BEFORE THE MINNESOTA OFFICE OF ADMINISTRATIVE HEARINGS
600 North Robert Street
St. Paul, MN 55101

FOR THE MINNESOTA PUBLIC UTILITIES COMMISSION
121 7th Place East, Suite 350
St Paul MN 55101-2147

IN THE MATTER OF THE APPLICATION OF XCEL ENERGY FOR A CERTIFICATE OF NEED FOR ADDITIONAL DRY CASK STORAGE AT THE PRAIRIE ISLAND NUCLEAR GENERATING PLANT INDEPENDENT SPENT FUEL STORAGE INSTALLATION	MPUC Docket No. E002/CN-24-68 OAH Docket No. 25-2500-39971

DIRECT TESTIMONY AND ATTACHMENTS OF DR. STEVE RAKOW

ON BEHALF OF

THE MINNESOTA DEPARTMENT OF COMMERCE
DIVISION OF ENERGY RESOURCES

FEBRUARY 10, 2025

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TABLE OF CONTENTS

I. INTRODUCTION

Q. Please state your name, occupation and business address?

A. My name is Dr. Steve Rakow. I am employed as a Public Utilities Analyst Coordinator by the Minnesota Department of Commerce (Department). My business address is 85 7th Place East, Suite 280, St. Paul, Minnesota 55101-2198.

Q. What is your educational and professional background?

A. A summary of these items is included as Ex. DOC - ___, at SR-D-1 (Rakow Direct).

Q. What is your experience on regulatory matters?

A. I have provided economic analysis in numerous resource planning and resource acquisition filings for 25 years. A summary of these items is included as Ex. DOC - ___, at SR-D-1 (Rakow Direct). I also follow issues related to resource planning and resource acquisition at the Midcontinent Independent System Operator, Inc. (MISO). Finally, I provide analysis of a variety of other filings before the Minnesota Public Utilities Commission (Commission).

II. PURPOSE AND SCOPE

Q. What are your responsibilities in this proceeding?

A. I am submitting testimony on behalf of the Department that:

- summarizes Northern States Power Company, doing business as Xcel Energy's (Xcel or the Company) *Application of Northern States Power Company,*

Minnesota d/b/a Xcel Energy for a Certificate of Need for Additional Dry Cask Storage at the Prairie Island Nuclear Generating Plant Independent Spent Fuel Storage Installation (Petition);[1]

- presents the relevant criteria established by Minnesota Statutes and Minnesota Rules;
- introduces the other witnesses sponsored by the Department in this proceeding
- provides my analysis of generation alternatives and related policy issues; and
- summarizes the Department witnesses' overall conclusions and recommendations at this time.

Q. Why are you providing analysis of generation alternatives in a certificate of need (CN) for additional storage of spent nuclear fuel?

A. Generation alternatives must be addressed since Minnesota Statutes § 216B.243 Subd. 3b states "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." One impact of continued operations at the Prairie Island Nuclear Generating Plant (Prairie Island) is avoiding acquiring other generation resources.

[1] *In the Matter of the Application of Xcel Energy for a Certificate of Need for Additional Dry Cask Storage at the Prairie Island Nuclear Generating Plant Independent Spent Fuel Storage Installation*, MPUC Docket No. E002/CN-24-68, Petition (Feb. 7, 2024) (eDocket Nos. 20242-203189-09, 20242-203189-07, 20242-203189-05, 20242-203189-03, 20242-203189-01, 20242-203185-10, 20242-203185-09, 20242-203185-08, 20242-203185-07, 20242-203185-06, 20242-203185-05, 20242-203185-04, 20242-203185-03, 20242-203185-01).

Q. Please introduce the other Department witnesses in this proceeding.

A. In addition to myself the Department is sponsoring three other witnesses in this proceeding:

- Mr. Ari Zwick addresses statutory goals and the impact on state energy needs;
- Ms. Diane Dietz addresses spent fuel storage alternatives and certain other considerations; and
- Mr. Sachin Shah addresses forecasting issues.

III. XCEL'S PROPOSED FACILITY

Q. Please provide a summary of the Company's request in this proceeding.

A. In the Petition Xcel proposes to expand the existing independent spent-fuel storage installation (ISFSI) at Prairie Island by constructing a Dry Fuel Storage (DFS) system that is licensed by the NRC for both storage and transportation.[2] The Petition states that the Company needs the additional storage space to extend Prairie Island's operating life by twenty years – through 2053 and 2054.[3] I understand that state law requires Xcel to obtain a CN from the Commission before expanding its ISFSI.[4]

Q. What kind of technology does Xcel propose to use?

[2] Petition at 1-6.
[3] Id. at 1-5.
[4] Minn. Stat. §§ 216B.2421, subd. 2(8), 216B.243, subd. 2 (2024).

A. Recently, Xcel selected a vendor and NRC-approved technology via a competitive bidding process for the storage necessary to operate Prairie Island to the end of its current license life. The Company awarded a contract to Orano TN Americas LLC to use the NUclear HOrizontal Modular System (NUHOMS) EOS 37PTH DFS system (DFS).[5] In the Petition Xcel estimates that, if approved, the ISFSI would store approximately 34 additional DFS systems.[6] The estimated installed cost of the additional storage at the ISFSI in 2020 dollars is $173.8 million.[7]

Q. When does Xcel propose to construct the expanded ISFSI and associated facilities?

A. In the Petition Xcel states that it would order the DFS in 2026. The Company would begin storing waste in the expended facility in 2030 to support Prairie Island's operations beyond 2033.[8]

Q. Is a CN required?

A. Yes, for the following reasons. First, Minnesota Statutes § 216B.2421, subd. 2 (8) defines a large energy facility (LEF) as "any nuclear fuel processing or nuclear waste storage or disposal facility." Since Xcel's proposed expansion of an existing facility would store additional nuclear waste, it qualifies as a LEF.

[5] Petition at 1-7.
[6] Id.
[7] Id. at 8-30.
[8] Id.

Second, Minnesota Statutes §2165.243, subd. 2 states that "[n]o large energy facility shall be sited or constructed in Minnesota without the issuance of a certificate of need by the Commission [...]." Therefore, a CN is required before the proposed storage facility expansion could be sited or constructed.

IV. CERTIFICATE OF NEED REQUIREMENTS

Q. Please summarize the criteria for demonstrating need for a large energy facility.

A. I understand that there are several factors to be considered by the Commission in making a determination in CN proceedings. In general, these factors are located in different sections of Minnesota Statutes. Some of the general statutory criteria are reflected in a more specific way in Minnesota Rules, part 7855.0120, which provides that the Commission shall grant a CN if four criteria are determined to be met:

1) 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;
2) a more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record by parties or persons other than the applicant;
3) it has been demonstrated by a preponderance of the evidence on the record 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

4) 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 Department's witnesses address various parts of the statutory and rule criteria. A cross-index matching the statutory and rule criteria to the witness addressing them is provided as Ex. DOC - ___, SR-D-2 (Rakow Direct).

I note that the Department relies on the Environmental Impact Statement (EIS) prepared by the Minnesota Department of Commerce, Energy Environmental Review and Analysis unit (EERA) for an analysis of the effects of the proposed project and the alternatives upon the natural and socioeconomic environments.

Q. Please summarize the overall Commission process for evaluating new electric generation and transmission facilities.

A. Ex. DOC - ___ at SR-D-3 (Rakow Direct) presents a high-level graphical representation of the Commission's regulatory process that generally applies to new electric generation and transmission facilities. This proceeding involves the second step (resource acquisition).

Q. Is there a difference in the resources considered in IRP proceedings and those considered in resource acquisition proceedings?

A. Yes. IRP proceedings generally evaluate generic resources that reasonably reflect expected costs and other attributes (e.g. expected life, maintenance outages, etc.). An IRP compares generic resources that have different size, type, and timing. In contrast, resource acquisition proceedings compare actual resources that would be available to meet the needs identified in the planning process. The resource acquisition proceeding takes as a given the IRP's size, type, and timing determination and attempts to acquire a specific project that best meets the general size, type, and timing identified in the IRP.

Q. Describe Xcel's most recently approved IRP.

A. The Commission's April 15, 2022 *Order Approving Plan with Modifications and Establishing Requirements for Future Filings* (IRP Order) in Docket No. E002/RP-19-368 described Xcel's position on the nuclear units as follows: "Xcel also proposed to seek to extend Monticello's operating life by ten years—to 2040—and to continue operating its Prairie Island Generating Plant (Prairie Island), Units 1 and 2, at least through the end of their current licenses—to 2033 and 2034, respectively."[9]

Ultimately, the IRP Order determined the following regarding Prairie Island:

> Second, the Commission will specifically approve the following elements of Xcel's Alternate Plan as filed on June 25, 2021:

[9] *In the Matter of the 2020–2034 Upper Midwest Integrated Resource Plan of Northern States Power Company d/b/a Xcel Energy*, MPUC Docket No. E002/RP-19-368, Minnesota Public Utilities Commission, ORDER at 7 (Apr. 15, 2022) (eDocket No. 20224-184828-01).

> …
> 11) Xcel may continue pursuing a ten-year extension for Monticello. Xcel will have the opportunity—and obligation—to explore plans for Prairie Island in a future proceeding, as discussed further below.[10]

The future proceeding referred to is Xcel's next IRP, which was filed February 1, 2024.

Q. What are the consequences of the IRP Order?

A. Minnesota Rules 7843.0600 Subp. 2 states:

> The findings of fact and conclusions from the commission's decision in a resource plan proceeding may be officially noticed or introduced into evidence in related commission proceedings, including, for example, rate reviews, conservation improvement program appeals, depreciation certifications, security issuances, property transfer requests, cogeneration and small power production filings, and certificate of need cases. In those proceedings, the commission's resource plan decision constitutes prima facie evidence of the facts stated in the decision. This subpart does not prevent an interested person from submitting substantial evidence to rebut the findings and conclusions in another proceeding.

Q. What did Xcel recommend in the February 1, 2024 IRP regarding Prairie Island?

A. Xcel filed the new IRP on February 1, 2024 as ordered.[11] The Company's IRP Petition recommended extending the life of Prairie Island for the following reasons:

[10] IRP Order at 15.

[11] *In the Matter of Northern States Power Company d/b/a Xcel Energy's 2024-2040 Integrated Resource Plan*, MPUC Docket No. E002/RP-24-67, Xcel Energy, IRP Petition (Feb. 1, 2024) (eDocket Nos. 20242-203029-07, 20242-203029-06, 20242-203029-05, 20242-203029-04, 20242-203029-03, 20242-203029-02, 20242-203027-01, 20242-203057-01).

> [T]he Prairie Island and Monticello nuclear extension scenario, Scenario 3, yields the most attractive customer value relative to the Reference Case. Further, Scenario 3 provides the best fit for our carbon goals and helps mitigate the potential for regulatory or legislative action around carbon costs or carbon reduction levels. Maintaining nuclear generation in our resource portfolio provides fuel diversity and an ongoing source of carbon-free baseload generation. From a reliability risk perspective, baseload nuclear adds value as we transition our generation fleet away from coal assets to more intermittent, renewable resources.[12]

Q. What is the current status of Xcel's February 1, 2024 IRP?

A. A Settlement Agreement was filed in both Docket Nos. E002/CN-23-212 and E002/RP-24-67.[13] For purposes of the IRP, the Settlement Agreement was signed by:

- Xcel;
- Department;
- Clean Energy Organizations (CEOs);[14]
- Laborers' District Council of Minnesota and North Dakota (LIUNA);
- International Union of Operating Engineers Local 49; and
- North Central States Regional Council of Carpenters.[15]

Regarding Prairie Island, the Settlement Agreement states:

> [T]he Settling Parties request approval of the following, based upon the modeling in the record provided by CEOs,

[12] IRP Petition at 5-25.
[13] *In the Matter of Northern States Power Company d/b/a Xcel Energy's 2024-2040 Integrated Resource Plan*, MPUC Docket No. E002/RP-24-67, Xcel Energy, Settlement Agreement (Oct. 2, 2024) (eDocket Nos. 202410-210672-01).
[14] For purposes of the IRP the Clean Energy Organizations are Minnesota Center for Environmental Advocacy, Clean Grid Alliance, Fresh Energy, and Sierra Club.
[15] Settlement Agreement at 2.

> the Department, and Northern States Power Company, as the Company's 5-year Action Plan including the following targets for resource acquisition:
> …
> **Nuclear**: Extension of Monticello Nuclear Generating Plant to 2050, and Prairie Island Generating Plant Units 1 and 2 to 2053 and 2054, respectively, for planning purposes.[16]

The Commission has not acted upon the Settlement Agreement at this time.

V. ANALYSIS RELATED TO NEED

Q. What determination is required by Minnesota Rules 7855.0120 A?

A. Minnesota Rules 7855.0120 A requires the Commission to determine that "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[.]" The rule then proceeds to provide five specific criteria for the Commission to consider.

A. MINNESOTA RULES 7855.0120 A (2)

Q. **What is the second consideration under Minnesota Rules 7855.0120 A?**

A. Minnesota Rules 7849.0120 A (2) requires the Commission to consider "the effects of existing or expected conservation programs of the applicant, the state government, or the federal government[.]"

[16] Settlement Agreement at 5-6.

Q. Please provide your analysis related to the effects of existing or expected conservation programs.

A. First, the effects of Xcel's existing and expected conservation programs were included in the EnCompass model during the IRP process and in the Petition.[17] Second, EnCompass had the option to select additional conservation above the expected level. Thus, the effects of existing or expected conservation programs were considered and additional conservation could be selected if cost effective.[18] The result of Xcel's analysis was that pursuit of energy efficiency beyond the expected level would increase system costs.[19] The Department's IRP analysis produced similar results as Xcel's analysis.[20]

In summary, the effects of existing or expected conservation programs were considered and could not replace Prairie Island.

B. MINNESOTA RULES 7855.0120 A (4)

Q. What is the fourth consideration under Minnesota Rules 7855.0120 A?

A. Minnesota Rules 7849.0120 A (4) requires the Commission to consider "the ability of current facilities and planned facilities not requiring certificates of need to meet the future demand[.]"

[17] EnCompass is an economic model referred to as a capacity expansion model. Capacity expansion models simulate a generation system and attempt to determine the best generating units to add or retire, given assumptions about future electricity demand, fuel prices, technology cost and performance, and policy. See Ex. DOC - ___, at SR-D-5 (Rakow Direct) for a detailed overview of EnCompass.
[18] IRP Petition at Appendix F, pages 6-8.
[19] IRP Petition at Appendix J, pages 8-9.
[20] *In the Matter of Northern States Power Company d/b/a Xcel Energy's 2024-2040 Integrated Resource Plan*, MPUC Docket No. E002/RP-24-67, Department, Comments at 42 (Aug. 9, 2024) (eDocket No. 20248-209394-02).

Q. Please provide your analysis related to current facilities and planned facilities.

A. During the IRP proceeding and this CN proceeding, EnCompass included all current and planned facilities as part of the existing resource mix or as a known addition.[21] The Company's IRP analysis found that extending Prairie Island tended to be the least cost way of meeting future demand.[22] The Department's IRP analysis produced similar results as Xcel's analysis.[23]

In summary, the effects of current facilities and planned facilities were considered and could not replace Prairie Island.

VI. ANALYSIS RELATED TO GENERATION ALTERNATIVES

Q. What determination is required by Minnesota Rules 7855.0120 B?

A. Minnesota Rules 7855.0120 B requires the Commission to determine that "a more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record by parties or persons other than the applicant[.]" The rule then proceeds to provide four specific criteria for the Commission to consider.

Recall that I address generation alternatives and Ms. Dietz addresses spent fuel storage alternatives.

Q. What alternatives should the Commission consider in making its determination?

[21] IRP Application, Chapter 5 at 2-4.
[22] IRP Application, Appendix G at 1-3.
[23] Department IRP Comment at 48-50.

A. Minnesota Rules 7855.0110 states, the Commission "shall consider only those alternatives proposed before the close of the public hearing and for which there exists substantial evidence on the record with respect to each of the criteria listed in part 7855.0120."

A. MINNESOTA RULES 7855.0120 B (1)

Q. What is the first consideration under Minnesota Rules 7855.0120 B?

A. Minnesota Rules 7849.0120 B (1) requires the Commission to consider "the appropriateness of the size, the type, and the timing of the proposed facility compared to those of reasonable alternatives[.]"

Q. Please provide your analysis related to appropriateness of the size, type, and timing of the proposed facility compared to those of reasonable alternatives.

A. In terms of size, Prairie Island is a 1,040 MW facility. In terms of type, Prairie Island is a baseload unit, meaning it generates electricity 24 hours a day for weeks at a time. In terms of timing, the CN would allow Prairie Island to continue generating electricity for an additional two decades beyond the current retirement dates of August 9, 2033 (unit 1) and October 29, 2034 (unit 2).

There are no reasonable alternatives, on their own, that could replace Prairie Island in terms of size, type, and timing. The only baseload alternatives that could be made available in a several hundred MW size are a new nuclear or coal plant. However, I

understand that state law prohibits the construction of new nuclear generating units.[24] In addition, experience in attempting to build new nuclear units in Georgia (Alvin W. Vogtle units 3 and 4) and South Carolina (Virgil C. Summer units 2 and 3) demonstrated new, large scale nuclear units to be prohibitively expensive and a high-risk endeavor.[25] Coal-fired generation also has fallen into disfavor. A new coal plant has not been considered in Minnesota since the Big Stone 2 unit proceeding was initiated in 2005.[26] Finally, a single 153 MW nuclear unit (in Louisiana) and a single, 20 MW coal unit (in Arkansas) are in the MISO generation interconnection queue.[27] In summary, combinations of resources would have to be considered as an alternative to Prairie Island.

Q. Has Xcel provided analysis of different resource combinations?

A. Yes. In Xcel's EnCompass modeling for this proceeding, the Company allowed generic energy storage, wind, solar, natural gas-fueled combustion turbines, demand response, and energy efficiency to be selected.[28] The only generic resource that is missing is natural gas-fueled combined cycle unit. While it would be preferrable for such an

[24] Minn. Stat. § 216B.243, subd. 3b.
[25] *See, e.g.*, Abbie Bennett & Alex Blackburne, Climate, Conflicts Prompt New Look At Old Nuclear, S&P Global (Nov. 8, 2022) ("South Carolina utilities stopped construction on the V.C. Summer plant after sinking $9 billion into the project, and Southern Co.'s Alvin W. Vogtle Nuclear Plant in Georgia has been mired in cost overruns and delays."), https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/climate-conflicts-prompt-new-look-at-old-nuclear-72851723.
[26] *In the Matter of the Application of Otter Tail Power Company and Others for Certification of Transmission Facilities in Western Minnesota*, MPUC Docket No. E017 et al/CN-05-619, Commission, ORDER (Feb. 25, 2010). (eDocket No. 20102-47472-02).
[27] See the data available at: https://www.misoenergy.org/planning/resource-utilization/GI_Queue/gi-interactive-queue/.
[28] Petition at 9-23.

alternative to be made available, Xcel has substantial combined cycle capacity already on the Company's system in the 2030s and that capacity could be used more intensively. Therefore, I conclude that the Company made a reasonable spectrum of alternatives available to EnCompass.

The expansion plan and cost results of Xcel's analysis were presented in various figures and tables in the Petition. The results of Xcel's analysis were that relicensing Prairie Island is superior to any combination of alternatives the Company considered.

B. MINNESOTA RULES 7855.0120 B (2)

Q. What is the second consideration under Minnesota Rules 7855.0120 B?

A. Minnesota Rules 7849.0120 B (2) requires the Commission to consider "the cost of the proposed facility and the cost of energy to be supplied by the proposed facility compared to the costs of reasonable alternatives and the cost of energy that would be supplied by reasonable alternatives[.]"

Q. Please provide your analysis related to the cost of energy to be supplied by the proposed facility compared to the costs of reasonable alternatives.

A. The total cost of energy from Prairie Island can be obtained from data filed by Xcel in Docket No. E999/CI-19-704. In the Company's March 1, 2024 filing Xcel provided the following data on the net cost of energy from Prairie Island for calendar year 2023:

Table 1: Prairie Island Net Cost of Energy[29]

ITEM	AMOUNT	SOURCE
Annual Fixed O&M Costs	$155,100,784	Attachment C
Annual Capital Rev. Req.	$114,837,325	Attachment C
[NOT PUBLIC DATA BEGINS...		
Annual Fuel Cost	**$59,447,380**	**Attachment B**
TOTAL COST	**$329,385,489**	**calculation**
Energy	**7,540,392**	**Attachment B**
TOTAL COST/MWh	**$43.68**	**calculation**
Total Revenue	**$192,033,424**	**Attachment B**
Total Revenue/MWh	**$25.47**	**calculation**
Difference	**($18.22)**	**calculation**
		. . . NOT PUBLIC DATA ENDS]

Thus, from this perspective, Prairie Island **[NOT PUBLIC DATA BEGINS created a net loss for Xcel's ratepayers in 2023 because total revenues are less than total costs. NOT PUBLIC DATA ENDS]** However, care must be taken in interpreting this data. The data does not provide the information required for an overall determination of whether a unit should be shut down or continue operating in a rate regulated environment. The missing data includes, for example, cost of transmission fixes required if a unit shuts down, a review of the socioeconomic impacts of a shutdown on the local areas, a capacity expansion analysis of how a unit might be replaced, and so forth.[30] This data is available in an IRP.

As discussed above, a combination of alternatives is necessary to replace Prairie Island and combinations of alternatives were analyzed in detail using the EnCompass

[29] *In the Matter of a Commission Investigation Into Self-Commitment and Self-Scheduling of Large Baseload Generation Facilities*, MPUC Docket No. E999/CI-19-704, Xcel Energy, Petition at Attachments B & C (Mar. 1, 2024). (eDocket Nos. 20243-204000-11, 20243-204000-15).

[30] *In the Matter of a Commission Investigation Into Self-Commitment and Self-Scheduling of Large Baseload Generation Facilities*, MPUC Docket No. E999/CI-19-704, Minnesota Department of Commerce, Comments at 36–37 (June 8, 2020) (eDocket No. 20206-163795-02).

capacity expansion model in the Company's most recent IRP by three parties: CEOs, Department, and Xcel.

The CEOs' analysis focused on Xcel's preferred plan, which includes extending Prairie Island's operational life. The CEOs did not analyze whether extending Prairie Island was cost effective. That is, they did not compare scenarios with and without a life extension.

The Department analyzed scenarios with and without a life extension for Prairie Island. The result was that a life extension for Prairie Island was part of the best overall plan. Therefore, the Department recommended "the Commission approve Xcel's proposed Scenario 3 to extend both Prairie Island and Monticello nuclear plants."

Xcel also analyzed scenarios with and without a life extension for Prairie Island. Again, the result was that a life extension for Prairie Island was part of the best overall plan.[31]

C. MINNESOTA RULES 7855.0120 B (3)

Q. What is the third consideration under Minnesota Rules 7855.0120 B?

A. Minnesota Rules 7849.0120 B (3) requires the Commission to consider "the effects of the proposed facility upon the natural and socioeconomic environments compared to the effects of reasonable alternatives[.]"

[31] IRP Petition at Chapter 4, page 10, Chapter 5, page 24.

Q. Please provide your analysis related to the effects of the proposed facility upon the natural and socioeconomic environments.

A. The continued operation of the Prairie Island through 2054 is expected to create minimal impacts. Non-radiological impacts are expected to be minimal.[32] The plant also generates minimal greenhouse gases emissions.[33] In addition, the EnCompass modeling discussed above included the Commission-approved externality values and nuclear plants generate minimal emissions.[34] Therefore, using the Commission-approved externality values would not impact the overall cost analysis against the proposed project.

The expanded ISFSI also is expected to create minimal impacts. Xcel's proposed additional spent fuel storage project will occur within the existing industrial site.[35] According to the Company, the ISFSI expansion will create typical construction wastes that will require appropriate disposal as well as fugitive dust generated by earthmoving equipment. Xcel also states that spent fuel storage itself will not generate any gaseous or particulate emissions.[36]

[32] *In the Matter of the Application of Xcel Energy for a Certificate of Need for Additional Dry Cask Storage at the Prairie Island Nuclear Generating Plant Independent Spent Fuel Storage Installation*, MPUC Docket No. E002/CN-24-68, Draft EIS (Oct. 31, 2024) (eDocket Nos. 202410-211479-01, 202410-211479-02, 202410-211479-03, 202410-211471-04, 202410-211481-01, 202410-211482-01).
[33] *Id.* at 35.
[34] Petition at 9-26 to 9-27 (discussing revenue requirements versus societal costs).
[35] *Id.* at 1-6.
[36] *Id.* at 12-10.

In comparison, the alternatives identified by the EnCompass modeling would likely generate more significant impacts through additional greenhouse gas emissions, and flora and fauna impacts.[37]

VII. ANALYSIS RELATED TO MINNESOTA STATUTES

A. MINNESOTA STATUTES §§ 216B.243 SUBD. 3 AND SUBD. 3 (8)

Q. What determination is required by Minnesota Statutes § 216B.243 Subd. 3?

A. Minnesota Statutes §§ 216B.243 Subd. 3 and Subd. 3 (8) require that "[n]o proposed large energy facility shall be certified for construction unless the applicant can show that demand for electricity cannot be met more cost effectively through energy conservation and load-management measures[.]"[38] In making this determination, the Commission must evaluate "any feasible combination of energy conservation improvements, required under section 216B.241, that can (i) replace part or all of the energy to be provided by the proposed facility, and (ii) compete with it economically[.]"[39]

Q. Please provide your analysis relating to whether demand for electricity from Prairie Island cannot be met more cost effectively through conservation and load management.

A. As part of the Petition, Xcel provided EnCompass modeling results. To perform the EnCompass modeling, Xcel locked in the Commission-approved energy efficiency and

[37] Draft EIS at 90.
[38] Minn. Stat. § 216B.243, subd. 3 (2023).
[39] Minn. Stat. § 216B.243, subd. 3(8) (2023).

demand response expansion plan (from the prior IRP) but allowed additional amounts to be selected. Thus, EnCompass could select more energy efficiency and demand response than approved by the Commission in the IRP but could not select less. The outputs from Xcel's modeling show the same amount of energy efficiency and demand response selected in most of the scenarios studied.[40] These results demonstrate that additional conservation and load management are not cost-effective substitutes for Prairie Island.

Based upon this analysis I conclude that the statutory requirement has been met.

B. MINNESOTA STATUTES §§ 216B.243 SUBD. 3a AND 216B.2422, SUBD. 4

Q. What determination is required by Minnesota Statutes § 216B.243 Subd. 3a?

A. Minnesota Statutes § 216B.243 Subd. 3a requires that the applicant for a CN demonstrate:

> to the commission's satisfaction that it has explored the possibility of generating power by means of renewable energy sources and has demonstrated that the alternative selected is less expensive (including environmental costs) than power generated by a renewable energy source. For purposes of this subdivision, "renewable energy source" includes hydro, wind, solar, and geothermal energy and the use of trees or other vegetation as fuel.

Q. What determination is required by Minnesota Statutes § 216B.2422 Subd. 4?

A. Minnesota Statutes § 216B.2422 Subd. 4 requires that:

> The commission shall not approve a new or refurbished nonrenewable energy facility in an integrated resource plan

[40] Petition at 9-25.

> or a certificate of need, pursuant to section 216B.243, nor shall the commission allow rate recovery pursuant to section 216B.16 for such a nonrenewable energy facility, unless the utility has demonstrated that a renewable energy facility is not in the public interest. When making the public interest determination, the commission must consider:
>
> 1) whether the resource plan helps the utility achieve the greenhouse gas reduction goals under section 216H.02, the renewable energy standard under section 216B.1691, or the solar energy standard under section 216B.1691, subdivision 2f;
> (2) impacts on local and regional grid reliability;
> (3) utility and ratepayer impacts resulting from the intermittent nature of renewable energy facilities, including but not limited to the costs of purchasing wholesale electricity in the market and the costs of providing ancillary services; and
> (4) utility and ratepayer impacts resulting from reduced exposure to fuel price volatility, changes in transmission costs, portfolio diversification, and environmental compliance costs.

Q. Please provide your analysis related to renewable energy alternatives.

A. Xcel demonstrated that Prairie Island is less expensive (including environmental costs) than power generated by a renewable energy source. The Petition at Table 9-6 shows the results from meeting a 100 percent carbon free standard. A comparison of Scenario 1 (maintaining the current retirement dates) and Scenario 2 (extend Prairie Island 20 years; maintain Monticello Plant retirement date) shows that the additional costs are likely to range from approximately $298 to $1,003 million on a present value of societal cost (PVSC) basis.[41] Xcel's proposed plan in the most recent IRP met Minnesota's

[41] *Id.* at 9-28.

greenhouse gas reduction goals, the renewable energy standard, and the solar energy standard.[42]

Second, impacts on the grid were considered in the IRP analysis by adding costs to address expected transmission issues that would arise with the retirement of Prairie Island.[43] Third, impacts from reduced exposure to fuel price volatility (running contingencies varying fuel prices) and changes in transmission costs (contingencies varying cost of adding new generating units) were considered directly through varying model inputs in separate model runs.[44] The impacts of portfolio diversification and environmental compliance costs would have to be considered qualitatively.

Based upon this analysis I conclude that the statutory requirement has been met.

C. MINNESOTA STATUTES § 216B.2426

Q. What determination is required by Minnesota Statutes § 216B.2426?

A. Minnesota Statutes § 216B.2426 requires that the Commission "ensure that opportunities for the installation of distributed generation, as that term is defined in section 216B.169, subdivision 1, paragraph (c), are considered in any proceeding under section […] 216B.243." In turn, Minnesota Statutes § 216B.169 Subd. 1 (c) states that "High-efficiency, low-emissions, distributed generation means a distributed generation facility of no more than ten megawatts of interconnected capacity that is certified by

[42] IRP Petition at Chapter 3, pages 21-22 and Chapter 5, page 2.
[43] *Id.* at Chapter 5, page 7 and Appendix J, page 19.
[44] *Id.* at Appendix G.

the commissioner under subdivision 3 as a high-efficiency, low-emissions facility."

Finally, Minnesota Statutes § 216B.169 Subd. 3 states:

> (a) The commissioner shall certify a power supply or supplies as eligible to satisfy customer requirements under this section upon finding:
>
> (1) the power supply is renewable energy or energy generated by high-efficiency, low-emissions, distributed generation; and
>
> (2) the sales arrangements of energy from the supplies are such that the power supply is only sold once to retail consumers.

Q. Please provide your analysis related to high-efficiency, low-emissions, distributed generation.

A. Any Commissioner-certified distributed generation provider could have intervened in this proceeding and offered an alternative. At this time no such alternatives have been offered. Given that there were opportunities for participation and the fact that no distributed generation proposals were provided, I conclude this requirement has been met.

VIII. CERTIFICATE OF NEED COST ESTIMATES AND COST CAPS

Q. Is it important for the Commission to hold utilities accountable for their CN cost estimates?

A. Yes, ratepayers' interests must be protected. Companies' cost estimates are used extensively in CN and other regulatory proceedings and provide a strong basis for the

Commission to hold utilities accountable to the costs they represent for facilities, particularly because CNs consider alternatives to proposed projects. In its role to ensure that rates are reasonable, the Commission has generally not allowed approval of projects in such proceedings to constitute a "blank check" for cost recovery when actual costs are greater than the estimated costs the utilities represented in regulatory approval proceedings. For example, the Commission typically requires utilities to demonstrate that it is reasonable to allow recovery of any such cost increases prior to charging the costs to ratepayers.[45]

In the past the Department fully supported the Commission's use of such mechanisms. Absent cost recovery caps tied to the evidentiary record in which the project was proposed and approved, utilities have little incentive to expend the effort needed to accurately report project costs in regulatory proceedings, nor to ensure that the actual costs are contained and are as reasonable as possible.

Q. How will the costs of continued operations of Prairie Island and the proposed ISFSI expansion likely be charged to ratepayers in Minnesota?

A. The most likely way is through the fuel clause adjustment for fuel costs and through a general rate case for all other costs such as capital costs and operations and maintenance costs.

[45] *In the Matter of a Commission Investigation into Xcel Energy's Monticello Life-Cycle Management/Extended Power Uprate Project and Request for Recovery of Cost Overruns*, MPUC Docket No. E002/CI-13-754, Minnesota Public Utilities Commission, ORDER (May 8, 2015) (eDocket no. 20155-110255-01).

Q. Please provide a recent example of how the Commission has protected Xcel's Minnesota ratepayers.

A. Sure. Attached to my testimony is a Commission order approving a Certificate of Need for Additional Dry Cask Storage at the Monticello Nuclear Generating Plant Independent Spent Fuel Storage Installation. Point 2 of the Commission's order specifies the ratepayer protections ordered by the Commission. See Ex. DOC - ___, at SR-D-1 (Rakow Direct) for details.

Q. Do you recommend the Commission apply the same conditions to Prairie Island and the ISFSI?

A. Yes.

IX. RECOMMENDATION

Q. Please summarize your overall conclusions and recommendations at this time.

A. Considering the direct testimony of Ms. Dietz, Mr. Shah, Mr. Zwick, and myself, along with the Draft EIS, I am unable to make a final recommendation at this time. Mr. Zwick withheld a final recommendation on the Company's compliance with Minn. Stat. § 216B.243, subd. 3(10) until after reviewing the Company's rebuttal testimony.

Q. Does this conclude your Direct Testimony?

A. Yes.

Steve Rakow
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Professional Background

1996 to present Public Utilities Analyst Coordinator • Minnesota Department of Commerce. Coordinate teams analyzing resource plans, certificates of need, and miscellaneous public policy issues filed with the Minnesota Public Utilities Commission. Testify before the Minnesota Office of Administrative Hearings in contested-case proceedings. A list of related filings analyzed and testimony presented is included below. For the past decade I have followed issues related to resource planning and resource acquisition at the Midcontinent Independent System Operator, Inc. (MISO). In the past I have been the state's contact for the U.S. Nuclear Regulatory Commission.

1999 to 2005 Board of Governors • MinforMed, L.L.C. Wrote portions of and advised on the economic and business sections of several grant proposals and the 2002 business plan. Named to Board of Directors, March, 2000.

1995 Instructor • University of Nebraska-Omaha. Taught Principles of Macroeconomics.

1993 to 1994 Instructor and Academic Assistant to the Rector • Concordia International University-Estonia. Taught Introduction to Economics. Wrote Student Handbook and Faculty Introduction to Tallinn Handbook.

1993 Instructor • Concordia University-Nebraska. Taught Principles of Microeconomics.

1989 to 1993 Graduate Teaching Assistant • University of Nebraska. Taught Introduction to Economics, Principles of Microeconomics, Principles of Macroeconomics, Current Economic Issues and Intermediate Macroeconomics. Specialized in public policy, economic history and comparative economics.

Education

Doctor of Philosophy, Economics, University of Nebraska, December 1994
Master of Arts, Economics, Mankato State University, March 1989
Bachelor of Arts, Economics, Moorhead State University, May 1987
Bachelor of Science, Accounting, Moorhead State University, May 1987

Testimony in Contested Case Proceedings

Docket No.	Company	Description	Subjects
E002/CN-21-668	Xcel Energy	Monticello ISFSI	Generation Alternatives
G002/GR-21-678	Xcel Energy	Rate Case	Sales to Electric Generators
E002, ET6675/CN-17-184	Xcel Energy, ITC-M	Huntley-Wilmarth 345 kV	Need
E015/AI-17-568	Minnesota Power	Nemadji Trail CC	Resource Plan, Contracts
E015/GR-16-664	Minnesota Power	Rate Case	Avoided Cost, Terms of Service
E015/CN-12-1163	Minnesota Power	Manitoba-Minnesota 500 kV	Alternatives, Policy
ET6675/CN-12-1053	ITC Midwest	Minnesota-Iowa 345 kV	Alternatives, Policy
E002/CN-12-1240	Xcel Energy	Competitive Resource Acquisition	Alternatives
E002/CN-12-113	Xcel Energy	Hollydale 115 kV	Alternatives, Policy
E017/M-10-1082	Otter Tail	Big Stone AQCS	Alternatives
E017/GR-10-239	Otter Tail	Rate Case	Big Stone II Background
E015/PA-09-526	Minnesota Power	Purchase DC Line	Alternatives
E002/CN-08-510	Xcel Energy	Prairie Island ISFSI	Planning, Alternatives, Policy
E002/CN-08-509	Xcel Energy	Prairie Island EPU	Planning, Alternatives, Policy
E002/CN-08-185	Xcel Energy	Monticello EPU	Planning, Alternatives, Policy
E002, ET2/CN-06-1115	Xcel Energy , GRE	CapX 161/230/345 kV	Planning Background, Alternatives, Policy
E002, ET3/CN-04-1176	Xcel, Dairyland	Chisago-Apple R. 115/161 kV	Planning Background, Alternatives, Policy
E017 et al/ CN-05-619	Otter Tail Power, et al	Big Stone-Morris 230 kV Big Stone-Granite Falls 345 kV	Planning Background, Alternatives, Policy
E002/CN-05-123	Xcel Energy	Monticello ISFSI	Planning Background, Alternatives, Policy
E002/CN-04-76	Xcel Energy	Blue Lake CT	Alternatives
IP6339/CN-03-1841	Trimont LLC	Trimont Wind	Settlement-Alternatives
E001/GR-03-767	Interstate Power	Rate Case	Rate of Return
IP6202/CN-02-2006	MMPA	Faribault CC	Settlement, Environmental Report
ET2/CN-02-536	GRE	Plymouth-Maple Gr. 115 kV	Forecasting
E002/CN-01-1958	Xcel Energy	SW Minn. 115/161/345 kV	Forecasting
PL9/CN-01-1092	Lakehead	Clearbrook-Superior Pipeline	Alternatives, Social Consequences
E002/CN-99-1815	Northern States Power	Black Dog CC	Alternatives, Forecasting
ET2/CN-99-976	GRE	Pleasant Valley CT	Forecasting, Environmental Report, Social Consequences
IP3/CN-98-1453	Tenaska, NRG	Lakefield Junction CT	Alternatives, Environmental Report, Social Consequences
PL9/CN-98-327	Lakehead	Clearbrook-Donaldson Pipeline	Alternatives, Social Consequences

Comments in Planning and Resource Acquisition Proceedings

Docket No.	Company	Type	Subjects
E002/RP-24-67	Xcel Energy	Resource Plan	Background and Coordination
E002/M-21-590	Xcel Energy	Acquisition-Biomass	Modeling
E111/M-23-420	Dakota Electric	Distribution Plan	Forecast
E015/M-23-258	Minnesota Power	Distribution Plan	Forecast
E017/M-23-380	Otter Tail Power	Distribution Plan	Forecast
E002/M-23-452	Xcel Energy	Distribution Plan	Forecast
E999/M-23-91	All Electric	Transmission Plan	All Areas
E017/CN-23-506	Otter Tail Power	Need-Transmission	Notice and Exemption
ET3/CN-23-504	Dairyland	Need-Transmission	Notice and Exemption
E111/M-23-495	Dakota Electric	Acquisition-Battery Tariff Pilot	All Areas
E002/CN-22-532	Xcel Energy	Need-Transmission	Notice and Exemption
E002, et al/CN-22-538	Xcel Energy, et al	Need-Transmission	All Areas
E015,ET2/CN-22-416	MP, GRE	Need-Transmission	All Areas
E002/CN-22-131	Xcel Energy	Need-Transmission	Need
E002/M-23-119	Xcel Energy	Acquisition-Long Duration Battery Pilot	All Areas
E017/RP-21-339	Otter Tail Power	Resource Plan	All Areas
E002/M-23-342	Xcel Energy	Acquisition-Development RFP	All Areas
E002/CN-23-212	Xcel Energy	Acquisition-Firm Dispatchable	Notice and Procedure
E999/M-21-111	All Electric	Transmission Plan	Process Reform
E002/M-22-403	Xcel Energy	Acquisition-Solar RFP	All Areas
ET2/RP-22-75	Great River Energy	Resource Plan	Coordination
E,G999/CI-22-624	All Electric & Gas	Planning & Acquisition-Federal Impact on Planning and Need	All Areas
IP7003/CN-19-223	Regal Solar	Need-Solar	Changed Circumstance
E999/CI-22-600	All Electric	Acquisition-Demand Resp. Aggregation	All Areas
E999/CI-22-268	MP, OTP, & Xcel	Acquisition-Demand Response & Fed. Law	All Areas
ET2/GS-22-122	Great River Energy	Generation Siting	CN Requirements
E017/RP-21-339	Otter Tail Power	Acquisition-Dual Fuel	Astoria Dual Fuel
IP7014/CN-19-486	Red Rock Solar	Need-Solar	All Areas
E015/RP-21-33	Minnesota Power	Resource Plan	Forecast, Policy
IP7013/CN-19-408	Big Bend Wind	Need-Wind	All Areas

Docket No.	Company	Type	Subjects
E002/M-20-891	Xcel Energy	Acquisition-Sherco Solar	All Areas
IP7053/CN-21-112	Hayward Solar	Need-Wind	All Areas
E002/CN-08-510	Xcel Energy	Need-Cask Bidding	All Areas
E999/CI-19-704	All Electric	Baseload Dispatch	All Areas
IP7041/CN-20-764	Byron Solar	Acquisition-Solar	All Areas
E002/M-20-844	Otter Tail Power	Acquisition-Solar	Modeling
E002/M-20-806	Xcel Energy	Acquisition-Wind	All Areas
E002/M-20-620	Xcel Energy	Acquisition-Wind	Modeling
E002/AI-19-810	Xcel Energy	Acquisition-Wind	Economics
E002/RP-19-368	Xcel Energy	Resource Plan	Modeling
E999/CI-19-704	All Electric	Dispatch-Coal	All Areas
E002/M-19-809	Xcel Energy	Dispatch-Coal	Economics
IP7026/CN-20-269	Walleye Wind	Need-Wind	Exemption
E002/M-19-268	Xcel Energy	Acquisition-Wind	All Areas
E002/PA-19-553	Xcel Energy	Acquisition-Wind	Modeling
E002/PA-18-702	Xcel Energy	Acquisition-Gas CC	Economics
E015/M-18-600	Minnesota Power	Acquisition-Wind	All Areas
E015/M-18-545	Minnesota Power	Acquisition-Wind	All Areas
IP6964/CN-16-289	Nobles 2 Power	Need-Wind	All Areas
ET9/RP-17-753	SMMPA	Resource Plan	Modeling
E002/M-17-551	Xcel Energy	Termination-Biomass	Economics
E002/M-17-532	Xcel Energy	Acquisition-RDF	Economics
E002/M-17-531	Xcel Energy	Termination-Landfill	Economics
E002/M-17-530	Xcel Energy	Termination-Biomass	Economics
IP6981/CN-17-306	Dodge County Wind	Need-Wind	Exemption
ET2/RP-17-286	Great River Energy	Resource Plan	Supply
E002/M-16-777	Xcel Energy	Acquisition-Wind	Economics
ET10/RP-16-509	Missouri River	Resource Plan	Modeling
E017/RP-16-386	Otter Tail Power	Resource Plan	Modeling
E002/M-16-209	Xcel Energy	Acquisition-Wind	Economics
E002/M-15-962	Xcel Energy	Distribution Plan	All Areas
E015/RP-15-690	Minnesota Power	Resource Plan	Modeling
E002/M-15-330	Xcel Energy	Acquisition-Solar	All Areas
E002/RP-15-021	Xcel Energy	Resource Plan	Modeling
E015/M-14-926	Minnesota Power	Acquisition-Hydro	All Areas
E015/M-14-960	Minnesota Power	Acquisition-Hydro	All Areas
E002/M-14-162	Xcel Energy	Acquisition-Solar	Modeling
ET6/RP-14-536	Minnkota	Resource Plan	Forecasting
E001/RP-14-77	Interstate Power	Resource Plan	Modeling

Docket No.	Company	Type	Subjects
E015/RP-13-53	Minnesota Power	Resource Plan	Modeling
E015/M-12-1349	Minnesota Power	Acquisition-Biomass	Modeling
ET2/CN-12-1235	Great River Energy	Need-Transmission	All Areas
ET3/RP-11-918	Dairyland	Resource Plan	Supply
E002, ET2/CN-11-826	Xcel Energy, GRE	Need-Transmission	Alternatives, Policy
ET6133/RP-11-771	MMPA	Resource Plan	Supply
IP6853, IP6866/CN-11-471	Black Oak & Getty Wind	Need-Wind	All Areas
E999/M-11-445	All Electric	Transmission Plan	All Areas
E002/CN-11-332	Xcel Energy	Need-Transmission	Alternatives, Policy
E002/RP-10-825	Xcel Energy	Resource Plan	Modeling
ET6/RP-10-782	Minnkota	Resource Plan	Modeling
E002/CN-10-694	Xcel Energy	Need-Transmission	Alternatives, Policy
E017/RP-10-623	Otter Tail Power	Baseload Study	Modeling
E017/RP-10-623	Otter Tail Power	Resource Plan	Modeling
E002/M-10-486	Xcel Energy	Acquisition-Digester	Modeling
ET6838/CN-10-80	Geronimo Wind	Need-Wind	All Areas
E002/CN-09-1390	Xcel Energy	Need-Transmission	Alternatives, Policy
E015/RP-09-1088	Minnesota Power	Baseload Study	Modeling
IP6701/CN-09-1186	National Wind	Need-Wind	All Areas
IP6830/CN-09-1110	Geronimo Wind	Need-Wind	All Areas
E015/RP-09-1088	Minnesota Power	Resource Plan	Modeling
E002/M-09-821	Xcel Energy	Acquisition-Biomass	Modeling
E999/M-09-602	All Electric	Transmission Plan	All Areas
ET9/RP-09-536	SMMPA	Resource Plan	Modeling
E015/PA-09-526	Minnesota Power	Acquisition-Transmission	Need, Alternatives
E002/CN-08-992	Xcel Energy	Need-Transmission	All Areas
IP6688/CN-08-961	EcoHarmony Wind	Need-Wind	All Areas
ET6125/RP-08-846	Basin	Resource Plan	Supply
ET2/RP-08-784	Great River Energy	Resource Plan	Supply
E001/RP-08-673	Interstate Power	Resource Plan	Modeling
E002/RP-07-1572	Xcel Energy	Resource Plan	Modeling, Nuclear
E017, et al/CN-07-1222	MP, OTP, Minnkota	Need-Transmission	Alternatives, Policy
E999/M-07-1028	All Electric	Transmission Plan	All Areas
E017/CN-06-677	Otter Tail Power	Need-Transmission	All Areas
ET9/RP-06-605	SMMPA	Resource Plan	Supply
E001/RP-05-2029	Interstate Power	Resource Plan	Supply

Docket No.	Company	Type	Subjects
E999/TL-05-1739	GRE, MP	Need-Transmission	All Areas
E999/TL-05-1739	All Electric	Transmission Plan	All Areas
ET10/RP-05-1102	Missouri River	Resource Plan	Modeling
ET2/RP-05-1100	Great River Energy	Resource Plan	Supply
E017/RP-05-968	Otter Tail Power	Resource Plan	Supply
E002/RP-04-1752	Xcel Energy	Resource Plan	Modeling, Bidding
E015/RP-04-865	Minnesota Power	Resource Plan	DSM, Supply
E002/M-04-91	Xcel Energy	Acquisition-Biomass	All Areas
E999/TL-03-1752	All Electric	Transmission Plan	All Areas
ET2/RP-03-974	Great River Energy	Resource Plan	DSM
E002/M-03-547	Xcel Energy	Acquisition-Hydro	All Areas
E002/RP-02-2065	Xcel Energy	Resource Plan	DSM, Nuclear
ET6/RP-02-1145	Minnkota	Resource Plan	Forecast, Contingency
E999/TL-01-961	All Electric	Transmission Plan	All Areas
ET2/RP-01-160	Great River Energy	Resource Plan	DSM
ET3/RP-00-1619	Dairyland	Resource Plan	All Areas
ET9/RP-00-863	SMMPA	Resource Plan	Forecasting
E002/RP-00-787	Xcel Energy	Resource Plan	DSM, Nuclear
E015/RP-99-1543	Minnesota Power	Resource Plan	DSM, Forecast
E017/RP-99-909	Otter Tail Power	Resource Plan	Rate Design
ET10/RP-98-938	Missouri River	Resource Plan	Supply, Rate Design
ET2, ET3/RP-98-366	CPA/Dairyland	Resource Plan	Supply
E002/RP-98-32	NSP	Resource Plan	Supply, Nuclear
E015/RP-97-1545	Minnesota Power	Resource Plan	DSM
E001/RP-97-955	Interstate Power	Resource Plan	Supply
ET9/RP-97-954	SMMPA	Resource Plan	Forecasting
ET7/RP-97-1	United Power	Resource Plan	DSM

Rules and Statutes Addressed in Testimony

Statute or Rule Citation	Notes	Witness
7855.0120 CRITERIA. A certificate of need shall be granted to the applicant if it is determined that:		
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, considering:		
(1) the accuracy of the applicant's forecast of demand for the energy or service that would be supplied by the proposed facility;		**Shah**
(2) the effects of existing or expected conservation programs of the applicant, the state government, or the federal government;	EnCompass Modeling	**Rakow**
(3) the effects of promotional practices in creating a need for the proposed facility, particularly promotional practices that have occurred since 1974;		**Dietz**
(4) the ability of current facilities and planned facilities not requiring certificates of need to meet the future demand; and	EnCompass Modeling	**Rakow**
(5) the effect of the proposed facility, or a suitable modification thereof, in making efficient use of resources;	addressed in Environmental Impact Statement	**None (EERA)**
B. a more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record by parties or persons other than the applicant, considering:		
(1) the appropriateness of the size, the type, and the timing of the proposed facility compared to those of reasonable alternatives;	● Generation Alternatives--Rakow; & ● Storage Alternatives--Dietz.	**Rakow & Dietz**
(2) the cost of the proposed facility and the cost of energy to be supplied by the proposed facility compared to the costs of reasonable alternatives and the cost of energy that would be supplied by reasonable alternatives;	● Generation Alternatives--Rakow; & ● Storage Alternatives--Dietz.	**Rakow & Dietz**
(3) the effects of the proposed facility upon the natural and socioeconomic environments compared to the effects of reasonable alternatives; and	● Generation Alternatives--Rakow; & ● Storage Alternatives--Dietz.	**Rakow & Dietz**
(4) the expected reliability of the proposed facility compared to the expected reliability of reasonable alternatives;		**None**
C. it has been demonstrated by a preponderance of the evidence on the record 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, considering:		
(1) the relationship of the proposed facility, or a suitable modification thereof, to overall state energy needs;		**Zwick**

Statute or Rule Citation	Notes	Witness
(2) the effects of the proposed facility, or a suitable modification thereof, upon the natural and socioeconomic environments compared to the effects of not building the facility;	addressed in Environmental Impact Statement	**None (EERA)**
(3) the effects of the proposed facility, or a suitable modification thereof, in inducing future development; and	addressed in Environmental Impact Statement	**None (EERA)**
(4) the socially beneficial uses of the output of the proposed facility, or a suitable modification thereof, including its uses to protect or enhance environmental quality; and	addressed in Environmental Impact Statement	**None (EERA)**
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.		**Dietz**
Minnesota Statutes § 216B.243 Subd. 3b **A**ny 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.	EnCompass Modeling	**Rakow**
Minnesota Statutes § 216B.243 Subd. 3 & Subd. 3 (8) **Subd. 3**: No proposed large energy facility shall be certified for construction unless the applicant can show that demand for electricity cannot be met more cost effectively through energy conservation and load-management measures ... **Subd. 3 (8)**: any feasible combination of energy conservation improvements, required under section 216B.241, that can (i) replace part or all of the energy to be provided by the proposed facility, and (ii) compete with it economically	EnCompass Modeling	**Rakow**
Minnesota Statutes § 216B.243 subd. 3 (9) with respect to a high-voltage transmission line, the benefits of enhanced regional reliability, access, or deliverability to the extent these factors improve the robustness of the transmission system or lower costs for electric consumers in Minnesota	this statute does not apply	**None**

Rules and Statutes Addressed in Testimony

Statute or Rule Citation	Notes	Witness
Minnesota Statutes §§ 216B.243 subd. 3a & 216B.2422, subd. 4 The commission may not issue a certificate of need under this section for a large energy facility that generates electric power by means of a nonrenewable energy source, or that transmits electric power generated by means of a nonrenewable energy source, unless the applicant for the certificate has demonstrated to the commission's satisfaction that it has explored the possibility of generating power by means of renewable energy sources and has demonstrated that the alternative selected is less expensive (including environmental costs) than power generated by a renewable energy source. For purposes of this subdivision, "renewable energy source" includes hydro, wind, solar, and geothermal energy and the use of trees or other vegetation as fuel.	EnCompass Modeling	**Rakow**
Minnesota Statutes § 216B.2426 The Commission shall ensure that opportunities for the installation of distributed generation, as that term is defined in section 216B.169, subdivision 1, paragraph (c), are considered	EnCompass Modeling	**Rakow**
Minnesota Statutes § 216B.1694, subd. 2 (a) (4) An innovative energy project…shall, prior to the approval by the commission of any arrangement to build or expand a fossil-fuelfired generation facility, or to enter into an agreement to purchase capacity or energy from such a facility for a term exceeding five years, be considered as a supply option for the generation facility, and the commission shall ensure such consideration and take any action with respect to such supply proposal that it deems to be in the best interest of ratepayers;	this statute does not apply	**None**
Minnesota Statutes § 216B.243 subd. 3 (10) **Compliance with § 216B.1691** whether the applicant or applicants are in compliance with applicable provisions of sections 216B.1691 and 216B.2425, subdivision 7…	RES Compliance	**Zwick**
Minnesota Statutes § 216B.243, subd. 3 (12) if the applicant is proposing a nonrenewable generating plant, the applicant's assessment of the risk of environmental costs and regulation on that proposed facility over the expected useful life of the plant, including a proposed means of allocating costs associated with that risk		**Dietz**
Minnesota Statutes § 216B.243, subd. 3 (10) **Compliance with § 216B.2425, subd. 7** whether the applicant or applicants are in compliance with applicable provisions of sections 216B.1691 and 216B.2425, subdivision 7…	Transmission for RES Compliance	**Zwick**

Rules and Statutes Addressed in Testimony

Statute or Rule Citation	Notes	Witness
Minnesota Statutes § 216H.03 on and after August 1, 2009, no person shall construct within the state a new large energy facility that would contribute to statewide power sector carbon dioxide emissions	this statute does not apply	**None**

E002/CN-24-68

Ex. DOC __ SR-D-3

The Commission's Regulatory Process

Resource Planning

- Alternatives
- Forecast
- DSM
- Existing Generation
- Planning Model
- Size, Type, & Timing Approved

Resource Acquisition

- Forecast Update
- Alternatives
- Environment & Socioeconomics
- Facility Approved

Facility Siting & Routing

- Public Participation
- Alternative Sites
- Environmental Review
- Siting/Routing Approved & Constructed

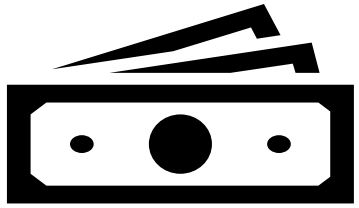
Facility Operation

- MISO Member Load
- MISO Member Generators
- MISO Market Design
- Actual MW & MWh
- MISO Member Load Mgmt

Cost Recovery

- Finance Adjustments
- Design Rates
- Forecast Adjustments
- Rate Increase Approved
- Assign Costs

Customer Bill



RESOURCE PLAN (Minn. Stat. 216B.2422, Minn. Rules 7843)

- DOES identify generic size, type, and timing of plants needed.
- DOES NOT identify specific power plants that would supply the deficit.
- Filed by every electricity provider (or its wholesale provider) with 100 MW of capacity and supplying electric service to 10,000 Minnesota customers.
- Consists of a 15-year forecast of projected power needs, existing energy supplies, and generic new additions to provide power to those projected customers.
- Results in a Commission determination of any projected deficits in supply on a generic basis i.e., identifies the size (how many MW), type (whether baseload, intermediate, peaking, wind, etc), and timing (which year) of resource needs.
- May substitute for a certificate of need process in circumstances prescribed by Minnesota Statute.

CERTIFICATE OF NEED (Minn. Stat. 216B.243, Minn. Rules 7849, 7851, 7853, and 7855)

- DOES identify specific large energy facilities.
- Filed by every electric provider (or its wholesale provider) for generation facilities above 50 MW and transmission facilities above 100 kV and 10 miles long or above 200 kV and 1,500 feet long.
- Consists of forecast of resource needs (the deficit to be addressed) and alternative projects to provide power to customers (supply).
- Starts with a resource plan-determined size, type, and timing of a need, confirms a specific need exists, and evaluates the economic, environmental, and social consequences of the alternatives to fulfill the need.
- Results in a Commission determination of the specific facility needed to fulfill demand (if any).

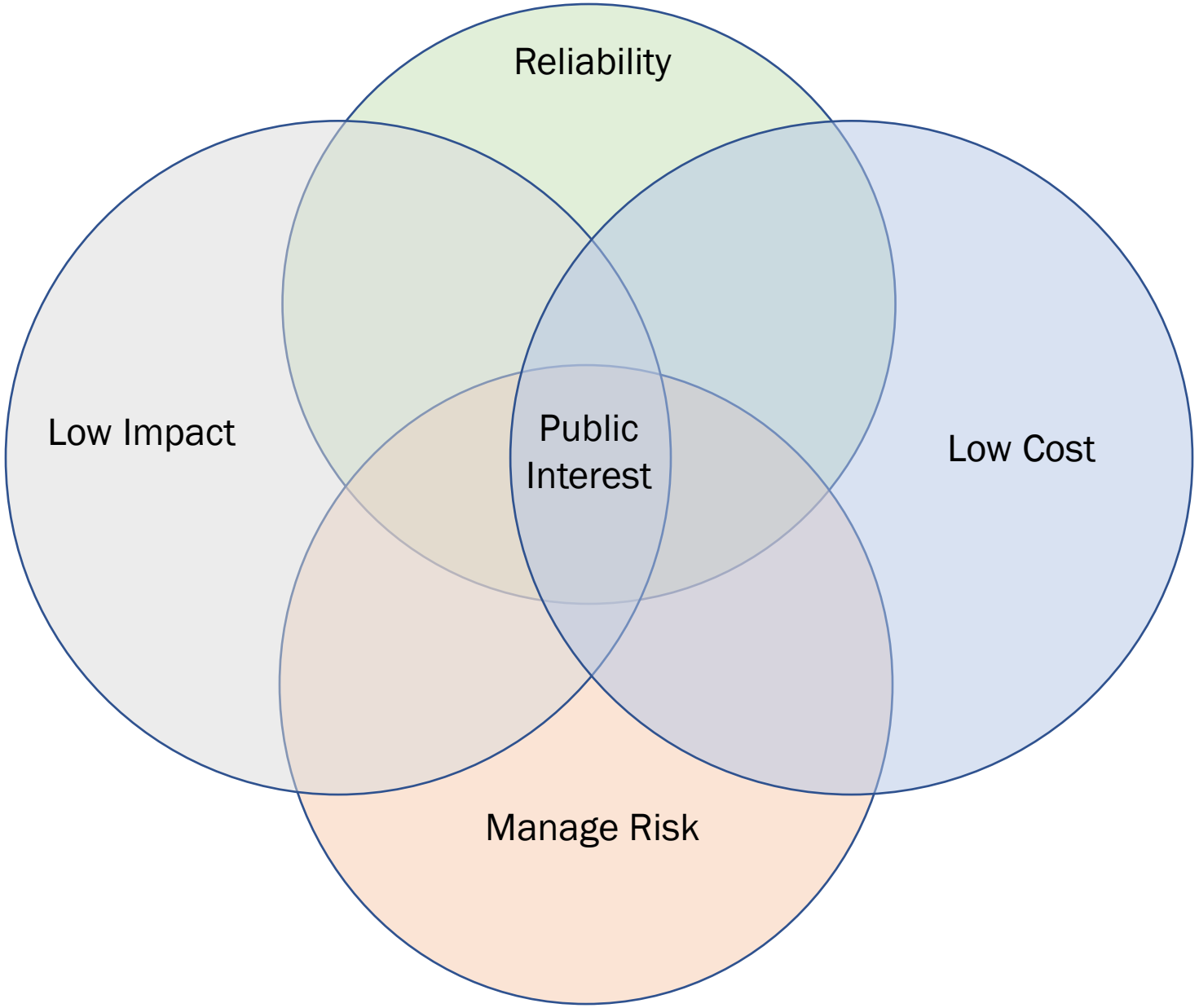
ROUTING AND SITING (Minn. Stat. 216E, Minn. Rules 7850, 7852, and 7854)

- Determines the location for new large energy facilities.
- Filed by every electric provider (or its wholesale provider) for generation facilities above 50 MW and transmission facilities above 100 kV and 1,500 feet long.
- May take place without a certificate of need for transmission facilities above 100 kV and between 1,500 feet and 10 miles in length.
- For other facilities, may take place simultaneously (at the same time as the certificate of need) or sequentially (after the certificate of need).
- Consists of a specific facility and one or more alternative locations.
- Starts with a certificate of need-determined facility and evaluates the economic, environmental, and social consequences of the alternative locations for the facility.
- Results in Commission determination of the specific location for a specific facility.

RATE CASE (Minn. Stat. 216B.16, Minn. Rules 7825)

- Determines the charges applied to customer bills for all utility services.
- Filed by every investor-owned retail electricity provider.
- Generally, new large energy facilities may only be included in a rate case only after they are constructed.
- Consists of one year’s data on sales, utility costs, and customer rates on a forecasted or historic basis.
- Starts with the costs incurred and evaluates the prudence of the utility’s costs.
- Results in specific rates being charged to specific customer classes.

Overlapping Decision Criteria in Planning & Acquisition Proceedings



Examples of Reliability in Decision Criteria:

Certificate of Need

- 216B.243 subd. 3 (5)—benefits of this facility, including its uses to .. increase reliability of energy supply in Minnesota and the region
- 216B.243 subd. 3 (9)—…the benefits of enhanced regional reliability, access, or deliverability to the extent these factors improve the robustness of the transmission system
- 7849.0120 A—the effect upon the future adequacy, reliability, or efficiency of energy supply
- 7849.0120 B (4)—the expected reliability of the proposed facility compared to the expected reliability of reasonable alternatives

Resource Planning

- 7843.0500 Subp. 3 A—ability to maintain or improve the adequacy and reliability of utility service

Examples of Cost in Decision Criteria:

Certificate of Need

- 216B.243 subd. 3 (9)—with respect to a high-voltage transmission line, the benefits of enhanced regional reliability, access, or deliverability to the extent these factors improve the robustness of the transmission system or lower costs for electric consumers in Minnesota;
- 216B.243 subd. 3 (12)—if the applicant is proposing a nonrenewable generating plant, the applicant's assessment of the risk of environmental costs and regulation on that proposed facility over the expected useful life of the plant, including a proposed means of allocating costs associated with that risk.
- 7849.0120 B (2)—the cost of the proposed facility and the cost of energy to be supplied by the proposed facility

Resource Planning

- 7843.0500 Subp. 3 B—keep the customers' bills and the utility's rates as low as practicable

Examples of Risk in Decision Criteria:

Certificate of Need

- 216B.243 subd. 3 (12) —if the applicant is proposing a nonrenewable generating plant, the applicant's assessment of the risk of environmental costs and regulation on that proposed facility over the expected useful life of the plant, including a proposed means of allocating costs associated with that risk.

Resource Planning

- 7843.0500 Subp. 3 E—risk of adverse effects on the utility and its customers from financial, social, and technological factors that the utility cannot control

Examples of Impact in Decision Criteria:

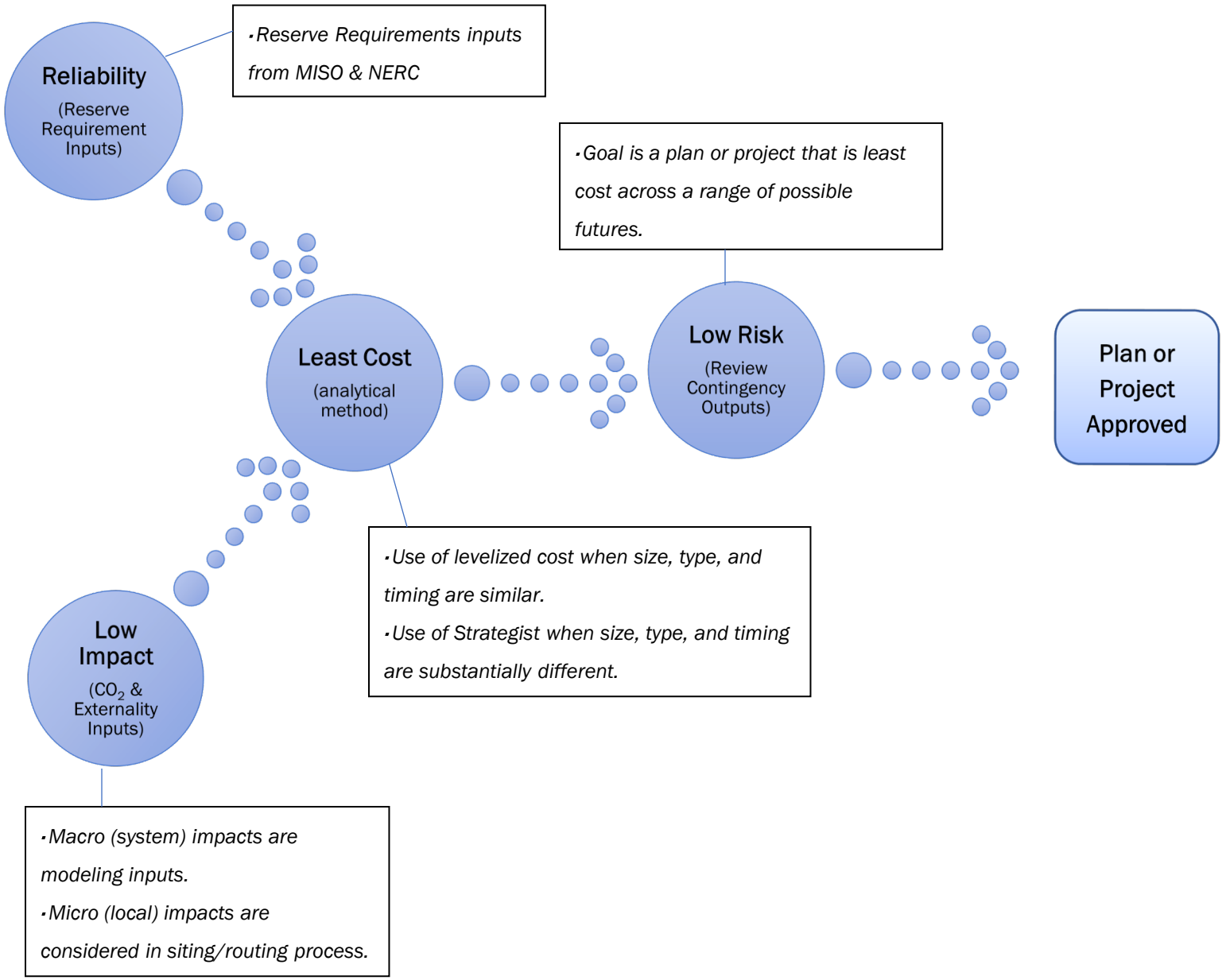
Certificate of Need

- 216B.243 subd. 3 (5)—benefits of this facility, including its uses to protect or enhance environmental quality
- 7849.0120 B (3)—the effects of the proposed facility upon the natural and socioeconomic environments compared to the effects of reasonable alternatives
- 7849.0120 C (2)—the effects of the proposed facility, or a suitable modification thereof, upon the natural and socioeconomic environments compared to the effects of not building the facility
- 7849.0120 C (4)—the socially beneficial uses of the output of the proposed facility, or a suitable modification thereof, including its uses to protect or enhance environmental quality

Resource Planning

- 7843.0500 Subp. 3 C—minimize adverse socioeconomic effects and adverse effects upon the environment

Example of How the Criteria Guide the Department's Analysis



BEFORE THE MINNESOTA PUBLIC UTILITIES COMMISSION

Katie J. Sieben	Chair
Valerie Means	Commissioner
Matthew Schuerger	Commissioner
Joseph K. Sullivan	Commissioner
John A. Tuma	Commissioner

In the Matter of the Application of Northern States Power Company d/b/a Xcel Energy for a Certificate of Need for Additional Dry Cask Storage at the Monticello Nuclear Generating Plant Independent Spent Fuel Storage Installation in Wright County	ISSUE DATE: October 17, 2023 DOCKET NO. E-002/CN-21-668 ORDER GRANTING APPLICATION WITH CONDITIONS

PROCEDURAL HISTORY

On September 1, 2021, Northern States Power Company—Minnesota d/b/a Xcel Energy (Xcel Energy or the Company) filed a petition for a certificate of need (CON or CN) to expand the capacity of its independent spent fuel storage installation (ISFSI) at the Company's existing site at the Monticello Nuclear Power Generating Plant (Monticello Plant).

On December 28, 2021, the Minnesota Department of Commerce (DOC) issued notices of public meetings to address the appropriate scope of the environmental impact statement (EIS) that its Energy Environmental Review and Analysis Unit (DOC-EERA) would generate for this project. The notices also announced the availability of a Scoping Environmental Assessment Worksheet and a draft "scoping decision"—that is, a decision identifying the topics to be addressed in the EIS.

On February 15, 2022, the Commission issued its Order Accepting Application and Notice and Order for Hearing, referring this matter to the Office of Administrative Hearings for a contested case proceeding—that is, a proceeding to establish facts, wherein witnesses file sworn testimony and may undergo cross-examination.[1]

On March 2, 2022, DOC-EERA issued its EIS Scoping Decision.

On September 9, 2022, Xcel Energy filed additional information to aid in the preparation of the draft EIS.

On October 4, 2022, DOC-EERA issued its draft EIS, and a notice of public information meetings regarding the draft. DOC-EERA convened a public information meeting at the Monticello Community Center in Monticello, Minnesota, on October 26 and another meeting online on October 27.

[1] Minn. Stat. §§ 14.57-14.62; Minn. R. 1400.5010-1400.8400.

On November 14, 2022, Xcel Energy filed comments on the draft EIS.

On January 10, 2023, DOC-EERA issued its final EIS.

On January 27, 2023, Xcel Energy filed comments asking DOC to find the final EIS adequate because it met all applicable regulatory requirements.

On February 6, 2023, DOC-EERA issued its Order Determining Final EIS to be Adequate and Order Determining ISFSI Design to be Protective of Groundwater.

On March 1, 2023, Xcel Energy filed direct testimony supporting its petition.

On March 1, 2023, DOC Division of Energy Resources (DOC-DER) also filed direct testimony, ultimately recommending that the Commission grant the petition.

On March 16, 2023, the Commission issued its Notice of Public Hearings. Public hearings were held at the Monticello Community Center in Monticello, Minnesota, on March 29 and online on March 30.

On March 27, 2023, Xcel Energy filed rebuttal testimony.

On April 7, 2023, the Commission received a public comment.

On April 14, 2023, DOC-DER filed surrebuttal testimony.

On April 17, 2023, the Commission received public comments.

On May 1, 2023, the Administrative Law Judge issued an order inviting comments regarding the tritium leak discovered at the Monticello Plant on November 22, 2022.

On May 15, 2023, Xcel Energy filed proposed findings of fact and a supplemental submission on the tritium leak.

On May 30, 2023, DOC filed comments regarding the potential consequences of the recent leak of tritium as requested by the Administrative Law Judge.

On June 29, 2023, the Administrative Law Judge filed his Summary of Testimony, Findings of Fact, Conclusions of Law, and Recommendation (ALJ Report) recommending that the Commission grant the certificate of need with conditions.

On July 14, 2023, DOC and Xcel Energy filed exceptions to ALJ Report.

On August 24, 2023, the Commission met to consider this matter.

FINDINGS AND CONCLUSIONS

I. Summary of Commission Action

In this order, the Commission adopts the ALJ Report to the extent that it is consistent with the Commission's determinations in this matter, and issues to Xcel Energy a certificate of need for additional dry cask storage at its independent spent fuel storage installation in Monticello with conditions. The Commission also authorizes its Executive Secretary to report the Commission's decision to the Legislature under Minn. Stat. § 116C.83, and directs the Company to make periodic reports to the Legislature about the status of the Monticello Plant and its spent fuel.

II. Applicable Law

A. Certificate of Need

The Commission has general jurisdiction over investor-owned public electric utilities.[2] In addition, anyone seeking to build a nuclear waste storage facility[3] in Minnesota must first obtain a certificate of need from the Commission.[4]

In applying for a certificate of need, the applicant must demonstrate that its project is needed, and that the relevant demand for electricity cannot be met more cost effectively through energy conservation and measures designed to shift the time when electricity is consumed.[5] In evaluating an application, the Commission considers alternatives, environmental information, historical and forecast data, wastes and emissions, pollution control, safeguard equipment, and estimates of resulting economic changes ("induced development").[6] The Commission grants the certificate if it finds the following facts[7]—but only to the extent that the Commission finds a given criterion applicable and pertinent to the proposed facility:[8]

> 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, considering:
>
> (1) the accuracy of the applicant's forecast of demand for the energy or service that would be supplied by the proposed facility;
>
> (2) the effects of existing or expected conservation programs of the applicant, the state government, or the federal government;

[2] Minn. Stat. §§ 216B.01; 216B.02.

[3] Minn. Stat. § 216B.2421, subd. 2(8).

[4] Minn. Stat. §§ 116C.83; 216B.243.

[5] Minn. Stat. § 216B.243, subd. 3.

[6] Minn. R. chapter 7855.

[7] Minn. R. 7855.0120.

[8] Minn. R. 7855.0100.

(3) the effects of promotional practices in creating a need for the proposed facility, particularly promotional practices that have occurred since 1974;

(4) the ability of current facilities and planned facilities not requiring certificates of need to meet the future demand; and

(5) the effect of the proposed facility, or a suitable modification thereof, in making efficient use of resources;

B. a more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record by parties or persons other than the applicant, considering:

(1) the appropriateness of the size, the type, and the timing of the proposed facility compared to those of reasonable alternatives;

(2) the cost of the proposed facility and the cost of energy to be supplied by the proposed facility compared to the costs of reasonable alternatives and the cost of energy that would be supplied by reasonable alternatives;

(3) the effects of the proposed facility upon the natural and socioeconomic environments compared to the effects of reasonable alternatives; and

(4) the expected reliability of the proposed facility compared to the expected reliability of reasonable alternatives;

C. it has been demonstrated by a preponderance of the evidence on the record 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, considering:

(1) the relationship of the proposed facility, or a suitable modification thereof, to overall state energy needs;

(2) the effects of the proposed facility, or a suitable modification thereof, upon the natural and socioeconomic environments compared to the effects of not building the facility;

(3) the effects of the proposed facility, or a suitable modification thereof, in inducing future development; and

(4) the socially beneficial uses of the output of the proposed facility, or a suitable modification thereof, including its uses to protect or enhance environmental quality; and

D. … 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.

In rendering its decision, the Commission makes a specific written finding with respect to each of the criteria listed above.[9]

Even if the Commission issues an order granting a certificate of need for additional storage for spent nuclear fuel, Minn. Stat. § 116C.83 prohibits the order from taking effect until the June following the start of the next regular meeting of the Minnesota Legislature—thereby granting the Legislature the opportunity to address the matter.[10] By the January 15th preceding that June, the Commission must submit a report on the matter to the chairs of the Minnesota House of Representatives and Senate committees with jurisdiction over energy and environmental policy issues; the report must contain a summary of the Commission's decision and the grounds for that decision, the alternatives considered and rejected, and the reasons for rejecting those alternatives.[11]

B. Environmental Requirements

Before the Commission grants a certificate of need to expand a storage facility for spent nuclear fuel, DOC must prepare an EIS in accordance with Minn. R. 4410.2000 to 4410.3100.[12]

In addition, Minn. Stat. § 116C.83 limits the storage of spent fuel and requires that spent nuclear fuel be managed in a manner to facilitate shipping the waste to another storage facility. In particular, the statute limits the amount of radionuclides released to groundwater and requires that spent nuclear fuel waste facilities be designed to minimize this amount.[13]

III. Monticello Nuclear Generating Plant

A. Operation of a Nuclear Generating Plant

Similar to fossil fuel-powered generating plants, the Monticello Plant generates electricity by heating water to form steam which then pushes the blades of a turbine. But unlike a fossil fuel plant, the Monticello Plant derives heat from a nuclear reaction. The chemical element uranium is unstable, tending to decay into other elements—and in the process, emitting energy and electrons that sometimes collide with other uranium atoms, which may cause those other atoms to decay, resulting in a chain reaction. But this reaction slows as ever more uranium decays into other elements. Consequently, the plant must periodically replace the uranium.

While spent fuel no longer emits sufficient radiation to power a commercial electric generator, it continues to emit sufficient radiation to pose a health hazard. During the first decade after being removed from the reactor, the spent fuel is stored in a water pool to capture its radiation. Thereafter the spent fuel can be stored in sealed containers (dry casks) which can be stored in an

[9] *Id.*

[10] Minn. Stat. § 116C.83, subd. 3.

[11] *Id.*

[12] Minn. Stat. § 116C.83, subd. 6; Minn. R. 4410.4400.

[13] Minn. Stat. § 116C.83, subd. 5, citing Minn. Stat. § 116C.76.

independent spent fuel storage installation.[14] The casks shield workers and members of the public from radiation during loading and storage, and keep external materials from seeping in.

B. The Monticello Plant and Independent Spent Fuel Storage Installation

For more than 50 years Xcel Energy has owned and operated the Monticello Plant on approximately 2,150 acres in Monticello, Minnesota, on the west bank of the Mississippi River approximately 50 miles northwest of Minneapolis. The plant can generate up to 671 megawatts (MW).

The current ISFSI occupies roughly 3.5 acres adjacent to the reactor and turbine building. The site contains storage vaults monitored by temperature sensors, cameras, and other security devices.

The facility currently contains spent fuel in 30 canisters in modular concrete vaults, supported by a reinforced concrete pad.

The U.S. Nuclear Regulatory Commission (NRC), which regulates the use of nuclear materials,[15] initially licensed the Monticello Plant to operate from 1970 to 2010.

In 2006 the Commission granted a certificate of need to build the Monticello Plant's ISFSI and store up to 30 casks, sufficient to store all the fuel that would be used through 2030.[16] Shortly thereafter the NRC authorized Xcel Energy to extend the operations at the Monticello Plant by 20 years, through 2030.

In 2022, the Commission approved a resource plan for Xcel Energy that incorporated the expectation that the Company would continue operating the Monticello Plant through 2040.[17]

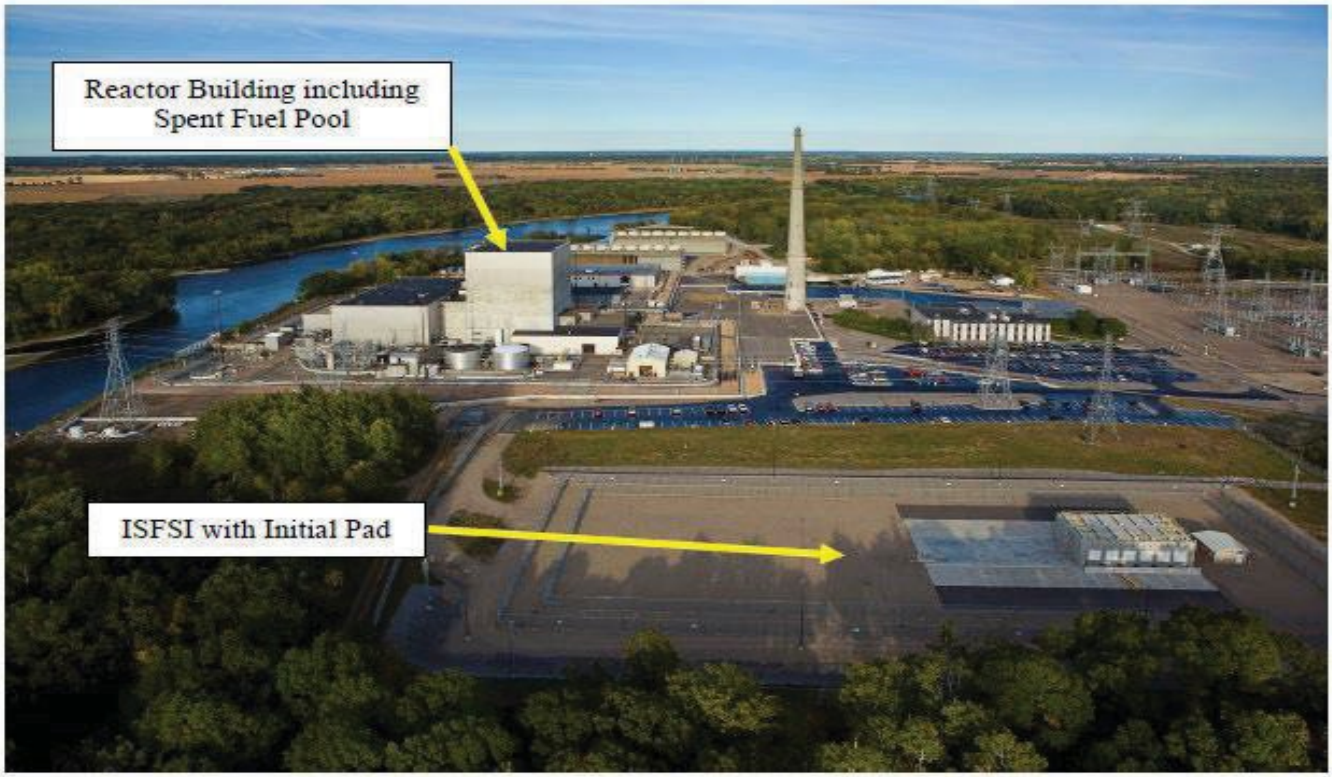
[14] *See* 10 C.F.R. § 72.3. The term "independent" distinguishes such storage facilities from storage pools that are part of a nuclear reactor plant.

[15] *See generally* Chapter 10 of the Code of Federal Regulations.

[16] *In the Matter of the Application of Northern States Power Company, d/b/a Xcel Energy, for a Certificate of Need to Establish an Independent Spent Fuel Storage Installation at the Monticello Generating Plant*, Docket No. E-002/CN-05-123, Order Granting Certificate of Need for Interim Independent Spent Fuel Storage Installation (October 23, 2006).

[17] *In the Matter of the 2020–2034 Upper Midwest Integrated Resource Plan of Northern States Power Company d/b/a Xcel Energy*, Docket No. E-002/RP-19-368, Order Approving Plan with Modifications and Establishing Requirements for Future Filings (April 15, 2022).

Figure 1: Storage Site Location[18]



Since then, the Company has petitioned the NRC to extend the Monticello Plant's operating license; because the NRC grants extensions in 20-year increments, the Company is seeking an extension through 2050.

IV. The Petition

Xcel Energy seeks authorization to add sufficient storage to permit the Monticello Plant to extend its operations from 2030 until 2040. This would require building a second concrete support pad within the existing ISFSI and adding another modular concrete storage system to house steel canisters containing the spent fuel. While Xcel Energy anticipates needing only around 14 new canisters through 2040, the Company proposes to build space for approximately 36 canister vaults.

In its application and testimony, Xcel Energy presented arguments that the proposal fulfilled the statutory and regulatory requirements for a certificate of need. As part of its application, it analyzed possible alternative proposals. Specifically, while the Company found no viable off-site or on-site alternatives for storing spent nuclear fuel, it analyzed two scenarios for maintaining and developing enough other resources as to permit the Company to discontinue operating the Monticello Plant in 2030. The Company ultimately concluded that maintaining the Monticello Plant was a better alternative than either of the two scenarios.

[18] Xcel Energy's application at 1-6.

V. Tritium Leak

Tritium is a radioactive form of hydrogen that occurs naturally in the atmosphere, and also as a byproduct of operating a nuclear power plant. Tritium releases low-energy beta particles that do not travel far in air and are too weak to penetrate skin, but could cause health problems if ingested in sufficient quantities. Because tritium readily combines with oxygen to form water, the U.S. Environmental Protection Agency (EPA) has established a maximum drinking water standard of 20,000 picocuries per liter (pCI/L).[19]

According to Xcel Energy, during routine groundwater testing near the Monticello Plant on November 21 and 22, 2022, the Company detected a tritium leak. The Company later determined that it had come from a leaking water pipe running between two buildings at the plant.

The Company promptly reported this finding to the Minnesota State Duty Officer and the NRC, and the NRC published this fact in its reports. News media in Minnesota began reporting on the leak by mid-March 2023, and the Commission began receiving public comments about the leak in April.

On May 1, 2023, the Administrative Law Judge issued an order directing parties to provide additional information about the leak of tritiated water. In response, Xcel Energy made a supplemental filing addressing the history of the leak and the Company's investigation and ongoing remediation at the site.

According to this filing, the Company had located the leak and repaired it, but not before approximately 400,000 gallons of water—containing approximately 8 curies of radioactivity—had leaked; the Company had recovered 4.111 curies. Xcel Energy stated that the leak has not affected groundwater outside the boundaries of the Monticello Plant or the Mississippi River. The Company cited statements from the Minnesota Department of Health and the Minnesota Pollution Control Agency reporting that the leak posed no health risks to people or affected animals or plants (including crops), and no evidence that it has affected public drinking water or private well water.[20]

Xcel Energy argued that the discovery and disclosures of the leak did not call into question whether any of the certificate of need factors have been satisfied. And the Company stated that it would continue to pump tritiated water and clean up the water plume, ensuring that the leak would not pose a threat to the health of the public or the environment.

After reviewing these developments, DOC filed comments stating that the tritium leak did not ultimately alter its recommendation to grant Xcel Energy's petition for authority to expand the Monticello Plant's ISFSI. DOC concluded that Xcel Energy will need to continue operating the Monticello Plant to meet the state's energy needs, and that the leak of tritiated water did not

[19] *See* 40 C.F.R. § 141.166(d)(1) and Table A. A picocurie is 10^{-12} curies.

[20] https://www.health.state.mn.us/communities/environment/air/tritiumleak.html; https://www.pca.state.mn.us/news-and-stories/minnesota-state-agencies-monitoring-cleanup-of-tritium-leak-at-xcel-energy-monticello-plant; https://www.pca.state.mn.us/news-and-stories/statement-on-xcel-energy-shutdown-of-monticello-nuclear-plant.

trigger the need to revise the Final EIS. But DOC recommended that the Company make regular reports until the issues related to the leak had been resolved.

Finally, DOC argued that the current docket did not provide the appropriate forum, nor the appropriate record, to evaluate questions about the Company's prudence in managing the Monticello Plant and the leak, nor questions about recovering from ratepayers any costs related to the leak. Accordingly, DOC cautioned the Commission against making any findings that might bear on these questions; to the contrary, DOC recommended that the Commission make explicit findings denying that it was addressing such questions.

VI. Public Comments

In addition to the public comments received by the DOC during discussions of the draft EIS, members of the public addressed comments to the Administrative Law Judge and the Commission. They offered a range of views, including the following:[21]

- The Commission should grant Xcel Energy's petition because nuclear power provides a safe, reliable, and reasonably priced source of electricity without generating greenhouse gases, and has benefitted the local community through providing employment and tax revenues.

- The Commission should grant the petition, but state agencies must continue to monitor the ISFSI throughout the Monticello Plant's operating life and beyond.

- DOC-EERA should revise the EIS in light of the information about the tritium leak.

- The Commission should postpone ruling on this matter until the tritium leak has been remedied and a thorough plan for alerting the public is assessed.

- Xcel Energy should not be allowed to continue operating the Monticello Plant because the tritium leak has not been resolved, the public was not adequately informed, and the plant's continued operation poses a risk to the public.

- Having large quantities of spent nuclear fuel stored above ground in the Mississippi River Valley creates a needless risk for contamination following an explosion or a breakdown of control following a pandemic. Federal authorities should take emergency action to secure spent nuclear fuel underground.

VII. Administrative Law Judge Report and Exceptions

A. The Report

After presenting 249 findings of fact and 15 conclusions of law, the ALJ Report concluded that

[21] *See*, for example, public comments of Wendy Schoen (Apr. 13, 2023), Jonathan Heinrichs (Apr. 12, 2023), Melissa Larsen (Apr. 14, 2023), Fredrick Patch (Mar. 30, 2023), 1st Public Hearing Transcript, at 1-4, 22-25.

Xcel Energy had satisfied the criteria for receiving a certificate of need and should receive the certificate subject to the following conditions recommended by DOC-DER.

> Xcel [Energy] must justify any costs (including operations and management expense, ongoing capital expense, revenue requirements related to capital included in rate base, insurance expense, land-lease expense, and property-production tax expense) that are higher than forecasted in this proceeding.
>
> Xcel [Energy] bears the burden of proof in any future regulatory proceeding related to the recovery of costs above those forecasted in this proceeding.
>
> The Commission will otherwise hold the Company accountable for the price and terms used to evaluate the project. Ratepayers will not be put at risk for any assumed benefits that do not materialize.
>
> Xcel [Energy's] customers must be protected from risks associated with the non-deliverability of accredited capacity, energy or both, from the project. The Commission may adjust Xcel [Energy]'s recovery of costs associated with this project in the future if actual production varies significantly from assumed production over an extended period.[22]
>
> Xcel Energy must file quarterly reports describing its activities to remediate the leak of tritiated water until such time as the leakage has been fully remediated. Further, the reports must include detail on the Company's groundwater monitoring and treatment of tritiated groundwater.[23]

B. Exceptions of Xcel Energy

Xcel Energy stated that the ALJ Report accurately sets forth the legal standards to be applied in the certificate of need proceeding and demonstrated a thorough review of the record.

But the Company opposed adoption of Finding 193 which states that the U.S. Department of Energy classifies waste streams that included tritium as "high level radioactive waste." The Company disputed this claim, arguing that it is unsupported in the record and unnecessary to support any other finding, conclusion, or recommendation in the ALJ Report.

[22] ALJ Report, Finding 245 and Conclusion 1.

[23] *Id.*, Finding 248 and Conclusion 1.

Xcel also proposed adopting the following findings clarified as follows:[24]

> 69. Xcel Energy filed an application with the NRC on January 9, 2023, to renew the Plant's operating license~~, again, this~~ which if granted, would permit the Plant to operate until September 8, 2050.
>
> 104. Company witness Ms. Peterson explained that the Monticello Plant is an essential part of the Company's electrical supply system and has been for 50 years. The need for additional storage is a simple function of ~~from~~ extending the life of the Plant beyond 2030.
>
> 124. The Administrative Law Judge finds that the record demonstrates that the denial of a CN would adversely affect the future adequacy, reliability, or efficiency of energy supplies. Moreover, the denial of the CN would ~~negative~~ negatively impact the applicant, its customers, the people of Minnesota and the residents of neighboring states. The Administrative Law Judge concludes that the Company has adequately met the first criteria for a CN.
>
> 146. Company witness Dan Flo explained that because of the availability and~~ suitable~~ suitability of the existing site, the Company did not expend a lot of planning resources on an alternative location for a second ISFSI within the Monticello Plant.
>
> 204. Approximately 400,000 gallons of water leaked before the source of the leak was discovered and contained. The amount of tritium contained in the leaked water was approximately 8 curies. ~~To date~~ As of May 15, 2023, the Company has recovered 4.111 curies of the 8 curies leaked.
>
> 225. As noted above, no other non-nuclear powered baseload generation source in the Company's system can operate at nearly full capacity, year-round. The Company's Monticello Plant and Prairie Island Nuclear Generating plant are the only generation resources in Xcel Energy's system that provides this level of consistent energy and capacity.

[24] Throughout this order, underlined language refers to text added to an original document, and language with lines through it refers to text being removed from an original document.

Xcel also proposed adopting modifications to clarify the Administrative Law Judge's final recommendation related to the duration of the reporting requirement related to the tritium leak at the plant:

> Xcel Energy must file quarterly reports describing its activities to remediate the leak of tritiated water until such time as ~~the leakage has been fully remediated~~ sampling results from the Company's monitoring wells demonstrate, for four consecutive quarters, tritium levels below the EPA drinking water standard of 20,000 pCI/L. Further, the reports must include detail describing the Company's groundwater monitoring and treatment of tritiated groundwater.

Xcel Energy asserted the proposed clarification is consistent with DOC's proposed conditions, and would provide certainty around expectations for both the Company and parties receiving and reviewing reports on the remediation efforts.

C. Exceptions of DOC

DOC asked that Findings 192 through 212 related to the tritiated water leak be replaced with proposed findings 162 and 163 from Xcel Energy's May 15, 2023, *Proposed Summary of Testimony, Findings of Fact, Conclusions of Law & Recommendation*.

DOC surmised that Findings 192-212 derived from the Company's supplemental filing regarding the tritiated water leak. DOC cautioned against relying on these detailed statements, as they arrived in the record too late to permit meaningful examination. DOC argued that Xcel Energy's proposed Findings 162 and 163 were a reasonable substitute:

> 162. The Company explained that it discovered a leak of tritiated water in November 2022 and promptly reported the leak to the Minnesota State Duty Officer and the NRC. The Company stated that the leak has not impacted groundwater outside the boundaries of the Plant, the Mississippi River, or any drinking water wells. The Company stated it has located the leak and repaired it. The Company also states that it continues to pump contaminated groundwater and will continue to take action to appropriately manage the cleanup of the tritiated water plume.
>
> 163. The ALJ finds that the Company's two replacement cases are reasonable test cases by which to compare the environmental impacts of extending the life of the Monticello Plant. The ALJ also finds that environmental considerations weigh in favor of extending the Monticello Plant and granting the CON, as compared to the Company's two replacement cases. The ALJ further finds that the circumstances around the leak of tritiated water at the Plant and the Company's response to that leak does not change the ALJ's finding on this point.

According to DOC, this language acknowledges that tritiated water leaked and finds that the record still supported granting the certificate of need, but does not address matters pertaining to the prudence of the Company's conduct or appropriate cost recovery.

VIII. Commission Analysis of Certificate of Need Criteria

In analyzing whether to grant this certificate of need, the Commission must consider the regulatory criteria of Minn. R. 7855.0120. Those criteria, and the relevant analysis, are set forth below.

A. Effect upon the future adequacy, reliability, safety, or efficiency of energy supply

Minn. R. 7855.0120(A) requires the Commission to evaluate whether —

> …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, considering [the following factors]

The Administrative Law Judge found that the record demonstrates that the denial of a certificate of need would adversely affect the future adequacy, reliability, or efficiency of energy supplies, and would negatively impact the applicant, its customers, the people of Minnesota and the residents of neighboring states. Therefore, the Administrative Law Judge concluded that the Company has adequately met these criteria for a certificate of need.[25] The Commission concurs, as set forth below.

> (1) the accuracy of the applicant's forecast of demand for the energy or service that would be supplied by the proposed facility….

The Commission extensively evaluated the demand for energy in Xcel Energy's service area, and affirmed the role of the Monticello Plant in meeting that demand through 2040, when evaluating and approving the Company's resource plan.[26] One key dynamic of that plan entailed retiring Xcel Energy's coal-fueled generators and delaying the retirement of other generators—including the Monticello Plant—to help offset the lost output. Accordingly, the Commission finds that operating the plant through 2040 as envisioned will generate additional spent fuel, thereby justifying the need for the additional storage sought in this docket.[27]

> (2) the effects of existing or expected conservation programs of the applicant, the state government, or the federal government….

[25] ALJ Report, Finding 124.

[26] *See In the Matter of the 2020-2034 Upper Midwest Integrated Resource Plan of Northern States Power Company d/b/a Xcel Energy*, Docket No. E002/RP-19-368, Order Approving Plan with Modifications and Establishing Requirements for Future Filing at 7, 31-32 (April 15, 2022).

[27] *See* ALJ Report, Findings 85-96.

Again, Xcel Energy's resource plan provided a context for reviewing the Company's resources for meeting customer demand—and, in particular, the context for identifying cost-effective conservation efforts. DOC, Xcel Energy, and the ALJ concluded that additional conservation efforts could not provide a practical replacement for the Monticello Plant's output.[28] The Commission concurs.

> (3) the effects of promotional practices in creating a need for the proposed facility, particularly promotional practices that have occurred since 1974….

Xcel Energy noted that the Monticello Plant had been contemplated, designed, and put into operation before 1974. In accordance with all parties, the Commission finds no evidence that the need to continue operating the Monticello Plant resulted from promotional practices.[29]

> (4) the ability of current facilities and planned facilities not requiring certificates of need to meet the future demand….

In the absence of receiving a certificate of need to expand its facility to store spent nuclear fuel, the Monticello Plant would cease operations in 2030. DOC and Xcel Energy concur that there are no places to store spent nuclear fuel from the plant beyond 2030 that would not require a certificate of need. While it might be possible to displace the need for extending operations at the Monticello Plant by maintaining the operations of the Company's coal-fueled plants, the Commission found that option too costly and inconsistent with state environmental policies.[30]

Accordingly, the Commission finds no evidence that current and planned facilities not requiring certificates of need could meet the forecast demand.

> (5) the effect of the proposed facility, or a suitable modification thereof, in making efficient use of resources….

Xcel Energy provided testimony that the Monticello Plant operates efficiently—maintaining continuous operations with high output and reduced operating costs. Moreover, the Company is exploring the ability to vary the plant's output to reflect changes in demand—an uncommon practice among nuclear generators.[31]

The Commission finds this analysis persuasive. Moreover, authorizing the expansion of the Monticello Plant's storage capacity will permit Xcel Energy to extend the operating life of the Monticello Plant, which reflects an efficient use of that resource.

[28] *Id*., Findings 97-102.

[29] *Id*., Findings 103-106.

[30] *Id*., Findings 107-118.

[31] *Id*., Findings 118-123.

B. Whether there is a more reasonable and prudent alternative

Minn. R. 7855.0120(B) requires the Commission to evaluate whether —

> … a more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record … considering:
>
> (1) the appropriateness of the size, the type, and the timing of the proposed facility compared to those of reasonable alternatives….
>
> (2) the cost of the proposed facility and the cost of energy to be supplied by the proposed facility compared to the costs of reasonable alternatives and the cost of energy that would be supplied by reasonable alternatives;
>
> (3) the effects of the proposed facility upon the natural and socioeconomic environments compared to the effects of reasonable alternatives; and
>
> (4) the expected reliability of the proposed facility compared to the expected reliability of reasonable alternatives….

The Administrative Law Judge concluded that a more reasonable and prudent alternative to the proposed facility had not been demonstrated by a preponderance of the evidence on the record.[32] The Commission concurs, for the reasons set forth below.

Xcel Energy provided an analysis of various alternative plans, including —

- reprocessing the spent fuel,
- storing the spent fuel off-site (at new or existing storage facilities, and at a federal or privately run facility),
- storing the spent fuel on-site at a new ISFSI,
- making more efficient use of existing storage space,
- changing the design of the Company's dry casks, and
- relying on other sources of generation in lieu of extending the operating life of the Monticello Plant.[33]

Regarding this last alternative, Xcel Energy explored two scenarios. Under the first scenario, a capacity expansion model identified the least-cost combination of resources that might, in aggregate, have a similar generation profile to the Monticello Plant. The second scenario is similar, except that the model was constrained to pick only storage options (for example, batteries) and generation resources that rely on sources of energy that do not emit more greenhouse gases than the Monticello Plant.

[32] *Id*., Finding 220.

[33] ALJ Report, Findings 125-169.

Xcel Energy argued that none of the alternatives were a better alternative than the Company's proposal to extend the operating life of the Monticello Plant to 2040 and to authorize construction of the necessary storage facilities. No variation in the time, type, or timing of facilities altered this conclusion.[34]

The Company acknowledged that its capacity expansion model could identify a collection of resources that provide nearly the same generation output to the Monticello Plant at a lower cost (measured as the present value of the revenue requirement). But this analysis omitted consideration of externalities (that is, pollution), the regulatory costs of carbon, and the cost of complying with the new statutory mandate requiring utilities to refrain from using carbon-emitting generators by 2040.[35] Once the effects upon the natural and socioeconomic environments are considered—even including the effects of the tritium leak—neither of the proposed alternative scenarios provided a lower cost strategy to meet the forecasted demand.[36] Moreover, neither scenario could match the reliability of the Monticello Plant.[37]

Accordingly, the Commission finds that no more reasonable and prudent alternative to the proposed facility has been demonstrated by a preponderance of the evidence on the record. No variation in the size, the type, and the timing of proposed facilities, nor analysis of cost differences, nor consideration of consequences to the natural and socioeconomic environment, nor consideration of reliability alters this conclusion.

C. Whether granting the petition is favorable to society

Minn. R. 7855.0120(C) requires the Commission to evaluate whether —

> …it has been demonstrated by a preponderance of the evidence on the record 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….

The record shows that approving Xcel Energy's proposal would generate more social benefits than would denying it. This conclusion is clear in light of the state's increasing need for energy and generating capacity, the project's benefits for the natural and economic environments, the project's potential for inducing future development, and the social and environmental benefits of maintaining the Monticello Plant relative to other scenarios considered in the record. These matters are discussed further below.

> (1) the relationship of the proposed facility, or a suitable modification thereof, to overall state energy needs….

[34] *Id*., Findings 170-178.

[35] *See* Minn. Stat. § 216B.2422, subd. 3; 2023 Minn. Laws, Ch. 7, § 10, adopting Minn. Stat. § 216B.1691, subd. 2g.

[36] ALJ Report, Findings 170-212.

[37] *Id*., Findings 213-219.

DOC noted, based on reviewing the resource plans of multiple regulated utilities in the state, that the state generally faced a growing need for energy and power—and that Xcel Energy in particular faced needs due to the retirement of various generators and the expiration of certain power purchase contracts. On this basis, DOC concluded that keeping the Monticello Plant in operation through 2040 would help meet the state's overall energy needs.

The ALJ concurred with the DOC's assessment.[38] The Commission will do likewise.

> (2) the effects of the proposed facility, or a suitable modification thereof, upon the natural and socioeconomic environments compared to the effects of not building the facility….

The ALJ identified three broad categories of consequences that the proposed project would have on the natural and socioeconomic environments. Most immediately, expanding the ISFSI would generate some amount of traffic, noise, and dust associated with construction—but since the construction would occur at an enclosed, remote location, and last briefly, the ALJ did not anticipate that this would have much consequence for either the natural or socioeconomic environments.

The ALJ noted that the proposal would generate and maintain economic activity in and around the City of Monticello. In addition to the short-term employment generated by the construction, discussed below, maintaining the Monticello Plant would maintain employment for hundreds of people for an additional ten years, and maintain substantial tax revenues for local units of government.

Perhaps most significantly, extending the life of the Monticello Plant would provide a source of electricity that would not generate a variety of externalities, especially greenhouse gases. In analyzing two alternative scenarios, Xcel Energy demonstrated that denying the certificate of need would have less beneficial effects for ratepayers and for the environment.

Weighing these considerations, the ALJ concluded that denying the certificate of need would tend to cause worse consequences for the natural and socioeconomic environments than would granting it.[39] The Commission concurs.

> (3) the effects of the proposed facility, or a suitable modification thereof, in inducing future development….

Citing testimony from Xcel Energy's witnesses, the ALJ found that granting the certificate of need would not cause the Monticello Plant to add more permanent employees, but during the six-month construction period the project would employ an estimated 40 construction workers (albeit no more than about 12 at any one time). The Company would anticipate the project causing minimal impact on other factors such as traffic, utilities, public services, or water usage levels.[40]

[38] *Id.*, Findings 223-228.

[39] *Id*., at Findings 229-231.

[40] *Id*., at Finding 232.

The Commission concludes that granting the certificate of need would have some small consequence in inducing development.

> (4) the socially beneficial uses of the output of the proposed facility, or a suitable modification thereof, including its uses to protect or enhance environmental quality….

The facility being proposed is an expansion of the Monticello Plant's ISFSI. Because Xcel Energy is pursuing this project to enable the Monticello Plant to continue generating electricity, it might appear that electric energy is the relevant output. But for purposes of this analysis, the relevant output is not energy, but generating capacity. Granting the certificate of need would help the Company maintain its capacity to generate electricity constantly and reliably with little harmful emissions. With this capacity, Xcel Energy can reduce its reliance on less constant, less reliable, more polluting sources of electricity. For this reason, the Commission finds that the Company's proposal has a socially beneficial use, and that the benefit relates to protecting the environment.[41]

D. Whether project would comply with legal requirements

Minn. R. 7855.0120(D) requires the Commission to evaluate whether —

> …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.

Xcel Energy stated that it would comply with relevant local, state, and federal policies, rules and regulations in building and operating the expanded ISFSI, knowing that the NRC is constantly monitoring the Company's actions.

Far from violating state policy, Xcel Energy argued that expanding the ISFSI is necessary to meet state policy goals—especially goals for reducing greenhouse gas emissions. In addition, expanding the ISFSI is necessary to continue operating the Monticello Plant until 2040, as set forth in the Company's Commission-approved resource plan. Finally, the Company stated that the project would comply with Minn. Stat. § 116C.83, subd. 4, by continuing to provide a flexible, modular storage system that would facilitate removing the spent fuel waste when an out-of-state storage facility becomes available.

The Department confirmed that it found no evidence that Xcel Energy's proposal would fail to comply with applicable federal, state and local policies, rules, or regulations—a position that the ALJ also adopted.[42] Accordingly, the Commission concurs.

[41] *Id*., Finding 233-234.

[42] *Id*., Findings 235-244.

IX. Commission Action

A. Conclusion, adoption of ALJ Report, and conditions

The record of this proceeding, as summarized by the ALJ Report, demonstrates that the regulatory requirements for a certificate of need have been fulfilled. Consequently, the Commission will adopt the findings and conclusions of the ALJ Report to the extent that they are consistent with the decisions in this order—including the recommendation to grant Xcel Energy's petition with conditions. The Commission will adopt the conditions recommended by the Administrative Law Judge—including the conditions proposed by DOC-DER—plus some additional conditions addressed below.

First, the Commission will adopt the ALJ Report modified to incorporate the uncontested clarifying changes proposed by Xcel Energy on July 14, 2023. These include changes to Findings 69, 104, 124, 146, and 225 as set forth above.

Second, the Commission will adopt the ALJ Report modified to replace Findings 192-212 with Xcel Energy's proposed Findings 162-163, as proposed in DOC's July 14, 2023, filing. These findings are sufficient to describe the events concerning the leak of tritiated water, while avoiding some unnecessary—and potentially contested—details set forth in the Administrative Law Judge's findings. The Commission will further modify the language to clarify that these findings are being made by the Commission, not the ALJ, as set forth below:

> 162. The Company explained that it discovered a leak of tritiated water in November 2022 and promptly reported the leak to the Minnesota State Duty Officer and the NRC. The Company stated that the leak has not impacted groundwater outside the boundaries of the Plant, the Mississippi River, or any drinking water wells. The Company stated <u>at the time of the ALJ report that</u> it has located the leak and repaired it. The Company also states that it continues to pump contaminated groundwater and will continue to take action to appropriately manage the cleanup of the tritiated water plume.
>
> 163. The ~~ALJ~~ <u>Commission</u> finds that the Company's two replacement cases are reasonable test cases by which to compare the environmental impacts of extending the life of the Monticello Plant. The ~~ALJ~~ <u>Commission</u> also finds that environmental considerations weigh in favor of extending the Monticello Plant and granting the CON, as compared to the Company's two replacement cases. The ~~ALJ~~ <u>Commission</u> further finds that the circumstances around the leak of tritiated water at the Plant and the Company's response to that leak does not change the ~~ALJ~~ <u>Commission</u>'s finding on this point.

C. Reporting Requirements

1. Commission

Consistent with Minn Stat. §116C.83, the Commission will delegate authority to its Executive Secretary to inform the appropriate Legislative committees that the Commission has issued an order to grant a certificate of need in this matter. While the statute prescribes a filing date of January 15, 2024, the Commission will direct the Executive Secretary to make this filing before December 31, 2023, to ensure that the Legislature has ample time to address the matter.

2. Xcel Energy

As originally envisioned, the Legislature authorized the Commission to grant certificates of need for a utility to store spent nuclear fuel on a temporary basis, with the expectation that the waste would eventually move to a federal storage facility.[43] While progress in developing a federal facility has stalled, Xcel Energy should maintain plans to fulfill its statutory obligation to remove the waste if and when the opportunity arises. To this end, the Commission will direct Xcel Energy to make regular reports on the status of the ISFSI at the Monticello Plant to the Commission and to the chairs of the relevant legislative committees in the Minnesota House of Representatives and the Senate.

This report should set forth —

- the Company's estimate of the number of casks required to run the Monticello Plant through 2040,
- the amount of fuel being loaded each cycle,
- the capacity of the cask selected, and
- a summary of all proceedings before federal regulatory authorities in the past two years regarding licensure of the facility and removal of waste.

The Commission will direct Xcel Energy to file these reports on or before January 15 of odd-numbered years. But because all parties have had the opportunity to review the current status of the Monticello Plant and its ISFSI, the Commission will postpone the start of this reporting requirement until 2029, when the Company may have new developments to report. Xcel Energy may discontinue filing these reports when the Monticello Plant begins the process of decommissioning, or when the Company files a new certificate of need application seeking storage permitting the plant to operate beyond 2040.

[43] *See*, for example, Minn. Stat. §§ 116C.775 and 116C.777 (requiring removal of spent nuclear waste from state as soon as possible) and 116C.779, subd. 1(i) (imposing annual fees if Xcel Energy fails to make good-faith effort to remove spent fuel from the state).

ORDER

1. The Commission adopts the June 29, 2023, report of the Administrative Law Judge of the Office of Administrative Hearings to the extent it is consistent with the Commission's final decision. In particular, the Commission adopts the report with the following modifications:

   A. Modifying findings 69, 104, 124, 146, and 225 as proposed in the July 14, 2023, filing of Northern States Power Company d/b/a Xcel Energy.

   B. Replacing findings 192-212 with Xcel Energy's proposed findings 162-163, as shown in the July 14, 2023, filing of the Minnesota Department of Commerce and modified below:

> 162. The Company explained that it discovered a leak of tritiated water in November 2022 and promptly reported the leak to the Minnesota State Duty Officer and the [federal Nuclear Regulatory Commission]. The Company stated that the leak has not impacted groundwater outside the boundaries of the Plant, the Mississippi River, or any drinking water wells. The Company stated <u>at the time of the ALJ report that</u> it has located the leak and repaired it. The Company also states that it continues to pump contaminated groundwater and will continue to take action to appropriately manage the cleanup of the tritiated water plume.
>
> 163. The ~~ALJ~~ <u>Commission</u> finds that the Company's two replacement cases are reasonable test cases by which to compare the environmental impacts of extending the life of the Monticello Plant. The ~~ALJ~~ <u>Commission</u> also finds that environmental considerations weigh in favor of extending the Monticello Plant and granting the [certificate of need], as compared to the Company's two replacement cases. The ~~ALJ~~ <u>Commission</u> further finds that the circumstances around the leak of tritiated water at the Plant and the Company's response to that leak does not change the ~~ALJ~~ <u>Commission</u>'s finding on this point.

2. The Commission issues a certificate of need to Xcel Energy for additional dry cask storage at its independent spent fuel storage installation in Monticello with the following conditions:

   A. Xcel Energy must justify any costs, including those of operations and maintenance, ongoing capital expense, revenue requirements related to capital including in the rate base, insurance expense, land-lease expense, and property tax expense.

   B. The Commission will otherwise hold Xcel Energy accountable for the price and terms used to evaluate the project.

C. Ratepayers will not be put at risk for any assumed benefits that do not materialize.

D. Xcel Energy's customers must be protected from risks associated with the non-deliverability of accredited capacity, energy, or both, from the project. The Commission may adjust Xcel's recovery of costs associated with this project in the future if actual production varies significantly from assumed production over an extended period.

E. The Commission's decision does not address the operations of the Monticello Nuclear Generating Plant beyond 2040, which will be subject to review in future resource planning proceedings.

F. Xcel Energy shall file Monticello Nuclear Generating Plant reports as follows:

1) Content: The reports shall contain —
   a. Xcel Energy's estimate of the number of casks required to run the Monticello Plant through 2040;
   b. the amount of fuel being loaded each cycle;
   c. the capacity of the cask selected; and
   d. a summary of all proceedings before federal regulatory authorities in the past two years regarding licensure of the facility and removal of waste.

2) Recipients: Xcel Energy shall file the reports with —
   a. the Commission and
   b. the chairs of the committees with jurisdiction over energy and environmental policy issues in both the Minnesota House of Representatives and Senate.

3) Timing: Xcel Energy shall file the reports on or before January 15, 2029, and by January 15 of odd-numbered years thereafter until either —
   a. a new certificate of need application has been filed for additional storage for the Monticello Plant to operate beyond 2040 or
   b. the plant has begun the process of decommissioning.

3. The Commission delegates authority to the Executive Secretary to report the Commission's decision to the Legislature under Minn. Stat. § 116C.83 before December 31, 2023.

4. This order shall become effective immediately.

BY ORDER OF THE COMMISSION

Will Seuffert
Executive Secretary

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CERTIFICATE OF SERVICE

I, Mai Choua Xiong, hereby certify that I have this day, served a true and correct copy of the following document to all persons at the addresses indicated below or on the attached list by electronic filing, electronic mail, courier, interoffice mail or by depositing the same enveloped with postage paid in the United States mail at St. Paul, Minnesota.

Minnesota Public Utilities Commission
ORDER GRANTING APPLICATION WITH CONDITIONS

Docket Number **E-002/CN-21-668**
Dated this 17th day of October, 2023

/s/ Mai Choua Xiong

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Mixed Integer Programming (MIP) in EnCompass

EnCompass utilizes mixed integer programming to determine the optimal solution to capacity expansion, unit commitment, and economic dispatch problems.

Economic Dispatch

The economic dispatch problem seeks to minimize total production costs given a commitment schedule of which units are online and offline in every interval (usually one hour). EnCompass formulates this as a linear problem by using a piecewise-linear representation of unit heat and emission rates, and either a zonal or DC (linearized) powerflow model for transmission. Constraints applied for the economic dispatch include load and ancillary service requirements, transmission limits, fuel limits, environmental limits, storage limits and efficiencies, capacity factor (energy) limits, ramp rates, and resource capacity limits for energy and ancillary services.

Linear programming is a fast, robust, and well-established process that will always return an optimal solution if the problem is feasible (i.e., the constraints are not conflicting). EnCompass uses "soft" constraints for load balance, ancillary services, and certain transmission limits by allowing the limits to be violated subject to input penalties (unserved load and curtailment penalties). In this way, the problem will always be feasible, and any limit violations are reported. In most cases, there is only a single optimal solution. However, if there are multiple units with identical costs, the selection of which units to dispatch is arbitrary. EnCompass will always produce the exact same solution for the same scenario. If a unit that was not dispatched is removed from the scenario, the structure of the problem changes, and a different dispatch of identical units could occur if a different route were taken to find an optimal solution.

When EnCompass is run using the "No Commitment" option, the minimum capacities of resources that are not must-run are relaxed, so that there is no unit commitment problem to solve. In this mode, any startup and no-load costs are converted to linear $/MWh costs using the input Expected Runtime (or if not set, the Minimum Uptime), and are added to a unit's energy and ancillary service costs. This option is the fastest way in which to run EnCompass.

Unit Commitment

The unit commitment problem extends the economic dispatch problem by allowing the selection of which units are online and offline in every interval, given a set of units with fixed commission and retirement dates. This selection uses integer, or whole-number, variables together with the continuous variables from the economic dispatch problem, which is why the methodology is referred to as a "mixed" integer program.

The unit commitment constraints that EnCompass applies includes minimum uptime, minimum downtime, maximum daily and weekly starts, and profiles for which intervals are allowed for unit starts and shutdowns. Fuel requirements and direct costs can be applied to starts and shutdowns, with the option to vary startup requirements based on cold, warm, and hot input definitions. Operating constraints can be applied across a group of units to model load pocket and voltage support requirements, as well as dependencies and other restrictions.

When EnCompass is run using the "Partial Commitment" option, all of the unit commitment costs and constraints are applied, but the number of units committed in any interval is allowed to be a continuous variable between 0 and 1. For example, if the optimal solution included a value of 0.3 for the number of units committed, this would incur 30% of the cost of a start and only allow the unit to dispatch up to 30% of its capacity. The unit would still have to be at least 30% committed for the minimum uptime, and once it goes below that cannot increase until the minimum downtime has passed. The Partial Commitment option turns the unit commitment problem into a linear problem, which makes it faster to solve than the "Full Commitment" option and provides more detail and constraints than the "No Commitment" option.

Capacity Expansion

The capacity expansion problem extends the unit commitment and economic dispatch problem by allowing the selection of new resources, transmission upgrades, and economic retirements. This selection uses also uses integer variables that represent the number of resource additions and retirements in each year. The economic carrying charge is used to represent capital costs for new projects, which increases at the rate of construction escalation and provides the same present value of annual revenue requirements over the book life.

Instead of firm reserve margin constraints, EnCompass uses capacity demand curves to incent meeting reserve margin targets. These can represent "high cliffs" where the penalty for falling short of the target reserve margin is very high ($10,000/kW-year) and then goes to 0 once the reserve margin is met; or they can be downward-sloping curves like those used in PJM, New York and New England for capacity markets.

Each project can have constraints on the maximum additions (incremental) per year, and the minimum and maximum active (cumulative) projects each year. Project Constraints can be used to set these constraints over a group of projects, which can include exclusivity and dependencies.

EnCompass includes a "Partial" optimization option which will allow the number of additions to be a continuous variable. For example, if the optimal solution included a value of 0.3 for the number of additions, this would incur 30% of the capital costs and only consider 30% of the capacity added. Over the operating life of the project, the number of active projects would be at least 30%. If the unit commitment option is "No Commitment" or "Partial Commitment" (which are the typical settings for capacity expansion), Partial project option turns the capacity expansion problem into a linear problem, which makes it faster to solve than the "Full" option. There is also a "Rounded" option which will automatically round up all additions and retirement to the next whole number, but this is typically only used for market-based capacity expansion over large regions. Finally, even with the "Full" option, individual projects can consider partial additions after an input year, which improves the overall runtime.

The MIP Process

If either the unit commitment or capacity expansion options are set to "Full", EnCompass will solve the problem using mixed integer programming. Unlike linear programming, it is not always feasible to find the global optimal solution to a mixed integer problem since the process requires evaluating numerous potential integer solutions. Instead, the problem is considered to be solved when the costs of the best integer solution found is within an input tolerance of the cost of the best remaining partial solution

(known as the best bound). The tolerance is measured as the percent difference between the best solution and best bound, and in EnCompass the MIP Stop Basis is input as basis points (1/100th of 1%).

The MIP process first determines the best partial solution using linear programming, as if the option had been set to "Partial". The cost of this solution then becomes the initial best bound, since rounding partial variables up or down will only increase the costs from there. Then, the MIP will create and evaluate several subproblems to find integer solutions and eliminate other possibilities. When a better solution is found, this reduces the best solution cost; when a path is eliminated, this increases the best bound cost. The process continues until the gap between these two costs is within the input tolerance.

Consider a simple example of a one-year capacity expansion problem with three potential projects (P1, P2, and P3) where each project has a maximum of 1. The first step is to solve the partial problem, and assume it provides these results:

- Node 0: Cost = $15.5 million, P1 = 0.3, P2 = 0.8, P3 = 0

The best bound is now $15.5 million, and the MIP will now start to evaluate the subproblems by branching on the partial solutions. For example, two subproblems will be created, one with the constraint P1 = 0 and the other with the constraint P1 = 1. These subproblems are then solved using linear programming, and assume these results:

- Node 1: Cost = $16.1 million, P1 = 0, P2 = 1, P3 = 0
- Node 2: Cost = $15.8 million, P1 = 1, P2 = 0.4, P3 = 0.1

Note that the project results for Node 1 are now all integers, and we have our first feasible solution. Node 2 still has partial projects, so the best bound now increases to $15.8 million. The gap between the best solution and best bound is 1.9%. If the MIP Stop Basis was set to 200, the process will stop and return Node 1 as the best solution. Assume that the MIP Stop Basis is lower, and the process will now branch on Node 2 by setting P2 = 0 and P2 = 1:

- Node 3: Cost = $15.9 million, P1 = 1, P2 = 0, P3 = 0.3
- Node 4: Cost = $16.2 million, P1 = 1, P2 = 1, P3 = 0

Node 4 is a feasible integer solution, but has a higher cost than Node 1, so the process does not do anything else with Node 4 (that "branch has been pruned"). Node 3 is a partial solution, so the best bound increases to $15.9 million, leaving a gap of 1.3% with the best solution (Node 1). Assume that the MIP Stop Basis is less than 120, so the process will now branch on Node 3 by setting P3 = 0 and P3 = 1:

- Node 5: Cost = $15.9 million, P1 = 1, P2 = 0, P3 = 0
- Node 6: Cost = $16.3 million, P1 = 1, P2 = 0, P3 = 1

The process is now left with only integer solutions, so the best bound and best solution are both $15.9 million, the gap is 0%, and Node 5 is the optimal solution.

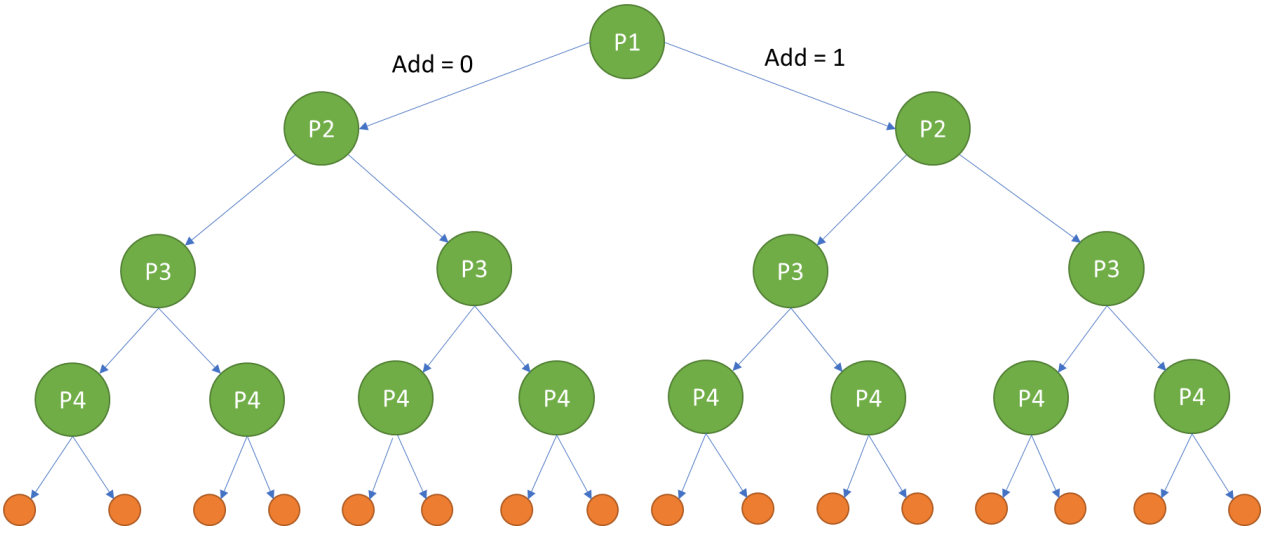
Objective Functions and the Unified Solution

Models like Strategist and EGEAS use dynamic programming to enumerate all feasible nodes. Each node is run through a non-linear probabilistic sub-module to determine production costs, which are added to the capital costs to determine the selected objective function value. The objective function is then ranked across all those nodes to determine the optimal plan. In this simple problem, there were 2 x 2 x 2

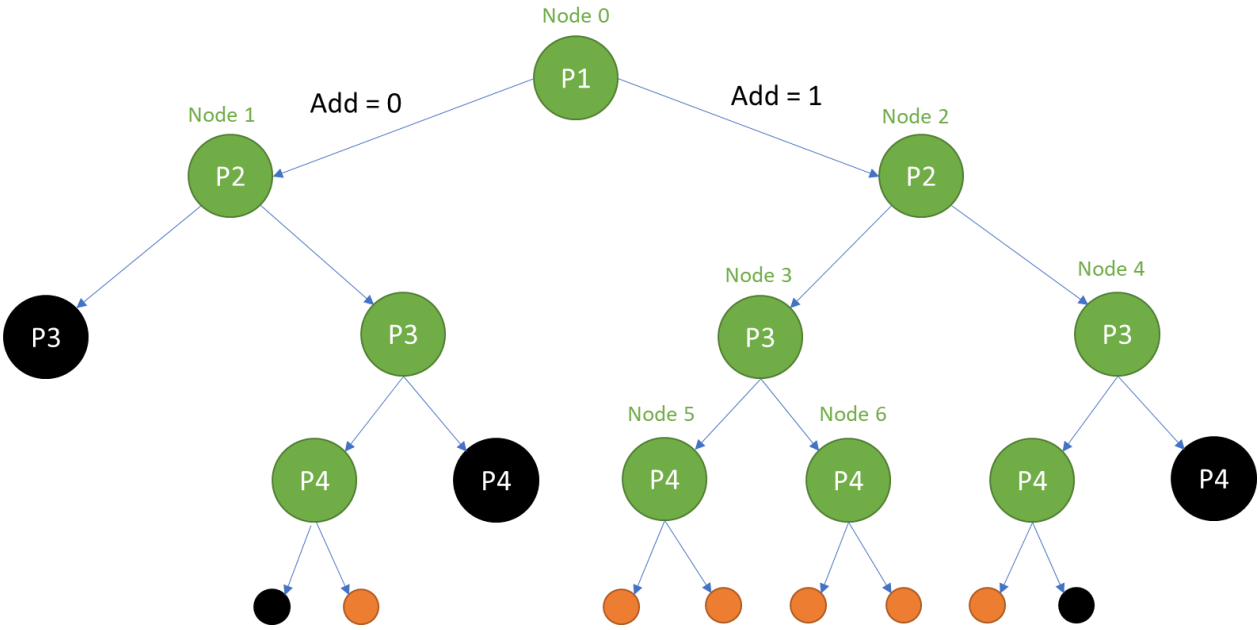
= 8 nodes to evaluate with dynamic programming, and 7 nodes with mixed integer programming. In a typical multi-year expansion problem, there are usually thousands of integer variables that can take values larger than 1. This makes the number of nodes to evaluate with a dynamic program skyrocket and requires additional constraints to be imposed to bring that number down. With mixed integer programming, the number of nodes is manageable since only those nodes that show promise are evaluated and used to look for other nodes.

With dynamic programming, the objective function can be distorted between the production cost sub-module and the capacity expansion decision. For example, if the objective function is to minimize total utility costs plus emission externalities, the ranking of nodes may pick up externality costs from the production cost sub-module, even if that was not included in the commitment and dispatch objective function. With mixed integer programming, there is no decoupling of capacity expansion, unit commitment, and economic dispatch, so all three of these decisions work together to minimize the single selected objective function. As an example, given the objective function of minimizing total utility costs plus emission externalities, a low-cost alternative might be to displace a MWh from a higher emitting resource, such as a coal-fired unit, with a MWh from a lower emitting unit such as either renewable or gas-fired generation. Depending on the design of the model, a dynamic programming algorithm might recognize one, both or neither of these options and possibly not produce the most economical alternative. Conversely, a mixed integer model that co-optimizes production cost and capacity expansion will evaluate all options for minimizing the objective function.

To illustrate this further, assume a fourth potential project, P4, is considered. The dynamic programming approach builds a decision tree, with a branch for every project decision (add 0 or 1). The result is 16 feasible solutions, shown in the figure below as orange leaves on the tree, each of which must be evaluated with the production cost sub-module:



Because the mixed integer process uses a unified solution, it knows the change in costs as the tree is being built and can prune branches that will always produce higher-cost feasible solutions. In the figure below, those pruned branches are shown in black, and the nodes from the example above are identified:



Another key advantage is that in the MIP process, each node can be evaluated using the solution to the prior node as a starting point, greatly reducing the processing time required to evaluate new nodes. The non-linear production cost sub-module of the dynamic program cannot “learn” as it goes, and each feasible solution must be evaluated from scratch.

To minimize the size of the problem that must be solved, EnCompass does not include the variables, constraints, and costs of any decisions which are fixed. This means that if the selections of one project in a capacity expansion optimization is “frozen” and the case is run again, the objective function values will be lower since the capital and fixed operating costs of that frozen project are not included. Since the convergence threshold is a percentage of the objective function, that gap becomes tighter, and a different overall plan with a slightly lower cost may be chosen.

The structure of the problem can also impact the selection of which variables are branched and the path that is used to find solutions. For example, removing limits that are never binding or resources and projects that are never utilized does not change the underlying economics, but it does make the problem smaller, which could lead to different approaches and different solutions that are both within the convergence tolerance. For capacity expansion problems where the MIP Stop Basis is set to a low value like 50 (0.5%), multiple solutions that are within that threshold should be considered to have comparable costs over the multi-year optimization period.

Xpress Optimization Suite

EnCompass uses the Xpress Optimization Suite from FICO to solve the linear and mixed integer problems described above. The branch-and-bound process can be sped up considerably by making better choices on which variables to branch on, and by performing heuristic searches for additional nodes. Xpress uses

these techniques and others to provide the best possible performance for solving mixed integer problems.

One of the key techniques to reduce runtime for large problems is parallelism. This allows multiple “leaf” nodes to be solved simultaneously, based on the number of available computing cores and memory. As a result, the solution path may be different when solving using one set of computing resources versus another. This could produce two different solutions that are both feasible and within the input gap threshold.