CHAPTER 1. INTRODUCTION

1.1 OVERVIEW

Xcel Energy submits this Application for a CN to the Minnesota Public Utilities Commission for additional spent nuclear fuel storage at our Monticello nuclear-powered electric generating plant, to allow the continued operation of one of our largest and most reliable baseload sources of carbon-free electricity beyond 2030. By approving this CN, the Monticello Plant can continue to provide cost-effective, reliable and environmentally responsible baseload electricity to our customers and help Xcel Energy 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 at the Monticello Plant to allow the Plant to continue operating until 2040. 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 for the following reasons:

1) The additional storage is needed to ensure future adequacy, reliability, safety and efficiency of the energy supply to Xcel Energy's customers. The Monticello 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 Xcel Energy's fleet. Moreover, the Plant provides critical capacity and carbon-free baseload energy while maintaining safety and affordability. For example, in 2020, Xcel Energy's nuclear fleet (including the Plant and the two reactors at Prairie Island) achieved its third year in a row of production costs below $30 per Megawatt hour (MWh), a nearly 30 percent decline in average production costs from 2013. The overall costs of the nuclear power from the Plants compare 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 license in 2030.

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. Xcel Energy analyzed replacing Monticello's 671 megawatts of power and approximately 5 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. Continuing operation of the Plant results in a reliable, reasonably priced, carbon-free supply of needed baseload electric power and supports the local economy by providing hundreds of well-paying jobs and substantial tax base. In addition, the Project will be constructed within the existing ISFSI footprint, minimizing environmental impacts. Issues of nuclear plant operation and spent nuclear fuel management can continue to be managed responsibly.

4) The additional storage will be in compliance 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 MONTICELLO POWER PLANT

For over 50 years, the Monticello Plant has played a critical role in the fleet of generating resources Xcel Energy has available to serve customers, generating over 200 million MWh of energy, which translates to over 210 million tons of avoided carbon emissions. The Monticello Plant is a 671-megawatt, nuclear powered, boiling water reactor, electric generating plant located in Monticello, Minnesota. The Plant provides base load service; that is, it operates at full capacity 24 hours a day, 7 days a week for extended periods of time and is used to meet the ongoing, steady or base demand for electrical power. No other resource in our fleet can provide this type of consistent, reliable, carbon-free energy and capacity. In fact, the Plant recently completed a record run of 704 days of continuous operation. Combined with Prairie Island, the Plant represents nearly 30 percent of the total electric energy (and 48 percent of the carbon-free energy) our customers consumed in 2020.

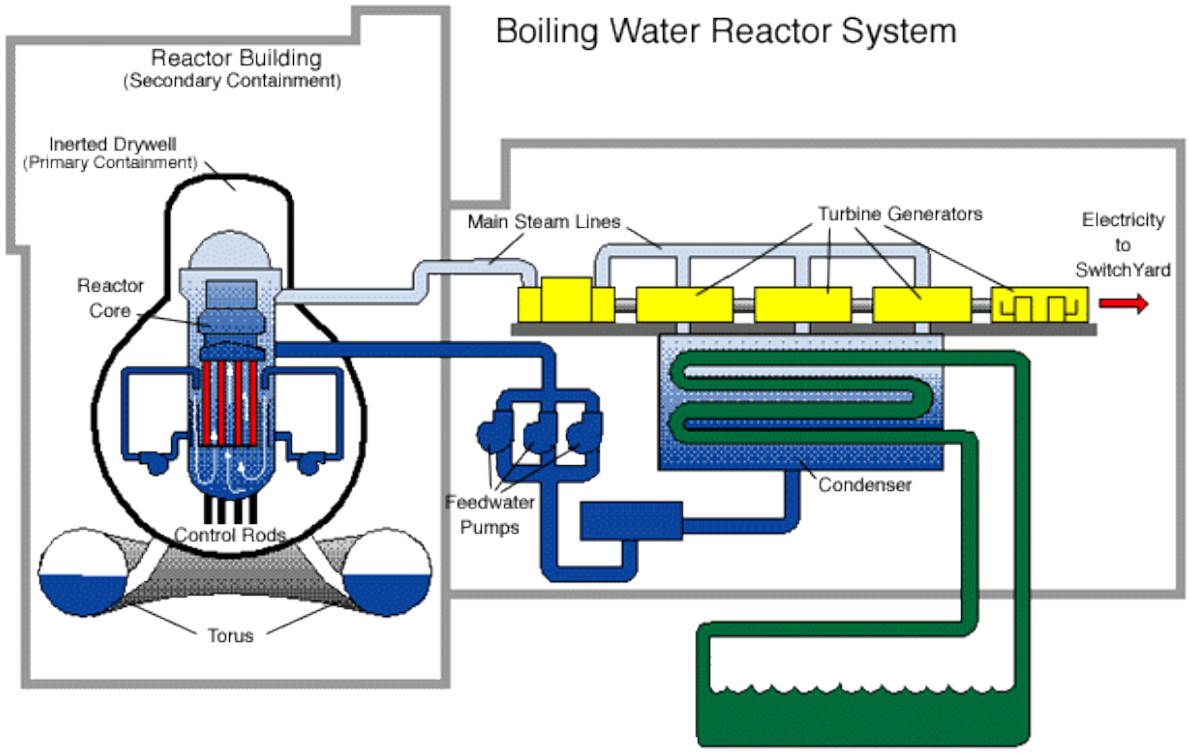
Throughout its life, the Company has operated the Plant safely and efficiently, while also protecting the health and safety of the public, our employees, and the environment. Along with Prairie Island, the Monticello Plant is among the top-rated nuclear plants in the country as measured by the Institute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

Operations (INPO). The Plant has also received the State of Minnesota Governor's Safety award for industrial safety every year since the program began in 2000.

The NRC regulates the operation of nuclear power plants. In 1970, the NRC granted the Monticello Plant its initial 40-year operating license, allowing the Plant to operate until September 8, 2010. In 2006, the NRC approved a 20-year license extension for the Plant; its current operating license expires September 8, 2030. Xcel Energy has examined the feasibility of continuing to operate the Plant beyond its currently licensed life and concludes that it can continue to operate safely, reliably and economically beyond 2030. 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 2023, we intend to file an application with the NRC to renew the operating license for the Monticello Plant. The NRC regulations provide for a 20-year renewal of an existing operating license.

The Monticello Plant has one boiling water reactor unit that utilizes 484 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 boiling water reactor design.

Figure 1-1



The Plant is shut down approximately every two years to refuel. Currently, during each refueling outage, an average of 160 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 three locations: (1) the Plant's spent fuel pool; (2) the existing ISFSI; and (3) at a storage facility in Morris, Illinois which accepted spent fuel assemblies from specific companies for a brief period of time in the mid 1980's.

1.3 SPENT FUEL STORAGE AT MONTICELLO

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, Xcel Energy 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 2005, Xcel Energy filed an application for a CN for dry cask storage to provide additional spent fuel storage capacity at the Monticello Plant. The application requested

approval to place up to 30 spent fuel canisters at an ISFSI to be constructed at the Monticello Plant site which would allow the Plant to continue operating until 2030.

In 2006, this Commission approved the CN for the Monticello ISFSI. Since that time, Xcel Energy has loaded casks in the 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 64 other ISFSIs operating in 35 states across the country.

Xcel Energy now proposes to add additional storage casks to the existing ISFSI to support the Plant's operation beyond 2030. 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 those Rules, and Xcel Energy respectfully requests that the Commission grant the Company a CN for additional dry spent nuclear fuel storage at the Monticello Plant's ISFSI, sufficient to allow the Plant to continue operating through 2040.

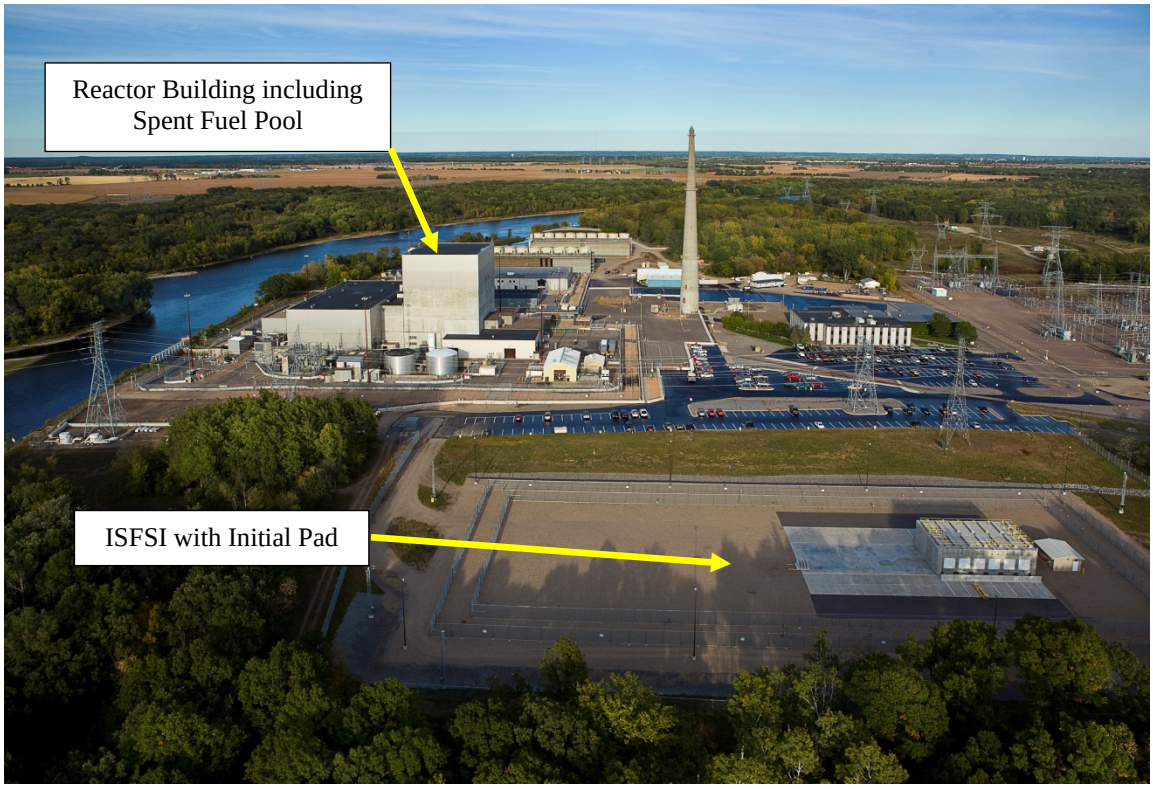
The additional casks would be placed within the existing ISFSI footprint, which consists of a lighted area, approximately 200 feet by 460 feet in size, slightly larger than a soccer or football field. Two fences surround the facility with a clear zone in between. It is located within 500 feet of the Plant's reactor and turbine-generator building on the western side.

Currently, the spent nuclear fuel at the ISFSI is stored in welded canisters. Those welded canisters are stored in large reinforced concrete vaults, 10 feet wide, 10 feet tall, and 20 feet long, and placed in two rows on a concrete support pad in the middle of the storage facility. The modules are the NUHOMS-61BT model, designed by Orano. The Standardized NUHOMS System consists of:

- A steel canister that provides a confinement boundary for the assemblies
- A concrete overpack that provides structural support and shielding during storage
- A steel transfer cask that provides structural support and shielding during loading and canister transfer to the overpack.

Figure 1-2 shows an aerial picture of the facility on the plant site.

Figure 1-2 Storage Site Location



As discussed in Chapter 8, we propose to use a spent fuel storage system that is licensed by the NRC for both storage and transportation. The Project involves construction of a second pad and modular concrete storage system within the existing ISFSI to support approximately 13 additional storage casks. The exact number of casks needed will be determined by the specific amount of nuclear fuel required to run an additional 10 years, from 2030 to 2040, how much fuel is loaded each cycle, and the capacity of the cask eventually selected. There are several designs certified by the NRC that could be used for the additional storage. Our Application does not identify a specific vendor or technology to be used, as we propose to use a competitive bidding process to select the technology and vendor. Regardless of the specific vendor selected, the technology will consist of welded, sealed canisters for confinement, stored in an overpack (typically concrete construction) that will provide additional radiation shielding and protect the sealed canister from external hazards. For transportation offsite, the canisters would be transferred to a shipping overpack licensed by the NRC without the need to move the fuel to a new container. Regardless of the technology selected, the Company will not use the additional storage to accommodate waste generated after the end-date specified in the CN without first obtaining additional Commission approval.

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 power carbon-free energy to our customers.

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 Shea
Director, Regulatory and Strategic Analysis
414 Nicollet Mall
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 Monticello Nuclear Generating Plant in Monticello, Minnesota by adding approximately 13 additional spent fuel storage casks at the Plant's existing storage facility. Currently, thirty (30) spent nuclear fuel storage casks are placed in horizontally configured concrete storage vaults, arranged in rows on a concrete pad within the storage facility. Additional storage is needed so that the Plant can continue to operate beyond 2030. Our application seeks approval from the Commission for a CN to expand the existing spent nuclear

fuel storage facility and to allow the Plant to continue to operate beyond 2030. This additional storage can be accommodated within the footprint of the existing facility already in use. As described in the Company's pending IRP, both our original preferred plan and our alternate plan filed June 25, 2021 include a ten-year extension of the operation of the Monticello Plant that would allow it to operate through 2040. Operation beyond 2030 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 2023.

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% of the fee should accompany the application and the remaining 50% 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 2040, at the Monticello Nuclear Generating Plant.

Christopher Clark,
President, Xcel Energy – Minnesota, South Dakota, North Dakota

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 the following Table, followed by a discussion of the relevant authorizations required.

Table 3-1
List of Governmental Authorities

Agency or Authority	Permit or Approval	Date of Application	Anticipated Date of Decision	Status
Minnesota Public Utilities Commission	Certificate of Need	August 2021	August 2022	Filed
	Integrated Resource Plan	July 1, 2019	Late 2021 or early 2022	Additional comments to be filed October 2021
Minnesota Department of Commerce – Energy Environment Review and Analysis	Environmental Impact Statement	August 2021	August 2022	Filed with CN
Nuclear Regulatory Commission	Subsequent License Renewal	Anticipated June 2023	January 2025	Not submitted

3.1 CERTIFICATE OF NEED – MINNESOTA PUBLIC UTILITIES COMMISSION

Xcel Energy must obtain a CN from the Commission before an expansion of the spent nuclear fuel storage facility at the Monticello Plant can be completed. In the 2003 session, the Minnesota legislature amended the statutes relating to spent nuclear fuel storage. Minn. Stat. § 116C.83 was established which requires a CN from the Commission before spent nuclear fuel storage can be built or expanded at the Monticello Plant and provides as follows:

> 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 also was amended to require the CN proceeding to address continued operation of the Monticello Plant as part of the Commission's evaluation of the need for spent fuel storage since the storage request is for the purpose of allowing the Plant to extend its operation beyond 2030 and provides, in part:

> 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 August 30, 2021. 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 by the Department of Commerce – Energy Environment Review and Analysis (EERA) 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).

The 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 and Minn. R. Chapter 4410, established to implement the Policy Act, provide a process which includes substantial public

participation that should be followed during the preparation of the EIS. The EIS process does not represent a separate approval process for the additional spent fuel storage. The purpose of the EIS is to inform the Commission of the environmental consequences and potential impact mitigation measures that can be considered in 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 draft EAW on August 6, 2021. 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 then be delivered to the Commission before final decisions concerning the CN are made.

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 Resource Plan on July 1, 2019 (2020-2034 Upper Midwest Integrated Resource Plan, Docket No. E002/RP-19-368), its Supplement to the Resource Plan on June 30, 2020 and Reply Comments including an Alternate Plan on June 25, 2021. 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 Monticello Plant.

While our Resource Plan recommends the extension of the Monticello Plant, we presume that, in the interest of regulatory efficiency, the issue of the Monticello 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 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 Monticello Plant received its initial operating license in 1970. In 2006, the NRC granted a 20-year extension of the initial operating license which permitted the Plant's operation until September 8, 2030. Operation beyond 2030 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 2023. 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, are more favorable to society than the consequences of denying the certificate; and

D. that it has not been demonstrated 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 Monticello Plant from 2030 until 2040. The Project, by enabling the Monticello Plant to continue to operate until 2040, 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 Monticello Plant, given its size, type and timing; its cost; and its effects on the natural and socioeconomic environment and other 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 Monticello Plant, a crucial component of Xcel's commitment to meeting aggressive carbon reduction goals while safely providing adequate and reliable energy to customers in Minnesota and surrounding states, maintaining over 600 high quality jobs and

providing 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 Monticello Nuclear Power Plant after 2030, 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 1970. In 2006, the NRC granted a 20-year license extension that allows the Plant to operate through September 2030. Xcel Energy intends to file a Subsequent License Renewal (SLR) application with the NRC in 2023 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 Monticello Nuclear Power Plant in 2030 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.

As discussed in other sections of this application, including Chapter 6, despite Xcel Energy's industry leading demand side management efforts, the Company will continue to need the capacity and energy provided by the Plant to meet our customers' needs. The Monticello Plant provides 671 megawatts of baseload capacity and has generated over 200 million MWh since it started operating. This translates into over 212 million tons of CO_2 emissions avoided since the Plant began operations. 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% reduction in carbon emissions compared to 2005 levels by 2030, on our journey to providing 100% carbon-free electricity to our customers, the state and the region by 2050. Achieving this goal will require technologies not yet commercially available. As we work with policy makers and other innovative enterprises to explore these new technologies, our nuclear units can provide critical reliable power and could be a place to pilot potential technologies that could help with further carbon reduction, like hydrogen production, playing a major part in our ongoing efforts to reduce our carbon emissions.

Due to its round-the-clock operations, the Plant is one of our system's most reliable generation resources, with a 2020 capacity factor of over 98% and the Plant recently completed a record 704 days of continuous operation. Combined with the Prairie Island nuclear plant, the Monticello Plant represents nearly 30 percent of the total electric energy (and 48 percent of the carbon-free energy) our customers required in 2020, making it a critical component of our overall generation fleet. As Xcel Energy starts to retire its coal units, the Monticello Plant serves an increasingly important role in providing stability, voltage and overall reliability. The continued operation of the Monticello Plant also helps us to maintain a healthy ratio of firm capacity to peak demand during the 2030 through 2040 time period, whereas scenarios that do not include an extension of the Monticello Plant either rely on leaving some of our coal units on through the 2030s, adding incremental gas or other (as-yet to be developed) firm dispatchable resources to provide firm capacity, or relying more heavily on variable or use-limited resources. As discussed in our Resource Plan Reply Comments, 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.

Regarding safety, 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. 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.

Based on the strong operational performance of its existing nuclear fleet, Xcel Energy was recently chosen by NuScale SMR Technologies to enter a memorandum of understanding (MOU) to explore the feasibility of Xcel Energy serving as a plant operator at NuScale Plants. Small modular reactors and the advanced nuclear industry is exciting for companies and communities interested in pursuing carbon-free alternatives and the nuclear fleet may have a role in advancing that technology.

Finally, granting the CN promotes efficiency. Xcel Energy has engaged in an ongoing operational excellence program that has delivered tangible results for our customers including achieving operational savings that have allowed our nuclear fleet, including the Plant and the two reactors at Prairie Island, to achieve production costs of under $30/MWh.

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 in Chapter 9, Xcel Energy used the EnCompass resource planning model and explored two primary "Replacement Case" scenarios to replace the capacity and energy provided by the Plant. In the first scenario – Replacement Case 1 – the model is allowed to select the most cost-effective resources to replace Monticello; it chooses to add approximately 750 MW of gas-fired combustion turbines (CTs) in 2030 to meet capacity needs, in addition to approximately 750 MW of additional wind resources and 200 MW of solar resources by 2034 (the planning period), relative to the Alternate Plan recently proposed in our pending IRP. This scenario also includes more market purchases and less market sales on net in the years beyond 2030, meaning that our system relies more on the market to serve customer needs, and also has less net excess generation to sell into the market. In the second scenario – Replacement Case 2 – Xcel Energy used the model to analyze a "no incremental gas" scenario where we would replace the full capacity and energy output of the Monticello Plant with wind, solar and battery energy storage. In this scenario, the model selects approximately 300 MW of incremental battery energy storage, 600 MW of incremental solar, and 950 MW of incremental wind by the end of the planning period in 2034. This maintains similar levels of market sales as the Alternate Plan, but also relies more heavily on market purchases, as it is replacing clean baseload generation with variable renewables and duration-limited energy storage

Both of these "replacement case" alternative scenarios impose incremental costs – on a present value of societal cost (PVSC) basis – relative to our Alternate Plan which proposes to operate the Monticello Plant to 2040, ranging from approximately $60 to $80 million on a PVSC basis. These alternative scenarios also achieve less carbon reduction than if the Monticello Plant extends its operations; our Alternate Plan achieves over 85 percent carbon reduction from 2005 levels by 2031 (the first year after Monticello would be extended from its current end of license). In the first replacement case, where Monticello is replaced by a mix of gas and wind resources, the total amount of carbon emissions associated with serving customer load (a measure we call "carbon serving customers") is higher; in part due to additional gas dispatch on our system and in part because more of customers' energy needs are filled with market purchases which, on average, have a higher carbon intensity than our own generation mix. The second replacement case, in which we require the Monticello Plant to be replaced by wind, solar, and batteries, attains similar – albeit slightly lower – levels of carbon reduction as compared to the Alternate Plan, but also results in a less diverse energy mix with a lower ratio of firm capacity to peak demand across summer and winter. As discussed in our IRP Reply Comments, a less diverse

energy mix with a lower ratio of firm and/or dispatchable generation relative to peak load presents potential market exposure and reliability risks for the Company and our customers.

As the Company and other generation owners in the area continue with proposed coal retirements and proceed toward a future with less emitting baseload 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 Alternate Plan – including the extension of the Monticello Plant – best balances cost effectiveness, carbon reduction, and risk and reliability objectives, relative to either of the cases in which Monticello is retired in 2030.

4.1.1 Continued Need for Baseload Power

The Monticello Power Plant provides baseload electrical power service. In 2020, the Plant produced over 5.8 million megawatt-hours of electricity, approximately 10 percent of the energy consumed by customers across the five-state region. The removal of the Monticello Plant from the electrical supply system would create a several hundred MW capacity deficit and a several million MWh deficit in the region in 2031, if not replaced with other generation resources. As discussed in the IRP docket, both demand and energy needs are projected to grow at slower rates than projected in previous resource plan filings due to increased energy efficiency, distributed energy resources and other factors. However, countervailing factors such as greater penetration of electric vehicles and other beneficial electrification adoption are expected to lead to approximately steady or increased demand, especially in 2030 and beyond. Moreover, both the Company and other utilities in the state and broader MISO footprint are increasingly announcing plans to divest of or retire carbon-emitting baseload generation assets, namely coal. As we transition to a cleaner energy mix and prepare for accelerating adoption of electrification measures (including supporting the decarbonization of other sectors of the economy), maintaining clean, steady and reliable baseload nuclear generation on our system will be paramount.

As discussed in Chapter 10, 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. If additional 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 Monticello 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.

4.1.2 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 Monticello 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, requiring increased carbon-free electricity to replace fossil fuels used outside of electricity generation.

4.1.3 Promotional Activities Have Not Created This Need

Xcel Energy has not engaged in promotional practices that would create a need for spent fuel storage. The Monticello Plant has been an essential part of the electrical supply system for over 50 years and, if its license is renewed and additional waste storage capacity is authorized, will continue to provide needed carbon-free baseload power beyond 2030.

4.1.4 Current and Planned Facilities Not Requiring a Certificate of Need Cannot Provide the Needed Storage Capacity or Replace Monticello

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 Monticello Plant's generating capacity.

Minnesota law provides limited options for storage of nuclear waste from the Monticello Plant. Pursuant to Minn. Stat. § 116C.83, subd. 2, a certificate of need is required to expand an ISFSI. Minn. Stat. § 116C.83, subd. 4 provides that any waste 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 Chapter 9, there are no permanent or interim facilities that are currently accepting such waste, and the need for waste generated at the Plant to be stored onsite will continue until an interim or permanent repository is accepting waste.

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 not sufficient current or planned facilities that do not require a CN that could replace that generation. Generation alternatives are discussed below.

4.1.5 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 waste generated by the Monticello Plant and generation alternatives in the event the CN is not approved and the Plant ceases operation in 2030. Chapter 9 of this Application provides more detailed discussion and analysis.

4.2.1 Storage Alternatives

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

Reprocessing

There are no facilities in the United States reprocessing commercial spent nuclear fuel, nor are any proposed or under construction. Reprocessing is not a viable option.

Private Fuel Storage

Xcel Energy pursued an interim spent fuel storage project in Utah as part of an 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 February 2006, the NRC issued PFS a license for the interim storage facility. Because of PFS's lengthy NRC approval process, companies who were initially interested instead constructed onsite dry fuel storage facilities. Reviving the PFS project would require the Department of Interior to

approve the lease and grant the right-of-way, the resolution of a judicial challenge at the D.C. Circuit, compliance with NRC license conditions, and sufficient interest and commitment to use the facility by companies with spent fuel. None of these conditions are currently in place.

General Electric's Morris Spent Fuel Storage Facility

In the mid 1980's, 1,058 spent nuclear fuel assemblies were transported from the Monticello Plant to a General Electric storage facility in Morris, Illinois. However, the Morris facility is no longer accepting additional spent fuel.

Consolidated Interim Storage

A centralized interim storage project is under active NRC review 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 expects to complete its review of the application in 2021. NRC approval is expected in the fall of 2021. 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.

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 issued the draft Environmental Impact Study (EIS) and it is currently available for public comment. The NRC is expected to complete their review of the application in early 2022. 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.

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 lack of progress in licensing over the past many years, Yucca Mountain is not considered a viable option at this time.

On-site Storage Alternatives

Our application also examines several alternate approaches to storing additional spent fuel at Monticello, 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.

The existing spent fuel pool at the Plant has enough capacity to allow the plant to operate through 2030. In 1978, all but one low-density storage rack in the pool was 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. A new pool would need to be a stand-alone structure as there is insufficient room within the existing reactor building to add onto the existing pool structure. This option is not viable due to the high cost and increased fuel handling required.

Alternative Sites

Minnesota Statutes restrict the location of a dry storage facility to the plant site for which it will be used. The existing site was selected during initial planning as the most suitable location within the Plant property and contains sufficient space to accommodate the additional storage required to support Plant operation through 2040.

Alternate Dry Cask Technologies

There are currently several available dry cask technologies licensed by the NRC. The Company requests that it be allowed to make a final selection of the appropriate dry cask technology at a later date from the available technologies that are approved for both storage and transportation by the NRC.

4.2.2 Generation Alternatives

A generation alternative to the Monticello Plant, whether accomplished via a single resource or multiple resources, must be capable of replacing both the capacity and energy of the Plant. In the past, the Company would have analyzed a baseload fossil fuel facilities as potential alternatives to the Plant. However, the Company does not view coal-fired generation as a reasonable alternative to extending Monticello'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. The Company also considered a combined cycle natural gas plant as an alternative baseload resource, and originally included the Sherco CC, along the Monticello Plant, in our current IRP. However, the Company now considers its Alternate Plan, with no incremental combined cycle facilities, to be the best path forward. Finally, the Company considered whether a large hydroelectric facility merited further analysis as an alternative, given a hydroelectric facility's ability to provide baseload power. However, the Company is aware of no potential hydroelectric facility or facilities that could be developed in Minnesota or neighboring states to replace a 671 MW baseload facility, and certainly none that could do so economically. Similarly, any potential hydroelectric purchases of this quantity are too speculative to be considered a reasonable alternative to the Plant.

As noted above, Xcel Energy analyzed two primary alternative "Replacement Cases" to determine whether extending the Monticello nuclear plant would be beneficial to customers. These analyses are described further in Chapter 9.

The first replacement case involved retiring the Monticello plant at its currently planned date (in 2030) in the model and allowing the model to choose the most economically optimal mix of resources to replace it, whether or not those resources were zero-carbon. In this case, the model can choose new generic wind, solar, firm dispatchable combustion turbines (CTs) (which are assumed to be gas-fired for the purposes of modeling), combined cycle gas units, or battery energy storage to meet customer needs in the years after the Monticello Plant is retired. The second alternative restricts the model from selecting any incremental CTs to those that are included in our recently filed IRP Alternate Plan. In essence, this restricts the model from replacing the Monticello Plant's capacity with gas-fired units, and thus utilizing only wind, solar or batteries as replacements.

The results of these analyses show that, in total, our IRP Alternate Plan – in which Monticello is extended to 2040 – provides the best balance of cost, carbon reduction, reliability and market risk outcomes, relative to the Monticello replacement cases. Retiring Monticello in 2030 and replacing it with other resources is either not cost beneficial, achieves less carbon reduction, increases reliability concerns and customer exposure to market risk, or a combination of the above. These findings are summarized in the table below. The most favorable outcomes for each cost, environmental and risk/reliability metric is highlighted in green below.

Table 4-1: Key Metrics for the Company's Alternate Plan Relative to Alternatives in which Monticello is Retired in 2030

Category	Measure	Alternate Plan *(as presented in IRP)*	Monticello Replacement 1 *(fully optimized replacement)*	Monticello Replacement 2 *(replace with only renewables and storage)*
Resource assumptions and selection	Baseload retirements assumed before 2034	• King (2028) • Sherco 3 (2030) • Prairie Island (2033-2034)	• King (2028) • Sherco 3 (2030) • Monticello (2030) • Prairie Island (2033-2034)	• King (2028) • Sherco 3 (2030) • Monticello (2030) • Prairie Island (2033-2034)
	Resources optimized	All available	All available	• Wind, solar, battery energy storage • Must replace all energy and capacity from Monticello by 2031
	Incremental resources (MW) selected to replace Monticello capacity and energy relative to the Alternate Plan, through 2034	n/a	• CT: 750 • Wind: 750 • Solar: 200 *Plus fewer market sales and additional market purchases*	• Storage: 300 • Solar: 700 • Wind: 950 *Plus additional market purchases*
Cost[1]	2020-2045 PVSC ($ million), delta from Alternate Plan	n/a	63	77
	2020-2045 PVRR ($ million), delta from Alternate Plan	n/a	(38)	77
Environmental Performance	Carbon reduction from 2005 levels, 2031 (percent)	86	83	86
	Total carbon serving customers, 2031 (million tons)	3.815	4.721	3.840

[1] Deltas may not tie out to total PVSC and PVRR values noted here due to rounding.

	Total carbon-free generation, 2031 (percent)	82	78	82
Risk and Reliability	Firm capacity-to-annual (summer) peak demand ratio, 2034	0.58	0.58	0.51
	Firm capacity-to-winter peak demand ratio, 2034	0.80	0.80	0.71

4.2.3 Demand Side Management

Xcel Energy has a long and proud history of being a leader on demand side management 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 11,795 GWh and 2,156 MW cumulative savings over the 2020 to 2034 planning period, including the growth of our Demand Response portfolio to over 1,500 MW by 2034. This represents an average annual energy savings of approximately 780 GWh. 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 Monticello Plant beyond 2030. 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 "generation alternatives," discussed above.

However, it 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.

Minnesota Statutes[2] and Administrative Rules[3] 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

4.3.1 Monticello Is A Critical Part of Meeting Minnesota's Energy Needs

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. 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 Monticello Plant will also serve to continue to provide the substantial property tax base which has been of great benefit to the local communities.

4.3.2 The Project Is Compatible With the Natural and Socioeconomic Environment

The Project merely expands the storage capacity within the existing fence line of the Monticello ISFSI. Construction impacts would be minimal, and the area impacted by the ISFSI would not be increased.

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 eight 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.

[2] Minn. Stat. 116C.771 (e).
[3] Minn. R. 7855.0030, Subpart 1.

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. As such, the Project is a key component of the Company's plans to achieve its goal of providing 100 percent carbon-free energy by 2050.

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 supports the State of Minnesota's energy policy 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 at least 80 percent below 2005 levels by 2050 and is consistent with and as 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, facilitating transportation when 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 2040.