signature of the preparer of the application if prepared by an outside agent.

Pursuant to Minn. Stat. §§ 116C.83 and 216B.243 and Minn. R. Chapter 7855, Northern States Power Company d/b/a Xcel Energy hereby submits this application to the Commission for a CN to expand the capacity of the spent nuclear fuel storage facility and add additional storage containers to support operations during a renewed operating license period, ending in 2053/2054, at the Prairie Island Nuclear Generating Plant.

RYAN LONG
PRESIDENT
NORTHERN STATES POWER COMPANY

CHAPTER 3: SCHEDULE OF OTHER FILINGS (MINN R. 7855.0240)

Minn. R. 7855.0240 requires an applicant for a CN to provide a schedule listing all known federal, state, and local agencies or authorities with which the applicant must file for the proposed facility and include the following information:

A. the names of all known federal, state, or local authorities with which the applicant must file;

B. the title of each required permit or certificate issued by the authorities named in response to item A and needed by the applicant;

C. for each permit or certificate listed in response to item B, the date an application was filed or the projected date of future application;

D. for each permit or certificate listed in response to item B, the actual date a decision was made on the application, or the anticipated decision date; and

E. for each permit or certificate listed in response to item B for which an application was filed, the disposition or status of the permit or certificate.

Xcel Energy provides Table 1 below, followed by a discussion of the relevant authorizations required.

Table 3-1
List of Governmental Authorities

Agency or Authority	Permit or Approval	Anticipated Date of Application	Anticipated Date of Decision	Status
Minnesota Public Utilities Commission	Integrated Resource Plan	February 1, 2024	3rd Quarter 2026	Submitted
	Certificate of Need	February 7, 2024	3rd Quarter 2025	Submitted
Minnesota Department of Commerce – Energy Environment Review and Analysis	Environmental Impact Statement	3rd Quarter 2024	2nd Quarter 2025	Anticipate final Scoping Environmental Assessment Worksheet (SEAW) to be submitted by Xcel Energy to EERA on February 29, 2024
Nuclear Regulatory Commission	Subsequent License Renewal	4th Quarter 2026	3rd Quarter 2028	Development

3.1 CERTIFICATE OF NEED – MINNESOTA PUBLIC UTILITIES COMMISSION

Xcel Energy must obtain a Certificate of Need (CN) from the Minnesota Public Utilities Commission (Commission) before an expansion of the spent nuclear fuel storage facility at the Prairie Island Plant can be completed. Minn. Stat. § 116C.83 requires a CN from the Commission before spent nuclear fuel storage can be built or expanded at the Prairie Island Plant:

> 116C.83 Subd. 2. [Commission Process For Future Additional Authorization.]
>
> Authorization of any additional dry cask storage other than that provided for in subdivision 1, or expansion or establishment of an independent spent fuel storage facility at a nuclear generation facility in this state, is subject to approval of a certificate of need by the public utilities commission pursuant to section 216B.243. In any proceeding under this subdivision, the commission may make a decision that could result in a shutdown of a nuclear generating facility. In considering an application for a certificate of need pursuant to this subdivision, the commission may consider whether the public utility that owns the nuclear

> generation facility in the state is in compliance with section 216B.1691 and the utility's past performance under that section.

Minn. Stat. § 216B.243 requires the CN proceeding to address continued operation of the Prairie Island Plant as part of the Commission's evaluation of the need for spent fuel storage:

> 216B.243 Subd. 3b [Nuclear power plant; new construction prohibited; relicensing.]
>
> (b) Any certificate of need for additional storage of spent nuclear fuel for a facility seeking a license extension shall address the impacts of continued operations over the period for which approval is sought.

Once the Commission has made a decision on the CN, Minn. Stat. § 116C.83 subdivision 3 provides the legislature with the opportunity to review and take action, if it chooses, during the legislative session following the Commission's decision.

> 116C.83 [Authorization for additional dry cask storage.]
>
> Subd. 3. Legislative review. (a) To allow opportunity for review by the legislature, a decision by the commission on an application for a certificate of need pursuant to subdivision 2 is stayed until the June 1 following the next regular annual session of the legislature that begins after the date of the commission decision. By January 15 of the year of that legislative session, the commission shall issue a report to the chairs of the house and senate committees with jurisdiction over energy and environmental policy issues, providing a summary of the commission's decision and the grounds for that decision, the alternatives considered and rejected by the commission, and the reasons for rejecting those alternatives. If the legislature does not modify or reject the commission's decision by law enacted during that regular legislative session, the commission's decision shall become effective on the expiration of the stay.

Xcel Energy filed its application for a CN with the Commission on February 7, 2024. Minnesota Rules Part 7855 govern CN proceedings for spent nuclear fuel storage facilities. We anticipate a final decision by the Commission will take one year or more.

3.2 MINNESOTA ENVIRONMENTAL REVIEW

Minn. Stat. § 116C.83 subdivision 6(b) requires an Environmental Impact Statement (EIS) be prepared with the Commissioner of the Department of Commerce as the Responsible Governmental Unit (RGU) pursuant to Minn. Stat. Chapter 116D, the Minnesota Environmental Policy Act.

> 116C.83 Subd. 6(b) An environmental impact statement is required under chapter 116D for a proposal to construct and operate a new or expanded independent spent-fuel storage installation. The commissioner of the Department of Commerce shall be the responsible governmental unit for the environmental impact statement. Prior to finding the statement adequate, the commissioner must find that the applicant has demonstrated that the facility is designed to provide a reasonable expectation that the operation of the facility will not result in groundwater contamination in excess of the standards established in section 116C.76, subdivision 1, clauses (1) to (3).

DOC-EERA must prepare an EIS, which adequately presents the potential environmental impacts of the proposal, examines the environmental impacts of alternatives and potential mitigation measures. Minn. Stat. Chapter 116D, the Minnesota Environmental Policy Act (MEPA) and Minn. R. Chapter 4410, established to implement MEPA, provide a process which includes substantial public participation that must be followed during the preparation of the EIS. The EIS process does not represent a separate approval process for the additional spent fuel storage, but instead is intended to inform the Commission of the environmental consequences of the proposed action, as well as potential impact mitigation measures that can be considered as part of the Commission's need determination.

The first step in the process is for the proposer to draft an Environmental Assessment Worksheet, a short project description and screening examination of potential issues associated with the project. The EAW is then used by the EERA to begin the process of identifying the scope of issues to be examined in the EIS. Xcel Energy provided the EERA with a final draft EAW on November 17, 2023. The EERA is in the process of developing a document that describes the scope of issues to be addressed in the EIS. The draft scoping document along with the EAW will be published. Comments on the proposed scope of the EIS will be accepted from the public during a 30-day period of time and a public meeting. Once the scope is established, the EERA will prepare a draft EIS, revise the draft based on public comments, publish a final EIS, and determine the final EIS adequate. The final EIS

must be declared adequate before final decisions concerning the CN are made by the Commission.

We anticipate the EIS process will take eight months to one year to complete.

3.3 RESOURCE PLAN

Pursuant to Minn. Stat. § 216B.2422, utilities in Minnesota are required to submit Resource Plans to the Commission. In its Resource Plan filing, the utility examines the need for electricity over a 15-year planning period, evaluates a broad spectrum of alternatives to meet the anticipated demand for power and presents its plan. In the case of regulated utilities such as Xcel Energy, the Commission accepts, modifies, or rejects the utility's Resource Plan. The process includes opportunities for comments, including alternative Resource Plan proposals and, if necessary, provides for public meetings and hearings. The proceeding typically takes more than one year to complete.

Xcel Energy filed its 2024-2040 Upper Midwest Integrated Resource Plan on February 1, 2024 in Docket No. E002/RP-24-67. Our Resource Plan filing includes similar information to that contained in this application for a CN regarding the role the Monticello and Prairie Island Plants play in meeting the demand for electricity as well as the alternatives to continuing to operate the Prairie Island Plant.

While our Resource Plan recommends the extension of the Prairie Island Plant, we presume that, in the interest of regulatory efficiency, the issue of the Prairie Island Plant's role in our future power supply will be determined in this CN proceeding.

3.4 NUCLEAR REGULATORY COMMISSION

The Atomic Energy Act authorizes the Nuclear Regulatory Commission (NRC) to issue licenses for commercial power reactors to operate for up to 40 years. These licenses can be renewed for an additional 20 years at a time. The period after the initial licensing term is known as the period of extended operation.

The Prairie Island Plant received its initial operating license in 1973. In 2011, the NRC granted a 20-year extension of the initial operating license which permitted the Plant's operation until 2033/2034. Operation beyond 2033 will require the Company to apply to the NRC for a Subsequent License Renewal ("SLR"). The NRC staff has defined SLR as the period of extended operation from 60 years to 80 years.

The SLR application process proceeds along two tracks—one for review of safety issues (10 CFR Part 54) and another for review of environmental issues (10 CFR Part 51). The SLR application must address the technical aspects of plant aging and describe how those aspects will be managed. It must also evaluate potential environmental impacts of the plant operating for another 20 years. The NRC reviews the application and verifies its evaluation through inspections.

The Company anticipates submitting the SLR application to the NRC in the fourth quarter of 2026. The NRC review is expected to last approximately 18 months.

CHAPTER 4: NEED SUMMARY (MINN. R. 7855.0250)

Minn. R. 7855.0120 provides that the Commission shall grant a CN if the following criteria are satisfied:

A. the probable direct or indirect result of denial would be an adverse effect upon the future adequacy, reliability, safety, or efficiency of energy supply to the applicant, to the applicant's customers, or to the people of Minnesota and neighboring states;

B. a more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence;

C. it has been demonstrated that the consequences of granting the certificate of need for the proposed facility, or a suitable modification thereof, are more favorable to society than the consequences of denying the certificate; and

D. that it has not been demonstrated on the record that the design, construction, operation, or retirement of the proposed facility will fail to comply with those relevant policies, rules, and regulations of other state and federal agencies and local governments.

The Project satisfies all of the criteria. As discussed in greater detail below and throughout this application:

A. Approval of the Project is essential to allow for the continued operation of the Prairie Island Plant from 2033/2034 until 2053/2054. The Project, by enabling the Prairie Island Plant to continue to operate until 2054, will result in a more adequate, reliable, efficient, and carbon-free energy supply to Xcel Energy's customers, the people of Minnesota and neighboring states (7855.0120A).

B. The Project, which proposes to add additional storage within an existing facility, is the best alternative for the storage of spent nuclear waste generated by the Prairie Island Plant, given its current availability to store the projected production of spent fuel; its cost; and its effects on the natural and socioeconomic environment. Alternatives to the continued operation of the Plant do not better meet Xcel Energy's and the State's capacity and energy needs (7855.0120B).

C. The Project allows the continued operation of the Prairie Island Plant, a crucial component of Xcel's commitment to meeting the aggressive carbon reduction goals established by the Company and the State of Minnesota while also safely

providing adequate and reliable energy to customers in Minnesota and surrounding states. Continued operation of the Prairie Island Plant also maintains 550 high quality jobs and provides substantial tax revenues and other economic benefits to the local community, state and region. As such, the consequences of approving the Project are more favorable to society than the consequences of denying the Project (7855.0120C).

D. The design, construction, operation, and eventual retirement of the Project will comply with applicable policies, rules, and regulations (7855.0120D).

4.1 ADEQUACY, RELIABILITY, SAFETY AND EFFICIENCY OF ENERGY SUPPLY

To allow for continued operation of the Prairie Island Plant after 2033, Xcel Energy must obtain: (1) the renewal of its operating license from the NRC and (2) additional storage capacity for spent nuclear fuel. The NRC granted the initial operating license for the Plant in 1973. In 2011, the NRC granted a 20-year license extension that allows the Plant to operate through September 2034. Xcel Energy intends to file a Subsequent License Renewal (SLR) application with the NRC in fourth quarter 2026 to renew the operating license for an additional 20 years. However, even if favorable action is taken on its SLR application, Xcel Energy will be forced to shut down the Plant beginning in 2033 if additional storage capacity for spent nuclear fuel is not authorized. The shutdown of the Plant would adversely affect the future adequacy, reliability, safety, and efficiency of the energy supply to Xcel Energy's customers, and the people of Minnesota and neighboring states.

4.1.1 Carbon-Free Benefits

As discussed in other sections of this application, including Chapter 6, despite Xcel Energy's industry leading demand side management (DSM) efforts, the Company will continue to need the capacity and energy provided by the Plant to meet our customers' needs. The Prairie Island Plant provides 1,100 megawatts of baseload capacity and has generated over 400 million MWh of zero carbon electricity since it started operating. This translates into over 405 million metric tons of carbon dioxide emissions avoided since the Plant began operations. In fact, the Prairie Island Plant avoids over 8 million metric tons of carbon dioxide emissions annually – the equivalent of removing approximately 1.8 million gas-powered cars from the roads.[1]

[1] 2022 Nuclear Energy Institute data is used for PINGP metric tons of carbon dioxide emissions avoided. Equivalent vehicle approximation comes from August 2023 Environmental Protection Agency vehicle emissions data (www.epa.gov).

In addition, the Plant operates 24 hours a day, seven days a week for extended periods of time. As a result, the Plant is critical to Xcel Energy's ability to meet the ongoing, steady or base demand for electrical power and is a cornerstone of Xcel Energy's vision to achieve an 80 percent reduction in carbon emissions by 2030.[2] The Plant's operation is also essential for the Company to meet the newly enacted requirement to provide carbon-free electricity equal to our Minnesota retail sales by 2040 and our commitment to providing 100 percent carbon-free electricity to our customers throughout the region by 2050. Achieving our 2050 goal will require technologies not yet commercially available. But as we work with policy makers and other innovative enterprises to explore these new technologies, our nuclear units can continue to provide critical reliable power. We also see our nuclear plants as an asset we can use to pilot potential technologies that could help with further carbon reduction, such as hydrogen production. For these reasons, we see our nuclear facilities playing a major part in our ongoing efforts to reduce our carbon emissions while providing safe, reliable, and affordable power to our customers.

4.1.2 Reliability

Due to its round-the-clock operations, the Plant is one of our system's most reliable generation resources, with record setting generation in recent non-refueling outage years. In 2021, Unit 1 had a capacity factor of 99.8 percent and in 2022, Unit 2 had a capacity factor of 99.9 percent. The Plant also completed a record 704 days of continuous operation on Unit 2 between 2019 to 2021 and 670 days on Unit 1 between 2018 to 2020. Combined with the Monticello nuclear plant, the Prairie Island Plant represents nearly 30 percent of the total electric energy (and 40 percent of the carbon-free energy) in the Upper Midwest, making it a critical component of our overall generation fleet. As Xcel Energy continues to retire its coal units, the Prairie Island Plant serves an increasingly important role in providing stability, voltage, and overall reliability. The continued operation of the Plant also helps us to maintain a healthy ratio of firm capacity to peak demand during the 2030s and 2040s, whereas scenarios that do not include an extension of the Plant either rely on additions of incremental gas or other (as-yet to be developed) firm dispatchable resources to provide firm capacity or rely more heavily on variable or use-limited resources. As discussed in our Resource Plan, the inherent variability of renewable resources creates a need for sufficient stable energy resources such as nuclear power to assure our ability to meet our customers' needs.

[2] As measured against the Company's 2005 emissions.

4.1.3 Safety

Regarding safety, the Prairie Island 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. Our nuclear fleet was recognized as one of the highest performing fleets in the country according to our nuclear industry peer group. In addition, the operation of the Plant will continue to face strict and continuous oversight by the NRC. Moreover, the relicensing process will include both technical and environmental review, which is intended to ensure that monitoring and inspection programs are maintained to ensure that any operational issues are detected and addressed before they affect Plant safety or reliability.

Additionally, the Company's Nuclear Innovation Team has contributed to improving safety and efficiency through the use of technology. In 2023, 32 robotic missions were executed at Prairie Island Plant and Monticello Plant. These missions were completed with drones, submarines, and remote cameras. Several of these robotic missions executed at the Prairie Island Plant, specifically, eliminated industrial safety risk that would otherwise be associated with specific inspections. These included the following:

- containment dome inspection – this eliminated personnel work at heights and obtained better photos of area;
- lighting arrestor preventative maintenance – this eliminated personnel work at heights; and
- intake bay stop log inspection – this eliminated the need for divers and contractor work.

The performance and implementation of the robotics technology just described is an example of the Company's placement of safety as its number one priority, which will continue should the operating license of the Plant be extended another 20 years.

4.1.4 Efficiency

Finally, granting the CN promotes efficiency. The nuclear fleet has engaged in ongoing operational excellence by combining our Maintenance and Operations Department resources to efficiently address equipment issues at our nuclear facilities. This process has also allowed us to strategically plan for routine maintenance at the right frequencies and share resources when able between the Prairie Island and Monticello Plants.

Additionally, as discussed in the previous section, the 32 robotics missions executed at both the Prairie Island Plant and Monticello Plant in 2023 have contributed to efficiency improvements and therefore, operational savings. In fact, it's estimated that as a nuclear fleet, we saw a savings of approximately $350 thousand as a result of implementing robotics into our work activities for 2023. We anticipate additional savings in future years in Nuclear and the broader Company as the Nuclear Innovation Team expands their expertise and use of robotics into non-nuclear areas of the Company.

The continued focus on operational excellence and incorporation of robotics to perform work activities have both contributed to tangible results for our customers and have allowed our nuclear fleet to maintain production costs at $31.25 per megawatt-hour (MWh) or less since 2019, which is a decrease of more than 20 percent when compared to 2013 production costs.

4.1.5 Continued Need for Baseload Power

The Prairie Island Plant provides approximately 8.7 million megawatt-hours of baseload electrical power service annually. That is nearly 20 percent of the energy consumed across the five-state region. The removal of the Prairie Island Plant from the electrical supply system would remove approximately 1,100 MW of capacity in the region by the end of 2034. This loss is compounded by our projections that both demand and energy needs are projected to grow and by the loss of other generators in our region as we move toward a cleaner resource mix.

We anticipate the demand for energy and capacity to grow over the course of our planning period. The demand for data centers has recently surged, and data centers are more energy-intensive than traditional data processing methods. Nuclear provides reliable resource diversity necessary for secure data management and can contribute to the necessary baseload power that will be required to power these large data centers. Likewise, greater penetration of electric vehicles—albeit slower than recent projections—and adoption of other beneficial electrification is expected to contribute to increased demand.

At the same time, both the Company and other utilities in the state and broader MISO footprint are increasingly announcing plans to divest from, or retire, carbon-emitting baseload generation assets, specifically coal. As we transition to a cleaner energy mix and prepare for accelerating adoption of electrification measures (which supports the decarbonization of other sectors of the economy), maintaining clean, stable and reliable baseload nuclear generation on our system will be paramount.

To be clear, the need for the additional spent fuel storage at the Plant is not a result of the growing demand for electricity, but rather the need to meet existing and ongoing demand for electricity in an environmentally responsible manner, regardless of any future increased demand. The new demand we project, coupled with the loss of other generation capacity, simply enhances this existing need. If additional spent-fuel storage capacity is not obtained, new generation resources to replace this electricity would need to be acquired. As further discussed in Chapter 9, any replacement of the Prairie Island Plant with new generation resources will result in detrimental impacts, including, to varying degrees, higher costs, less reliability, greater air quality impacts, and greater exposure to market risks, depending on the type of replacement power.

4.1.6 Conservation Cannot Eliminate This Need

As discussed in detail in Chapter 6, Xcel Energy's conservation programs are among the most aggressive in the nation. However, while energy conservation programs can slow the growth in demand for electricity, they cannot sufficiently reduce demand in a way that would replace the electricity generated by the Prairie Island Plant. This is particularly true as Minnesota and the region continue to pursue greenhouse gas emission reductions through efforts such as electrification of buildings and vehicle fleets, which require increased carbon-free electricity to replace fossil fuels used outside of electricity generation.

4.1.7 Promotional Activities Have Not Created This Need

Xcel Energy has not engaged in promotional activities that would create a need for spent fuel storage. Promotional activities have similarly not created the need for continued generation of carbon-free baseload power.

4.1.8 Current and Planned Facilities Not Requiring a Certificate of Need Cannot Provide the Needed Storage Capacity or Replace Prairie Island

There are no alternative facilities that do not require a CN (unless exempted via a resource planning process, pursuant to Minn. Stat. § 216B.2422, Subd. 5) that can either provide the needed additional storage capacity or replace the Plant's generating capacity.

Minnesota law provides limited options for storage of spent fuel from the Plant. Minn. Stat. § 116C.83, subd. 4(b) limits the storage of spent nuclear fuel generated by a Minnesota nuclear facility to the site of that facility. Minn. Stat. § 116C.83, subd. 4(a)

provides that any spent fuel stored at either the Monticello or Prairie Island Plants must be shipped to an out-of-state permanent or interim storage facility as soon as it is feasible. As discussed in the next section and further in Chapter 9, there are no permanent or interim facilities that are currently accepting such spent fuel, and the need for spent fuel generated at the Plant to be stored onsite will continue until an interim or permanent repository is accepting spent fuel.

Finally, as discussed above, were the Plant to cease operation, substantial new generation resources would be required to replace the baseload electricity generated by the Plant. There are no sufficient current or planned facilities that do not require a CN that could replace the Prairie Island Plant's generating capacity. Generation alternatives are discussed below.

4.1.9 The Project Makes Efficient Use of Resources

The Project allows continued operation of an existing reliable, carbon-free and cost-effective resource. Without the Project, a new facility or facilities would be required, increasing the cost of electricity for our customers. Additionally, the Project simply allows for greater spent fuel storage capacity within an already developed area with an existing fence line. Construction impacts would be minimal, and the area impacted by the ISFSI would not be increased.

4.2 ALTERNATIVES

This section presents a summary overview of the potential alternatives for storage of spent fuel generated by the Prairie Island Plant and generation alternatives in the event the CN is not approved and the Plant ceases operation beginning in 2033. Chapter 9 of this Application provides more detailed discussion and analysis on this topic.

4.2.1 Storage Alternatives

Xcel Energy examined the alternatives to on-site dry spent fuel storage but found no currently viable alternatives to on-site storage. As discussed in Chapter 9, alternatives for the storage of spent fuel generated at the Plant are limited by Minnesota law. As noted in that discussion, currently there are no permanent or interim storage repositories accepting spent fuel from commercial nuclear generating plants. This section of the application provides an overview of the Company's analysis in Chapter 9, Section 1.

4.2.1.1 Reprocessing and Recycling

There are no facilities in the United States reprocessing or recycling[3] commercial spent nuclear fuel at this time. One company, Oklo Inc. has submitted a Licensing Project Plan outlining pre-application activities to the NRC for recycling of spent nuclear fuel. It's unclear when a license application would be submitted and if or when approval would be granted to build a recycling facility. Neither reprocessing or recycling are viable options at this time; however, the Department of Energy (DOE) Office of Nuclear Energy is progressing with spent nuclear fuel research and development programs aimed at reducing the volume of spent nuclear fuel required for permanent disposal.[4] This is discussed in more detail in Chapter 9, Section1.

4.2.1.2 Existing off-site storage facility- General Electric in Morris, Illinois

The only facility currently 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 Monticello to the Morris facility in the 1980s, where they are currently stored under contract. However, the General Electric Morris facility is no longer accepting spent fuel from commercial nuclear power plants and is therefore not a viable existing off-site alternative to the ISFSI for storing additional spent fuel.

4.2.1.3 Private Centralized Interim Storage

Three privatized potential off-site storage facilities are evaluated in the following discussion. Private centralized interim spent fuel storage has received more attention in the past five years with the NRC licensing application submittals and approvals of the Integrated Storage Partners (ISP) and Holtec HI-STORE facilities. There are current and ongoing legal challenges to both of these projects and the timing of potential construction activities is uncertain. We do not consider any of these proposed facilities to be a currently viable alternative to granting additional storage capacity at the Prairie Island ISFSI.

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[3] While the terms "reprocessing" and "recycling" of spent nuclear fuel are often used interchangeably, "reprocessing" generally refers to the process of separating fissile materials (such as plutonium and uranium) from the used fuel. "Recycling" is the process of using reprocessed fuels to create new fuels for commercial power use, or potentially for advanced reactor use.

[4] www.energy.gov/ne/articles/3-early-stage-rd-programs-transforming-nuclear-industry.

4.2.1.3.1 Private Fuel Storage

Xcel Energy pursued an interim spent fuel storage project in Utah as part of the eight utility consortium Private Fuel Storage (PFS). PFS proposed to build an interim spent fuel storage facility on the West Central Utah reservation of the Skull Valley Band of Goshute Indians.

In 2006, the NRC issued PFS a license for the interim storage facility. The Department of Interior, however, never granted the necessary approvals for the site lease and the right of way.

In March 2022, the State of Utah, one of the petitioners in the D.C. Circuit judicial challenges to the NRC license, filed a motion with the Court to vacate as moot the NRC's final action on the PFS application. The NRC and PFS opposed the Utah's motion. The Skull Valley Band supported the motion, stating that there is no current consent by the Band to construct the facility on the Band's reservation. In July 2022, the D.C. Circuit dismissed the pending court challenges as moot but declined to vacate the NRC's underlying decisions or the license. Based on the current status and lack of consent by the Band, this facility is not a viable option for storage of spent fuel.

4.2.1.3.2 Interim Storage Partners (ISP) Consolidated Interim Storage Facility

On September 13, 2021, the NRC issued ISP a license to construct and operate a centralized interim storage facility in Andrews County, Texas, adjacent to the Waste Control Specialists (WCS) existing low-level radioactive waste and hazardous waste storage and disposal facilities. However, as noted in Chapter 9, significant work remains before this facility could become operational, and it is not considered a viable option at this time.

4.2.1.3.3 Holtec HI-STORE Consolidated Interim Storage Facility

On May 9, 2023, the NRC issued Holtec International Inc. a license to construct and operate the HI-STORE facility on a site located in southeastern New Mexico. Similar to the ISP proposal, significant work remains before this facility could become operational, and it is not considered a viable option at this time. Additional discussion is provided in Chapter 9: Alternatives.

4.2.1.4 Yucca Mountain

The application to license the Yucca Mountain permanent repository remains pending before the NRC. The NRC Staff's technical and environmental reviews have been essentially completed, but the adjudicatory hearings on the application before NRC's Atomic Safety and Licensing Board remain suspended pending Congressional appropriations for both DOE and NRC. Given the political challenges and lack of progress in licensing over the past many years, Yucca Mountain is not considered a viable option at this time.

4.2.1.5 Consent-Based Siting for Federal Interim Storage

Beginning in 2015, DOE began efforts to develop a consent-based siting approach for federal away-from-reactor spent fuel storage facilities. Congress has authorized a limited amount of funding for DOE to pursue this effort. Various DOE activities to obtain public feedback took place starting in 2017. In April 2023, DOE outlined a road map for a consent-based siting process for federal interim storage facilities. In June 2023, DOE awarded $2 million to each of the 13 consent-based siting consortia to work with communities interested in consent-based siting for federal interim storage. One of these consortia includes the Prairie Island Indian Community as a partner and Xcel Energy as a collaborator. The DOE does not anticipate soliciting consent-based sites for another 18-24 months, with implementation of a consent-based site estimated to take ten to fifteen years. Therefore, this process does not currently present a viable option for storage.

4.2.1.6 On-Site Storage Alternatives

Our application also examines several alternate approaches to storing additional spent fuel at Prairie Island, none of which provide a reasonable alternative to the Project. Fuel rod consolidation is a concept that was explored in the 1980s at several facilities, including the Company's Prairie Island Plant. Technical challenges in all of the demonstration projects resulted in the abandonment of rod consolidation as a potential solution.

Redesign of the existing spent fuel pool to allow for increased capacity has also been evaluated. In 1980, the low-density storage racks in the pool were replaced with higher density racks in order to establish today's capacity. Only limited additional modifications can be made to storage space within the pool at this time.

Adding an additional spent fuel storage pool has been considered. A new spent fuel pool would need to be a stand-alone structure, as there is insufficient room within the existing auxiliary building to add onto the existing pool structure. This alternative would also result in the need to handle spent fuel additional times relative to the current process. This would result in higher operational costs. This option is not viable due to the high cost and increased fuel handling required.

4.2.1.7 Alternative Sites

Minnesota Statutes restrict the location of a dry fuel storage facility to the nuclear generating facility site at which the spent nuclear fuel was generated.[5] The existing site was selected during initial planning as the most suitable location within the Plant site and contains sufficient space to accommodate the additional storage required to support Plant operation through 2054.

4.2.1.8 Alternate Dry Cask Technologies

On April 30, 2021, the Company requested authorization to use a welded-canister dry fuel storage technology certified by the NRC for dual-use as storage and transportation under 10 CFR § 72.212(b) at the Prairie Island Plant Independent Spent Fuel Storage Installation (ISFSI). In August 2022, the MN PUC approved the request and the Company entered into a competitive bidding process. Following completion of the competitive bidding process and extensive technical and commercial evaluation,[6] the Company signed a contract with Orano TN Americas in November 2023 for use of the NUHOMS EOS 37PTH Dry Fuel Storage (DFS) system through the end of current license (EOCL). It is anticipated that this DFS technology will continue to be used during the subsequent license renewal period[7] should authorization be given at the federal and state levels. Details of the DFS technologies are further discussed in Chapters 8 and 9.

4.2.2 Generation Alternatives

A generation alternative to the Prairie Island Plant, whether accomplished via a single resource or multiple resources, must be capable of replacing both the capacity and

[5] Minn. Stat. § 116C.83, subd. 4(b).
[6] The application and decision is filed under Docket No. E-002/CN-08-510. A compliance filing was submitted under the same docket in January 2024 detailing the evaluation criteria and results.
[7] Xcel Energy plans to apply for an SLR with the NRC in late 2026 to extend the operation of the Prairie Island Plant to 2053/2054. Extension of the Prairie Island Plant is modeled in the Preferred Plan and Scenario 2 of the currently pending 2024 IRP, Docket No. E002/RP-24-67.

energy quality of the Plant. The Plant provides synchronous generation, which results in inertia and greater power quality and robustness on the transmission system than does other generation sources, such as renewables. In the past, the Company would have analyzed baseload fossil fuel facilities, such as coal, as potential alternatives to the Plant. However, the Company does not view coal-fired generation as a reasonable alternative to extending Prairie Island's operating life, given current state policy and the Company's carbon reduction goals. Moreover, regardless of state and Company policy, new baseload coal facilities cannot compete economically with the Plant.

Regarding the potential for a replacement hydroelectric facility, the Company is not aware of a potential hydroelectric facility or facilities that could be developed in Minnesota or neighboring states to replace an 1,100 MW baseload facility. Similarly, any potential hydroelectric purchases of this quantity are too speculative to be considered a reasonable alternative to the Plant.

4.2.2.1 2024 IRP Baseload Scenario Comparison

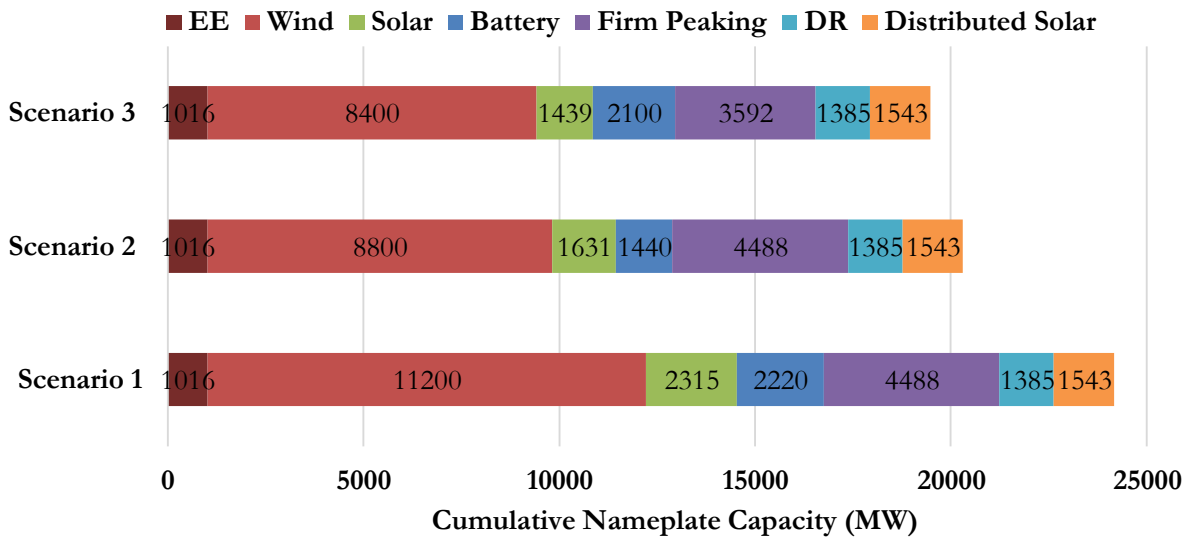
In contrast, if the CN is not granted, this generation capacity would need to be replaced with more costly, less environmentally beneficial sources of energy, and/or place our reliability obligations at risk. As discussed further in Chapter 9, Xcel Energy used the EnCompass resource planning model and explored three scenarios in the pending 2024-2040 Integrated Resource Plan (IRP) that examined different combinations and timing of baseload nuclear unit retirements, and the resulting size, type, and timing of new resources we would need to add in order to continue meeting customers' needs and achieve our carbon reduction goals. We refer to these scenarios, shown in Table 4-1, as "baseload study scenarios."

Table 4-1
Baseload Scenarios

	Plant Retirement Dates	
Scenario Name and Description	**Prairie Island Plant Unit 1/Unit 2**	**Monticello Plant**
Scenario 1 – Reference Case Maintain current planned retirement dates	2033/2034	2040
Scenario 2 – Prairie Island plant Extension Extend Prairie Island Plant 20 years; maintain Monticello Plant retirement date	2053/2054	2040
Scenario 3 – Preferred Plan – Extend All Nuclear Extend Prairie Island Plant 20 years; extend Monticello Plant 10 additional years	2053/2054	2050

After this analysis was completed, we used the outcomes and sensitivity tests to select and refine a Preferred Plan. Figure 4-2 below shows results of the model for each scenario, indicating the capacity of new resources required to replace lost generation from retirement of the nuclear plants through 2040.

Figure 4-2
Expansion Plans by Scenario
(MW, Cumulative Nameplate Capacity Resource Additions by Resource Type, 2024-2040)



In Scenarios 1 and 2, the analysis we perform allows the model to select the most cost-effective resources to replace Prairie Island Plant in Scenario 1 and the Monticello Plant in both Scenarios 1 and 2. As shown above in Figure 4-2, Scenario 3, which would extend the lives of both the Prairie Island and Monticello Plants, results in fewer additions of firm peaking and wind capacity relative to both Scenarios 1 and 2. While Scenario 2 includes the same amount of cumulative firm peaking resources through 2040, those additions are delayed by the extension of Prairie Island Plant, and fewer firm peaking resources are needed over the 20 year life extension. Moreover, the nuclear extensions provide a certain and stable source of energy to our system as we transition our generation fleet away from fossil-based generation.

As discussed below and in our pending IRP, this analysis demonstrates that extending the Plant is a foundational part of the most cost-effective plan for our customers to achieve the Company's and State's goals. This CN to expand Independent Spent Fuel Storage Installation (ISFSI) at the Prairie Island Plant is needed to support a 20-year

operating license extension. Therefore, the modeling discussion will include some discussion of the Preferred Plan, which models license extension for both plants,[8] and will also focus on Scenario 2 of the pending 2024 IRP, which models Prairie Island Plant retirement extension to 2053/2054 and Monticello Plant retirement as scheduled in 2040.

Both Scenario 1 and 2 impose incremental costs – on a present value of societal cost (PVSC) basis – relative to our Preferred Plan. These costs range from approximately $400 million to over $1 billion on a PVSC basis.[9] Extension of the operating license for the Prairie Island Plant to 2053/2054 – Scenario 2 – results in PVSC savings to our customers of approximately $500 million when compared to the Reference Case (Scenario 1) between 2024 and 2050. Implementation of the Preferred Plan results in a potential cost savings to our customers of approximately $1 billion on a PVSC basis when compared to the Reference Case between 2024 and 2050. See Table 4-2 for details.

Table 4-2
Scenario PVSC/PVRR Deltas from Reference Case
($2024 millions)

PVSC Production Cost	Delta in NPV ($m) 2024-2040	NPV ($m) 2024-2040	Delta in NPV ($m) 2024-2047	NPV ($m) 2024-2047	Delta in NPV ($m) 2024-2050	NPV ($m) 2024-2050
Scenario 1 PVSC	$0	**$51,037**	$0	**$63,635**	$0	**$68,788**
Scenario 2 PVSC	($413)	**$50,624**	($437)	**$63,198**	($513)	**$68,275**
Scenario 3 PVSC	($785)	**$50,252**	($941)	**$62,695**	($1,025)	**$67,762**
PVRR Production Cost	**Delta in NPV ($m) 2024-2040**	**NPV ($m) 2024-2040**	**Delta in NPV ($m) 2024-2047**	**NPV ($m) 2024-2047**	**Delta in NPV ($m) 2024-2050**	**NPV ($m) 2024-2050**
Scenario 1 PVRR	$0	**$34,678**	$0	**$44,948**	$0	**$48,927**
Scenario 2 PVRR	($97)	**$34,581**	$291	**$45,239**	$391	**$49,317**
Scenario 3 PVRR	($464)	**$34,215**	$46	**$44,994**	$239	**$49,166**

[8] The Company will pursue another CN with the MN PUC should a Monticello Plant license extension to 2050 be approved in the pending 2024-2040 IRP, Docket No. E002/RP-24-67.
[9] PVSC and PVRR production costs were modeled over three different time periods: 2024-2040, 2024-2047 and 2024-2050. Results of modeling and sensitivity studies are discussed further in Chapter 5 of the 2024-2040 IRP, Docket No. E002/RP-24-67.

Extension of the operating license for the Plant is essential to meeting our carbon reduction goals; our Preferred Plan achieves nearly 88 percent carbon reduction from 2005 levels by 2030 (when the Monticello Plant subsequent license renewal period begins). In the Reference Case and Scenario 2, where the nuclear plants are replaced by a mix of gas, wind, solar and battery storage resources, the total amount of carbon emissions associated with serving customer load is higher in part due to additional gas dispatch on our system. And although the scenarios have limited market reliance to ensure our plan can serve our customers' needs throughout all hours of the year, we will continue to access the MISO market to dispatch our resources to achieve the greatest benefit for our customers. On average, market purchases have a higher carbon intensity than our own generation mix. Retiring the Plant at the EOCL results in a less diverse energy mix and removes a reliable source of carbon-free baseload energy.

4.2.2.2 Nuclear Leave Behind Study

Additionally, a Nuclear Leave Behind Study[10] was performed to evaluate steady state impacts and dynamic resources needed as a result of retiring the nuclear plants. It is assumed in the study that the nuclear plants are not replaced with other generation sources. The steady state analysis identified that the retirement of the plants without replacement generation results in thermal overloads and voltage violations requiring system upgrades. Dynamic analysis indicated significant replacement generation is needed. Scenarios used load levels for summer shoulder average wind and summer peak. Available natural gas was turned on as needed to stabilize the system and mitigate voltage and thermal violations. If no natural gas generation sources are available, load in the Twin Cities area would require downscaling to achieve a stable dynamic response. The analysis results indicate there are significant costs incurred to mitigate voltage violations and improve transmission system stability. The specific cost details are non-public and can be found in the 2024 IRP, Appendix M-1: Nuclear Leave Behind Study Report (attached as Appendix I of this application). Reinforcement costs identified in the study are included as capital expenditure in the IRP modeling based on the timing of the plant retirements. The results further emphasize the significant role the nuclear plants play in providing a stable and reliable transmission system.

4.2.2.3 Generation Alternative Conclusion

As the Company and other generation owners in the region continue with proposed coal retirements and proceed toward a future with less carbon emitting baseload

[10] 2024-2040 IRP filing, Docket No. E002/RP-24-67 Appendix M1: NSP Nuclear Leave Behind Study Report (Appendix I in this application).

generation, managing fleet diversity and maintaining sufficient firm and/or dispatchable generation to meet much of our load across seasons is an essential approach to mitigating customer risk. This is especially true as the broader MISO market increasingly transitions to integrating more variable renewable generation and duration-limited resources. Overall, the Company's Preferred Plan—including the extension of the Prairie Island Plant to 2053/2054 and the Monticello Plant to 2050—best balances cost effectiveness, carbon reduction, and risk and reliability objectives, relative to either of the cases. In comparing the Preferred Plan and Scenario 2 to the Reference Case, selecting the Reference Case would be most detrimental. Retiring the Prairie Island Plant in 2033/2034 and replacing it with other resources either is not cost beneficial, achieves less carbon reduction, increases reliability concerns and customer exposure to market risk, or a combination of the above.

4.2.3 Demand Side Management

Xcel Energy has a long and proud history of being a leader on demand side management (DSM) efforts. In addition, the Company was the first major U.S. power company to announce its vision to provide customers 100 percent carbon-free electricity. To support that vision, Xcel Energy has pursued aggressive energy and demand response savings through the framework of our DSM programs and will continue to do so. For example, the Company's current IRP proposes goals of on average 532 MW of yearly load through the planning horizon. Additionally, it includes growth of Demand Response over 1,300 MW through 2040. However, even this level of achievement cannot eliminate the need for the reliable, affordable, and carbon-free baseload power provided by the Plant and enabled by this Project, as discussed further in Chapter 6.

4.2.4 No Action

Our application requests approval for the additional dry spent fuel storage facility and containers necessary to operate the Prairie Island Plant beyond 2034. Without such additional storage capability, the Plant would need to shut down and the Company would need to replace the capacity and energy it provides. In that sense, the "no action" alternative has the same cost and other implications as the Reference Case discussed above.

However, it is important to note that the need for additional on-site storage would not be eliminated if the plant ceases operation at that time. In order to decommission the Plant, spent fuel would have to be removed from the reactor and spent fuel pool, which would require an expansion of the existing ISFSI capacity at that time, which,

like the proposed expansion here, is currently estimated to be within the existing ISFSI fence line.

Minnesota Statutes[11] and Administrative Rules[12] recognize this need to provide dry storage for decommissioning and require the Company to obtain a Certificate of Need to construct this expansion.

4.3 CONSEQUENCES TO SOCIETY

Continued operation of the Plant will continue to benefit society by providing carbon-free baseload generation that is cost-effective, reliable, safe, and beneficial to the local community. The following discussion will highlight the significance of the carbon free energy the Plant provides to the system in meeting the Company's and state's carbon-free energy goals as well as the significant societal and economic impact the Plant provides to its surrounding communities.

4.3.1 Prairie Island is a Critical Part of Meeting Minnesota's Energy Needs

As detailed throughout this application, the Plant is a cornerstone of the Company's efforts to dramatically reduce its carbon emissions. In 2018, the Company announced a goal of reducing carbon emissions by 80 percent from 2005 levels by 2030 and becoming the first utility in the nation to state its intention to serve customers with 100 percent carbon-free electricity by 2050. Last year, Minnesota implemented a law requiring 100 percent carbon free energy in an amount equivalent to our Minnesota retail sales by 2040. As we work toward these goals and move toward a portfolio that is carbon free, our nuclear units have never been more important to our ability to reliably serve our customers. The Project will benefit society by meeting overall state energy needs in an environmentally responsible manner, especially by providing reliable and reasonably priced electricity with minimal air quality impacts.

The Project will also support future regional development by helping to ensure a reliable and cost-effective electrical supply system. As discussed above, the Nuclear Leave Behind Study analyzed the impact of retiring the Prairie Island Plant on the transmission system. Significant costs are identified in the study due to the need to add generation and transmission system modifications to mitigate voltage violations and an unstable system. These reinforcement costs were included in the Resource Plan modeling, which resulted in a Present Value Societal Cost (PVSC) savings of

[11] Minn. Stat. § 116C.771 (e).
[12] Minn. R. 7855.0030, Subpart 1.

approximately $1 billion[13] to customers when Monticello Plant retirement date is also extended to 2050.

Locally, the Project will ensure the continued employment of the Plant's highly skilled and dedicated workforce. This workforce not only benefits the Plant but the entire community as active, involved, tax paying citizens participating and contributing to the greater social fabric of the community. The continued operation of the Prairie Island Plant will also continue to provide the substantial property tax base that has significantly benefited local communities.

4.3.2 The Project Is Compatible with the Natural and Socioeconomic Environment

The storage expansion contemplated by the Project would be contained entirely within the existing fence line of the Prairie Island ISFSI. Construction impacts would therefore be minimal, and the area impacted by the ISFSI would not be increased. As a result, environmental impacts will be minimal as discussed in Chapter 11, Environmental Information and Alternatives.

A previous study performed by the Nuclear Energy Institute (NEI) in 2017, "*The Impact of Xcel Energy's Nuclear Fleet on the Minnesota Economy*," determined that the Company's nuclear fleet generates $1 billion in economic activity annually. The Company's nuclear fleet also generates substantial tax revenue for the state, contributing an estimated $42 million in state and local taxes annually with approximately $22 million generated by the Prairie Island Plant.

Additionally, the Company has engaged extensively with the Prairie Island Indian Community (PIIC) since the last IRP was approved. The agreement reached with the PIIC on annual payments going forward represents a major accomplishment with respect to our ongoing partnership with the PIIC.[14] This will ensure that the PIIC will receive annual payments comparable to those received by other communities hosting nuclear power plants, which receive payments through property taxes paid by the Company. The Company and PIIC maintain a partnership through regular meetings with the Tribal Council and community to discuss key issues on legislation, strategic vision, and plant performance.

[13] Calculated between 2024 and 2050.
[14] Laws of Minnesota 2023, Chapter 60-H.F.No. 2310, Section 15.

An updated comprehensive cost-benefit analysis of continued operation of the Plant through 2053/2054, which will include potential environmental and socio-economic impacts to the neighboring communities, will be filed in the coming months of 2024 to supplement the 2024 IRP and this CN application pursuant to MPUC order in docket no. E002/RP-19-368, Order 23 E.

4.3.3 Inducing Future Development

As discussed in Chapter 14, during the six-month construction period, the Project will employ an estimated total of 40 construction workers, with a peak at any one time of 12 workers and an average of 8 workers. No full-time staff will be required at the expanded ISFSI facility during operation beyond current plant personnel. The Project will have minimal impact on other factors required to be considered, including traffic, utilities and public services or water usage levels.

4.3.4 Societal Benefits and Enhancing Environmental Quality

In addition to facilitating the continued supply of reliable and reasonably priced baseload power, important for both residential and business customers, the Project enables Xcel Energy to provide carbon-free energy to our customers, thereby enhancing environmental quality. As noted above, the Minnesota legislature passed legislation in 2023 requiring utilities, including Xcel Energy, to generate or procure carbon-free energy equivalent to 100 percent of its Minnesota retail sales by 2040. As described in the 2024 IRP, the law, Minn. Stat. § 216B.1691, also requires Xcel Energy to achieve interim carbon-free standards of 80 percent by 2030 and 90 percent by 2035, and a renewable energy standard of 55 percent by 2035. The Company is positioned to achieve compliance with the new legislation under the Preferred Plan submitted as part of our 2024 IRP. As discussed above, extension of the Prairie Island Plant's operation is a crucial part of that Preferred Plan.

Economically, the Plant provides a constant flow of financial activity within the surrounding communities. The Plant employs approximately 550 individuals who live in the surrounding area and, therefore, spend their money in the local communities. As previously stated, the nuclear fleet generates $1 billion in economic activity annually and Prairie Island Plant, specifically, pays $22 million in state and local taxes. In 2023, Xcel Energy paid 45 percent of Red Wing's property tax revenue.[15]

[15] Tax Base — Red Wing Community Indicators (redwingreportcard.org).

Additionally, construction for the Project will be done using local unionized labor, further contributing to the local economy. In November 2023, the Company signed a contract with Orano TN Americas to manufacture NUHOMS EOS 37PTH dry fuel storage systems for the Plant through EOCL. As part of the contract, Orano has committed to provide economic benefit to our surrounding communities by hiring local concrete ready-mix plants, labor, testing services, rebar manufacturing facilities, equipment rental companies, and other construction tool and consumable companies to support project activities, thereby improving societal and socio-economic impacts in the surrounding communities.

4.4 CONSISTENCY WITH OTHER RULES AND REGULATIONS

The Project is consistent with federal and state energy policy and will comply with all applicable policies, rules and regulations. It also supports the State of Minnesota's carbon reduction goals as set forth in Minnesota Statutes, including Minn. Stat. § 216H.02, subd. 1, which sets a goal of reducing statewide greenhouse gas emissions to a level of net zero by 2050 when compared to 2005 emissions levels. And, as noted above, the Project is also an important part of the Company's strategy to meet the carbon reduction requirement set forth in Minn. Stat. § 216B.1691, subp. 2g, and is consistent with and an integral part of Xcel Energy's Resource Plan. The Project also complies with Minn. Stat. § 116C.83, subd. 4 by continuing to provide a flexible, modular storage system, which will facilitate transportation from the ISFSI once out of state offsite storage becomes available. Finally, Xcel Energy will obtain all necessary permits and will comply with all applicable environmental laws and regulations.

As discussed above and in the remainder of this application:

- Denial of a CN for the Project would have an adverse effect upon the future adequacy, reliability, safety, or efficiency of energy supply to the applicant, to the applicant's customers, or to the people of Minnesota and neighboring states;
- No more reasonable and prudent alternative to the Project has been identified;
- The consequences of granting a CN for the Project are more favorable to society than the consequences of denying the CN, when considering cost, reliability, risk and environmental factors; and
- The design, construction, operation, or retirement of the Project will comply with the relevant policies, rules, and regulations of other state and federal agencies and local governments.

Therefore, Xcel Energy respectfully requests that the Commission grant a CN for the Project and approve sufficient additional storage to allow the Plant to continue operating until 2053/2054.