Public Service Commission

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March 28, 2024

Public Service Commission
Attention: Steve Kahl
600 East Boulevard Avenue, Dept 408
Bismarck, ND 58505-0480

In re: Northern States Power Company
Advance Prudence – Monticello Nuclear Extension
Application
Case No. PU-23-64

Dear Mr. Kahl,

Enclosed for filing in the above referenced matter please find the original copy of the following public document:

1. Direct Testimony of Richard A. Polich, P.E.

Respectfully,

Brian Johnson
Special Assistant Attorney General Bar ID 07397
North Dakota Public Service Commission
600 East Boulevard Avenue Dept. 408
Bismarck ND, 58505
701-328-2407

BEFORE THE

NORTH DAKOTA PUBLIC SERVICE COMMISSION

In the Matter of the Application of Northern States Power Company for an Advance Determination of Prudence for the Monticello Nuclear Generating Plant Life Extension

Case No. PU-23-064

DIRECT TESTIMONY

OF

RICHARD A. POLICH, P.E.

ON BEHALF OF THE

NORTH DAKOTA PUBLIC SERVICE COMMISSION

ADVOCACY STAFF

March 28, 2024

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I. Introduction

Q. Please state your name and place of employment.

A. My name is Richard A. Polich. I am employed by GDS Associates, Inc. ("GDS"), and my office is located at 1850 Parkway Place, Suite 800, Marietta, Georgia 30067.

Q. What position do you hold?

A. I hold the position of Managing Director.

Q. On whose behalf are you submitting this testimony?

A. I am submitting this testimony on behalf of North Dakota Public Service Commission Advocacy Staff ("Staff").

Q. What is your educational background?

A. I graduated from the University of Michigan - Ann Arbor in August 1979 with a Bachelor of Science Engineering Degree in Nuclear Engineering, and a Bachelor of Science Engineering Degree in Mechanical Engineering.

In May 1990, I received a Master of Business Administration from the University of Michigan - Ann Arbor.

Q. Please describe your work experience.

A. In my role as both employee and consultant, I have had over 46 years of work experience in the energy sector, performing duties and services for a

myriad of companies and organizations, and representing the interests of private and public constituencies throughout the country.

In May 1978, I joined Commonwealth Associates, Inc., located in Jackson, Michigan, as a Graduate Engineer and worked on several plant modification and new plant construction projects.

In May 1979, I joined Consumers Power Inc. (now called Consumers Energy), located in Jackson, Michigan, as an Associate Engineer in the Plant Engineering Services Department.

In April 1980, I transferred to the Midland Nuclear Project and progressed through various job classifications to Senior Engineer. I also participated in the initial design evaluation of the Midland Cogeneration Plant.

In July 1987, I transferred to the Market Services Department as a Senior Engineer and reached the level of Senior Market Representative. While in this department, I analyzed the economic and engineering feasibility of customer cogeneration projects.

In July 1992, I transferred to the Rates and Regulatory Affairs Department of Consumers Energy as a Principal Rate Analyst. In that capacity, I performed studies relating to all facets of development and design of Consumers Energy's retail gas and electric rates and electric wholesale rates. During this period, I was heavily involved in the development of Consumers Energy's Direct Access program and Consumers Energy's

Retail Open Access program. I also participated in the development of Consumers Energy's revenue forecast.

In March 1998, I joined Nordic Energy, LLC ("Nordic"), located in Ann Arbor, Michigan, as Vice President in charge of marketing and sales. My responsibilities included all aspects of obtaining new customers and enabling Nordic to supply electricity to those customers. In May 2000, my responsibilities shifted to Operations and Regulatory Affairs. My Operations responsibilities included management of supply purchases, transmission services, and development of new power projects. My Regulatory Affairs responsibilities included overseeing regulatory and legislative issues for the company.

In March 2003, I formed Energy Options & Solutions, based in Ann Arbor, Michigan, as a consulting concern focusing on providing engineering services and regulatory support. Through my work with Energy Options & Solutions, I gained extensive experience consulting in the areas of project development and economic analysis with renewable energy companies across the country, including: Noble Environmental Power located in Centerbrook, Connecticut; Third Planet Windpower, LLC located in Palm Beach Gardens, Florida; TradeWind Energy, LLC located in Lenexa, Kansas; Windlab Developments USA located in Canberra, Australian

Capital Territory, Australia; and Matinee Energy Inc. located in Tucson, Arizona, among others.

Other examples of my consulting work have included evaluation of the Arkansas Weatherization Assistance Program for the Arkansas Energy Office, and providing the West Michigan Prosperity Alliance with an evaluation of the business opportunities for Western Michigan businesses in the renewable energy business sector.

In 2007, I served as primary author of the report on the economic impacts of renewable portfolio standards and energy efficiency programs for the Department of Environmental Quality – State of Michigan.

In 2011, I joined KEMA, Inc. ("KEMA") located in Burlington, Massachusetts, as a Service Line Leader responsible for developing its renewable energy consulting business. While at KEMA, I performed multiple renewable energy studies for the Electric Power Research Institute, including a renewable energy options study for the country of Saint Maarten (a constituent country of the Kingdom of the Netherlands). I also assisted Lake Erie Energy Development Corporation in its successful application to the U.S. Department of Energy for a multi-million dollar grant to develop an offshore wind project in Lake Erie.

In 2013, I joined CLEAResult located in Little Rock, Arkansas, as Director of Operations. My primary responsibility involved supporting program

operations in assisting the company's Arkansas unit to successfully meet a 400% increase in energy efficiency goals that it managed for Entergy. I was also responsible for managing the company's natural gas energy efficiency programs in the State of Oklahoma.

In 2015, I joined the Georgia office of GDS Associates, Inc., a consulting group focusing on utility engineering and consulting services, as Managing Director in its Generation Services area.

A copy of my Curriculum Vitae is attached hereto and incorporated herein as Exhibit PSC-1.

Q. Do you have any professional registrations?

A. Yes, I am a registered Professional Engineer in Michigan.

Q. Have you published any papers?

A. Yes, I have authored the following publications:

- Engineering and Economic Evaluation of Offshore Wind Plant Performance and Cost Data, 2011, Produced for the Electric Power Research Institute, KEMA, Inc.
- Island of Saint Maarten Sustainable Energy Study, 2012, Produced for the Cabinet of Ministry VROMI, KEMA Inc.
- A Study of Economic Impacts from the Implementation of a Renewable Portfolio Standard and an Energy Efficiency Program in Michigan, 2007, Produced for the Michigan Department of Environmental Quality

- Alternative and Renewable Energy Cluster Analysis, 2007, Produced for the West Michigan Strategic Alliance and The Right Place

Q. Have you testified in any other regulatory proceedings?

A. Yes, I have testified in multiple regulatory proceedings in various states and the Federal Energy Regulatory Commission. I have also testified in one civil arbitration case. A list of regulatory proceedings in which I have testified is contained in Exhibit PSC-2.

II. Testimony Purpose and Summary

Q. What is the purpose of your testimony?

A. The North Dakota Public Service Commission ("Commission") hired GDS Associates, Inc. ("GDS") to provide an analysis, recommendations, and testimony concerning Northern States Power's ("NSP") request for Advanced Determination of Prudence (ADP) on the proposed life extension of the 671 MW Monticello Nuclear Generation Plant (Monticello) beyond its current 2030 retirement date. My testimony provides the results of GDS's assessment of NSP's application, assessment of Monticello life extension, the impact of Monticello life extension on North Dakota ratepayers, and recommendations to the Commission.

Q. Please summarize your testimony.

A. My testimony finds that NSP's economic assessment of Monticello's life extension fails to include the full life cycle cost of Monticello through the

new 2050 end of life of the plant. In addition, NSP discusses various economic metrics which purport to demonstrate the economic benefits of Monticello life extension, which are not applicable to North Dakota and include multiple changes in NSP's generation portfolio which do not provide benefit to North Dakota ratepayers. As such it is impossible to determine the exact impact of only extending Monticello's life through 2050 as compared to NSP's current generation resource costs. NSP's economic analysis of Monticello life extension based on North Dakota criteria still incorporates retirement of multiple NSP generation resources due to NSP's and Minnesota's reduced carbon emission goals and not due to obsolescence or need to retire fossil generation assets. An example of this is the retirement of Sherco 3 coal plant which had significant investment to repair the steam turbine-generator in 2013, due to the catastrophic failure in 2011. In a recent Minnesota regulatory proceeding, NSP claimed the investments made in Sherco 3 were a benefit to ratepayers because the repairs extended the life of the plant. Thus, NSP's analysis based on adjustments to comply with North Dakota conventions, does not result in proper economic analysis based on the best options for North Dakota ratepayers.

The total cost of Monticello Subsequent License Renewal is estimated at only $25 million. Other capital investments include the cost of spent nuclear fuel storage and these costs should be recovered from the Department of Energy, as NSP has done historically. Capital costs that NSP will incur over the period of Monticello's life extension should be consistent with the periodic capital investments incurred due to plant operation. With Monticello's high capacity factor, the reliability its synchronous generator provides NSP's electric grid, and the unknown impact of fossil generation retirement on MISO capacity markets, there appears to be benefit to North Dakota ratepayers of Monticello life extension.

The cost of Monticello life extension is an inexpensive insurance option to the changes in the power industry and gives the Commission an opportunity to observe the economic impact of those changes. Thus, it is my recommendation that the Commission approve NSP's proposed Monticello life extension and periodically review the economics of Monticello's continued operation to determine if it remains prudent to include its cost in North Dakota ratebase. I have also included additional recommendations for the Commission to consider in future rate case proceedings in Section VIII of this testimony.

Q. What are your other key Commission recommendations in this proceeding?

A. Based on review of NSP's testimony filed in its application and NSP's discovery responses, it is recommended that the Commission approve NSP's application with the following conditions.

Q. How is your testimony organized?

A. I have organized my testimony into the following sections:

1. **NSP's ADP Application** – Presents finding regarding NSP's ADP Application and justification for Monticello life extension based on North Dakota rate payer impacts.
2. **Monticello Life Extension Assessment** – Presents finding regarding proposed life extension process, Monticello history, and spent fuel storage issues.
3. **Monticello Projected Capital Expenditures** – Presents findings regarding proposed Monticello capital expenditures and North Dakota ratepayer impacts.
4. **Future Rate Proceedings Recommendations** – Recommendations for adjustments to rate base and Monticello capital costs allowances.

Q. Have you prepared any Exhibits?

A. Yes, the following is a list of Exhibits included with my testimony:

EXHIBIT	DESCRIPTION

PSC-1	Richard A. Polich Curriculum Vitae
PSC-2	Regulatory Proceedings Testimony List
PSC-3	NSP Discovery Response PU23-NDPSC-1-2-011.
PSC-4	NSP Discovery Response PU23-NDPSC-1-3-7.

III. NSP's ADP Application

Q. Please summarize NSP's ADP application for Monticello life extension?

A. NSP is requesting Commission approval to extend the service life of Monticello from its current nuclear operating license expiration date of September 8, 2030, to September 8, 2050, a 20-year life extension. Monticello is a single unit, 671 MW electric generating plant, powered by a nuclear boiling water reactor that began service in 1971. According to NSP Witness Mr. Allen D. Kruger, NSP is projecting a $97 million capital investment in Monticello for the cost of a Subsequent License Renewal (SLR) with Nuclear Regulatory Commission (NRC) and to expand the Independent Spent Fuel Storage Facility (ISFSF). Mr. Krug's testimony provides Background on Monticello plant's recent operating history.[1]

[1] See Mr. Allen D. Kruger's Testimony, pages 2 – 9, North Dakota Public Service Commission Case PU-23-064, dated February 3, 2023.

Q. What economic anlaysis does NSP provide in its Monticello ADP Application to support the life extension of Monticello?

A. NSP's primary resource for economic justification of Monticello life extension is based upon the 2020-2034 Upper Midwest Integrated Resource Plan (2020 IRP) filed with the State of Minnesota Public Utility Commission[2] (MPUC) and a Monticello specific "Alternate Plan"[3]. The 2020 IRP only provides modeling results through the end of 2040 and does not include analysis through for the full Monticello extended life. NSP also performed a North Dakota Alternate Plan (ND Alternate Plan) analysis, which also only provides modeling of the Monticello life extension through 2040 according to Ms. Mandich's testimony. Thus, none of NSP's models include an economic analysis for the full Monticello life extension period.

Q. Please provide an overview of the progression of NSP's 2020-2034 Upper Midwest Integrated Resource plans filed with the MPUC.

A. NSP presents the results of four separate modeling exercises in its testimony. The number of models presented is due in part to NSP's change in modelling tools from Strategist to EnCompass. NSP claims that

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[2] *In the Matter of the 2020-2034 Upper Midwest Integrated Resource Plan of Northern States Power d/b/a Xcel Energy,* Minnesota Public Utilities Commission Docket No. E-002/RP-19-368.
[3] See Ms. Farah L. Mandich Testimony, Pages 16 – 23, North Dakota Public Service Commission Case PU-23-064, dated February 3, 2023.

EnCompass allows it to better account for renewable resources and duration limited resources. A summary of the modeling prepared by NSP is presented below:

- Strategist modeling based on the 2019 IRP filing ("2020 IRP")
- Encompass modeling based on a Supplemented Resource Plan prepared in June of 2020 ("2020 IRP Supplement"). This supplemented Resource Plan incorporated changes to model inputs which accounted for the passage of time and further analysis requirements.
- EnCompass modeling with updates based on response to stakeholder feedback on 2020 IRP Supplement ("2020 IRP Alternate")

Q. What scenarios has NSP included in its filing?

A. NSP include the following 15 scenarios in the initial filing and the 2020 IRP Supplement:

- Scenario 1 – Base Case
- Scenario 2 – Early Retirement of King
- Scenario 3 – Early Retirement of Sherco 3
- Scenario 4 – Early Retirement of Coal
- Scenario 5 – Early Retirement of Monticello

- Scenario 6 – Early Retirement of Prairie Island
- Scenario 7 – Early Retirement of all Nuclear
- Scenario 8 – Early Baseload
- Scenario 9 – Early Retirement of Coal, Extension of Monticello
- Scenario 10 – Early Retirement of King, Extension of Monticello
- Scenario 11 – Early Coal, Extension of Prairie Island
- Scenario 12 – Early Retirement of Coal, Extension of all Nuclear
- Scenario 13 – Extension of Monticello
- Scenario 14 – Extension of Prairie Island
- Scenario 15 – Extension of all Nuclear

The 2020 IRP Alternate only included Scenario 9 and an "Alternate Plan" which was produced in preparation for a June 2020 IRP process.

NSP also included an IRP analysis based on North Dakota considerations toward the cost of carbon that was based on the 2020 IRP Alternate (2020 ND IRP"). This analysis only compared the MPUC adopted scenario, which NSP calls the "Alternate Plan" to a case in which Monticello is retired in 2030 and replaced with gas peakers. This analysis also excluded the

consideration of externality values in capacity expansion or production cost modeling, such as carbon costs and societal impact cost. The changes in generation resources between the MPUC plan and the 2020 ND IRP are shown in Ms. Mandich's testimony's Table 2.[4]

In summary, I will be using the following abbreviations for the key NSP IRP cases in the remainder of my testimony:

1. 2020 IRP Supplemental – This was the June 2020 update to NSP's original 2020 IRP filing. This is the only analysis that appears to include a comparison of Monticello life extension (Scenario 13) economics to NSP's Reference Case economics.

2. 2020 IRP Alternative – This was the update NSP completed in 2021 that included updates from stakeholder responses to the 2020 IRP Supplemental. This analysis only compares the economic results of NSP's Preferred Case from the 2020 IRP Supplemental, which includes a Monticello extension through 2040 and early coal retirements, to an updated case called the "Alternate Case", which among other changes removes the combined cycle and replaces

[4] Ms. Mandich Testimony, page 17, Table 2.

Sherco site with solar resources and adds tie-lines to re-utilize the interconnection.

3. 2020 ND IRP – In this analysis, NSP starts with the Alternate Case from the 2020 IRP Alternative study, modifies it to remove without consideration of externality values in capacity expansion or production cost modeling, consistent with North Dakota law, creating the "Alternate Plan – ND Scenario". This plan was then modified by retiring Monticello in 2030 to produce the "Monticello Replacement 1" case. Ms. Mandich's testimony provides a summary of the generation resource differences under in on page 17, Table 2.

Q. Please explain your concerns, if any, about the scenarios included in the NSP's analysis.

A. My main concern regarding NSP's analysis is that it incorporates scenarios from the IRP filing from the June 2020 IRP Supplemental filing and assumptions from the 2016-2030 IRP cycle. The 2020 IRP is now over four years old. Out of the fifteen scenarios, three of them assume that either Monticello is retired in 2026, that Prairie Island is retired in 2025, or both units are retired on those dates. These retirement dates are no longer reasonable or achievable, and therefore their inclusion as alternatives to the NSP's 2020 IRP Supplement are of limited value.

Further, the NSP screens out any scenario in which the Prairie Island unit life is extended (Scenarios 11, 12, 14 and 15) when choosing its preferred plan, as it felt there was value in deferring a decision on Prairie Island license extensions until for a future resource planning process. In discovery, NSP stated it is proposing to extend the life of the Prairie Island units in the 2024 North Dakota IRP. This leaves a total of six alternatives to the Base Case.

None of the economic analysis presented by NSP goes beyond 2045. Thus, the full economic impact of Monticello life extension was not provided by NSP in the 2020 ND IRP analysis. In the discovery process, NSP, in response to a question stated that they did not include any modeling beyond 2040 (Exhibit PSC-4).

If the purpose is to determine how the cost of extending Monticello compares to other options available to the Commission, rather than deciding on whether the extension of Monticello in isolation is prudent, it is concerning that so few of the Scenarios provided by NSP are relevant, and those that are provided, include costs that cannot be considered under North Dakota law.

Q. How does NSP compare the various scenarios?

A. NSP provides both present value of societal cost (PVSC) and present value of revenue requirements (PVRR) analysis of the 15 planning scenarios. The calculation of PVSC is required by Minnesota and includes negative externality of emissions. The PVSC calculation excludes carbon costs and all externalities when modeling production costs, but still considers carbon costs in the capacity expansion step. Inclusion of costs of carbon dioxide and emissions are prohibited for consideration under North Dakota law.

Q. How does NSP use the 2020 IRP Supplement to illustrate the economic benefits of Monticello life extension?

A. Mr. Krug uses the 2020 IRP Supplement PVRR results for the Scenario 9 – Early Retirement of Coal, Extension of Monticello (Preferred Case) to show that the Monticello life extension is economical. The PVRR metric NSP used in the 2020 IRP Supplement, is a calculation applying NSP's 6.47% weighted cost of capital to the net present value calculation of total projected company PVRR over the period of 2020-2045[5]. The $46 million of economic benefits of Monticello life extension discussed by Mr. Krug is calculated by comparing the Preferred Case PVRR, which bundles

[5] Mr. Krug Testimony, page 18, lines 20 -24.

multiple generation resource changes, to the Base Case PVRR. Review of NSP's Excel spreadsheets contained in Discovery Response 1-1-004 appears to include a Monticello life extension case (Scenario 13) (Scenario 13), which indicates a Monticello life extension PVRR is about $970,000 higher than the Base Case.[6]

Q. What are the results of NSP's 2020 IRP Supplement economic analyses?

A. NSP compares the PVRR of each scenario to a Reference Case based on its 2016-2030 Resource Plan to determine whether cost savings or increases will occur. A negative PVRR delta is produced if a scenario creates savings relative to the Reference Case, where a positive PVRR delta represents increased costs. The comparisons provided by NSP for the 2020 IRP Supplement EnCompass Model are shown below. Scenarios that were deemed impracticable due to the passage of time or because they include extension of Prairie Island are shown in grey, and NSP's Preferred Plan, Scenario 9, is shown in orange.

[6] NSP Discovery Response 1-1-004, Xcel Spreadsheet PU-23-064-1-2-012 Attachment A_EO – Base PVSC PVRR June 2020 Supplemental IRP (Trade Secrete), spreadsheet tab "PVSC-PVRR Total", dated February 17, 2024.

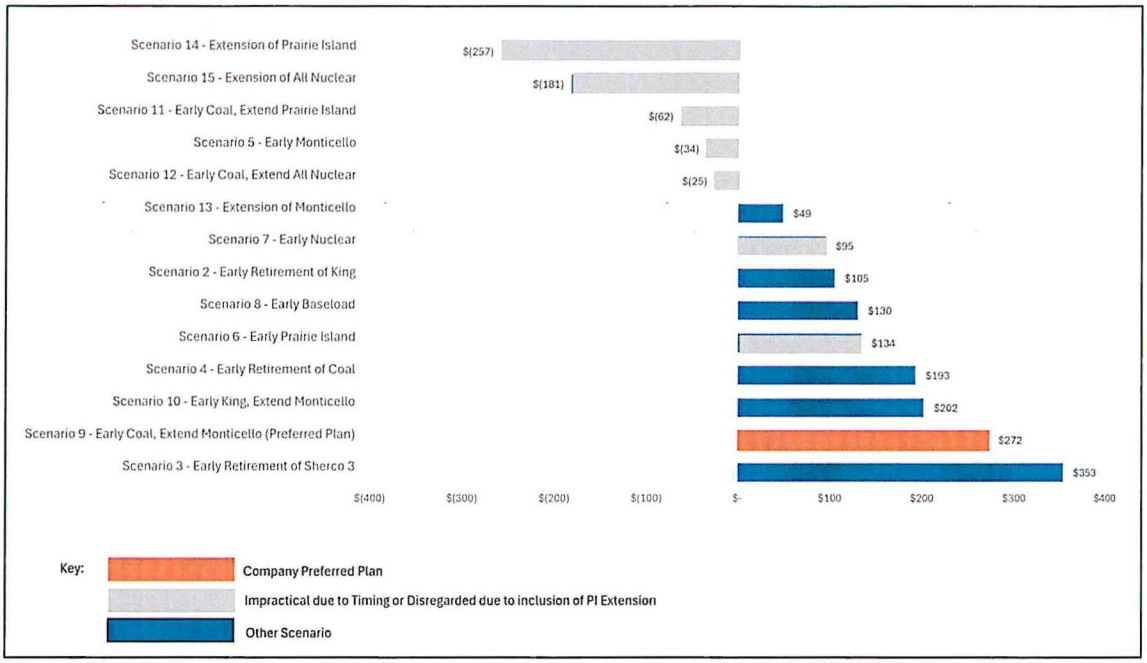

Figure 1 - 2020 IRP Supplement PVRR Comparison to Reference Case

NSP's comparison of scenario outputs from the 2020 IRP Supplemental model shows a PVRR cost of $96 million for Scenario 9 against the against the Reference Case and a PVRR savings of $46 million for the Alternate plan. The Company states that Minnesota has approved the Alternate Plan.

Q. How did NSP use the 2020 ND IRP Alternate Plan from the 2020 IRP to illustrate the economic benefits of Monticello life extension?

A. The ND Alternate Plan is a comparison of the Alternate Plan - ND Scenario to retirement of Monticello in 2030 and replacing it with other generation resources. The resource planning model used by NSP replaced Monticello with approximately 730 MW of natural gas fueled

combustion turbines, 750 MW of wind generation, and 200 MW of solar generation.[7] Table 2 of Ms. Mandich's testimony indicates there the changes included reduction of 50 MW of battery storage, a 200 MW increase in wind generation, a 50 MW increase in solar generation, and an increase of 748 MW of simple cycle combustion turbines to replace Monticello's generation. Ms. Mandich states that the ND Alternate Plan shows:

> *"Ultimately, Table 2 above shows that under North Dakota planning assumptions, the Company's proposed extension of the Monticello Plant to 2040 results in $145 million in additional costs on a PVRR basis."*[8]

Ms. Mandich goes on to discuss other benefits of Monticello life extension but does not quantify those benefits. NSP includes additional analysis based on Environmental Performance and Risk/Reliability sensitivities.[9] NSP also includes fuel and market price sensitivities that result in Monticello life extension PVRR ranging from a savings of $144 million to a $355 million in additional cost. Below is the results table from Ms.

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[7] Ms. Mandich testimony, page 16, lines 16 – 21.
[8] Ms. Mandich Testimony, page 19, lines 8-10.
[9] See Ms. Mandich Testimony, Table 2, titled "*Summary Results of North Dakota Monticello Scenarios*".

Mandich's testimony.

Category	Measure	Alternate Plan *(as presented in IRP)*	Alternate Plan - ND Scenario *(as presented in IRP)*	Monticello Replacement 1 *(fully optimized replacement)*
	Incremental resources (MW) selected to replace Monticello capacity and energy relative to the Alternate Plan – ND Scenario, through 2034	n/a	n/a	• Battery: (50) • CT: 748 • Wind: 200 • Solar: 50 *Plus fewer market sales and additional market purchases*
	2020-2045 PVRR ($ million), delta from Alternate Plan – ND Scenario	n/a	n/a	(145)
Environmental Performance	Carbon reduction from 2005 levels, 2031 (percent)	86	80	78
	Total carbon serving customers, 2031 (million tons)	3.82	5.53	6.16
	Total carbon-free generation, 2031 (percent)	82	77	72
Risk and Reliability	Firm capacity-to-annual (summer) peak demand ratio, 2034	0.58	0.72	0.72
	Firm capacity-to-winter peak demand ratio, 2034	0.75	0.93	0.93

Table 1 - 2020 North Dakota IRP Results

Q. What are your concerns with NSP's 2020 ND IRP analysis?

A. The selection of generation resources in the Monticello Replacement I scenario adds 948 MW of new generation to replace Monticello's 671 MW capacity, which is 41.2% higher than Monticello's capacity. The additional

748 MW of combustion turbine capacity (11.5% higher than Monticello capacity) alone would be sufficient to replace Monticello capacity.

Generation Resource	Difference between 2020 ND IRP Alternative Plan ND Scenario vs. Monticello Replacement 1 (MW)
Battery Storage	-50
Combustion Turbine	748
Wind	200
Solar	50
TOTAL CAPACITY CHANGE	948

Table 2 - Difference in Capacity in 2020 ND IRP Analysis

I understand that IRP modeling is intended to produce the most economic package of generation resources, but I fail to see how a capacity increase of 41.2% of Monticello's capacity can be economical. I understand that the generation resources NSP selected included significant intermittent capacity, such as wind and solar. It appears that this analysis still favors carbon free generation resources because it does not include any natural gas combined cycle (NGCC) generation. With Monticello's high cooperating capacity, NGCC would be a natural replacement for Monticello generation.

Q. What information did NSP provide on Monticello Capital investments?

A. As mentioned earlier, Mr. Krug discusses $97 million of capital investment associated with ISFSF expansion and SLR. NSP states the total cost of ISFSF for the 2030 - 2050 period to be about $298 million based on NSP Discovery Response 1-2-11 (Exhibit PSC-3). NSP has not identified any other capital investments in Monticello, needed to operate the plant between 2030 and 2050. Review of the 2020 IRP analysis included in discovery responses find capital expenditures in the Monticello life extension only scenario, Scenario 13, to be 4.6% higher than the Reference Case (Scenario 1).

Q. What reliability benefits has NSP identified due to Monticello life extension?

A. According to NSP witness Mr. Andrew W. Seibenaler, Monticello will provide reliability and system balancing benefits to the NSP system and Midwest Independent System Operator (MISO). According to Mr. Seibenaler:

"...the high capacity factor and accredited capacity of the Plant, with predictable and planned fuel outages, helps the Company maintain reliable operations and meet our obligations to MISO."[10]

Monticello historically has provided reliable operation and has operated at a capacity factor of 95 percent for the last three years. The plant is not subject to fuel supply issues and weather conditions as other fossil fueled base load capacity. Monticello also strengthens system voltage because it is a synchronous generator and can provide reactive power. NPS contends that if Monticello were retired, the types of generation replacing Monticello could cause transmission congestion.[11]

IV. Monticello Plant Assessment

Q. What material have you reviewed to determine if NSP's operation of Monticello and plant conditions life extension?

A. I have reviewed NRC Monticello Inspection Reports since 2019, Monticello's outage history over the last five years, plant performance, and operating history.

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[10] Mr. Andrew W. Seibenaler's testimony, page 2, lines 17-19, North Dakota Public Service Commission Case PU-23-064, dated February 3, 2023.
[11] Ibid, page 10 lines 13 – 22.

Q. What is your assessment of Monticello's record regarding NRC performance?

A. In my review of the 44 or so NRC inspection reports, covering the period of 2009 through 2024, NSP has done an excellent job in operating Monticello in accordance with NRC regulations. None of the inspection reports contain any findings above low safety significance, and NRC "green" designation and all items contained in the reports were non-cited violations. The inspection reports contain a few instances in which inspectors found issues which had not been initially addressed by NSP's team and brought to the NRC's attention.

The only concern raised in the NRC reports, which I feel needs continued NSP attention, is adherence to plant procedures and ensuring personnel understand the technical implications of actions. Continuous training and education of plant staff is important, and it appears NSP does a good job of this based upon the NRC findings. Making sure the plant has a corporate culture that supports questioning of actions when uncertainty arises is a major factor in making correct decisions. One instance in the NRC November 13, 2023 Integrated Inspection report discusses and instance in the full impact of a minor valve packing leak on over plant

safety, is an example of plant personnel not assessing the full implication of an event (Exhibit PSC-4).[12]

Q. What is your assessment of Monticello's plant performance and operating history for the last five- seven years?

A. NSP's witnesses discuss Monticello's plant performance over the last three years, which is based on a comment regarding the last six months being in 2022 on page 9, line 26 of Ms. Prochaska's testimony means the three year period would be 2019 – 2021. Using information obtained from S&P Capital IQ, the average capacity factor between 2017 and 2023 is 92.9%. This period includes four years with refueling outages and four

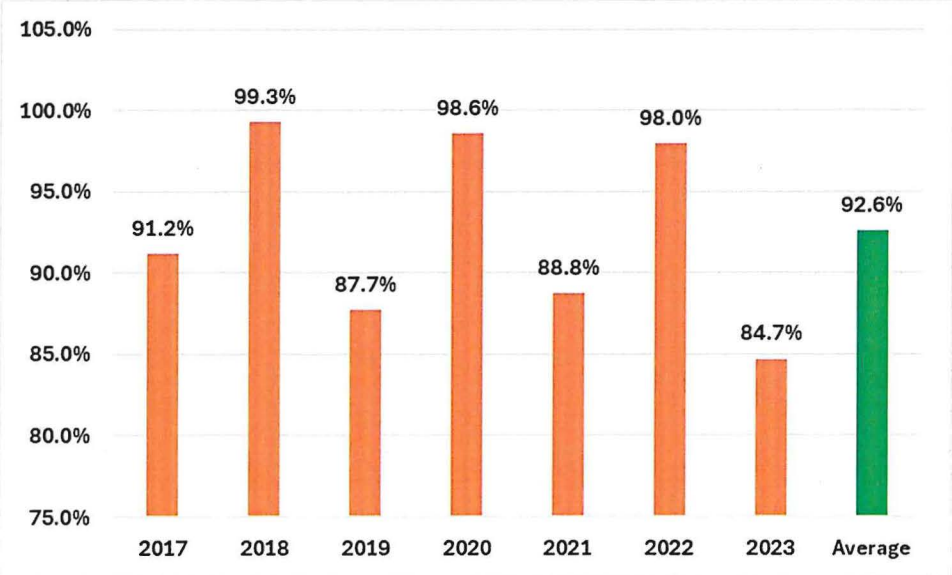

Table 3 - Monticello Capacity Factor

[12] Nuclear Regulatory Commission Integrated Inspection Report 05000263/2023003 AND 07200058/2023001, dated November 13,2023. See Inspection Results section, Finding labeled "*Failure to Meet Technical Specification Limiting Condition for Operation 3.6.1.3, Condition E, for Individual Main Steam Isolation Valve Leakage*".

years of full operations. This high of a capacity factor indicates the plant high plant availability with few forced outages or derates, especially in non-outage years in which the capacity factor exceeds 98%.

Q. Have you reviewed any Monticello outage reports?

A. Yes. There are critical components with a nuclear plant that are import to the ability for it to operate another 20 years. The NRC will perform a thorough review of the health of those components which are part of the nuclear safety related systems as part of the SLR process, to ensure they are capable of life extension. NSP has an Aging Management Program (AMP) which has reviewed Monticello systems and components, which may be near end of life.[13] It is my opinion the Monticello AMP's program is properly addressing aging infrastructure.

Monticello is a boiling water reactor, which produces steam with temperature and pressure conditions that result in condensation in the steam turbine. This can cause a failure of steam turbine blades and other components caused by structural failure of the parts. These failures can be caused by erosion from water droplets in the steam and by stress

[13]Ms. Prochaska's testimony, pages 41 – 47.

corrosion cracking in the metal. Stress corrosion cracking caused the catastrophic failure of the Sherco 3 steam turbine in 2011.

I reviewed Monticello turbine maintenance reports provided by NSP in Discovery Response 1-4-010, to determine how MSP has maintained Monticello's steam turbine and turbine components and the ability for the steam turbine to last through the end of 2050. Based on the inspection reports, I feel NSP has performed well in regard to Monticello's steam turbine maintenance and the unit should be able to operate through 2050.

V. Monticello Projected Capital Expenditures

Q. What categories of Capital expenditures do you expect Monticello to incur through 2050?

A. I would place expected Monticello Capital expenditures into four categories. The first capital cost category would be the cost of securing the SLR. The second capital cost category would be associated with ISFSF. I would place AMP related capital investments in their own category because at this point in time they are linked to Monticello life extension. The fourth category is annual capital associated with plant maintenance and refurbishment due to wear and tear on equipment.

Q. Do you feel NSP has included all the capital costs associated with securing an extension of its operating license through the SLR process?

A. Yes, to the extent they can. There is always a chance in NRC proceedings of surprises that create additional studies or exploration and result in additional capital costs. NSP appears to have a good relationship with the NRC and the inspection reports indicate NSP's approach to plant safety is sound. Thus, I feel the SLR cost shown in Mr. Kruger's Table 1, of $25 million is adequate.[14]

Q. Do you feel NSP has included all Monticello capital expenditures associated with spent fuel storage through 2050?

A. No. As discussed on page 12, NSP only included $72.1 million of the estimated $298 million ISFSF funds needed to store all spent nuclear fuel based on operating the plant through 2050. Although this is a significant increase in the ISFSF capital costs over the amount NSP has included in its ADP filing, the impact on North Dakota ratepayers would be negligible. This is due to the fact that the Department of Energy (DOE)is responsible for all spent nuclear fuel storage costs and NSP should be reimbursed for all ISFSF capital costs. Unfortunately the process set up by the DOE

[14] Mr. Kruger's testimony, page 11.

requires utilities with nuclear plants to spend the funds to construct, store and maintain nuclear spent fuel and then file a lawsuit to recover the costs from DOE. Thus, NSP will initially incur the spent fuel costs, then recover them from DOE, and then reimburse ratepayers.

Q. Do you feel NSP has included all Monticello capital expenditures associated with its operation through 2050?

A. No. The only Monticello operating capital investments discussed in NSP's ADP application are associated with the AMP activities, which is estimated to be around $2.0 million per year. NSP's application does not address any other capital expenditures that will occur during Monticello's operation through 2050. The 2020 IRP analysis and ND Alternative Plan analysis all include Projected Monticello capital expenditures but only through 2045 Thus, NSP has not identified the full amount of capital expenditures associated with operation of Monticello through 2050.

VI. Impact of Monticello Life Extension on North Dakota Ratepayers

Q. Did you review the load forecast prepared by NSP Energy which is used in support of its Integrated Resource Planning efforts?

A. I did. I reviewed documentation of NSP's methodologies and data sources used to develop long-term load forecasts and scenarios used for IRP planning purposes.

Q. Did you identify any concerns with the load forecast that would impact your opinion in this case?

A. I did not. I conclude that NSP is generally using industry standard data sources and methods to produce its long-term load forecast. I also conclude the data sources and general assumptions framing the load forecast meet or exceed industry standards.

Q. Can you provide more details on your review of the load forecast?

A. Yes. I shall cover specific elements of the load forecasts in the following discussion.

Q. What general methodology does NSP use for load forecasting?

A. NSP deploys a "bottom-up" forecasting approach, meaning that it projects energy sales at the jurisdictional (state) and sector (Residential, Commercial, Industrial) level. NSP uses econometric and other statistical modeling approaches to develop its sales forecasts. It then aggregates sales and applies loss factors to get energy requirements. NSP's demand model is based initially on a regression model that related energy to demand (load factor model) with adjustments made for energy efficiency, beneficial electrification, and large load impacts on demand.

NSP also makes several post-modeling adjustments to the forecasts prepared by their models. These adjustments include adjustments to reflect energy efficiency impacts, impacts of rooftop solar and distributed

energy resources, impacts from beneficial electrification, and adjustments to reflect large load expansions, contractions, and additions or losses.

Q. Do these approaches meet or exceed industry standard approaches?

A. Yes, they do. It is noteworthy that NSP is making a good faith attempt to incorporate the difficult-to-predict impacts that elements such as vehicles and beneficial electrification can have on future load requirements.

Q. What did you review with regard to NSP's input data sources?

A. NSP relies upon economic projections from HIS Global Insight and draws from national databases for other economic and weather-related assumptions. These data sources are used in the industry by many utility load forecasts.

Q. How did NSP develop load forecast scenarios?

A. In prior load forecasts, NSP had used a Monte Carlo simulation approach to develop forecast ranges around the base case forecast. In the current forecast, NSP chose a discrete scenario approach, citing the relative large impacts that data centers, beneficial electrification, and electric vehicles can have on ranges. The discrete scenarios used are reasonable and the resultant scenario forecasts produce a reasonable range of outcomes.

VII. Recommended Commission Action on NSP's ADP Request

Q. Has NSP provided a compelling economic case for the Monticello's proposed life extension through 2050?

A. No. I feel NSP failed to incorporate the full impacts of Monticello life extension for the entire 20-year life extension. None of NSP's economic anlaysis include the impact of Monticello's life extension through the period between 2040 and 2050. The PVRR benefit of $46 million discussed in Mr. Kruger's and Ms. Mandich's testimony is associated with the MPUC approved plan which incorporates multiple generation resource changes other than just the Monticello life extension. This PVRR benefit should not be used to identify the Monticello's life extension economic benefit because of the other generation resource change impacts on costs. Scenario 13 of NSP's 2020 IRP appears to provide the closest economic assessment of only Monticello's life extension, and it indicates the economic impact to be neutral.

NSP's ND Alternate Plan analysis appears to indicate that Monticello's life extension will increase PVRR by $145 million over the MPUC adopted plan. The sensitivity analyses associated with fuel and markets indicates a range of PVRR impact from $144 million benefit (high fuel and market price case) to $355 million higher cost (low fuel and market price). If

NSP's ADP for Monticello life extension were only based on this analysis, I would recommend the Commission reject NSP's request because the analysis shows that Monticello's life extension is more probable to cause an increase in North Dakota ratepayer rates over the life extension period then other alternatives included in NSP's ND Alternate Plan.

Q. Do you feel that Monticello's life extension would be imprudent for North Dakota ratepayers?

A. No, I feel Monticello can provide value to North Dakota ratepayers and that it will prove to be a prudent and economical source of energy for North Dakota. NSP makes the point that investments in Monticello over the last several years have improved plant operations and provides ratepayer benefits. Unfortunately, proper economic analysis dictates that sunk costs are not a reason to continue operation and incur future costs unless the asset continues to be used and useful. I do feel NSP's position on Monticello's reliability benefits are an important benefit to the reliability of the electric grid. With the amount of synchronous generation being retired in MISO, grid stability is going to be a major issue. Although improvements in inverter technology have made it possible for inverters to produce reactive power and other ancillary services, having major sources of synchronous generation on the grid simplifies the ability to maintain grid

stability. Monticello provides large synchronous generation stability, a highly reliable source of power, and does so without carbon emissions.

I am also concerned that NSP's ND Alternate Plan analysis did not include the potential impact on MISO capacity and energy markets from early retirement of baseload coal generation that has been announced throughout MISO's northern service area. As recently as MISO's 2022/2023 Planning Resource Auction indicated capacity shortfalls for the MISO North/Central Regions, causing capacity prices to reach the cost of building new generation. MISO's analysis found the North central region was short 4,458 of capacity and including imports remained 1,230 MW short of needed capacity. This caused the price of capacity to increase from $5.00/MW-day ($1,825/MW annually) to $236.66/MW-day ($86,381/ MW annually), over 4,700% increase. Over 10,000 MW of generation is scheduled to be retired in MISO before 2030 and even more after 2030. If newly proposed Environmental Protection Agency carbon emission rules or similar future rules are enacted, retirement of fossil generation will be significantly impacted.

In summary, Monticello's life extension is valuable because it provides the opportunity to continue utilization of an existing generation resource North

Dakota ratepayers have relied upon for many years. It is also an inexpensive insurance plan compared with the current technologies, such as inverter-based generation, battery storage, demand side management attempting to replicate the attributes of baseload generation already in the ground. Thus, I feel approval of Monticello's life extension is a prudent Commission decision.

Q. What is your overall recommendation for the Commission on the prudency of Monticello life extension?

A. The Commission should approve the life extension of Monticello at this time with the provision that if future economic analysis determines the plant is no longer economical to operate, it should be removed from the North Dakota ratebase. The economic analysis should be performed as part of the North Dakota IRP process. The analysis should compare Monticello cost to that of comparable generation resources that provide similar reliability and operating capacity factor on a total cost basis.

VIII. Future Rate Proceedings Recommendations

Q. What recommendations for the Commission do you suggest regarding Monticello costs treatment in future rate proceedings?

A. Based on the review of NSP's filing and the analysis discussed in this testimony, the following are recommendations for Commission action in

future NSP rate proceedings to ensure North Dakota customers are not harmed by various aspects of Monticello Life Extension:

1. The total cost of Monticello Subsequent License Renewal is capped at $25 million when calculating North Dakota ratepayer portion of the total costs.
2. North Dakota ratepayers should not pay any cost of ISFSF expansion costs and other spent nuclear fuel costs. These costs are ultimately refunded by DOE and NSP should include recovery of any costs associated with spent fuel storage, including interest, return on investment, taxes, etc., in the costs to be recovered from DOE.
3. Any capital costs associated with enabling Monticello to operate at lower load levels should not be incorporated in North Dakota rates unless NSP can demonstrate economic benefit to North Dakota ratepayers. If Monticello is required to operate at lower loads due to renewable generation resources, this is not a benefit to North Dakota customers because these resources are being added based on meeting Minnesota goals for reducing NSP's carbon emissions from power generation sources.
4. The Commission should periodically review the economics of continued Monticello operation to determine if it is the most

economical alternative for North Dakota ratepayers. As the amount of renewable generation increases, MISO hourly market prices will significantly change. In addition, the impact of fossil generation retirements on MISO capacity prices is unknown at this time. BY periodically reviewing Monticello economics, the Commission can determine if Monticello continues to be an economic resource.

Q. Does this conclude your testimony?

A. Yes, it does.