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November 12, 2024

—Via Electronic Filing—

Will Seuffert
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, MN 55101

RE: REPLY COMMENTS
NOBLES COUNTY SUBSTATION
DOCKET NO. E999/CI-24-316

Dear Mr. Seuffert:

Northern States Power Company, doing business as Xcel Energy, submits the enclosed Reply Comments per the Commission's September 23, 2024, NOTICE OF COMMENT PERIOD.

Portions of the Reply Comments are marked "Not-Public" as they contain information the Company considers to be trade secret data as defined by Minn. Stat. § 13.37(1)(b). The information contains confidential forecast data that derives an independent economic value from not being generally known or readily ascertainable by others who could obtain economic value or a financial advantage from its disclosure or use. The Company takes efforts to protect this information from public disclosure. Thus, Xcel Energy excises this information as protected data pursuant to Minn. Rule 7829.0500.

We have electronically filed this document with the Minnesota Public Utilities Commission, and copies have been served on the parties on the attached service list. Please contact Taige Tople at taige.d.tople@xcelenergy.com or me at jody.l.londo@xcelenergy.com if you have any questions regarding this filing.

Sincerely,

/s/

JODY LONDO
DIRECTOR, REGULATORY POLICY AND STRATEGIC ANALYSIS

Enclosure
cc: Service List

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STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION

Katie J. Sieben
Hwikwon Ham
Valerie Means
Joseph K. Sullivan
John A. Tuma

Chair
Commissioner
Commissioner
Commissioner
Commissioner

IN THE MATTER OF THE INVESTIGATION
INTO TRANSMISSION-CURTAILMENT
MATTERS, DRIVERS, AND POTENTIAL
SOLUTIONS TO LIMITATIONS RESULTING
FROM THE NOBLES COUNTY
SUBSTATION

DOCKET NO. E999/CI-24-316

REPLY COMMENTS

INTRODUCTION

Northern States Power Company, doing business as Xcel Energy, submits these Reply Comments to the Minnesota Public Utilities Commission in response to Comments submitted by several parties on October 23 and 24, 2024. We respond to these Comments by addressing the cause of congestion in southwestern Minnesota, overall congestion trends in Minnesota, and proposed solutions to help alleviate or resolve congestion in southwestern Minnesota.

First, we note that there is consensus among the commenting parties that the foundational cause of congestion in southwestern Minnesota is the current transmission grid's inability to handle the high volume of wind generation in this wind-rich area. Consequently, when generation is too high, wind farms in the area are curtailed to maintain grid stability. Older wind farms, with expired Production Tax Credits (PTCs), are the first to be curtailed because they are more expensive. MISO bases its generation dispatch on an economic model, which means that newer wind farms with active PTCs are prioritized over wind farms with expired PTCs. As an example, the Fenton wind farm, with no remaining PTCs is curtailed more often the wind farms that receive PTCs.

While the Department of Commerce Comments discuss this issue in terms of thermal and stability constraints, the fundamental cause of congestion in the area remains the same. The stability constraint in this area is due to voltage limitations; in other words, the transmission infrastructure cannot handle the high volume of energy generation in

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the area. The thermal constraints also stem from excessive generation; if MISO did not curtail wind generation, the energy produced would exceed the capacity of the transmission lines in the area, causing them to sag, collapse, or trip off, thus compromising their integrity.

We understand the impact of curtailments on wind farm owners and counties where these wind farms are located. We have implemented interim measures to minimize curtailments while long-term transmission infrastructure is being developed. Below, we discuss some of these solutions, including grid enhancing technologies (GETs) and non-wires alternatives, which aim to increase the capacity of the existing transmission infrastructure. Additionally, we outline the long-term transmission projects underway that will significantly increase the capacity of the grid in southwestern Minnesota and more broadly.

REPLY COMMENTS

For context, Figure 1 below presents information about congestion in Minnesota from January 2020 through September 2024.¹ The green lines represent MISO's calculations of total wind generation in Minnesota and the black bars indicate congestion costs. Overall, congestion has been decreasing.

Figure 1
Congestion Costs in Relation to Total MISO Wind Production
Determined by the LMP at NSP Generators
(not SW Minnesota Specifically)

[PROTECTED DATA BEGINS]

Figure 1 redacted.

[PROTECTED DATA ENDS]

There was a significant increase in cumulative congestion costs from 2020 to 2021, rising from [PROTECTED DATA BEGINS...² ...PROTECTED DATA ENDS] Another, smaller increase occurred from 2021 to 2022, with costs going from [PROTECTED DATA BEGINS...² ...PROTECTED DATA ENDS] The large increases between 2020 and 2022 coincided with a substantial amount of new wind generation coming online and transmission infrastructure being offline for upgrades during this period. However, in 2023, as transmission upgrades and projects were completed, congestion

¹ Congestion costs in the chart are determined by the LMP at all NSP generators, which may move over transmission lines owned by transmission owners other than the Company.

² This paragraph references the cumulative congestion costs for the years 2021-2024.

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costs decreased from [PROTECTED DATA BEGINS... [REDACTED]
[REDACTED] ...PROTECTED DATA ENDS] in 2023. Through September of this year, congestion costs have totaled [PROTECTED DATA BEGINS... [REDACTED]
[REDACTED] ...PROTECTED DATA ENDS] and are on track to be below the high congestion costs of 2021 and 2022.³

With that backdrop, the remainder of our reply addresses the solutions recommended in the parties' comments to alleviate or resolve the congestion in southwestern Minnesota.

In summary, commenters proposed increased transmission planning and inquired about how specific ongoing transmission projects will help alleviate regional congestion. They also asked the Company and MISO to address whether MISO's transmission planning studies consider the congestion affecting the Nobles County area. Additionally, commenters suggested GETs as potential short-term solutions while transmission infrastructure is being developed. We addressed these suggestions and discussed some of the non-wires alternatives we have implemented in the area. Finally, commenters inquired about whether new generation in the area might cause additional congestion and whether the Minnesota Energy Connection line will help alleviate congestion in the region.

A. Increased Transmission Planning

EDF Renewables, NG Renewables, and Minnesota Power all highlighted the need for more transmission lines in southwestern Minnesota. As discussed in our initial comments, we agree that increased and improved transmission infrastructure is the long-term solution to resolve the congestion in this area.

We also mentioned several of our ongoing transmission studies and projects in this area that work toward this goal. The *Nobles County Transformer Study* will add a third transformer to the Nobles County substation to resolve outages and ensure grid stability in the region. The *Buffalo Ridge Right Sizing Study*, which EDF Renewables inquired about,⁴ will replace an aging 115 kV transmission line with a double circuit line that helps transfer energy from Nobles County to less congested parts of the transmission grid. The *Joint Targeted Interconnection Queue Study* (JTIQ) includes a transmission line that is being reconfigured to run through Chanarambie Township in

³ There was a spike in congestion in September 2024 because certain transmission lines in the area were offline for upgrades.

⁴ EDF Renewables specifically requested that the Company and/or MISO describe how the Buffalo Right Sizing Study (i.e., MTEP 25 Project #50489) may alleviate congestion in the area—which we address in our initial comment and here.

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southwestern Minnesota and help transfer energy from Nobles County to less congested parts of the grid. We note that all these projects are contingent on various approvals, as discussed in detail in our initial comments.

Our initial comments also pointed to projects coming out of MISO's long range transmission planning (LRTP) that are expected to help this region. The *2023 MISO Informational Market Congestion Study* includes a project that helps upgrade the Stone Lake 345/161 kV Transformer in southwest Minnesota. *MISO Tranche 2 LRTP* includes two projects to help mitigate congestion in southern Minnesota, including upgrading an existing substation to better handle the increased energy production in the area – and building a new 765 kV transmission line from this substation to load centers in the Twin Cities. Again, these projects have not been finalized yet and are in various stages of approval, as discussed in our initial comments.

We appreciate EDF Renewables, NG Renewables, and Minnesota Power recognizing the current transmission development underway and understanding the significant time and financial investment required for this development.

B. MISO's Transmission Planning Studies

EDF Renewables requested that the Company and/or MISO discuss whether and how transmission planning and interconnection studies have considered the congestion and stability limitations in the Nobles County area. MISO establishes and administers its transmission planning and interconnection studies and protocols. From our understanding, the MISO studies mentioned in our initial comments have not specifically considered the congestion and stability limitations in the Nobles County area.⁵

However, our initial comments also highlighted the studies we have conducted in southwestern Minnesota, which do consider these limitations. The *Nobles County Transformer Study* will add a third transformer to the Nobles County substation to resolve outages and ensure grid stability in this area. This third transformer is projected to be in-service by December 31, 2026. Additionally, the *Buffalo Ridge Right Sizing Study* evaluated replacing an aging 115 kV transmission line with a double circuit line that includes both 115 kV and 345 kV lines. This new line would transfer energy from Nobles County to less congested parts of the transmission grid and, if approved, is expected to be in-service in the early 2030s.

⁵ This includes the *Joint Targeted Interconnection Queue Study*, *2023 MISO Informational Market Congestion Study*, and *MISO Tranche 2 LRTP*.

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C. Medium-Term Transmission Development

NG Renewables proposed medium-term transmission planning in the three-to-five-year range and suggested a strategy similar to the CapX2020 portfolio to alleviate congestion in this region. CapX2020 was a unique consortium of utilities that collaborated to plan transmission projects benefiting a multi-state geographic area served by multiple utilities.

We do not believe a CapX2020 style portfolio would address NG Renewables' concerns, because it took far longer than 3-5 years. The study and completion of the resulting projects was long-term and spanned 13 years, from 2004 to 2017; this is similar to the current long-range efforts MISO and Minnesota transmission owners have underway. In our experience, transmission planning is difficult to expedite and complete in the three-to-five year timeframe that NG Renewables envisions. If NG Renewables or other stakeholders have specific examples of medium-term transmission developments completed within the shorter timeframe, we would be happy to evaluate whether we can achieve something similar in this region.

D. Grid North Partners' Transmission Projects

Minnesota Power discussed its efforts with Grid North Partners to identify transmission projects to relieve congestion across Minnesota and the eastern Dakotas. We are also part of this effort and Grid North Partners is currently evaluating the feasibility of further transmission projects. This new project list has not been finalized, but if it includes projects in southwestern Minnesota, we will include information about these projects in the Minnesota Transmission Owners' 2025 Biennial Transmission Projects Report (BTPR).

E. Grid Enhancing Technologies

The Department raised GETs as a short-term solution to help alleviate congestion while longer-term transmission infrastructure is built. GETs aim to adjust settings on existing transmission infrastructure to optimize energy flow. While GETs may provide useful in this region, we first must run pilot programs to evaluate the reliability and then assess whether each GET would be helpful and cost-effective to use. We are accountable to our customers and take pride in delivering safe and reliable electric service across our entire service area, which requires thorough evaluation of new technologies through pilots.

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We will provide an update on our investigation into using GETs in our Minnesota Service territory as part of the 2025 BTPR, as required under Minn Stat. § 216B.2425 subd. 2. If the Commission determines it is a priority to use GETs and NWAs in southwestern Minnesota, we can also provide annual updates on our ongoing efforts with these technologies in this region. In the balance of this section, we address each GET proposed by the Department in its initial comments.

1. Dynamic Line Ratings

We agree with the Department's definition of Dynamic Line Rating (DLR): hardware or software used to calculate the thermal limit of existing transmission lines at a specific point in time by incorporating information on real-time and forecasted weather conditions. Essentially, transmission lines can handle slightly increased electric loads when the ambient temperature is cooler and wind speeds are higher, as both help cool the lines and prevent issues like sagging, collapsing, tripping off, and other integrity compromises. However, while DLRs can help lines handle some increased load, the increase is generally minimal and not a substitute for expanding transmission infrastructure.

The Company currently has one DLR project in Monticello, Minnesota, which is outside the region this docket focuses on. The project began in Q4 2023, when we installed the equipment to collect transmission line ratings. We intend to analyze the data collected this year and next year to ensure the safety and reliability of the line ratings and integrity of the systems and equipment used to generate these ratings. Concurrently, we will continue to evaluate other areas of our Minnesota service territory that could benefit from DLRs, potentially including southwest Minnesota. We will file an update with our analysis of the results from this year in the 2025 BTPR.

2. Power Flow Controllers

We agree with the Department's definition of Power Flow Controllers (PFC): hardware and software used to reroute electricity from overloaded transmission lines to underutilized transmission lines. We are currently reviewing presentations from companies that offer power flow controllers and are internally discussing their potential usefulness for our Minnesota service territory.

3. Topology Optimization/Reconfiguration Requests

We agree with the Department's definition of Topology Optimization (TO): software that uses calculations to identify reconfigurations in the transmission grid, rerouting

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electricity from overloaded transmission lines to underutilized ones. TO's are also referred to as reconfiguration requests. TOs are generally requested by energy producers experiencing curtailments or outages. Before MISO established an application process in 2023, these requests were submitted directly to utilities. Currently, MISO evaluates these requests and refers the requests to local utilities if there is a known local grid instability issue.

We completed the Hawksnest reconfiguration in 2022, which was submitted by EDF Renewables directly to the Company. This involved reconfiguring the Hawksnest 345 kV substation by opening breaker 8N85, which helped reduce thermal loading on several lines and reduced curtailments/outages at several windfarms, including EDF Renewables' Red Pine wind farm.

Another TO/reconfiguration request involving our service territory in southwest Minnesota was submitted by EDF Renewables and Minnesota Power earlier this year. Both EDF Renewables and Minnesota Power discussed this request in their initial comments. As we explained in our initial comments, this request involved a temporary system reconfiguration to reduce wind farm curtailments while we upgraded two of our transmission lines. We contacted EPRI for assistance to study the proposed request. Generally, requestors fund special study requests, and EDF Renewables initially agreed to pay for this one. However, as discussions continued, EDF Renewables withdrew its funding commitment, and thus the study was never initiated. We have since completed upgrades on the two transmission lines, and EDF Renewables' initial request only sought a temporary reconfiguration while these lines were offline. Therefore, while the study might inform future stability considerations if these particular lines go offline again, the primary driver for EDF's request has been resolved.

We agree that TO/reconfiguration requests can help alleviate congestion in this region and will continue evaluating other requests that MISO refers to us.

4. HVAC to HVDC Conversions

The Department also raised the category of "Other GETs," and requested that the Minnesota Transmission Owners discuss any completed, ongoing, or future efforts to convert high voltage AC (HVAC) transmission lines to high voltage DC (HVDC) lines. To alleviate the congestion in southwestern Minnesota using HVDC lines, we would need a HVDC line running from this area directly to load centers in the Twin Cities.

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We currently do not have any HVDC lines in our portfolio and do not plan to install any in the near future because of the significant costs.⁶ We do not foresee costs coming down anytime soon to make HVDC lines a financially feasible option to alleviate congestion in southwestern Minnesota.

F. Non-Wires Alternatives

Although stakeholders did not specifically mention non-wires alternatives (NWAs), we believe it would be beneficial to highlight some of our recent projects in this area, considering the Department's emphasis on short-term solutions during the ongoing transmission development. We also analyze NWAs for every transmission project included in our 2023 BRTP, as required by the Commissions June 12, 2018 Order in response to our 2018 BRTP.⁷ This section focuses on NWAs that are not GETs. Below, we describe some of our recent efforts in southwestern Minnesota.

Forman Transformer Rating Increase. We partnered with Otter Tail Power Company to evaluate and subsequently increase the emergency rating of the Forman Transformer at the substation in Forman, North Dakota.⁸ Although this substation is not in southwestern Minnesota, it affects congestion in this region because the Forman substation is connected to transmission lines that transfer power from this area to load centers. Increasing the emergency rating of this transformer enhances the substation's capacity. The previous emergency rating for this transformer was based on a decades-old manufacturer's recommendation using older technology. We funded a study of the transformer and the substation equipment to determine if the emergency rating could be safely increased. The evaluation confirmed that the upgrades to the substation in recent years allowed for a safe increase in the transformer's emergency rating. This, in turn, boosted the energy capacity of the Forman substation, reducing curtailments at wind farms in southwestern Minnesota. This project was completed in Q1 2021.

Wilmarth-Swan Lake Transmission Line Rating Increase. We increased the ratings on this line by adjusting our water clearance marks to reflect short-term flood forecasts. Lines with increased ratings can carry more electricity. The original ratings for this line were based on the 100-year floodplain levels for the area because we

⁶ The estimated cost is in the billions, regardless of whether we build a new HVDC line or convert an existing HVAC line to a HVDC line.

⁷ In the Commission's June 12, 2018 ORDER ACCEPTING REPORT, GRANTING VARIANCE, AND SETTING ADDITIONAL REQUIREMENTS, in Docket No. E999/M-17-377, Order Point 2 states: "In their 2019 Report, the MTO shall include content similar to 2017 Report, and include an improved and expanded assessment of non-wire alternatives"

⁸ Otter Tail Power Company owns the substation where this transformer is located.

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could not accurately forecast flood levels every year. Because we can now accurately forecast floods for the upcoming year, we adjusted the line rating accordingly. The rating on this line has been increased, except when a flood is forecasted, in which case we decrease the rating. This project was completed in Q3 2024.

Scott County-Blue Lake Transmission Line Meter Upgrades. We increased capacity on a 345 kV transmission line between Scott County and Blue Lake by removing an old meter that had a maximum reading below what the connecting substation could handle. Removing this old meter did not affect the safety or reliability of this line or connected substation. This project was completed in Q3 2022.

Battery Storage. We are currently conducting an internal study to determine substations that would most benefit from battery storage to ease generation restraints; the southwestern Minnesota area is included in our study. After we decide whether and if so, which substations to focus on, we will evaluate what battery size is needed to help ease capacity generation constraints. We will prioritize installing battery storage sites at areas experiencing the most generation constraints. We will provide updates in the 2025 BTPR.

As mentioned earlier, if the Commission determines it is a priority to use GETs and NWAs in southwestern Minnesota, we will provide annual updates on our ongoing efforts with these technologies in this region.

G. Further Restrictions from New Generation

EDF suggests that the Company and/or MISO should provide information on whether new generation in the area might trigger existing limits, introduce new restrictions, or cause additional congestion or curtailment for generators. MISO has rigorous protocols to assess the impact of new generation, whether it is in this specific geographic area or anywhere in its footprint. If the Commission determines a special study is necessary, we believe it will be important to ensure that it is not duplicative and that it is conducted in accordance with established MISO protocols.

H. Minnesota Energy Connection Line

NG Renewables believed that the Company should provide more information on the Minnesota Energy Connection line, including on “the types of resources and the nameplate vs. accredited capacity of interconnecting resources, and the real MW amount that will be available for non-Xcel interconnectors.”⁹

⁹ NG Renewables’ Initial Comment at 6.

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The Minnesota Energy Connection line will not help alleviate or relieve the congestion in southwestern Minnesota. This line is a generation tie line that brings energy from multiple resources to one point of interconnection. It is not a transmission line that would help transfer energy from the congested parts of the grid in southwestern Minnesota to load centers or other parts of the grid with transmission capacity available.

We also note that we have made many proactive and substantial filings in dockets related to the Minnesota Energy Connection line to inform stakeholders on what this line will entail and our progress with it.¹⁰ We encourage stakeholders to address their comments about this line in the dockets specific to the Minnesota Energy Connection to help the Commission streamline these discussions.

CONCLUSION

The Company appreciates the opportunity to comment on the causes of congestion in southwestern Minnesota and the proposed solutions to help alleviate or resolve this congestion. We are actively collaborating with MISO, Grid North Partners, and other stakeholders to alleviate the underlying issues and decrease curtailments in Minnesota. We look forward to providing further updates on an ongoing basis in the 2025 Minnesota Transmission Owners' Biennial Transmission Projects Reports. As mentioned earlier, if the Commission determines it is appropriate for the Company to prioritize the use of GETs and NWAs in southwestern Minnesota, we can provide ongoing annual updates on our efforts with these technologies in this area.

Dated: November 12, 2024

Northern States Power Company

¹⁰ Docket Nos. E002/CN-22-131, E002/CN-22-132.

CERTIFICATE OF SERVICE

I, Christine Schwartz, hereby certify that I have this day served copies of the foregoing document on the attached list of persons.

xx by depositing a true and correct copy thereof, properly enveloped
with postage paid in the United States mail at Minneapolis, Minnesota

xx electronic filing

DOCKET No. E999/CI-24-316

Dated this 12th day of November 2024

/s/

Christine Schwartz
Regulatory Administrator

[illegible]

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