CERTIFICATE OF NEED &
ROUTE PERMIT APPLICATION
FOR THE HVDC MODERNIZATION PROJECT

MINNESOTA POWER

E015/TL-22-611

E015/CN-22-607

minnesota power

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Prepared by:

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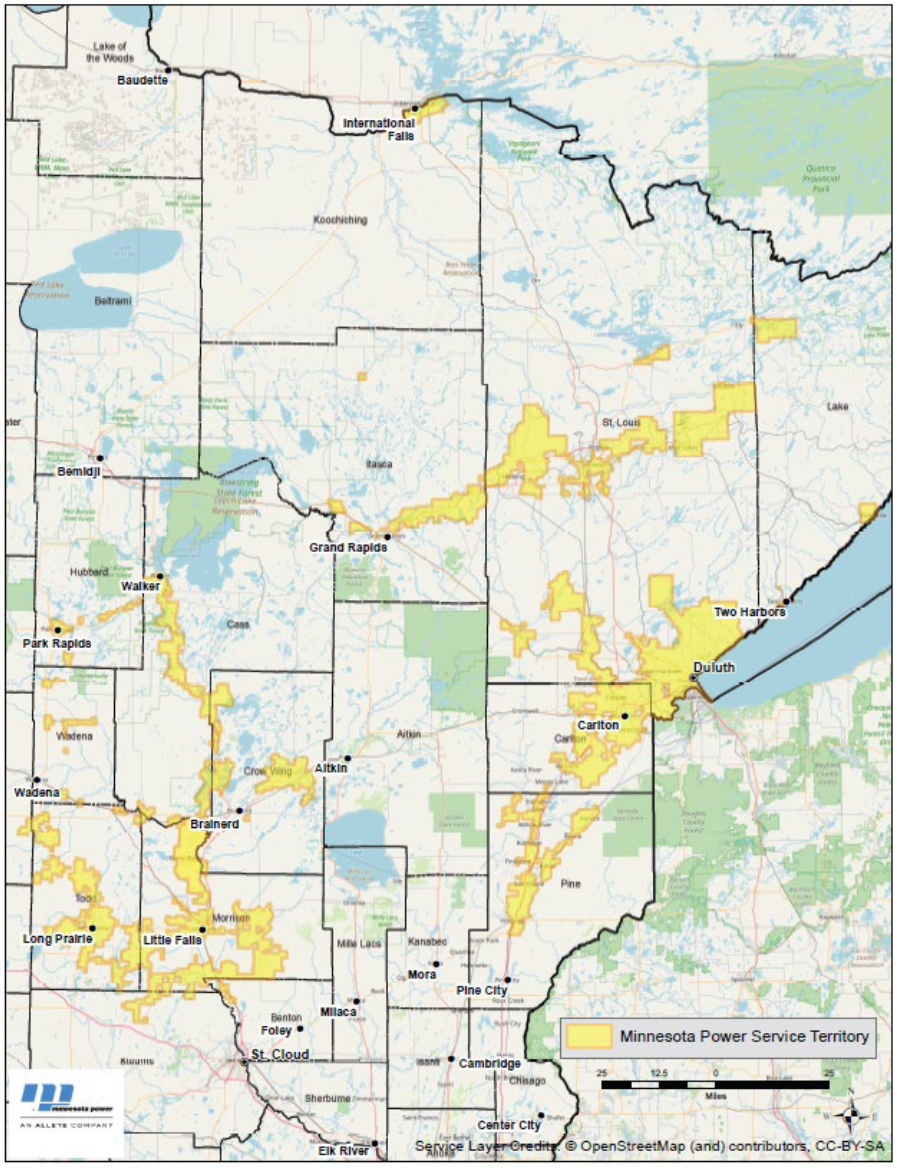
1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

Minnesota Power (or the "Applicant") is an investor-owned public utility headquartered in Duluth, Minnesota. Minnesota Power supplies retail electric service to 150,000 retail customers, including some of the nation's largest industrial customer operations, and wholesale electric service to 14 municipalities in a 26,000-square-mile electric service territory located in northeastern Minnesota. Minnesota Power generates and delivers electric energy through a network of transmission and distribution lines and substations throughout northeastern Minnesota. Minnesota Power's transmission network is interconnected with the regional transmission grid to promote reliability and Minnesota Power is a member of the Midcontinent Independent System Operator, Inc. ("MISO") and the Midwest Reliability Organization ("MRO").

Figure 1.1-1 – Minnesota Power Service Territory



Minnesota Power operates a 1,600-megawatt ("MW") peak demand system with electric power generation in the form of renewable wind, solar, and hydropower generation facilities as well as coal, biomass, and natural gas-fired power plants in Minnesota and additional wind facilities in North Dakota. Minnesota Power also purchases electricity from independent power producers and other public utilities. Minnesota Power was the first utility in the state to deliver 50 percent of its power from renewable resources and a significant portion of that carbon-free energy is currently delivered to Minnesota Power's service area by the 465-mile-long Square Butte High-Voltage Direct-Current ("HVDC") 550 MW transmission line ("HVDC Line").

Minnesota Power submits this application to the Minnesota Public Utilities Commission ("Commission") for a Certificate of Need and Route Permit to construct modernized HVDC Line terminals and transmission facilities necessary for their operation (the "HVDC Modernization Project" or the "Project"). The original HVDC Line and terminals were placed in service in 1977 prior to Minnesota siting and permitting requirements and were, therefore, exempt from state permitting requirements.

The Project involves modernizing and upgrading both HVDC terminals for the 465-mile-long HVDC Line and interconnecting the upgraded HVDC terminals to the existing alternating-current ("AC") transmission system. These HVDC terminals are currently located near the Arrowhead Substation in Hermantown, Minnesota and the Center Substation in Center, North Dakota. Voltage and power transfer capabilities on the HVDC Line will remain the same and the Project will ensure bi-directional flow capability through the installation of state-of-the-art equipment. Additional detail on bi-directional flow and dispatch capabilities is covered in Section 3.3.2.4 of this Application. Minnesota Power will own all the facilities proposed and will acquire all land rights needed for the construction and operation of the Project facilities.

To modernize the HVDC terminals and implement the latest technology, new buildings and electrical infrastructure need to be constructed on a new site near the existing HVDC terminals. In Minnesota, to connect the new HVDC terminal to the existing AC system, the Project would require the construction of a new St. Louis County 345 kilovolt ("kV")/230 kV substation located less than one mile west of the current Arrowhead Substation. The new HVDC terminal would be connected to the new St. Louis County Substation by less than one mile of 345 kV large high-voltage transmission line ("LHVTL") and the St. Louis County Substation would be connected to the existing Arrowhead Substation by two parallel 230 kV LHVTLs less than one mile in length. Additionally, a short portion of the existing ±250 kV HVDC Line in Minnesota will need to be reconfigured to terminate at the new HVDC terminal.

The HVDC Modernization Project is scheduled to be placed in service between 2028 and 2030 and is a critical component of Minnesota Power's efforts to leverage existing infrastructure to efficiently maintain the current load, gain additional access to renewable resources for customers, and keep momentum for reaching the state's goal of 100 percent carbon-free energy by 2040. The Project also innovatively proposes flexible design options to allow for future expansion and additional renewable energy transfer capability, leveraging the unique attributes of HVDC technology—the most efficient way to transfer power over long distances.

1.2 PROJECT NEED AND PURPOSE

The HVDC Modernization Project is needed to modernize aging HVDC assets that are critical to the grid, continue to position the grid for the clean energy transition, and improve the reliability of the transmission system in Minnesota and North Dakota. The existing HVDC terminal has successfully operated for 45 years—15 years beyond its 30-year design life—continuously

delivering value for Minnesota Power's customers. In recent years, Minnesota Power has experienced HVDC terminal outages due to failures in the control system, power electronics, transformers, and other components. Based on experience with other electric system components, the failure rate is expected to increase, which is of particular concern for the existing HVDC system because of limited parts availability. The orderly replacement of the HVDC terminal equipment is prudent to ensure continuous efficient delivery (and expansion) of Minnesota Power's renewable, carbon-free energy resources into the future.

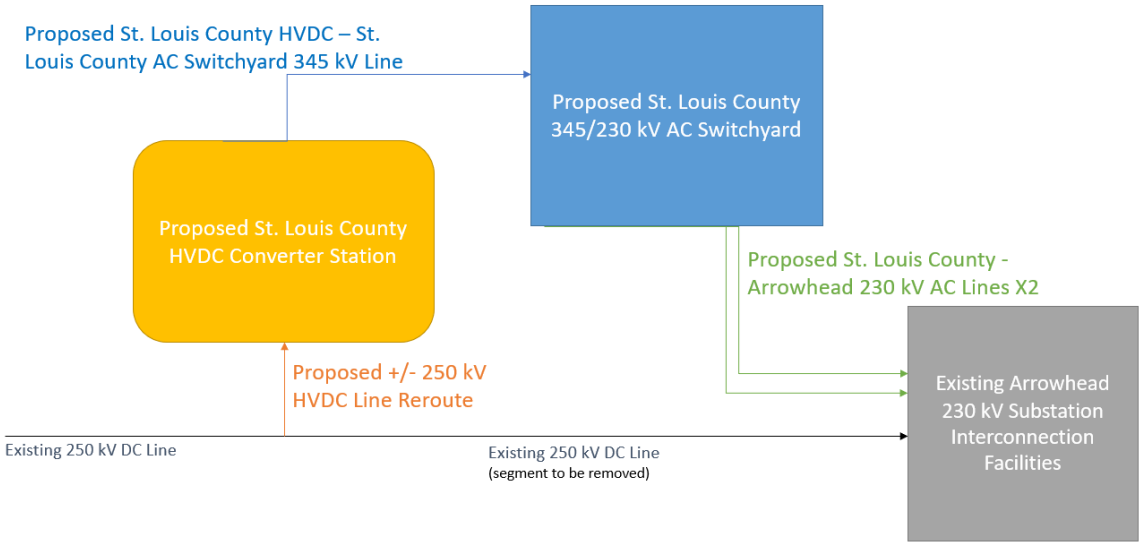
In addition to the replacement of the existing HVDC terminals, the new Voltage Source Converter ("VSC") HVDC technology implemented for the Project will be designed to provide voltage regulation, frequency response, blackstart capability, and bidirectional power transfer capability, all of which will enable Minnesota Power and the region to continue to support its clean energy transition reliably.

1.3 PROPOSED PROJECT FACILITIES

To modernize the HVDC terminals and implement the latest technology, new buildings and electrical infrastructure need to be constructed on a new site near the existing HVDC terminals. In Minnesota, to connect the new HVDC terminal to the existing AC system, the Project would require the construction of a new St. Louis County 345 kV/230 kV substation located less than one mile west of the current Arrowhead Substation. The new HVDC terminal would be connected to the St. Louis County Substation by less than one mile of 345 kV LHVTL and the new St. Louis County Substation would be connected to the existing Arrowhead Substation by two parallel 230 kV LHVTLs less than one mile in length. Additionally, a short portion of the existing ±250 kV HVDC Line in Minnesota will need to be reconfigured to terminate at the new HVDC terminal.

Figure 1.3-1 provides a conceptual drawing of the proposed new facilities relative to the existing ±250 kV HVDC Line and the Arrowhead Substation in Minnesota. This figure is not drawn to scale and does not represent a final site design, layout, or proposed transmission alignment.

Figure 1.3-1 – Proposed Facilities Drawing



In North Dakota, the Project will consist of an expansion of the separately-proposed Nelson Lake 230 kV Substation to add a 345 kV/230 kV transformer and 345 kV line entrance, a new HVDC Converter Station, a new 345 kV line from the Converter Station to the Nelson Lake Substation, and a ±250 kV HVDC Line Extension from the new Converter Station to tie into the existing ±250 kV HVDC Line. The siting of the North Dakota HVDC terminal upgrades will be permitted separately through the North Dakota Public Service Commission.

1.4 PROJECT SCHEDULE AND COST

Once regulatory approvals are in place, Minnesota Power will enter into a firm engineering, procurement, and construction ("EPC") contract with the preferred HVDC supplier to finalize material orders and engineering design for long lead time components. Because of the limited number of manufacturers of the type of equipment used in HVDC terminals and highly constrained global HVDC market conditions, Minnesota Power has already secured a manufacturing slot reservation with a preferred supplier to ensure it can meet the schedule laid out below. Amid rapidly evolving global HVDC market conditions and supply constraints, this procurement strategy ensures schedule certainty for Minnesota Power's customers while stabilizing the budgetary outlook for the Project. These timelines are primarily dictated by the manufacturing process and are out of Minnesota Power's control. However, Minnesota Power anticipates beginning construction of the Minnesota terminal as early as 2024 and starting construction of the North Dakota Terminal in 2025 dependent on having all required regulatory approvals in place. The Project is scheduled to be in service between 2028 to 2030. In aggregate, the HVDC Modernization Project (both Minnesota and North Dakota portions) is anticipated to cost approximately $660 to $940 million, and construction will take three to five years to complete. Federal and State grant cost mitigation continues to be pursued to help support this critical infrastructure.

1.5 POTENTIAL ENVIRONMENTAL IMPACTS

Minnesota Power analyzed the potential environmental impacts from the proposed Project. No significant unavoidable impacts will result from construction of the proposed Project. Additionally, Minnesota Power has acquired or is in the process of acquiring the majority of the land within the Proposed Route, including sites for the new HVDC Converter Station and the St. Louis County 345 kV/230 kV Substation. The land acquired by Minnesota Power contains a limited number of homesteads which will be abandoned after acquisition. Additional information about the potential environmental impacts of the proposed Project and proposed mitigation measures is provided in Chapter 7.0.

The Department of Commerce, Energy Environmental Review and Analysis unit ("DOC EERA") is responsible for environmental review of the Project. The Certificate of Need rules require the preparation of an Environmental Report, whereas the Route Permit rules require preparation of an Environmental Document, which Minnesota Power intends to do under the alternative review process via an Environmental Assessment ("EA"). The DOC EERA may elect to prepare an EA for the Project that analyzes potential environmental impacts and meets all statutory and rule requirements of both the Environmental Report and the EA.

1.6 PUBLIC INPUT AND INVOLVEMENT

Minnesota Power employed various engagement methods to provide information about the proposed Project to the public and local agencies, Tribal government representatives, and elected officials. These engagement methods included open houses, direct mailings, agency meetings, and Project information included on Minnesota Power's website. Additional information regarding

the public outreach efforts conducted prior to the filing of this application is provided in Chapter 8.0.

Interested stakeholders and the public will have the opportunity to review this application and to submit comments to the Commission about the Project. A copy of the application will be available on the Department of Commerce's Project website (http://mn.gov/commerce/energyfacilities). Additionally, a copy of this application will be available at the Duluth Public Library for the public to review.

Within 60 days of the Commission's acceptance of this application as complete, a public information and scoping meeting will be held in the Project area by the Commission and DOC EERA to answer questions about the Project and to solicit public comments and suggestions for matters to examine during its environmental review. In a few months, assuming the Department of Commerce chooses to prepare an EA that includes all requirements of an Environmental Report, a public hearing will be held in the Project area after the EA is complete. At this hearing, members of the public will be given an opportunity to ask questions and submit comments. Minnesota Power will also present further evidence to support its need and route for the Project. Minnesota Power anticipates that the Commission will hold a joint public hearing on both the Certificate of Need and the Route Permit pursuant to Minn. Stat. § 216B.243, subd. 4.

Persons interested in receiving notices and other announcements about the Project's Certificate of Need application can subscribe to the docket by visiting https://mn.gov/puc/ and using the following steps. Select "eDockets", then "eFiling Home/Login" in the left menu and click on the "Subscribe to Dockets" button. Enter an email address and select "Docket Number" from the Type of Subscriptions dropdown box, then select "[22]" from the first Docket number drop down box and enter "[607]" in the second box before clicking on the "Add to List" button. You must then click the "Save" button at the bottom of the page to confirm your subscription to the Project's Certificate of Need docket. These same steps can be followed to subscribe to the Project's Route Permit docket (E015/TL-22-611).

Persons wanting to have their name added to the Project Route Permit proceeding mailing list (MN PUC Docket No. E015/TL-22-611) may register by contacting the public advisor in the consumer affairs office at the Commission at consumer.puc@state.mn.us, or (651) 296-0406 or 1-800-657-3782. Please be sure to note: 1) how you would like to receive notices (regular mail or email) and 2) your complete mailing or email address.

A separate mailing list is maintained for the Certificate of Need proceeding. To be placed on the Project Certificate of Need mailing list (MN PUC Docket No. E015/CN-22-607), mail, fax, or email Robin Benson at Minnesota Public Utilities Commission, 121 7th Place E., Suite 350, St. Paul, MN 55101-2147, Fax: 651-297-7073, or robin.benson@state.mn.us. Contact information for the Minnesota state regulatory staff for this Project is listed below:

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1.7 CERTIFICATE OF NEED PROCESS

Minnesota Statute § 216B.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…." "Large energy facility" is defined in Minn. Stat. § 216B.2421, subd. 2(2), as "any high-voltage transmission line with a capacity of 200 kilovolts or more and greater than 1,500 feet in length." Minnesota Power anticipates that both the Proposed St. Louis County HVDC – St. Louis County AC Switchyard 345 kV line and the Proposed St. Louis County – Arrowhead 230 kV lines will exceed 1,500 feet in length. Therefore, the proposed new transmission facilities require the issuance of a Certificate of Need from the Commission prior to construction.

The term Large High Voltage Transmission Line, or LHVTL, is defined in Minn. Rule 7849.0010, Subp. 14, as "a conductor of electrical energy as defined by Minnesota Statues, section 216B.2421, subdivision 2, clause (2), and associated facilities necessary for normal operation of the conductor, such as insulators, towers, substations, and terminals." As a result, Minnesota Power's application for a Certificate of Need includes the three LHVTL described in the paragraph above, plus the proposed associated facilities, including the Proposed St. Louis County HVDC Converter Station, the Proposed St. Louis County 345 kV/230 kV Substation, and the Proposed ±250 kV HVDC Line reroute.

The Commission has adopted rules for the consideration of applications for Certificates of Need. Minn. R. 7829.2550 requires a Notice Plan to be submitted for review by the Commission at least three months before filing a Certificate of Need application under Minn. Stat. § 216B.243. On November 30, 2022, Minnesota Power submitted the Notice Plan for Commission approval.

The Commission has adopted rules for the consideration of applications for Certificates of Need, found in Minn. R. Ch. 7849. On November 30, 2022, Minnesota Power filed a Petition for Exemption under Minn. R. 7849.0200, subp. 6, requesting that the Applicant be exempt from certain filing requirements under Chapter 7849. The Commission approved the Petition in an order dated February 1, 2023 ("Exemption Order") which is provided in Appendix E.

This application assumes a joint regulatory review process will be pursued and thus contains the information required under Minn. R. ch. 7849, as modified by the Commission in its Exemption Order. A copy of the Commission's Exemption Order is provided in Appendix E. A Certificate of Need completeness checklist is provided in Appendix A with cross references indicating where the information required by Minnesota statute and rules can be found in this application.

1.8 STATE ROUTING PROCESS

Minnesota Statute 216E, also known as the Minnesota Power Plant Siting Act, provides the Commission with siting and routing authority for large electric power facilities. Pursuant to this authority, Minn. R. ch. 7850 lays out the process by which the Commission should select sites and routes for large electric power generating plants and high voltage transmission lines. Minn. Rule 7850.1000, subp. 9, defines "high voltage transmission line" or HVTL as "…a conductor of electric energy and associated facilities designed for and capable of operating at a nominal voltage of 100 kV or more either immediately or without significant modification. Associated facilities shall include, but not be limited to, insulators, towers, substations, and terminals."

This application is submitted under the alternative permitting process set forth in Minn. Stat. § 216E.04 and Minn. R. 7850.2800 to 7850.3900. The Project qualifies for review under the alternative permitting process authorized by Minn. Stat. § 216E.04, subd. 2(4) and Minn.

R. 7850.2800, subp. 1(D) because the Project is a high voltage transmission line in excess of 200 kV and fewer than five miles in length.

Minnesota Power notified the Commission on November 30, 2022 that Minnesota Power intended to use the alternative permitting process for the Project. The letter complied with the requirements of Minn. R. 7850.2800, subp. 2, to notify the Commission of its intent at least 10 days prior to submitting an application for a Route Permit. A copy of this letter is attached as Appendix G.

The Commission has adopted rules for the consideration of Route Permit applications in Minn. R. 7850.4000 to 7850.4400. A Route Permit completeness checklist is provided in Appendix B with cross references indicating where the information required by Minnesota Statutes and Administrative Rules can be found in this application.

1.9 REQUEST FOR JOINT CERTIFICATE OF NEED AND ROUTE PERMIT PROCEEDING

Minn. Stat. § 216B.243, subd. 4 and Minn. R. 7849.1900, subp. 4 permit the Commission to hold joint proceedings for the Certificate of Need and Route Permit in circumstances where a joint hearing is feasible, more efficient, and may further the public interest.

Minnesota Power respectfully requests that the Commission order a joint regulatory review process for the Certificate of Need and Route Permit applications. A joint hearing is feasible and more efficient than two separate proceedings and will further the public interest by allowing both need and routing issues to be examined in a singular proceeding.

1.10 PERMITTEE

Minnesota Power is the requested permittee for the Project, who will have ownership at the time of filing this application and after commercial operation. Phone and email addresses for the Project are:

Project Phone Number: 218-355-3515
Project email address: askus@mnpower.com

Minnesota Power's contact for the Project is:

Dan McCourtney
Manager – Strategic Environmental Initiatives
Minnesota Power
30 West Superior Street
Duluth, MN 55802
218.355.3515

1.11 APPLICANT'S REQUEST

Minnesota Power respectfully requests that the Commission approve a Certificate of Need and Route Permit for the proposed Project along the Proposed Route. The Commission has established criteria in Minn. R. 7849.0120 to apply in determining whether a Certificate of Need should be granted for a proposed high voltage transmission line. An applicant for a Certificate of Need must show that the probable result of denying the request would be an adverse effect on the future adequacy and reliability of the system, there is not a more reasonable and prudent alternative, the proposed facility will provide benefits to society compatible with protecting the

environment, and the project will comply with all applicable standards and regulations. Minnesota Power has demonstrated in this application that the proposed Project meets all the requirements to obtain a Certificate of Need. The Project will modernize aging assets, improve the reliability of the transmission system and is critical to the reliable delivery of renewable energy to Minnesota Power's customers.

This application demonstrates that issuance of a Route Permit for construction of the proposed Project along the Proposed Route effectively considers and satisfactorily addresses factors as set forth in Minn. Stat. § 216E.03, subd. 7, and Minn. R. 7850.4100. The proposed Project will support the State's goals to conserve resources and to minimize environmental and human settlement impacts and land use conflicts by leveraging existing assets, using land owned by Minnesota Power in close proximity to existing transmission substations and transmission lines, and will ensure the State's electric energy security through the construction and modernization of efficient, cost-effective transmission infrastructure.

2.0 PROPOSED PROJECT

2.1 PROJECT DESCRIPTION

To modernize the terminals of the existing Square Butte HVDC Line and implement the latest VSC HVDC technology, new buildings and electrical infrastructure need to be constructed on a new site near the existing HVDC terminals. In Minnesota, to connect the new HVDC terminal to the existing AC system, the Project would require the construction of a new St. Louis County 345 kV/230 kV substation located less than one mile west of the current Arrowhead Substation (see Map 1). The new HVDC terminal would be connected to the St. Louis County Substation by less than one mile of 345 kV LHVTL and the new St. Louis County Substation would be connected to the existing Arrowhead Substation by two parallel 230 kV LHVTLs less than one mile in length. Additionally, a short portion of the existing ±250 kV HVDC Line in Minnesota will need to be reconfigured to terminate at the new HVDC terminal.

In North Dakota, the Project will consist of an expansion of the separately proposed Nelson Lake 230 kV Substation to add a 345 kV/230 kV transformer and 345 kV line entrance, a new HVDC Converter Station, a new 345 kV line from the Converter Station to the Nelson Lake Substation, and a ±250 kV HVDC Line Extension from the new Converter Station to tie into the existing ±250 kV HVDC Line. The siting of the North Dakota HVDC terminal upgrades will be regulated by the North Dakota Public Service Commission and permitted as part of the Certificate of Corridor Compatibility and Route Permit Application process.

2.1.1 Substation and Terminal Facilities

Substation and terminal facilities are sometimes referred to as 'Associated Facilities' in transmission line Certificate of Need and Route Permit Applications. For the proposed HVDC Modernization Project, the substations and terminals are the primary and most significant facilities proposed, and the short transmission line segments are ancillary facilities for interconnecting the HVDC terminal with the substation facilities. Chapter 3.0 further discusses the rationale for the proposed relocation of the substation and terminal facilities.

For substation and terminal facilities, the Project will require a new HVDC terminal, a new St. Louis County 345 kV/230 kV substation, and upgrades to the existing Arrowhead Substation 230 kV bus. The HVDC terminal will convert the DC electricity into AC and will interconnect to

the AC transmission system at 345 kV via a short 345 kV transmission line to the St. Louis County Substation. The area proposed for this infrastructure is identified in Figure 2-1.

2.1.2 Proposed Route

The Project includes the construction of approximately 40 acres of new terminal facilities as well as the construction of LHVTL to connect those facilities to each other and to the existing electrical grid (see Map 1). Minnesota Power plans to have all proposed Project facilities located on land owned by Minnesota Power in St. Louis County, although land acquisition is ongoing at the time of filing this Application. The preliminary layout on Map 1 is conceptual only and all facilities are proposed within the area identified on Map 1 as the Proposed Route. The term "Proposed Route" when used in this application includes all LHVTL and associated facilities, plus all work areas needed to build and operate the proposed modernizations.

2.1.2.1 Route Width

The Power Plant Siting Act, Minn. Stat. ch. 216E, directs the siting of transmission lines in a way that "minimize[s] adverse human and environmental impact while ensuring continuing electric power system reliability and integrity and ensuring that electric energy needs are met and fulfilled in an orderly and timely fashion." Further, it authorizes the Commission to meet its routing responsibility by designating a "route" for a new transmission line when it issues a Route Permit. A "route" may have "a variable width of up to 1.25 miles," within which the right-of-way for a HVTL can be located. Minnesota Power's Proposed Route is approximately 0.5 mile wide from north to south and 0.7 mile long from east to west.

The transmission line right-of-way is the specific area within a route that is required for the construction, maintenance, and operation of a HVTL. For the proposed HVDC Modernization Project, the substations and terminals are the primary and most significant facilities proposed, and the short transmission line segments are ancillary facilities for interconnecting the HVDC terminal with the substation facilities. Chapter 3.0 further discusses the rationale for the proposed relocation of the substation and terminal facilities.

Minnesota Power is requesting a route width that is wide enough to provide flexibility to design facilities to minimize system impacts and outages, to optimize future expandability work with landowners, to address engineering concerns after a Route Permit has been issued, to avoid sensitive natural resources, and to manage construction constraints as practical. In addition, unlike traditional transmission line projects, Minnesota Power plans to purchase and own in fee simple all the land required for Project construction and operation, in which case no "right-of-way" as such would be required. However, at the time this application was filed with the Commission, landowner negotiations were still ongoing for some required Project parcels.

2.1.2.2 Transmission Line Right-of-Way

To the extent possible, the Project will not use traditional transmission line easements for rights-of-way and will, instead, construct the Project on land owned by Minnesota Power. Because landowner negotiations are ongoing for several required Project parcels, Minnesota Power reserves the possibility of exercising eminent domain pursuant to an approved Certificate of Need as required to complete the proposed Project. Map 2 shows the Project parcels and names of each owner whose property is within the proposed route in purchase negotiation or those for which acquisition is complete as of the date this application was filed. If Minnesota Power is

unable to acquire all Project lands in fee simple ownership, the company will acquire traditional utility rights-of-way for any remaining land required to build and operate the Project.

For the purpose of traditional operation and maintenance of the transmission lines, Minnesota Power will maintain typical "right-of-way" widths for the transmission lines within the Proposed Route. In this case, typical right-of-way widths are those established by both industry standards and Minnesota Power's standard practices for maintaining transmission line rights-of-way. The proposed transmission lines will be designed such that vegetation clearing will use the typical right-of-way widths per voltage class as indicated in Table 2.1.2-1. Additional maintained width beyond these values may be required as needed based on design requirements. Reduction in these right-of-way width values will only be considered on a case-by-case basis as necessary.

Table 2.1.2-1 – Structure Design Summary

Line Type	Structure Type	Structure Material	Right-of-Way Width (feet)	Structure Height (feet)	Foundation	Foundation Diameter (feet)	Span Between Structures (feet)
230 kV	Tubular Steel Pole	Weathering Steel	130	60-180	Concrete Pier	4-12	200-1000
345 kV	Tubular Steel Pole	Weathering Steel	150	60-180	Concrete Pier	4-12	200-1000
±250 kV HVDC	Tubular Steel Pole	Weathering Steel	120	60-180	Concrete Pier	4-12	200-1000

Note: The values in the table above are typical values expected for the majority structures based on similar facilities. Actual values may vary.

2.1.2.3 Transmission Structure and Conductor Design

The proposed transmission structures for the Project are anticipated to be tubular steel pole structures; however, steel lattice or wood pole structures could be used as necessary. Structure heights and span lengths are a function of span properties, topography, structure type and configuration, wire, voltage, tension, route, and other factors. The height and span lengths provided here are general values expected for the majority of structures based on similar facilities. Actual span lengths and structure heights may vary outside typical values as necessary. Tubular steel pole structures are anticipated to be supported on concrete drilled pier foundations; however, other foundation types including but not limited to helical piles and direct embedment may also be used as appropriate.

The new ±250 kV HVDC, 230 kV, and 345 kV steel pole structures will be approximately 60 to 180 feet tall with spans of approximately 200 to 1,000 feet. Structures may be configured as double circuit or double circuit-capable as appropriate to facilitate future development consistent with planning efforts at the terminals and substations. The proposed transmission line will be designed to meet or surpass relevant state codes including the National Electric Safety Code ("NESC").

The specific conductors for the 230 kV and 345 kV transmission lines have yet to be determined but will consist of aluminum conductor steel reinforced ("ACSR") or possibly aluminum conductor steel supported ("ACSS") wire and are likely to use bundled configurations (e.g., two sub-conductors per phase). The conductors will be selected according to the near-term and long-term capacity needs of the proposed transmission lines while also considering electrical performance characteristics, such as electric and magnetic fields, audible noise, radio interference, and lifecycle operating and maintenance costs. The conductor for the short segment of new ±250 kV HVDC line is anticipated to be 2839 ACSR to match the existing HVDC line conductor. This is an

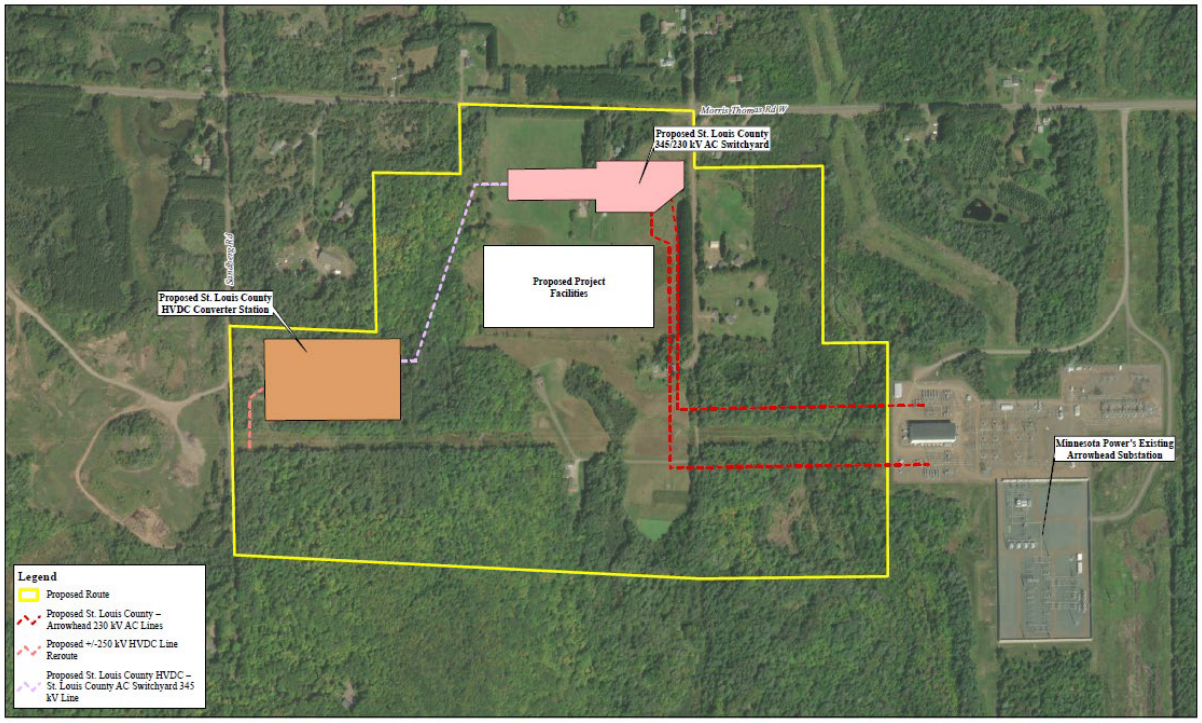
atypically large conductor that is necessary to facilitate the full capacity of the HVDC line. Typical transmission line construction utilizes one or two Overhead Ground Wires ("OHGW") based on structure configuration, shielding requirements, fault current rating requirements, and communication requirements. It is also not uncommon for Optical Ground Wire ("OPGW") to be installed in some or all of the OHGW positions.

2.1.2.4 Design Options to Accommodate Future Expansion

Given the long-term significance of the HVDC Line for Minnesota Power and the region, design options to accommodate future expansion are a major consideration for the Project. The new VSC HVDC Converter Stations will be designed with a flexible, scalable approach that will enable their future expansion to accommodate bulk regional transfers of renewable energy. Minnesota Power is working with the HVDC supplier to procure the most current capacity and technology for the new VSC Converter Stations, as well as additional expandability features to enable staged development of additional HVDC capacity to meet future regional needs.

The new St Louis County 345 kV/230 kV Substation will be designed with room for several future 345 kV line additions to accommodate regional transmission development in conjunction with increasing capacity and utilization of the HVDC line. The new substation will also include space to accommodate a second 345 kV/230 kV transformer to facilitate expanded delivery of power to the local transmission system in northeastern Minnesota. New 345 kV and 230 kV transmission lines constructed for the Project will be designed with sufficient capacity to accommodate reasonably foreseeable long-term needs, and Minnesota Power will consider making new transmission structures double-circuit capable where appropriate.

Figure 2-1 – HVDC Modernization Project Route



2.2 PROJECT COST AND SERVICE CHARACTERISTICS

2.2.1 Project Costs

The estimated cost to construct both the Minnesota and North Dakota terminal upgrades for the Project is approximately $660-940 million.[1] Costs are presented in 2022 dollars, with an upper and lower range provided to illustrate contingencies in cost estimating assumptions. The cost estimates below are based on preliminary engineering considerations, which includes all HVDC Converter Station costs (including engineering, materials, construction, permitting, and design costs) new transmission line costs (including engineering, materials, associated construction, permitting and design costs), substation construction costs (including engineering, materials, construction, permitting, and design costs), allowance for funds used during construction ("AFUDC") through Certificate of Need approval, and land and right-of-way costs. The main components are discussed briefly below.

Table 2.2.1-1 – Estimated Construction Costs

Project Component	Lower-Range (2022$) ($Millions)	Mid-Range (2022$) ($Millions)	Upper-Range (2022$) ($Millions)
HVDC Converter Stations	$590	$705	$815
Minnesota Interconnection Facilities	$40	$55	$70
North Dakota Interconnection Facilities	$30	$40	$55
TOTAL	**$660**	**$800**	**$940**

The cost of HVDC Converter Stations is based on the budgetary estimate provided by the HVDC supplier along with Minnesota Power's estimates for supporting internal and professional services and AFUDC. Due to the specialized nature of the technology, HVDC Converter Stations are typically delivered as turnkey projects by the original equipment manufacturer ("OEM"). Due to the scale and complexity of the Project, there are only two OEMs in the world capable of supplying the HVDC Converter Stations that can meet the size and cybersecurity requirements of the proposed design. Minnesota Power engaged in discussions with both OEMs over the course of approximately 12 months before issuing a competitive request for proposals ("RFP") to obtain a guaranteed manufacturing slot and an exclusivity agreement for further development of the Project. The OEM with the most favorable schedule proposal and lowest budgetary pricing was selected at the beginning of 2023, cementing a guaranteed latest in-service date in April 2030 and stabilizing the budgetary outlook for the Project through collaboration and ongoing engagement with the preferred OEM.

In this case, the OEM's estimate includes all engineering, procurement, construction, and installation for the Converter Stations themselves, up to the point of interconnection with the AC transmission system. Minnesota Power is responsible for bringing the existing HVDC line to the Converter Station and constructing a new 345 kV transmission line from the point of interconnection in the HVDC Converter Station to the new AC substations being constructed for the Project. The costs received from the OEM are budgetary and subject to change based on typical market forces, like inflation and commodities pricing, until such time as Minnesota Power

[1] Minnesota Power's initial mid-range project cost estimate from early 2022 was approximately $700 million which was based on preliminary discussions with HVDC suppliers. Since early 2022, there has been a worldwide surge in HVDC system orders directly competing with Minnesota Power for limited manufacturing slots. Competitive market conditions combined with high inflation on basic components through the end of 2022 have impacted the cost range, as evidenced by the most recent budgetary estimates provided by HVDC suppliers in late 2022 and reflected in this Application.

is able to enter into a firm EPC contract with the OEM. Minnesota Power does not anticipate executing a firm contract until after the Commission grants the Certificate of Need for the Project. The HVDC Converter Station cost also includes Minnesota Power's internal and professional services and AFUDC associated with the HVDC Converter Stations. Internal and professional services include Minnesota Power's engineering, permitting, project management, and other resources contributing to the Project, as well as external consultants supporting system impact and design studies, engineering, permitting and environmental review, legal support, land, and right-of-way. The costs associated with Minnesota Power's HVDC Owner's Engineer, HVDC technical experts who will provide detailed technical review of all HVDC OEM work through project commissioning, are also included. The cost of AFUDC was calculated based on the anticipated cash flow for the Project. Accrual of AFUDC will cease once the Commission grants a Certificate of Need for the Project, because the Project will then become eligible for current cost recovery under the Transmission Rider. Based on this, AFUDC accrual is assumed to stop by the end of 2024, well in advance of the most significant financial commitments for the Project.

The cost of Minnesota Interconnection Facilities is generally based on the 2022 MISO Transmission Expansion Planning Cost Estimating Guide. Minnesota Interconnection Facilities include the short extension of the HVDC line to the Converter Station, as well as all 345 kV and 230 kV facilities from the HVDC Converter Station to the Arrowhead Substation. This includes the new St. Louis County 345/230 kV Substation, rebuilding existing 230 kV bus sections at Arrowhead, and constructing new 345 kV and 230 kV lines for the Project. Land acquisition costs in Minnesota for the Project are also included.

The cost of North Dakota Interconnection Facilities is generally based on the MISO MTEP22 cost estimating guide. North Dakota Interconnection Facilities include the two-mile extension of the HVDC line to the new Converter Station, as well as all 345 kV and 230 kV facilities from the HVDC Converter Station to the separately planned Nelson Lake 230 kV Substation. This includes the addition of a 345 kV/230 kV transformer at Nelson Lake Substation, as well as constructing a short new 345 kV line segment from the HVDC Converter Station to Nelson Lake Substation. Land acquisition costs in North Dakota for the Project are also included.

2.2.2 Operations and Maintenance Costs

Operations and Maintenance ("O&M") Costs for the Project consist of three components: the new transmission lines, new AC substations, and new HVDC Converter Stations. Of the three components, the O&M costs for the HVDC Converter Stations are expected to be the most significant.

Once constructed, O&M costs associated with the new transmission lines will be minimal for several years since vegetation maintenance on the route corridor will occur prior to construction. Minnesota Power's average vegetation management costs for all of its transmission lines (100 kV and above) on its system was approximately $660 per line mile in 2020. In addition to vegetation management, Minnesota Power also performs other general maintenance on its transmission facilities such as repairing aged or worn equipment or facilities. Minnesota Power's average maintenance costs, excluding vegetation management, for its transmission lines (100 kV and above) was approximately $520 per mile in 2020. The specific O&M costs for an individual transmission line varies based on the location of the line, the number of trees located along the right-of-way, the age and condition of the line, the voltage of the line, and other factors.

Over the life of the AC substation facilities, inspections will be performed regularly to maintain equipment and make necessary repairs. Transformers, circuit breakers, batteries, protective

relays and other equipment need to be serviced periodically in accordance with the manufacturer's recommendation. The site itself must also be kept free of vegetation, and drainage maintained. Minnesota Power's substation maintenance costs typically range from $50k to $100K, annually.

The HVDC Converter Station has more heating, ventilation, and air conditioning; programmable; and solid-state equipment than a standard AC substation and an effective O&M program includes inspection and maintenance of not only transformers, circuit breakers, batteries, and protective relays, but also includes converter valves, protection and control systems, valve cooling systems, and building services. Bi-directional capabilities of the HVDC Converter Station are not anticipated to have an appreciable impact on O&M cost, this capability is inherent to all modern HVDC Systems. The HVDC Converter Station is expected to be staffed during normal business hours and will also be supported by dedicated engineering staff to support normal operations. During scheduled outages, additional staff will be needed to support operations. Costs related to O&M will be less during the warranty period (i.e., the first three to five years of operation depending on final EPC contract terms) due to the limited scope of outages and parts will be replaced under warranty. After the warranty period, outages become more time intensive and additional maintenance is needed based on the age of equipment. Regular maintenance, regardless of age, includes periodic inspections (e.g., daily, weekly, monthly), equipment testing, cybersecurity, compliance support, and vegetation management. The annual HVDC O&M costs are anticipated to be approximately $1 million annually.

2.2.3 Effect on Rates

Minnesota Power recognizes the value and importance of ensuring affordable rates for all customer classes while also delivering reliable service and executing state energy policy goals and mandates. While approval of the Project will impact the rates that Minnesota Power charges its customers as described in this section, the Company has taken steps to prepare to minimize that impact, as discussed in Section 2.2.5 below.

Table 2.2.3-1 summarizes the estimated Minnesota jurisdictional revenue requirements and rate impacts by customer class for an in-service date of May 1, 2030. Although Minnesota Power is working to secure an earlier in-service date, conducting the rate impact analysis requires a distinct in-service date to be chosen. Since the guaranteed latest in-service date provided by the OEM is currently in April 2030, May 1, 2030 is the date used to calculate the Project's effect on rates. The estimated impacts are provided using a Mid-Range and Upper-Range capital costs before any Federal or State grant funding is applied. The total revenue requirements were estimated using the approved rate of return in the Company's recently completed rate case (Docket No. E015/GR-21-335). The revenue requirements incorporate property tax values based on the range in cost and reflect current assumptions for Minnesota and North Dakota property tax treatment.

For the average residential customer, the rate impact for the first 12 months following Project in-service would range from approximately $8.32 to $9.80 per month. When compared to the estimated average current 2023 residential rate reflecting the outcomes of the recently completed rate case, this would represent an increase of approximately 7.89 to 9.29 percent. For Large Power customers, the estimated rate impact for the first 12 months following in-service would range from approximately 1.112¢ to 1.311¢ per kilowatt-hour ("kWh") of energy. If compared to the estimated average current 2023 Large Power rate reflecting the outcomes of the recently completed rate case, this would represent an increase of approximately 11.88 to 14.01 percent. By 2030, however, the above percent rate increases are expected to be lower because base rates

will continue to increase due to changes in other system costs that will be incorporated into base rates through future rate cases and other mechanisms.

Table 2.2.3-1 – Estimated Retail Customer Impacts

For the twelve months ending	4/30/31 Mid-Range	4/30/31 Upper-Range
MN Jurisdictional Revenue Requirements	$86,423,884	$101,860,375
Rate Class Impacts [a]		
Residential		
Average Current Rate (¢/kWh)	14.894	14.894
Increase (¢/kWh)	1.175	1.384
Increase (%)	7.89%	9.29%
Average Impact ($/month)	$8.32	$9.80
General Service		
Average Current Rate (¢/kWh)	14.943	14.943
Increase (¢/kWh)	1.175	1.384
Increase (%)	7.86%	9.26%
Average Impact ($/month)	$32.76	$38.61
Large Light & Power		
Average Current Rate (¢/kWh)	11.960	11.960
Increase (¢/kWh)	1.175	1.384
Increase (%)	9.82%	11.58%
Average Impact ($/month)	$2,883.04	$3,397.99
Large Power		
Average Current Rate (¢/kWh)	9.361	9.361
Increase (demand+energycombined) (¢/kWh)	1.112	1.311
Increase (%)	11.88%	14.01%
Average Impact ($/month)	$534,935	$630,482
Lighting		
Average Rate (¢/kWh)	31.964	31.964
Increase (¢/kWh)	1.175	1.384
Increase (%)	3.67%	4.33%
Average Impact ($/month)	$1.93	$2.27

[a] *Average current rate based on 2022 Final General Rates based on the 2023 Commission decision (Docket No. E015/GR-21-335) without riders adjusted to include current rider rates. Current rider rates include the Transmission Cost Recovery Rider rates, Renewable Resources Rider rates, Solar Renewable rates, Conservation Program Adjustment rates, and the 2022 Fuel and Purchased Energy Adjustment with True-Up. The increase (¢/kWh) shown above is the increase from the new project.*

2.2.4 Costs of Outages

As discussed in further detail in Section 3.2, the HVDC terminal equipment has been reliable for most of its long history; however, the forced (unplanned) outage hours due to converter equipment failure have been increasing with the age of the asset. Scheduled (planned) outages due to the need to repair converter equipment before it fails have also increased over the last five years, though the impact on rates is less because scheduled outages can be planned around peak demand and peak wind production times in some cases. Furthermore, the Company is anticipating significant volatility in energy market prices when the HVDC line experiences forced outages. During periods of outages Minnesota Power utilizes the AC system, resulting in higher congestion cost between generation and load and increases the risk of wind curtailment. The cost of replacement energy for wind curtailment is expected to increase in future years as more

dispatchable coal and natural gas units are retired. These are real and negative impacts to Minnesota Power customers from increasing levels of HVDC system outages.

Recently, Minnesota Power has seen significant increases in energy prices and hourly price volatility, especially related to the cost of delivering remotely located wind resources to load. Furthermore, Minnesota Power expects energy price volatility and congestion cost risks to increase over time due to the transition from baseload to intermittent resources, which drives a need for additional transmission infrastructure. Market price volatility poses an increased risk in terms of costs to customers when the HVDC line is not available. The HVDC line effectively makes Minnesota Power's North Dakota wind assets look like they are located in northeast Minnesota, reducing congestion cost to deliver wind to load. This has significant value for customers that is passed along through the Fuel Adjustment Clause ("FAC"). When the HVDC line is in outage, Minnesota Power loses that capability and pays the higher congestion cost to deliver North Dakota wind to customers. Furthermore, when the HVDC line is not available, Minnesota Power's wind resources must be delivered across the non-MISO North Dakota AC transmission network, adding to the regional congestion issues and are subject to curtailment.

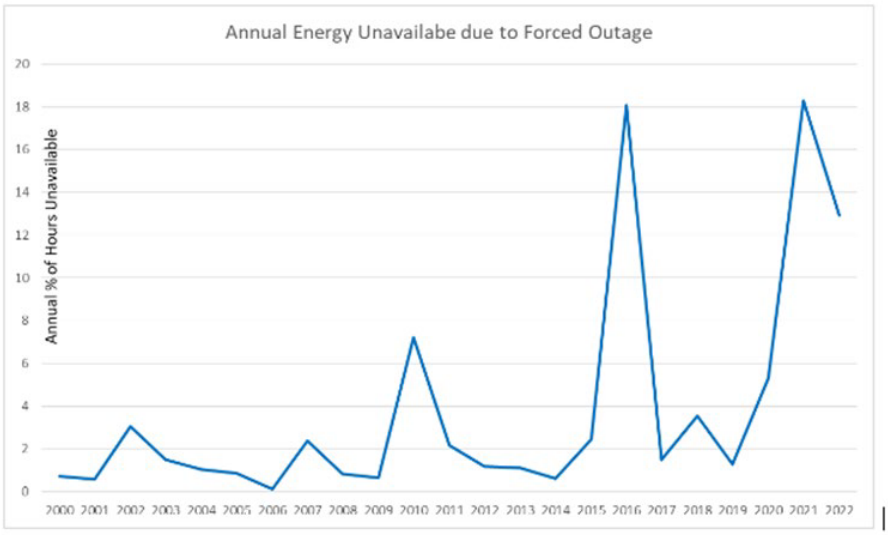
If the HVDC system is unavailable, there is also a higher risk of curtailment of its North Dakota wind energy, along with the congestion cost risk discussed above. Specifically:

1. If the Minnesota Power Bison Wind Facility in Center, ND is curtailed, then Minnesota Power would incur replacement energy costs for the Company's 500 MW generated by its Bison units.
2. If the Oliver County I and II Wind Facilities in Center, ND are curtailed, the language of the PPA controls as to payments in the event replacement power is necessary. Minnesota Power's PPA amendment was granted approved by the Commission via Docket No. E015/M-18-600.

Typically, replacement energy will be from higher carbon intensive resources inmarket or from Minnesota Power's own power supply. The curtailments associated with HVDC outages could lead to the Company not meeting the state 100 percent carbon free goal by 2040. Reaching the state's 100% carbon free goal will require optimization of the existing renewable portfolio customers have already invested in. Maintaining and upgrading existing transmission assets, for example modernizing the HVDC line, is an important part of the broader plan to achieve decarbonization in Minnesota. The risk of higher replacement energy prices is expected in future years as more baseload coal units retire; however, reliable wind energy transferred along the HVDC line will help mitigate these congestion challenges as grid congestion patterns continue to evolve.

Minnesota Power anticipates the risk of forced outages on the HVDC line to increase given the age and condition of the existing infrastructure. Figure 2.2.4-1 displays the annual energy unavailability when the HVDC system is not available due to forced (unplanned) outages from all causes, including transmission and converter equipment outages. In 2022, 9.86 percent of annual energy unavailable due to forced outages occurred because of converter equipment failures. This was the second highest recorded forced unavailability due to converter equipment since 2000 and represented approximately 76 percent of total forced outages in 2022. HVDC unavailability due to converter station forced outages is shown in Figure 3.2.2-1 and discussed later in the application. Although total forced outages were lower in 2022 than 2021, Figure 3.2.2-1 shows that forced outages due to converter equipment failures was notably higher in 2022 and has been increasing steadily over the last five years.

Figure 2.2.4-1 – Annual Energy Unavailable due to Forced Outage



Note: Unavailability defined as capacity not available due to outage. Percent unavailable is based on full year of full production: 550MW x 8760 hours/year = 4,818,000 (4,831,200 in leap years).

The Company's current risk assessment, which is updated annually based on current market prices, is anticipating volatility in energy market prices for replacement energy when the HVDC line experiences forced outages and North Dakota wind is curtailed. During periods of outages when Minnesota Power utilizes the North Dakota AC system, unprecedented congestion between generation and load in the MISO region exacerbates the cost impact to customers. The risk of higher replacement energy prices is expected in future years as more baseload coal units retire; however, reliable wind energy transferred along the HVDC Line will help mitigate these congestion challenges as grid congestion patterns continue to evolve.

2.2.5 Efforts to Lessen Rate Impacts

As stated earlier, Minnesota Power recognizes the importance of providing reliable and increasingly clean electric service at affordable rates for customers, and as such is exploring several options that could reduce the rate impact of the Project for its customers.

1. **Earlier in-service date:** Because of the limited number of manufacturers of the type of equipment used in HVDC terminals and highly-constrained global HVDC market conditions, Minnesota Power has already secured a manufacturing slot reservation with a preferred supplier to obtain a guaranteed in-service date for the Project. In the midst of rapidly evolving global HVDC market conditions and supply constraints, this procurement strategy ensures schedule certainty for Minnesota Power's customers while stabilizing the budgetary outlook for the Project. Unfortunately, the earliest in-service date that could be guaranteed by any manufacturer capable of delivering the Project is April 2030. This is roughly three years later than the originally desired in-service date. As discussed in Section 3.8, with several years of delay it is possible that the HVDC Line may experience an extended outage. Because of this, the Company is working with the supplier to secure an earlier in-service date. Those efforts include regular collaboration, early initiation of design activities, and ongoing discussions to secure an earlier manufacturing slot and in-service date guarantee. It is also possible that other projects with manufacturing reservations in the supplier's

queue may experience delays, in which case the supplier may offer Minnesota Power an earlier manufacturing slot. Minnesota Power's early engagement with the supplier is intended to place the Project in a position to take advantage of such an opportunity, should it come to fruition, provided all regulatory approvals are in place. An earlier in-service date may result in a slightly different capital cost and rate impact, but the overall rate impact customers pay over time will be lower if the in-service date is sooner.

2. **MISO recognition of system support in North Dakota that is added with VSC technology:** The VSC technology brings additional benefits to the MISO system that should be recognized as MISO considers long-term reliability needs. Minnesota Power has initiated discussions with MISO regarding potential wholesale Tariff changes to investigate ways to create a method to compensate Minnesota Power for these broader system benefits. MP is monitoring MISO's efforts to identify sufficient resource attributes, a key MISO priority being taken up by the Resource Adequacy Subcommittee in 2023 (RASC-2022-1), to determine if and/or how VSC HVDC can fit into resource adequacy to provide additional system support and benefits to the broader regional grid.

3. **Federal Incentives for Shovel-Ready Project:** Minnesota Power has explored available opportunities for Federal Funding options through the Infrastructure Investment and Jobs Act ("IIJA") and submitted an application for the Deployment of Technologies to Enhance Grid Flexibility (Section 40107-Smart Grid Grants) program in March 2023. Minnesota Power submitted a Concept Paper for this program in December 2022 and received a recommendation to apply for this funding from the Department of Energy ("DOE"). If awarded, Minnesota Power could apply up to $50 million—the maximum award amount—to the project costs associated with expansion capability of the facility. A number of stakeholders submitted letters in support of Minnesota Power's Federal Funding application, including International Union of Operating Engineers Local 49, the Laborers' International Union of North America, the Duluth Area Chamber of Commerce, the Greater North Dakota Chamber, St. Louis County, the Area Partnership for Economic Expansion, the Center for Energy and Environment, the Minnesota Center for Environmental Advocacy, Fresh Energy, and the Minnesota Tribal Contractors Council. Additionally, more Federal Funding Opportunity Announcements are expected over the coming years and Minnesota Power anticipates pursuing them when practical for the Project. If any are identified before the Project is placed in service and construction is completed, Minnesota Power will provide an update to the Commission in this docket as a compliance filing. Minnesota Power also provided an update on efforts taken to maximize benefits from both the IIJA and Inflation Reduction Act ("IRA") in a filing submitted on January 30, 2023 in the Commission's Joint Investigation into the Impacts of the Federal IRA in Docket No. E,G999/CI-22-624.

4. **State funding:** The Company has sought funding from both the states of Minnesota and North Dakota to support the Project and further reduce its rate impact through state matching programs related to IIJA funding as well as state competitive and budgetary processes. Minnesota Power has secured $15 million in funding for the Project from the state of Minnesota,[2] which is available until June

[2] See line 293.15 in HF No. 2310, Conference Committee Report - 93rd Legislature.

30, 2034, and will continue to pursue state funding as opportunities become available. Should any of the state funding be awarded before the Project is placed in service and construction is completed, Minnesota Power will provide an update to the Commission in this docket as a compliance filing.

5. **Procurement processes**: Minnesota Power uses a competitive bidding process for all capital projects and other purchases over $10,000, ensuring projects are delivered at the best value for customers. Minnesota Power procurement professionals manually track savings achieved through these competitive bidding processes, and the total cost savings for all projects averages approximately $14 million per year. These proven procurement processes will be used on this Project to capture savings for customers wherever possible.

   Minnesota Power conducted a thorough and competitive vendor selection process for the Project's Converter Station equipment that included a formal Request for Proposal for indicative pricing and in-service dates for a single project/configuration the two vendors that are able to supply an HVDC project of this scale and complexity. This approach differed from the typical approach to bid a fully developed project due to the state of the market supply chain for HVDC converters. In addition to the converter stations, the Minnesota and North Dakota interconnection facilities, including AC substations and transmission line facilities, will also follow the procurement process for materials and construction in line with standard project delivery practices. Project Schedule

The anticipated permitting and construction schedule for the Project is provided in Table 2.3-1. It is anticipated that construction of the Project will begin in Q4 2024. This schedule is based on information known as of the date of the filing of this Application and may be subject to change.

Table 2.3-1 – Anticipated Project Schedule

Activity	Anticipated Date
Land Acquisition Begins	Apr 2022
Secure Manufacturing Slot Reservation with Preferred Supplier	Jan 2023
Kick off technical coordination and engagement with Preferred Supplier	Mar 2023
Certificate of Need and Route Permit Application Filed	May 2023
Begin Front End Studies & Engineering Design (FEED) with Preferred Supplier	Jan 2024
Certificate of Need and Route Permit Issued	July 2024
Other Federal, State, and Local Permits Issued	July – November 2024
Order Long Lead Time Equipment for AC Substations	November 2024
Clearing Begins	January 2025
Construction of AC Interconnection Facilities Begins	May 2025
Receive Firm Proposal for HVDC converters from Preferred Supplier	Dec 2025 – Aug 2026[a.]
Execute Firm EPC Contract and Give Final Notice to Proceed with HVDC Manufacturing & Delivery	Feb 2026 – Oct 2026[a.]
Construction of HVDC Converter Stations Begins	Feb 2027 – Oct 2027[a.]
Project In-Service	Dec 2028 – Apr 2030[a.]

[a.] *Date range represents potential outcomes based on supplier availability to expedite manufacturing slot reservation.*

3.0 PROJECT PURPOSE AND NEED

3.1 SUMMARY OF NEED

The HVDC Modernization Project is needed to modernize aging HVDC assets, continue to position the transmission grid for clean energy transition, and improve the reliability of the transmission system. The existing HVDC terminal has operated for 45 years—15 years beyond its 30-year design life. In recent years Minnesota Power has experienced HVDC terminal outages due to failures in the control system, power electronics, transformers, and other components. Based on experience with other electric system components, the failure rate is expected to increase, which is of particular concern for the existing HVDC system because of limited parts availability. The orderly replacement of the HVDC terminal equipment is prudent to ensure continuous efficient delivery and l expansion of Minnesota Power's renewable, carbon-free energy resources into the future.

In addition to the replacement of the existing HVDC terminals, the new HVDC technology implemented for the Project will be designed to provide key reliability attributes including voltage regulation, frequency response, blackstart capability, and bidirectional power transfer capability. These modernizations to the HVDC technology will enable Minnesota Power and the region to continue to support its clean energy transition.

3.2 AGE AND CONDITION OF HVDC CONVERTER STATIONS

The fundamental need driver for the HVDC Modernization Project is the age and condition of the existing HVDC Converter Stations located on either end of the transmission line. These Converter Stations are responsible for making the conversion between the AC transmission system and the HVDC Line. They consist of power electronics, transformers, control and protection systems, and other supporting equipment necessary to complete the conversion between AC and DC. The HVDC Converter Stations are the gateway between the HVDC Line and the grid, and it cannot operate without functional and reliable converter stations. To aid in understanding the need to replace these Converter Stations, this section will provide a brief history of the Square Butte HVDC system, an overview of the main age and condition issues with the existing Converter Stations, a discussion of the consequences of outages on the Square Butte HVDC system for Minnesota Power's customers, and a description of how the proposed HVDC Modernization Project will address these concerns.

3.2.1 History of the Square Butte HVDC System

In early 2010, Minnesota Power finalized its purchase of a 465-mile-long, ±250 kV HVDC Line with Converter Stations located in Hermantown, Minnesota and Center, North Dakota. After a contested case proceeding (MPUC Docket No. E-015/PA-09-526), the Commission approved the Company's purchase of the HVDC Line from the Square Butte Cooperative, finding the proposed transactions associated with the acquisition to be reasonable, prudent, and in the public interest.[3]

The Square Butte HVDC Line and its Converter Stations at the Center and Arrowhead substations were released for commercial operation in May 1977, and such construction was prior to the existence of statewide permitting requirements for HVTLs in both Minnesota and North Dakota. The original purpose of the HVDC Line was to bring electricity from the coal-fired Milton R. Young

[3] *See In re Minnesota Power's Petition to Purchase the Square Butte Coop.'s Transmission Assets and for Restructuring Power Purchase Agreements from Milton R. Young Unit 2 Generating Station*, Docket No. E015/PA-09-526, Order Granting Petition with Conditions (Dec. 21, 2009).

2 (“Young 2”) generating station in Center, North Dakota, directly to Minnesota Power’s customers and use the Minnesota transmission system to flow energy to Minnkota Electric Cooperative’s customers in western Minnesota. Minnesota Power’s purchase of the HVDC Line in 2010 cleared the way for the line to be repurposed to facilitate the delivery of wind power generated in North Dakota directly to Minnesota Power’s service territory. Minnesota Power subsequently developed a portfolio of approximately 600 MW of North Dakota wind that now relies on the HVDC Line for reliable and efficient transmission deliverability.

The Center and Arrowhead HVDC Converter Stations were originally designed by General Electric. The original Converter Station technology, which was the best available at the time, is line commutated converter (“LCC”) technology. The Square Butte HVDC line was the first long-distance project in North America to implement 12-pulse thyristor[4] valve converter technology. Under normal conditions, the system operates as a ±250 kV bipole, meaning there is a positive pole that operates at +250 kV and there is a negative pole that operates at -250 kV, with a total voltage between the poles of 500 kV. Each pole has its own HVDC converter within the Converter Stations at each end of the line. In the event of an outage in one of the converters, the HVDC system can operate with a single 250 kV pole in metallic return using the wire of the outaged pole as a ground wire for an extended duration. If the wire of the outaged pole is also unavailable, the original HVDC system also includes ground electrodes on either end that allow for short-term operation as a single 250 kV pole in ground return.

The original LCC converters were designed for a 30-year operating lifetime, which is typical for the type of power electronics and substation apparatus in the converters. As of 2023 the Converter Stations have been operating reliably for over 45 years. The main components of the HVDC Converter Stations include power electronics (thyristor valves) and their associated cooling system, converter transformers, smoothing reactors, harmonic filters, and reactive resources to complete the conversion between AC and DC. General Electric, the original vendor, exited the HVDC business for a time in the 1980s before restarting its HVDC line of business in the 1990s. However, due to the end of the original General Electric HVDC Line of business, much of the documentation and knowledge base from the original designers of the Square Butte HVDC system has been lost. In recent years, it has been increasingly difficult to procure spare parts for the Converter Stations as the technology is becoming obsolete and the individuals involved in the original design are no longer available for support. Minnesota Power has researched reverse engineering solutions to this technology issue, but has had limited success and thus spare and replacement parts for the Converter Stations remain limited. Minnesota Power has also sought out and procured spare components from similar HVDC systems as they have been upgraded and replaced in order to maximize the lifespan of the existing HVDC system. At this time, however, the spare parts inventory is becoming depleted with no straightforward solution to continue replenishing it.

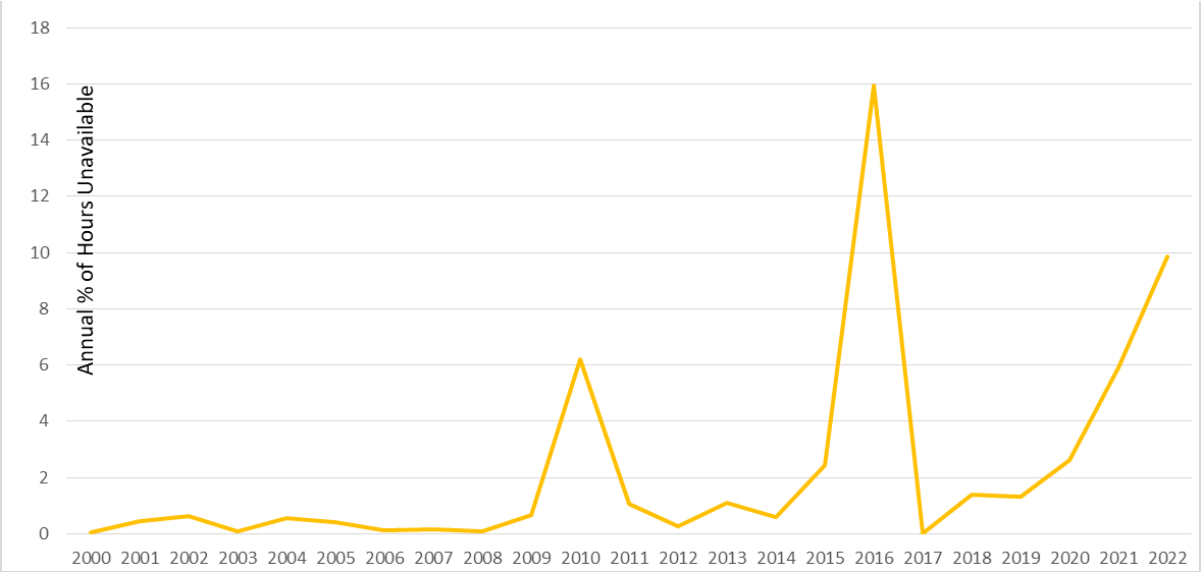
3.2.2 Age and Condition Concerns

Modernizing the HVDC Converter Stations by replacing the original equipment with modern, state-of-the-art equipment will greatly reduce the likelihood of an extended outage due to component failures in the HVDC Converter Stations. The equipment has been reliable for most of its history, but as shown in Figure 3.2.2-1, forced outages due to HVDC Converter Station component failures have increased since approximately 2009 and appear to be accelerating over the last five years. In the worst historical case shown in Figure 3.2.2-1, the annual availability of the HVDC

[4] A thyristor is a power electronics component that performs high-speed switching operations to convert between alternating current and direct current waveforms.

system was reduced by 16 percent (equivalent to about 1,400 hours) due to a failure in one of the HVDC Converter Stations.

Figure 3.2.2-1 – HVDC Unavailability due to Converter Station Forced Outages



In recent years, the most common outages in the HVDC Converter Stations have been the result of failures in the thyristors, converter transformers, control and protection system components, and filters, among other things. Based on experience with other system components and the trend shown in Figure 3.2.2-1, the failure rate is expected to continue to increase in both frequency and duration. Specifically, as addressed below, the top three equipment categories of concern for the HVDC system at this time are the 1) control and protection system, 2) pulse transformers, and 3) converter transformers.

3.2.2.1 Control and Protection System

Each of the two poles of the current HVDC system has its own control and protection system, with components located at each HVDC terminal. Control and protection systems depend on computer technology that reaches obsolescence much more rapidly than the rest of the components in the HVDC Converter Station. As such, control system upgrades typically take place every 10 to 20 years. The most recent control system upgrade for the Square Butte HVDC system was completed in 2004 by ABB and had to be retrofitted to work with the original General Electric equipment. The current HVDC control and protection system is microprocessor-based and is built on an older Microsoft Windows platform from the early 2000s that is no longer supported or commercially available. Due to the embedded nature of the proprietary programming within the outdated Windows operating system, it is not possible to simply replace failed control equipment with new computers that run current versions of Windows. Rather, the Square Butte HVDC system is due for a complete overhaul and replacement of the control and protection system.

However, based on the failure rates in the control system components, it would be more accurate to say that the control system upgrade is reaching the point of being overdue. To date, Minnesota Power has experienced one complete server failure and increasing failures of input/output ("I/O") cards caused by bad inputs. The server is a critical component that is used to operate the control

and protection system and ensure all other components can communicate accurately. Minnesota Power replaced the failed server with a spare that was provided by ABB and kept on-site since the original control system upgrade in 2004. Currently, it is possible to procure a limited number of replacement I/O cards from ABB, but many other components, like industrial processing boards for the workstations and servers, are obsolete. Further, given the limited number of replacement I/O cards available, those will also soon become obsolete. The processing boards are not unique to the control system, but they have not been manufactured in many years, which forces Minnesota Power's engineers to have to look to secondary markets—such as Sillworks and Splus Technologies—for replacement. Because new processing boards are difficult to acquire, Minnesota Power has had to rely on refurbished boards. This dependence on secondary markets and refurbished parts creates a potential cyber security risk because the secondary vendor may not be associated with an OEM.

Minnesota Power can continue to operate and maintain the control and protection system in this manner for as long as it can continue to procure spare parts. However, once these critical spares are no longer available, Minnesota Power will be unable to operate the HVDC system at full capacity. At that point, HVDC system operations would be reduced to one pole, using the control system components from the failed pole for spare parts as long as the servers remain intact. Under these operating constraints, the capacity of the HVDC system would be indefinitely limited to 275 MW, or half of its current total capacity. However, two servers are needed for the entire system to run, so if either server fails and cannot be replaced or refurbished, then the entire HVDC system would be unavailable until a complete control and protection system upgrade could be implemented. The lead time on a full control and protection system upgrade is estimated to be at least two years, and the cost for such an upgrade is estimated to be within the range of $50 to $100 million. Any control and protection system upgrade implemented without also replacing the HVDC converters would not be usable when the converters are replaced with a more modern system and would, thus, become a stranded investment if done separately from a project like the HVDC Modernization Project proposed by Minnesota Power.

3.2.2.2 Pulse Transformers

As noted earlier, the thyristor valves are the power electronics component of the HVDC converters responsible for making the conversion between AC and DC. To perform this conversion, individual groups of thyristors are switched rapidly on and off by a gate-drive system in order to transform the electrical current waveform from an AC sine wave to a DC signal at the sending end and then from a DC signal back to an AC sine wave at the receiving end. One converter consists of many thyristor valves connected together to produce a conversion between AC and DC at the desired voltage and current levels. The individual subcomponents in the thyristor valves are called power modules. Within each power module are the thyristors and all the subcomponents required to drive them. One of those required subcomponents, the pulse transformer, is becoming an increasing concern for the Square Butte HVDC system.

The design specifications for the pulse transformers in the power modules, which are original to the 1970s design of the HVDC system, have been destroyed or lost due to General Electric's initial exit of the HVDC business. Minnesota Power has spent many hours working with past General Electric employees, other owners of similar-vintage General Electric HVDC systems, and unassociated pulse transformer manufacturers to find a suitable replacement for failed pulse transformers for the Square Butte HVDC system.

Pulse transformers fail for various reasons, but the biggest contributors are a failed gate drive (the component that tells the pulse transformer to fire, directing a thyristor to operate) or a

disturbance on the HVDC transmission line that is close enough to the converter to cause a transient electrical signal to travel into the valves. There is some redundancy built into the converters to withstand individual component failures, but if there were enough accumulated pulse transformer failures, Minnesota Power would no longer be able to operate the HVDC system at full capacity. At that point, similar to the control system failures discussed above, HVDC system operations would be reduced to one pole, using the power module components from the failed pole for spares. Under these operating constraints, the capacity of the HVDC system would be indefinitely limited to 275 MW, or half of its current total capacity, until a full refurbishment or replacement of the HVDC converters could be completed. The lead time on a full like-for-like replacement of the thyristor valves is estimated to be at least five years. In light of the current state of the HVDC market, it is possible that vendor interest and availability for this type of project would be very limited, further increasing the lead time and cost. Any like-for-like replacement of the thyristor valves would also commit Minnesota Power to the existing LCC technology for the foreseeable future, forgoing all the added benefits from the HVDC Modernization Project as proposed by Minnesota Power.

3.2.2.3 Converter Transformers

Converter transformers are the interface between the HVDC Converter Station and the AC transmission system. They are specialized power transformers that change the voltage from the HVDC system output voltage to the AC system interconnection voltage and are built to withstand the unique stresses involved in the process of converting between AC and DC. One particularly important aspect of the design of these converter transformers is that they require load tap changers ("LTC") to make minor adjustments to the turns ratio to maintain voltage within acceptable limits on either side of the transformer. Each pole of the HVDC system has 6 converter transformers (two for each of the three phases on the AC side), which means there are 12 converter transformers energized at each Converter Station and 24 transformers in total between the two Converter Stations. The transformers are located next to the building containing the HVDC converters (the valve hall), with bushings that protrude through the building walls to connect the converter valves to the transformers.

In the past seven years, three converter transformers on the Square Butte HVDC system have failed due to problems caused by LTCs. Large power transformers are typically reliable for 40+ years, as these have been, but the LTCs are mechanical devices with many physical contacts and moving parts, and that have relays in the control circuit that experience wear and tear. After years of mechanical operations, vibrations, and other stresses, some of the LTC components are wearing out. Like many of the other components of the HVDC system, several of the parts in these transformers have become obsolete. As a result, Minnesota Power has been searching secondary markets for refurbished parts and has been in contact with several non-OEM companies who are able to remanufacture certain parts.

When a converter transformer fails there is also a risk that it is a catastrophic failure causing collateral damage. The most recent converter transformer failure, which involved a catastrophic failure in a bushing, resulted in a fire. Fortunately, the fire was contained and not spread to the valve hall, limiting the damage. If the fire had reached the valve hall, the outage would have lasted significantly longer as building repairs and potentially converter valve repairs would have been required. Minnesota Power has a spare unit available for emergency replacement in the event of a failure of any of the 24 transformers currently in use. Replacing a failed converter transformer with an onsite emergency spare unit typically takes about two weeks to complete. This is because the replacement requires physically removing the failed transformer, moving the spare into position, completing all power wiring and control connections, and commissioning the

new unit for operation. If there is collateral damage to other Converter Station infrastructure or components, outage restoration can take significantly longer due to required repairs. If a subsequent transformer failure were to occur after the emergency spare had already been allocated, Minnesota Power would no longer be able to operate the HVDC system at full capacity. At that point, similar to the control system and pulse transformer failures discussed above, HVDC system operations would be reduced to one pole, de-energizing the pole with the failed converter transformer(s). Under these operating constraints, the capacity of the HVDC system would be indefinitely limited to 275 MW, or half of its current total capacity, until one of the failed transformers could be repaired and reinstalled, or a new replacement could be manufactured and delivered. The lead time for repair or replacement of a failed converter transformer is two to three years. As transformers fail, Minnesota Power will likely need to purchase replacements in order to retain a spare in case of emergency, which come at a considerable cost—over $2 million per unit. These transformers would also be specifically designed for the existing Square Butte HVDC system, meaning they would not be usable when the converters are replaced with a more modern system and would thus become a stranded investment if done separately from the full-scale HVDC Modernization Project proposed by Minnesota Power.

3.2.2.4 Summary

The HVDC Modernization Project is needed to address the significant age and condition concerns with the existing HVDC Converter Stations, including increasing concerns with the control and protection system, power modules, and converter transformers. In the short term, Minnesota Power has the ability to deal with minor problems (such as occasional single thyristor failures). But more extensive outages, such as failures of critical control and protection system components, the cascading failure of an entire valve (consisting of 12 power modules), or multiple converter transformer failures, could require weeks or months-long outages. Depending on the nature of the failure, Minnesota Power would be able to continue operating the HVDC system in one pole operation with a reduced capacity of 275 MW, or half of its current total capacity, until a full refurbishment or replacement of the failed component(s) could be completed in two to five years. In the extreme, a failure impacting both poles of the Converter Station would render the HVDC system entirely inoperable. This would result in a long-term (multi-year) outage of the Square Butte HVDC line until a refurbishment or replacement of the failed components or a full-scale HVDC Modernization Project could be permitted, engineered, procured, and constructed. Under current HVDC market conditions this would take a minimum of five years.

The HVDC Modernization Project will address these concerns by implementing a replacement of the existing Square Butte HVDC Converter Stations on both ends of the line (Hermantown, Minnesota and Center, North Dakota). Because the replacement will take place primarily on an adjacent site, the existing converters can continue to be maintained and operated as long as possible until the HVDC Modernization Project is implemented. Following completion of the Project, the new Square Butte HVDC Converter Stations will use modern voltage source converter HVDC technology, as discussed in more detail in Section 3.3, and the HVDC system will be positioned for another four (or more) decades of reliable operations.

3.3 NEED FOR VOLTAGE SOURCE CONVERTER TECHNOLOGY

There are two different types of HVDC converter technology available in the market today: LCCs and VSCs. The HVDC Modernization Project involves upgrading the HVDC converter technology used for the Square Butte HVDC system from LCC to VSC technology.

In addition to addressing the fundamental age and condition issues discussed in Section 3.2, upgrading to VSC technology addresses several other significant needs related to reliability and grid support, renewable integration, and long-term flexibility. Selecting VSC technology for the upgrade of the Square Butte HVDC Converter Station is also consistent with global HVDC market trends as the worldwide electric utility industry continues to re-position itself for a clean energy future. This section provides a brief overview of the two different HVDC technologies, followed by a discussion of why it is necessary for the Project to upgrade Minnesota Power's HVDC Converter Stations from LCC to VSC technology.

3.3.1 HVDC Technology Options

LCC HVDC technology, which was used for the original Square Butte HVDC Converter Stations, has been available for several decades. LCC HVDC converters utilize thyristor valves to drive the conversion between AC and DC, and they rely on the AC system voltage for commutating current from the outgoing valves to the incoming valves. LCC converters have a long track record of reliable and effective performance and can be an efficient option for high-power transfer applications. However, LCC converters come with inherent limitations due to the underlying technology and its reliance on the AC system voltage and performance. These limitations include significant filtering requirements due to high harmonic content generated by the AC-DC conversion process, significant steady state and dynamic reactive power requirements, susceptibility to commutation failures caused by faults on the AC transmission system, and poor performance in weak AC systems leading to minimum system strength (short circuit level) requirements for LCC HVDC systems.

In response to these limitations and advances in VSC technology, the implementation of new LCC HVDC converters has rapidly diminished in the last two decades. Today, VSC has become the dominant technology choice for new HVDC systems worldwide. VSC HVDC converters utilize integrated gate bipolar transistors ("IGBTs") to drive the AC-DC conversion process, coupling the IGBTs with DC capacitors to produce an internal voltage source. As a result of these inherent technical advantages, VSC HVDC converters generally produce little to no harmonic content, provide for their own steady state and dynamic reactive power requirements, are able to ride through AC system faults without failing, and provide robust operation in weak or strong AC systems with no minimum short circuit requirements. All of these features serve to make VSC HVDC technology the most robust and future-proof HVDC technology available today.

Disadvantages of VSC HVDC technology compared to LCC technology include higher Converter Station operating losses (primarily due to the need for more power electronics components compared to LCC), slower fault recovery for faults on the HVDC line, more significant spatial requirements leading to larger buildings, and generally higher costs. With respect to the advantages and disadvantages of VSC converters, and particularly considering the higher cost of VSC, it is important to develop a holistic comparison of the two technology options. To achieve similar performance attributes as VSC HVDC converters, LCC HVDC converters require additional supporting system upgrades, the cost of which tends to result in a more equal cost comparison between the two technologies, particularly in the rapidly changing operational environment created by the clean energy transition. Even then, the inherent advantages of VSC technology make it nearly impossible to develop a comprehensive alternative utilizing LCC converters. Further discussion of LCC HVDC technology as an alternative for the HVDC Modernization Project is provided in Section 4.9. As stated above, VSC HVDC technology is the most robust and future-proof HVDC technology available today, and its value-added attributes provide confidence and long-term value that are not achievable with LCC HVDC technology.

Table 3.3.1-1 – LCC and VSC Technology Comparison Attributes

Attributes	LCC	VSC
Future-Proof Technology	No	Yes
Reactive Power Requirements	Significant	Self-Provided
Dynamic Voltage Support	Not Included	Included
AC System Harmonic Impact	Significant	Minimal
Blackstart Capability	No	Yes
Risk of HVDC Failures Due to AC System Events	Susceptible	Immune
Minimum AC System Short Circuit Level Requirement	Required	None
Long-Term Outlook for Development & Support	Fewer Projects	More Projects
Outdoor Equipment	Most	Least
Building Size	Moderate	Large
Converter Power Losses[5]	Moderate/Lower	Moderate/Higher
Bi-Directional Capability and Dispatch Frequency	Limited Flexibility	Highly Flexible
HVDC Fault Recovery Performance	Fastest	Slowest
Reliability & Availability	Similar	Similar
Expandability Options	Yes	Yes

3.3.2 Reliability and Grid Support

VSC HVDC converters offer inherent grid-supporting attributes not found in LCC HVDC converters. In many ways, the grid-supporting attributes of VSC HVDC converters provide comparable performance to traditional central station baseload generators. The role of coal-fueled baseload generators in the regional energy mix continues to decline as traditional central station resources are displaced by intermittent renewable resources. Minnesota Power has previously discussed the impact of transitioning away from local baseload generation on its own transmission system, specifically citing concerns about system strength and voltage support, local power delivery, and regional power delivery.[6] The implementation of VSC HVDC technology for the Square Butte HVDC system is a foundational component for ensuring the continued reliability of the transmission system as Minnesota Power navigates the clean energy transition. This section provides a more detailed analysis of the technology enhancements offered by VSC HVDC and discussion of how these enhancements will contribute to the reliability of the transmission system.

3.3.2.1 Reactive Power and Voltage Support

VSC HVDC converters provide for their own steady state and dynamic reactive power requirements. This inherent attribute of VSC technology eliminates the need for additional reactive support from mechanically switched capacitors, synchronous condensers, or static synchronous compensators ("STATCOM") external to the HVDC system itself. In addition to providing for the needs of the HVDC system itself, VSC converters are capable of producing or absorbing reactive power with very fast response times to support the surrounding AC system in both steady state and transient timeframes. Real and reactive power operations in a VSC HVDC system are independent of one another, meaning that this reactive power support is available to support the AC system regardless of the real power transfer level of the HVDC line at any given

[5] While converter station losses are a differentiator between LCC and VSC technology, it is also important to note that converter station losses in both cases are only a fraction of overall HVDC system losses. As noted in Section 3.7, the losses in the converters are much smaller than the losses in the transmission line itself when the HVDC system is operating at peak.

[6] See Appendix P.

time. This feature of the new VSC HVDC converters will contribute to maintaining predictable steady-state transmission voltages and robust transient voltage performance for Minnesota Power and the region.

3.3.2.2 Resiliency Against Adverse AC System Conditions

Unlike LCC HVDC converters, VSC HVDC converters do not rely on the AC system voltage for commutating current from the outgoing valves to the incoming valves. Instead, they use electronic signals to commutate current in the valves. This feature of VSC technology renders it very resilient, and practically immune, to faults on the surrounding AC transmission system. Whereas an LCC HVDC system may stop transferring power briefly due to low transient voltages caused by nearby AC system fault events, VSC HVDC converters can normally operate through AC system faults. When an LCC HVDC system experiences a commutation failure, all of the power formerly being transferred on to HVDC line is dumped onto the underlying AC system, aggravating the post-fault system response. VSC converters prevent this problem by continuing to transfer real power over the HVDC line. When this inherent resiliency is combined with the dynamic reactive support discussed in Section 3.3.2.1, which acts like a STATCOM to support the surrounding system during and after nearby fault events, VSC converters can contribute to significant improvements in transient performance.

VSC converters are also capable of operation at very low short circuit levels and can even be designed to operate in "grid-forming" mode to restart and support an islanded system. This feature makes VSC converters uniquely suitable for transmission systems with a high penetration of inverter-based resources and little to no synchronous generation. To achieve similar performance, LCC converters often require synchronous condensers to ensure a minimum short circuit level of at least 2.5 times the HVDC power rating. If the surrounding system is not sufficiently strong, LCC HVDC systems may experience control interaction issues with surrounding inverter-based resources or high transient over-voltages due to significant amounts of fixed reactive support (filters and capacitor banks). The resiliency of VSC converters to weak system conditions ensures their long-term viability regardless of how the surrounding system develops, effectively future-proofing the HVDC system. With the added value of being able to support blackstart and islanded (grid-forming) operation,[7] VSC HVDC converters provide additional flexible options for recovering from adverse AC system conditions.

3.3.2.3 Low Impact on AC Transmission System

The current design standard for VSC HVDC converters, known as multi-level modular converter, consists of multiple sub-modules connected in series. This converter design produces an AC waveform with a large number of steps, resulting in very little harmonic content. Harmonic content occurs when the AC waveform varies from a standard 60 Hz sine wave due to the inclusion of higher-frequency content. LCC HVDC converters produce a waveform with a significant amount of harmonic content, which must then be filtered out on the AC side by fixed-sized capacitive filter banks. Because VSC converters do not produce significant harmonics, there is less potential harmonic impact on the AC system. Without a need for large capacitive filter banks, VSC HVDC systems are significantly less likely to contribute to low-order resonances, high transient over-voltages, and circuit breaker transient recovery voltage issues.

The symmetric monopole configuration that is proposed for the Project will also contribute to reduced AC system impacts. In this configuration, the HVDC system has a high-impedance

[7] Black start capability is an added feature that requires additional equipment and control functions which must be specified and incorporated into the technical design of the VSC HVDC converter.

ground point on the DC system. Due to this grounding configuration, faults on the DC system do not draw fault current from the AC system. Instead, DC system faults appear to the AC system as an interruption of real and reactive power flow only, rather than drawing a significant amount of fault current and negatively impacting AC system voltage.

3.3.2.4 Flexible Bi-Directional Dispatch Capability

Bi-directional dispatch capability refers to the ability to transfer power in both directions. In the case of the Square Butte HVDC system, that creates the ability to transfer power from West to East and East to West. The present Square Butte HVDC system operates exclusively in West to East dispatch, moving from central North Dakota to northeastern Minnesota. When it was originally commissioned, the Square Butte HVDC system would have had the capability to operate bidirectionally. However, several decades of exclusively West to East operation have polarized the HVDC terminal equipment, rendering it impossible to reverse the direction of power flow. The existing system is also capable of changing the power transfer level only once per hour and requires a minimum dispatch of 50 MW per pole at all times when the HVDC line is in use.

The new VSC converters will have bidirectional dispatch capability and greater flexibility for changing the dispatch of power flow on the HVDC Line. VSC HVDC converters can operate continuously from zero to maximum power transfer in each direction without changing voltage polarity. This allows power transfer on the HVDC Line to be ramped up and down, and even reversed if necessary, very rapidly to respond to system events or market signals. The capability to dispatch on a more frequent basis will also align HVDC operations with current MISO market operations, which can update dispatch every five minutes. Thus, the VSC converters provided enhanced operational flexibility for both supporting transmission reliability and optimizing HVDC dispatch for market economics.

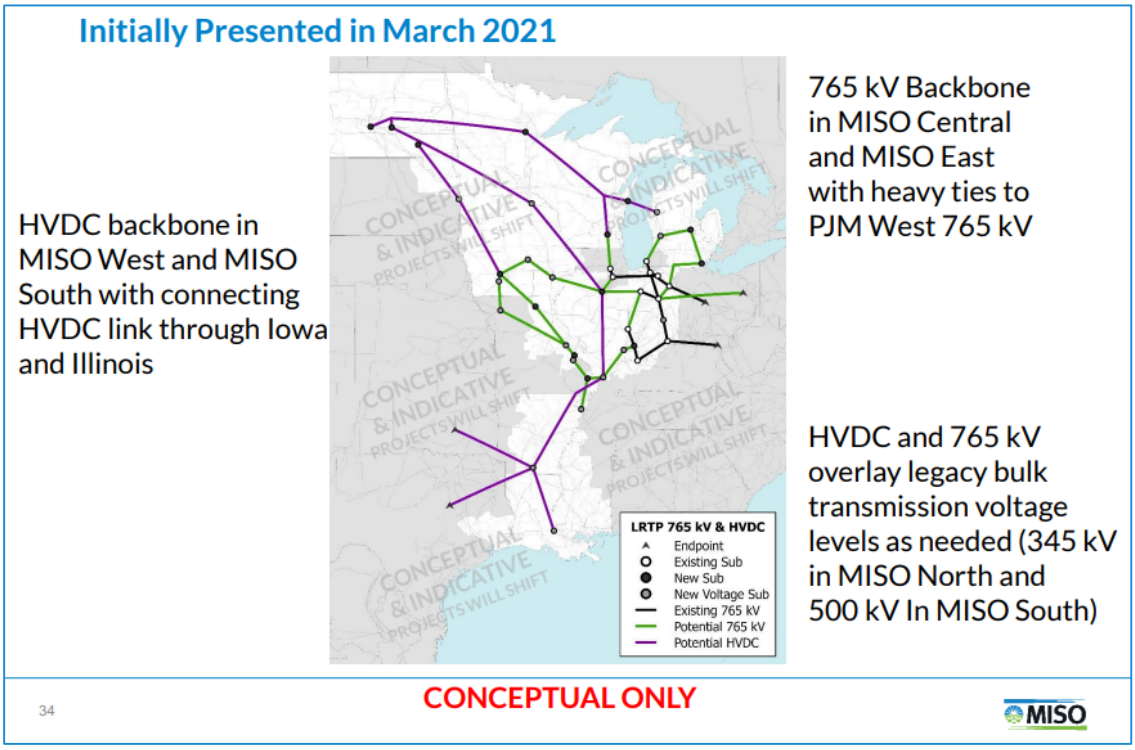
3.3.3 Future-Focused Technology

The many attributes listed above position VSC HVDC converters to support Minnesota Power as it navigates the continued evolution of the power system and make positive contributions to grid reliability as the clean energy transition continues. With their inherent technological advantages, VSC HVDC converters are better suited to operations in weaker and less predictable system conditions associated with higher penetrations of renewable energy. In addition, the VSC HVDC converters implemented with the HVDC Modernization Project will provide flexibility and scalability to support both the near-term and long-term needs of the electric grid. Previous sections have already provided a thorough discussion of how the VSC HVDC converters will support the near-term needs of Minnesota Power's system. This section provides an overview of how the VSC HVDC converters will best support the long-term needs of Minnesota Power's transmission system and the regional grid.

Utilities, RTOs, Federal agencies, and states are in various stages of developing plans to meet their goals for a carbon-free future, with Minnesota leading the way in the upper Midwest region in many respects. The pace of the transformation is increasing, and the grid needs to be adapted to meet the needs of the future renewable-heavy power system. Across the world, VSC HVDC systems are being examined to support reliable integration of large amounts of renewable energy. This is also true in the Upper Midwest, where the regional transmission operator, MISO, has taken on an ambitious multi-year effort to identify and advance the regional electric grid of the future. This effort is called the Long Range Transmission Plan ("LRTP"), and similar to many other long-term transmission roadmaps being developed to support the clean energy transition, high-capacity regional HVDC systems play a significant role in the MISO LRTP roadmap as shown in

Figure 3.3.3-1.[8] Notably, the MISO roadmap specifically highlights several high-capacity HVDC connections, including the Square Butte HVDC corridor, as key components of the roadmap.

Figure 3.3.3-1 – 765 kV and HVDC Components of LRTP Indicative Long-term Road Map



This is consistent with the previous findings from MISO's Renewable Energy Integration Impact Assessment ("RIIA"). RIIA was a technically rigorous analysis of system needs resulting from increasing renewable (wind and solar) penetration levels in the MISO footprint up to 50 percent. The focus of the assessment was to understand the complexities of large-scale renewable integration, identify potential issues and inflection points (where complexity increases significantly), and examine potential mitigation solutions.[9] One of the major findings of RIIA was that power delivery from weak areas of the grid, defined by large amounts of inverter-based resources and low short circuit levels, would require a holistic approach to solution development to solve a myriad of reliability issues. According to MISO, "For the purposes of the RIIA analysis, the only workable solution found was addition of Voltage Source Converter (VSC) HVDC transmission lines."[10] It is, therefore, clear from the RIIA report and the present MISO LRTP analysis that the implementation of VSC HVDC technology is fundamental for transforming the power grid and integrating the vast amounts of renewable resources necessary to meet clean energy goals.

High-volume renewable energy transfer by large HVDC transmission projects will be required for the nation to make considerable progress towards clean energy objectives. While the urgent need to replace the existing Square Butte HVDC Converter Station due to aging infrastructure \requires Minnesota Power to proceed with the HVDC Modernization Project now, the

[8] Figure reference: March 8, 2023 Planning Advisory Committee presentation.
[9] RIIA Report, Page 2
[10] RIIA Report, Page 118

implementation of VSC technology in a flexible, scalable, and expandable configuration best positions the Square Butte HVDC corridor for the future development in support of the regional grid.

3.3.4 HVDC Market Drivers

Over the most recent two decades, VSC HVDC has evolved from a niche technology to the preferred HVDC converter technology for the majority of projects worldwide. Through ongoing discussions with the top worldwide HVDC suppliers, it has become clear that some of the suppliers are moving toward specializing in VSC HVDC projects in order to maximize their opportunity in the market. Given these conditions in the market, the likelihood of getting multiple responses to a competitive request for proposals for a LCC retrofit project for the Square Butte HVDC system is minimal. Further complicating the situation is that LCC and VSC projects fight for similar engineering, project delivery, and manufacturing resources within each of the suppliers. Thus, it is not altogether certain that the timeline for delivery of a LCC retrofit project would be any more favorable than what is currently available for VSC projects. Further, as mentioned above, the system support components necessary to augment LCC systems creates a near level comparison with respect to costs of the two systems. Finally, with a dwindling number of new LCC projects and a rapidly growing number of new VSC projects, there are concerns about long-term support for LCC projects.

The HVDC Modernization Project is intended to establish new Converter Stations that will last another four decades for Minnesota Power's customers. While it is clear that the knowledge and expertise, spare parts, and technical support will be available for VSC converters over that time period, the status of long-term support for LCC Converter Stations appears less certain. Based on Minnesota Power's assessment of the current market conditions and long-term support outlook, VSC HVDC converters are the most effective and reasonable way to deliver the HVDC Modernization Project in the near-term while meeting Minnesota Power's goal of establishing facilities that will be viable for the next several decades.

3.4 NEED TO RELOCATE THE HVDC TERMINALS

The implementation of new VSC HVDC converters for the HVDC Modernization Project requires that the Converter Stations be relocated and constructed on adjacent sites. The Company determined that the most suitable parcels for relocation of the Converter Station are west of the existing Arrowhead Substation due to its proximity to the existing Arrowhead Substation and HVDC terminal, as well as its proximity to the existing HVDC line. This site is preferred to minimize the number and length of new transmission lines required to connect the new HVDC Converter Station to the existing HVDC line and AC transmission system, while also maximizing the use of existing utility infrastructure at the Arrowhead Substation.

This section provides a brief overview of the underlying need drivers for relocation of the HVDC terminals, including the difference in spatial requirements for VSC technology compared to LCC technology, outage constraints, and future expansion considerations.

3.4.1 Spatial Requirements of VSC Technology

For the purpose of understanding the need to relocate the Converter Stations as Minnesota Power transitions the Square Butte HVDC system from LCC technology to VSC technology, it is necessary to understand the fundamental difference in the type of power electronics utilized for each technology option.

As discussed previously, the power electronics that do the work of converting between AC and DC current signals in a LCC HVDC system are called thyristors. On the other hand, VSC HVDC systems use IGBTs to perform high-speed switching to make the conversion. The IGBTs in a VSC HVDC system are coupled with DC capacitor banks to create an internal voltage source (hence the name, "voltage source converter") that inherently provides for its own reactive power and voltage support. Due to the fundamental difference in the power electronic components, VSC HVDC systems generally require a much larger building than similarly rated LCC HVDC systems. For the HVDC Modernization Project, this means that the new VSC HVDC equipment is much too large to be retrofitted into Minnesota Power's existing HVDC Converter Station buildings, which were designed for a substantively different (LCC HVDC) application. Therefore, new buildings must be constructed for the new VSC converters.

The larger footprint of the buildings required for VSC converters is generally offset by significantly less required outdoor equipment compared to LCC converters. This is because LCC HVDC systems require significant amounts of reactive power to maintain voltage within minimum limits and large filter banks to smooth out harmonic components inherent to the LCC HVDC conversion process. To meet these requirements, LCC HVDC systems typically come with a large number of outdoor capacitor and filter banks, and sometimes also include synchronous condensers. VSC HVDC systems inherently provide reactive power and voltage support and produce a waveform with very little harmonic content, generally eliminating the need for AC filters. In the end, the comprehensive footprint including all indoor and outdoor equipment tends to be similar for comparably rated LCC and VSC converters.

3.4.2 Outage Constraints

In addition to the requirement for new buildings, constructability and outage constraints are another major reason to construct the new Converter Stations on an adjacent site. The consequences of extended outages discussed above are similar whether the outages are "forced" by failures or whether those outages are planned due to construction. Relocating the Converter Stations enables the existing HVDC Converter Stations to continue operating to the greatest extent practicable during the construction of the HVDC Modernization Project, further minimizing costs to customers.

The new HVDC Converter Stations and most of the new AC interconnection facilities may be constructed adjacent to the existing HVDC Line and substation infrastructure. Single pole outages will be required to upgrade the capacity of 230 kV substation bus and equipment in the Arrowhead Substation at the points of interconnection for the two new 230 kV lines. An outage will also be required to cut into the existing HVDC line and reconnect it to the newly constructed extension to the new VSC Converter Station. These outages are significantly shorter in duration compared to the multi-year outages that would be required to retrofit new converters into the existing buildings.

3.4.3 Future Expansion

The Square Butte HVDC system has a significant role to play in the ongoing clean energy transition and decarbonization of our region's energy resources, as discussed in Section 3.3. As such, the HVDC Modernization Project is designed to accommodate future expansion of the HVDC system and the interconnected AC transmission system, to support the future regional transmission development that is necessary to successfully navigate the clean energy transition. Relocating the Converter Stations to adjacent sites where there is considerably more space and

flexibility to accommodate future expansion is necessary to ensure that the HVDC system is positioned to provide maximum value over its lifespan.

3.5 IMPACT OF DENIAL

The Commission has established criteria in Minn. R. 7849.0120 to apply in determining whether a Certificate of Need should be granted for a proposed high voltage transmission line. An applicant for a Certificate of Need must show that the probable result of denying the request would have an adverse effect on the future adequacy and reliability of the system, there is not a more reasonable and prudent alternative, the proposed facility will provide benefits to society compatible with protecting the environment, and the project will comply with all applicable standards and regulations. Minnesota Power has demonstrated in this application that the proposed Project meets all the requirements to obtain a Certificate of Need. The Project will modernize aging assets that are critical to the reliable delivery of renewable energy to Minnesota Power's customers, improve the reliability of the transmission system and thoughtfully position for continued clean energy system transformation.

Should the Commission deny Minnesota Power's Certificate of Need Application for the Project, failure rates of the existing HVDC Converter Station equipment are anticipated to increase, resulting in outages that impact the reliable and efficient delivery of Minnesota Power's North Dakota wind energy and result in direct cost impacts to Minnesota Power's customers and reliability impacts to the regional transmission system. As these outages increase in frequency and duration, the cost and reliability impacts will continue to grow. With no viable plan to modernize the existing HVDC converters, Minnesota Power would immediately need to determine if it was prudent to invest in relatively short-term fixes to keep the HVDC Line operating on a limited basis or to move on from the HVDC Line entirely and begin to develop alternative AC transmission solutions.

As discussed in Section 4.8.2, the alternative transmission solutions required to facilitate continued delivery of Minnesota Power's zero fuel cost North Dakota wind energy, mitigate system impacts caused by the retirement of the HVDC Line, and replace the grid support provided by the VSC HVDC converters would come at a substantially higher cost and with greater human and environmental impacts than the HVDC Modernization Project. Given that the alternative AC transmission solutions include multiple regional-scale 345 kV transmission lines, there would likely be prolonged exposure to outages of the HVDC Line during the 10 or more years it would take to develop these projects. At some point during that time, it may become impossible to continue operating the HVDC Line at its full capacity, leading to extended outages and associated impacts to Minnesota Power's customers and regional reliability.

Were Minnesota Power to choose to invest in relatively short-term fixes to keep the HVDC Line operating on a limited basis, these fixes would result in significant risk of stranded investment as the regional transmission system develops. Targeted replacements of the existing control system, converter transformers, and thyristor valves could serve to keep the existing LCC HVDC system running for several more decades at its existing capacity. These replacements would not bring the additional grid-supporting attributes associated with VSC technology, and therefore additional investments in STATCOMs, synchronous condensers, or other solutions may become necessary as the clean energy transition continues to challenge the historical operating conditions of the grid. As MISO continues to advance proactive long-range transmission planning solutions to position the grid for the future of clean energy, VSC HVDC solutions will inevitably begin to play a major role in the regional grid. At that point, Minnesota Power's short-term investments in keeping its existing LCC HVDC system may have to be replaced before the end of their useful

asset life by a VSC HVDC upgrade similar to the Project in order to continue reliable operation of the Square Butte HVDC corridor and provide the best value for Minnesota Power's customers and the region.

As discussed above, the impact of denial of the Application will be cost impacts to Minnesota Power's customers in the near-term from increased exposure to HVDC outages, substantial additional long-term cost for alternative projects to address reliability issues created by retirement of the HVDC Line, and lost opportunity to efficiently provide long-term bulk power transfer and grid support solutions for Minnesota Power and the region.

3.6 PROJECT AREA LOAD DATA

As discussed in previous sections, a significant portion of the electricity consumed by Minnesota Power's retail and municipal customers is delivered to its service area by the Square Butte HVDC Line. Minnesota Power has either constructed or entered into purchase agreements for 600 MW of wind energy in North Dakota, all of which depends on the HVDC Line for reliable and efficient delivery to Minnesota Power's customers. When the HVDC Line is unavailable due to forced outages, there are potentially significant cost impacts to Minnesota Power's customers. As discussed in the Company's Exemption Requests, which were approved by the Commission on February 1, 2023, the Project is not proposed to address growing peak demand or system capacity issues. Instead, the Project is designed to upgrade and modernize the existing infrastructure of the HVDC terminals to assure the reliable and efficient delivery of renewable energy to Minnesota Power's customers, and enhance the reliable operations of the transmission system, for the coming decades. Since the need for the Project is associated with the ability to serve all of Minnesota Power's customers with reliable and affordable energy, the most relevant project-area load data is documented in Minnesota Power's most recent AFR, which was filed on June 24, 2022 in Docket No. E999/PR-22-11.

3.7 ESTIMATED SYSTEM LOSSES

Losses are a measure of the energy flow across the system that is converted into heat due to impedance within the elements of the transmission system. It is necessary for utilities to provide enough generation to serve their respective system demands (plus reserves), taking into account the loss of energy before it can be usefully consumed. When system losses are reduced or minimized, electrical energy is delivered to end users more efficiently, helping to defer the need to add more generation resources to a utility's portfolio. Therefore, system loss reduction results in monetary savings in the form of less fuel required to meet the system demand plus potentially delayed capital investment in generation plant construction.

Each new transmission line that is added to the electric system affects the losses of the system. In determining the amount of loss associated with a particular transmission project, it is typically not reasonable to consider only the project's transmission facilities and calculate losses directly from operation of those new transmission facilities. However, due to the unique nature of HVDC transmission and the specific circumstances of the HVDC Modernization Project, it is feasible to provide expected losses for the HVDC system under projected maximum loading and under projected average loading in the length of the line and at its terminals. This is because HVDC is a controllable, point-to-point transmission technology for which direct losses can be measured and reasonably quantified. One of the primary drivers for implementing HVDC transmission is that it is the most efficient option for long-distance bulk power transfer, in part due to reduced losses. For the HVDC Modernization Project in particular, the existing Converter Stations are being directly replaced with new Converter Stations and AC interconnection facilities, which

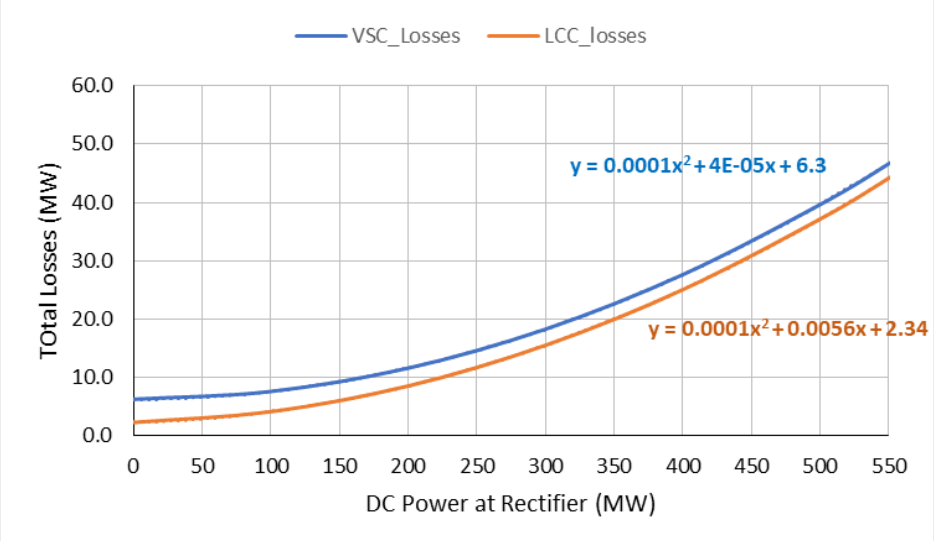
makes a direct comparison of pre- and post-Project losses in the HVDC facilities a simple and reasonable way to assess system loss impacts.

In previous proceedings, Minnesota Power has used power flow software PSS/E to calculate the losses in the transmission system before and after implementation of a project. Unfortunately, power flow programs like PSS/E are not equipped to provide holistic analysis of losses in HVDC systems, including both the transmission line and Converter Stations. While HVDC transmission line losses are fairly straightforward to calculate, the losses in the Converter Stations on either end are generally too complex for the power flow program to accurately model. Since the HVDC Modernization Project only involves replacing the Converter Stations on either end of the existing HVDC line, the losses in the transmission line component will be unaffected. Therefore, the primary comparison of pre- and post-Project losses is a comparison of the original LCC HVDC Converter Stations to the new VSC HVDC Converter Stations.

In the course of evaluating technology options for the HVDC Modernization Project, Minnesota Power's Owner's Engineer ("OE") developed a calculation methodology to approximate Converter Station losses in order to compare LCC and VSC options. The methodology takes into account fixed loss components, including transformer no load losses and basic station service losses that are present any time the Converter Station is energized, as well as current-dependent losses, including power wiring, component, and heating losses that increase as the power flow through the Converter Station increases.

Based on the OE's methodology, VSC converter losses are expected to be about 0.35 percent higher than LCC converter losses (1.0 percent versus 0.65 percent). The higher losses are well-documented as one of the drawbacks of VSC technology compared to LCC technology and are primarily due to the greater number of power electronics components and the larger buildings required for VSC Converter Stations. Fortunately, the impact on total HVDC system losses is relatively minimal because the transmission line losses continue to dominate the total losses. Figure 3.7-1 below shows a comparison of total HVDC system losses with VSC converters compared to LCC converters across the full range of dispatch from 0 MW to 550 MW. The underlying formula from the OE's methodology is also shown on the plot to illustrate how the losses have been calculated.

Figure 3.7-1 – HVDC System Losses with VSC Converters vs. LCC Converters



At 550 MW, total losses for the LCC HVDC system are 44.2 MW (8.0 percent) while total losses for the VSC HVDC system are 46.7 MW (8.5 percent). At maximum power transfer on the HVDC line, losses are expected to be approximately 2.5 MW higher with the new VSC HVDC converters compared to the original LCC HVDC converters.

Because the power flow on the HVDC line changes from day to day and hour to hour, and losses are related to the square of the current flowing through the HVDC line, the losses will change over time, increasing as HVDC line flow increases and decreasing as HVDC line flow decreases. Since losses change over time, there is no precise method to calculate average annual loss reductions. One common method is to use the loss savings at peak demand to estimate the average annual loss savings based on the following formulas:[11]

$$Loss\ Factor = (0.3 \times Load\ Factor) + (0.7 \times Load\ Factor^2)$$

$$Annual\ Loss\ Savings\ (MWh) = (Loss\ Factor \times Peak\ Loss\ Savings) \times 8760\ hours\ per\ year$$

Assuming an average load factor for the HVDC line of 70 percent based on historical operating data and using the calculated difference in losses (2.5 MW) at peak demand (550 MW), the Project will increase average HVDC line losses by an estimated 11,990 MWh annually. This relatively modest increase in losses is offset by the significant value of the additions VSC technology brings to support the grid, as discussed in previous sections.

3.8 IMPACT OF DELAY

If the Commission delays issuing a Certificate of Need and Route Permit for the HVDC Modernization Project, Minnesota Power's customers will have increased exposure to HVDC outage impacts, and the ability to meet even the 2030 in-service date for the Project may become compromised.

Further delay of the HVDC Modernization Project could lead to significant and extended outages, as discussed in Chapter 3.0. These outages come with potentially significant costs to Minnesota Power's customers due to their impact on the reliable and efficient delivery of Minnesota Power's North Dakota wind energy facilities, as discussed in Section 2.2.4. Given the age and condition of existing HVDC Converter Stations, three general outage scenarios exist, all with of which have significant impacts on Minnesota Power's customers:

1. **Continued Short-Duration Outages:** Component failure rates continue to grow over time, resulting in increasing short-duration outages similar to what have been occurring in recent years (see Figure 3.2.2-1). In some years, extended-duration outages may occur due to more challenging failures. Eventually a failure occurs that cannot be repaired, advancing to one of the extended outage situations discussed below.

2. **Extended Outage of a Single Pole:** Many of the scenarios discussed in Section 3.2.2 would result in failures in the control system, thyristor valves, or converter transformers that render it impossible to continue operating the HVDC system at its full capacity. At that point, HVDC system operations would be reduced to one pole, de-energizing the pole with the failed equipment. Equipment from the failed pole would then be utilized to fix any failures in the operating pole in order to keep

[11] Gönen, Turan. Electric Power Distribution System Engineering. McGraw Hill, 1986. 55, 58-59.

it running as long as possible. Under these operating constraints, the capacity of the HVDC system would be indefinitely limited to 275 MW, or half of its current total capacity.

3. **Extended Outage of Both Poles:** There are equipment failure scenarios whereby repair would not be feasible and, as a result, it would be impossible to continue operating either pole of the HVDC system. In that case, the entire 550-MW capacity would be unavailable until the Project could be completed or until Minnesota Power could procure, engineer, and construct a project to repair the existing HVDC Converter Stations. Current estimates indicate that a six-month outage could cost between $25 to $40 million. For delays longer than six months, replacement energy costs could be $100 million/year or more, and there would be major delays in Minnesota Power's carbon and renewable energy progress. Minnesota Power's wind deliveries, totaling about 2,000,000 MWh/year, are vital to meeting Minnesota Power and State of Minnesota carbon reduction and clean electricity goals.

While the most likely scenario is continued short-duration outages with the ability to repair and restore the HVDC system to full capacity, further delays to the Project in-service date will increase the risk of realizing one of the extended outage scenarios described above.

In addition to the operational and customer impacts, a delayed Commission decision may impact Minnesota Power's ability to expedite the Project in-service date. As discussed in Section 2.2.1, Minnesota Power is presently working with a preferred HVDC supplier to evaluate options for improving upon the best-available guaranteed in-service date of April 2030. The HVDC supplier could present Minnesota Power with this opportunity at any time. If there is uncertainty surrounding the status or timing of the Certificate of Need, it would not be possible for Minnesota Power to make a commitment to achieve the earlier in-service date. If the Commission delays issuing a decision long enough, even the ability to procure the project by 2030 may come into question, as Minnesota Power needs to make significant commitments to obtain long lead time items for AC substations and HVDC system design with the preferred supplier in late 2024 and 2025 toward meeting the 2030 in-service date. Given the highly competitive state of the global HVDC market, a slight delay on the front end of the Project could result in a multi-year delay to the in-service date on the back end.

In light of the substantial risks and costs of delayed action on this Application, it is critically important that the Commission does not delay issuing a Certificate of Need and Route Permit for the HVDC Modernization Project.

3.9 EFFECT OF PROMOTIONAL PRACTICES

Minnesota Power has not conducted any promotional activities or events that have triggered the need for the Project. Rather, the Project is driven by the need to replace an aging HVDC system with current technology to enable and augment the renewable energy transition in Minnesota.

3.10 EFFECT OF INDUCING FUTURE DEVELOPMENT

The HVDC Modernization Project is not intended to induce future development, but it may support future economic development that otherwise would not be possible if the aging HVDC system is not brought to current technology and operational standards. Additionally, the replacement of this aging infrastructure through the HVDC Modernization Project will ensure that zero fuel cost

renewable generation from North Dakota can continue to be efficiently transmitted to Minnesota along the existing HVDC Line, ensuring Minnesota Power remains well positioned to meet Minnesota's clean energy goals.

3.11 SOCIALLY BENEFICIAL USES OF FACILITY OUTPUT

As discussed above in Chapter 3.0, the purpose of the HVDC Modernization Project is to replace aging infrastructure and, thus, improve the HVDC Line reliability and availability for socially beneficial use.

4.0 ALTERNATIVES TO THE PROJECT

4.1 ANALYSIS OF ALTERNATIVES

In any Certificate of Need proceeding for a proposed transmission line project, an applicant is required to consider various alternatives to the proposed project. Minn. Stat. § 216B.243, subd. 3(6) provides that in assessing need, the Commission shall evaluate "possible alternatives for satisfying the energy demand or transmission needs including but not limited to potential for increased efficiency and upgrading of existing energy generation and transmission facilities, load-management programs, and distributed generation." The Commission has also provided in its rules that an applicant for a Certificate of Need must discuss alternatives in the application and environmental report. Minn. R. 7849.0260 states:

Each application for a proposed large high voltage transmission line must include:

> B. a discussion of the availability of alternatives to the facility, including but not limited to:
>
> > (1) new generation of various technologies, sizes, and fuel types;
> >
> > (2) upgrading of existing transmission lines or existing generating facilities;
> >
> > (3) transmission lines with different design voltages or with different numbers, sizes, and types of conductors;
> >
> > (4) transmission lines with different terminals or substations;
> >
> > (5) double circuiting of existing transmission lines;
> >
> > (6) if the proposed facility is for DC (AC) transmission, an AC (DC) transmission line;
> >
> > (7) if the proposed facility is for overhead (underground) transmission, an underground (overhead) transmission line; and
> >
> > (8) any reasonable combinations of the alternatives listed in sub items (1) to (7).

Minn. R. 7849.0340 also requires an applicant to consider the option of not building the proposed facility.

This section discusses the various alternatives to the Project that Minnesota Power considered, including: 1) generation alternatives; 2) various transmission solutions, including upgrading other existing facilities, different voltage levels, and different endpoints; and 3) a no-build alternative.

As discussed below, none of these alternatives is more reasonable and prudent than the HVDC Modernization Project.

4.2 GENERATION AND NON-WIRE ALTERNATIVES

The Project involves replacing the Converter Stations on either end of the existing HVDC Line with relatively limited development of new transmission facilities for the purpose of reconnecting the new Converter Stations to the existing AC transmission system. Because the Project is enabling the continued delivery of existing high-capacity renewable wind energy resources from North Dakota by utilizing existing transmission infrastructure, it has similar attributes to both a generation solution and a non-wire solution. There is no alternative generation or non-wire solution that can replace the function of the HVDC Converter Stations in facilitating the bulk long-distance transfer of renewable energy across the grid.

4.3 ALTERNATIVE VOLTAGES

4.3.1 Alternative HVDC Transmission Voltages

The Project involves replacing the Converter Stations on either end of Minnesota Power's existing ±250 kV HVDC transmission line. The 465-mile transmission line itself will continue to be operated using its existing structures, which are designed specifically to operate at ±250 kV DC. To continue using the existing transmission line, the new Converter Stations must be designed for the same operating voltage as the line. To change the HVDC transmission voltage at this time would require rebuilding the entire 465-mile line on new structures designed for a higher operating voltage—a significant increase in scope and cost that is not necessary at this time to support the near-term capacity needs on the HVDC system. Therefore, alternative HVDC transmission voltages are not a necessary improvement or a cost-effective alternative for the Project.

4.3.2 Alternative AC Transmission Voltages

The Project involves interconnecting the new Converter Stations at 345 kV and then stepping down the voltage from 345 kV to 230 kV to interconnect to the existing transmission system at the Arrowhead Substation. Minnesota Power considered interconnecting the new HVDC converters directly to the 230 kV system. This would involve designing the HVDC converter transformers with a 230 kV winding on the AC system side rather than a 345 kV winding, and then building new 230 kV bus and transmission to connect to Arrowhead. While this alternative would have a lower cost in the near term, the long-term cost would likely be significantly higher than developing an initial interconnection at 345 kV.

As the regional transmission system continues to develop to support the clean energy transition, the near-term focus has been on developing a strong 345 kV backbone network. This is clearly demonstrated by Tranche 1 of the MISO Long Range Transmission Plan, which was approved by the MISO Board of Directors on July 25, 2022 and consists of 18 individual 345 kV projects totaling over $10 billion. As discussed in Section 3.2, Minnesota Power believes the Square Butte HVDC corridor has long-term significance for the regional transmission system, enabling efficient and flexible long-distance transfer of high-value and zero fuel cost renewable energy resources in North Dakota to customers throughout MISO. As the use and significance of this existing HVDC system evolves over the life of the proposed VSC Converter Stations, it will become increasingly important for the HVDC system to be directly interconnected to the regional 345 kV network, rather than the underlying local 230 kV network. However, to move the point of interconnection from the 230 kV system to the 345 kV system at a later date would require an expensive

replacement of the converter transformers to change the winding voltage on the AC-system side. Since the converter transformers are approximately 20 percent of the overall cost of the HVDC Converter Station itself, there would be a significant sunk cost at the time the transition from 230 kV to 345 kV is made. Therefore, alternative AC transmission voltages are not a cost-effective long-term alternative for the Project.

4.4 UPGRADE OF EXISTING FACILITIES

The Project involves upgrading existing facilities as discussed throughout Chapter 3.0.

4.5 ALTERNATIVE ENDPOINTS

The Project's endpoints are determined by the endpoints of the existing 465-mile HVDC transmission line. While the implementation of VSC HVDC technology requires that the new Converter Stations be developed on new sites nearby to the existing Converter Stations, as discussed in Section 3.3, the new sites have been carefully selected to minimize the amount of new transmission line construction required to interconnect the Converter Stations to the existing HVDC transmission line and the AC transmission system. Moving the endpoints farther away from the existing HVDC transmission line endpoints would significantly impact the scope and scale of the Project. Therefore, there are no feasible alternative endpoints for the Project outside of the immediate vicinity of the existing HVDC Converter Stations and no route alternatives were considered outside of what is proposed.

4.6 DOUBLE CIRCUITING

The Project includes AC interconnection facilities required to connect the new VSC HVDC Converter Stations to the existing AC transmission system. These proposed AC transmission lines are very small in scope and scale, with none of them exceeding half a mile in length. The Company will consider implementing double circuit-capable structures for these short new AC interconnection facilities where appropriate given the potential future use of the facilities. Use of double-circuit or double-circuit capable structures within the proposed route will be determined during detailed design based on engineering and site constraints, constructability review, and future considerations for the facilities.

4.7 ALTERNATIVE NUMBER, SIZE, AND TYPE OF CONDUCTOR

The Project includes AC interconnection facilities required to connect the new VSC HVDC Converter Stations to the existing AC transmission system. The specific conductors for the proposed AC transmission lines have yet to be determined but will consist of ACSR or possibly ACSS wire and are likely to utilize bundled configurations (e.g., two sub-conductors per phase). The conductors will be selected according to the near-term and long-term capacity needs of the proposed transmission lines while also considering electrical performance characteristics, such as electric and magnetic fields, audible noise, and radio interference, as well as the lifecycle operating and maintenance costs. The conductor for the short segment of new ±250 kV HVDC line is anticipated to be 2839 ACSR to match the existing HVDC Line conductor. This is an atypically large conductor that is necessary to facilitate the full capacity of the HVDC Line, and there are limited or no feasible alternatives at this time.

4.8 ALTERNATING CURRENT (AC) TRANSMISSION ALTERNATIVES

Since the Project involves improvements to an existing HVDC Line, the Company considered AC transmission alternatives, including directly converting the HVDC transmission line to AC or developing a broader AC network solution to enable the HVDC Line to be retired.

4.8.1 Converting the HVDC Line to AC

The Company considered converting the existing HVDC Line to AC to avoid having to replace the Converter Stations on each end. The existing Square Butte HVDC line is a direct 465-mile connection from Center, North Dakota, to Hermantown, Minnesota. Along the entire length of the line, there are no interconnections to the underlying system. The existing transmission line structures are designed to operate at ±250 kV DC and consist of two energized conductor positions, one for each pole of the HVDC line, and a shield wire. A typical AC transmission line consists of three energized conductor positions (for three-phase power transfer) and one or more shield wires. Transmission line insulation and phase-to-ground clearances are also driven by the designed operating voltage of the line.

Considering these facts, it would not be possible to convert the existing HVDC Line to operate at an alternative AC voltage. Rather, the entire 465-mile line would need to be rebuilt to specifications for the selected AC transmission voltage, and new substation interconnections would need to be developed on either end. Depending on the selected AC transmission voltage (345 kV, 500 kV, or 765 kV) large power transformers would be required at each end to step down the voltage for interconnection to the underlying 230 kV system. Additional mid-line interconnections to the underlying system would also be required to reduce line lengths and facilitate the interconnection of new reactive support. This reactive support would be necessary because AC transmission lines consume significant amounts of reactive power proportionally to their transfer capacity and line length. In this case, an exceptionally long high-capacity AC transmission line would be required to replace the HVDC Line, driving the need for substantial amounts of reactive power compensation. Changing the line from HVDC to AC would also raise significant constructability concerns due to the need to remove the existing line before replacing it with the new AC transmission lines. To avoid constructability concerns, the new line could be built next to the existing HVDC Line corridor, but this would create additional human and environmental impacts that are well beyond the limited impacts of the Project.

In summary, direct replacement of the HVDC transmission line with an AC transmission line to avoid replacement of the Converter Stations would result in significant increases to cost and human and environmental impacts. The entire 465-mile transmission line would need to be rebuilt, expanded substation interconnections would need to be developed on both ends of the line, and new mid-line substations would need to be established to connect reactive resources and interconnect to the underlying AC transmission system. Considering these factors, direct replacement with AC transmission is not a reasonable alternative to the Project.

4.8.2 HVDC Line Retirement with AC Network Upgrades

The Company considered running the existing HVDC Converter Stations to failure, retiring the HVDC Line, and developing a package of AC transmission network upgrades to mitigate the impacts of HVDC Line retirement and facilitate delivery of Minnesota Power's existing and planned North Dakota wind generation. If Minnesota Power were to run the HVDC Converter Stations to failure, effectively retiring the HVDC Line after it becomes inoperable, a package of AC transmission network upgrades would need to be developed and implemented to mitigate the

system impacts of retiring the HVDC Line (the "AC Alternative"). The AC Alternative would need to restore direct transmission outlet capacity for Minnesota Power's North Dakota wind generation, mitigate deficiencies in regional transfer capability to allow the generation to move out of North Dakota, and address local reliability impacts for Minnesota Power's customers in Northeastern Minnesota who depend on the support provided by the Arrowhead HVDC terminal.

The process of developing the AC Alternative would involve identifying the system impacts from retirement of the HVDC Line through steady state and stability analysis of regional power system models, coordinating with MISO and neighboring impacted utilities through the annual MTEP reliability process to determine appropriate AC system mitigation solutions, and permitting, engineering, and constructing the network upgrades included in the AC Alternative as expeditiously as possible while keeping the HVDC Converter Stations operational for as long as possible.

Minnesota Power performed a power flow screening analysis to develop a better understanding of the potential scope and scale of impacts and AC network upgrades associated with a retirement of the HVDC Line. Impacts were evaluated with and without the MISO LRTP Tranche 1 projects to identify the extent to which LRTP transmission may help mitigate the impacts of a HVDC Line retirement. Results indicate that the $10 billion LRTP Tranche 1 portfolio of transmission projects does mitigate some of the constraints, but is not sufficient to address all, or even most, of the constraints associated with HVDC Line retirement. In addition to LRTP Tranche 1, Minnesota Power estimates that the AC Alternative would include:

- **340** miles of new 345 kV and 230 kV transmission lines in North Dakota and Minnesota
- **220** miles of upgraded 345 kV transmission lines in North Dakota, South Dakota, and Iowa
- **204** miles of upgraded 230 kV and 115 kV transmission lines in North Dakota and Minnesota
- **3,000** megavolt amperes of additional transformer capacity in North Dakota and Minnesota
- **600** megavolt amperes reactive ("MVAR") of new STATCOMs in North Dakota and Minnesota to equal the dynamic reactive support provided by the HVDC Modernization Project
- **300** MVAR of new capacitor banks along the North Dakota / Minnesota border

The total estimated direct cost for the AC Alternative is nearly $1.4 billion, a 70 percent increase over the estimated mid-range cost of the HVDC Modernization Project. Because the need for these network upgrades would be triggered by retirement of the HVDC Line, the entirety of this cost would most likely be assigned to Minnesota Power. Besides being more costly, the AC Alternative comes with other drawbacks that cannot be reconciled when compared with the HVDC Solution. Other key differences between the Project and the AC Alternative include:

1. **Controllability:** The HVDC line moves Minnesota Power's wind generation directly from Center, North Dakota, to Minnesota Power's customers in Northeastern Minnesota. Minnesota Power controls the HVDC Line flow,

facilitating the transfer of wind energy directly to its customers while bypassing a broad and often congested area of the regional AC transmission network. With an AC Alternative, Minnesota Power's wind generation is injected into the regional AC transmission network in North Dakota, and Minnesota Power withdraws an equivalent amount of energy from the AC transmission network in Northeastern Minnesota. There is no direct control over the system flow to support the needs of the grids (other than by redispatching generation resources). This contributes to further congestion on the MISO network and drives a need for significant transmission expansion, unlike the Project, which provides controllability of the HVDC Line, eliminating these impacts in their entirety without degrading the reliability of the regional transmission system.

2. **Congestion Risk:** With power transmitted on the HVDC Line, there is no risk of market congestion costs; the HVDC Line provides the perfect bridge for Minnesota Power's wind generation because its 465-mile direct connection between wind-rich Central North Dakota and Northeastern Minnesota bypasses constrained areas of the regional AC transmission network. With an AC Alternative, Minnesota Power bears the market risk if significant cost differences (i.e., congestion) develop between the North Dakota wind generation and Minnesota Power's load due to transmission constraints on the AC network. The AC Alternative creates a significant risk of exposure to increased delivery costs for Minnesota Power's North Dakota wind generation as it is subject to network constraints and congestion that are sometimes unpredictable, especially as major shifts in generation resources are projected for the future.

3. **Human and Environmental Impacts:** The Project makes efficient use of the existing 465-mile HVDC transmission line. It requires no additional transmission corridor development outside the immediate area of the Converter Stations, resulting in very limited human and environmental impacts. Comparatively, the AC Alternative would require an estimated 340 miles of new 345 kV lines to be routed and permitted, in addition to other network upgrades, establishing substantial new transmission corridors with significant human and environmental impacts. In addition to the human and environmental impacts, there is a significantly higher risk profile for permitting, engineering, procurement, and construction of the AC Alternative projects, potentially leading to even higher costs and longer implementation timelines.

In summary, running the existing HVDC Converter Stations to failure, retiring the HVDC Line, and developing a package of AC transmission network upgrades to mitigate the impacts of HVDC Line retirement would be almost double the cost of the Project and come with additional drawbacks including significant increases in human and environmental impacts due to the need for many miles of new AC transmission lines to be built to mitigate regional reliability impacts. Considering these factors, the AC Alternative is not a reasonable alternative to the Project.

4.9 HVDC TECHNOLOGY ALTERNATIVES

The Project involves upgrading the HVDC converter technology used for the Square Butte HVDC system from LCC to VSC technology. The need for VSC HVDC technology is discussed in Section 3.3. This section will discuss the Company's consideration of LCC HVDC technology as an alternative to the Project.

LCC HVDC technology, which was used for the original Square Butte HVDC Converter Stations, has been available for several decades. LCC HVDC converters utilize thyristor valves to drive the conversion between AC and DC, and they rely on the AC system voltage for commutating current from the outgoing valves to the incoming valves. LCC converters have a long track record of reliable and effective performance and can be an efficient option for high-power transfer applications. However, LCC converters come with inherent limitations due to the underlying technology and its reliance on the AC system voltage and performance. These limitations include significant filtering requirements due to high harmonic content generated by the AC-DC conversion process, significant steady state and dynamic reactive power requirements, susceptibility to commutation failures caused by faults on the AC transmission system, and poor performance in weak AC systems leading to minimum system strength (short circuit level) requirements for LCC HVDC systems. In response to these limitations and advances in VSC technology, the implementation of new LCC HVDC converters has rapidly diminished in the last two decades.

Advantages of LCC HVDC technology compared to VSC technology include lower Converter Station operating losses (primarily due to fewer power electronics components and smaller buildings compared to VSC), faster recovery for faults on the HVDC line, smaller buildings, and generally lower direct installed cost. With respect to the advantages and disadvantages of LCC converters compared to VSC converters, and particularly considering the higher installed cost of VSC, it is important to develop a holistic comparison of the two technology options.

For LCC HVDC converters to achieve similar performance attributes as VSC HVDC converters, they require additional supporting system upgrades, the cost of which tends to result in a more equal cost comparison between the two technologies, particularly in the rapidly changing operational environment created by the clean energy transition. Even then, the inherent advantages of VSC technology make it nearly impossible to develop a comprehensive alternative utilizing LCC converters. The key comparison attributes of LCC and VSC technology are summarized and compared in Table 4.9-1 below.

Table 4.9-1 – LCC and VSC Technology Comparison Attributes

Attributes	LCC	VSC
Future-Proof Technology	No	Yes
Reactive Power Requirements	Significant	Self-Provided
Dynamic Voltage Support	Not Included	Included
AC System Harmonic Impact	Significant	Minimal
Black Start Capability	No	Yes
Risk of HVDC Failures Due to AC System Events	Susceptible	Immune
Minimum AC System Short Circuit Level Requirement	Required	None
Long-Term Outlook for Development & Support	Fewer Projects	More Projects
Outdoor Equipment	Most	Least
Building Size	Moderate	Large
Converter Power Losses	Moderate/Lower	Moderate/Higher
Bi-Directional Capability and Dispatch Frequency	Limited Flexibility	Highly Flexible
HVDC Fault Recovery Performance	Fastest	Slowest
Reliability & Availability	Similar	Similar
Expandability Options	Yes	Yes

To close the performance gap for an LCC alternative compared to a VSC alternative, the main supporting upgrades that would be necessary are large STATCOMs and/or synchronous

condensers at each Converter Station. VSC HVDC converters would be designed to produce or absorb reactive power up to 0.95 power factor (equal to approximately one-third of the real power rating) to provide steady state voltage regulation and dynamic reactive support to the surrounding transmission system. An equivalent LCC HVDC solution would need to have at least ±300 MVAR of installed dynamic reactive power support from STATCOMs or synchronous condensers. Large amounts of fixed reactive support from harmonic filters required to be online any time the HVDC Line is energized may also increase reactive power absorption needs to prevent high voltages at low HVDC transfer levels and for transient events. If it is expected that the LCC converters will be operating in a system with a low short circuit level due to a lack of synchronous generation or because they will be used for blackstart restoration, the preference may be for synchronous condensers, which provide fault current as well as dynamic reactive support. Otherwise, large STATCOMs are a more optimal solution for flexible, fast-responding steady state and dynamic reactive support. Utilizing the MISO Transmission Cost Estimate Guide for MTEP22, each ±300 MVAR STATCOM or synchronous condenser would cost approximately $45 million to $60 million. Since these devices would be required on both ends of the HVDC Line, the total cost adder would be $90 million to $120 million in addition to the Converter Station cost. Even with the added support from STATCOMs or synchronous condensers, the LCC HVDC converter would continue to be more susceptible to AC system fault events and poor performance during adverse AC system conditions. As inverter-based renewable energy resources continue to displace traditional synchronous resources, changing system conditions may require that LCC converters be re-assessed and potentially re-tuned to changing requirements for short circuit levels or harmonic performance.

The long-term outlook for continued technical and maintenance support from the HVDC OEM may also become challenging as the worldwide HVDC market continues to lean heavily toward VSC technology. The challenges facing the current Square Butte HVDC system related to obsolescence and limited spare parts availability are much more likely to impact LCC Converter Stations over the next several decades than they are to impact VSC Converter Stations. In fact, some of the OEMs surveyed by the Company indicated that they were evaluating moving away from LCC technology entirely to maximize their ability to meet worldwide demand for VSC HVDC systems. As the Company was developing its competitive RFP for the Project in 2022, it became evident that none of the OEMs engaged in discussion with the Company had interest in supplying a LCC HVDC project at this time and that some would not even consider bidding on an LCC project.

In summary, the Company determined that LCC HVDC technology would be an inferior long-term technical solution compared to VSC HVDC technology, that overall costs for the LCC Converter Stations combined with supporting upgrades necessary to approximate the performance attributes of VSC technology would not be substantially less than the cost of implementing VSC Converter Stations, and that the present and long-term market outlook for LCC converters places them at a significant procurement and long-term support disadvantage compared to VSC converters. As the power system continues to evolve around the clean energy transition, the value-added technical attributes of VSC technology will make it the most flexible and future-proof option for HVDC development, a consensus position that is clearly being demonstrated in the global utility industry by recent rapid growth in demand for VSC HVDC projects. Therefore, LCC HVDC technology is not a prudent alternative to the Project.

4.10 UNDERGROUND ALTERNATIVE

The Company plans to have all proposed Project facilities located on land owned by the Company in St. Louis County, although land acquisition is ongoing at the time of filing this Application.

The Project includes AC interconnection facilities required to connect the new VSC HVDC Converter Stations to the existing AC transmission system. These proposed AC transmission lines are approximately a half a mile in length. The cost of constructing underground AC transmission is significantly greater than the cost of constructing overhead AC transmission, and underground transmission comes with considerable drawbacks for operations and maintenance.

While HVDC transmission lines are comparatively better suited for underground construction due to fundamental differences in their electrical characteristics, underground HVDC construction would still be substantially higher cost than overhead and come with similar operations and maintenance concerns. The HVDC line segment proposed for the Project is even shorter than the AC transmission line segments.

Beyond initial costs, another important consideration of undergrounding lines is consistency with existing lines and standards. Minnesota Power does not have any buried lines at voltages of 115 kV and above. The addition of underground transmission is outside of Minnesota Power's current standards and would require new installation training, tooling, equipment, and new inventory to be carried for maintenance and critical spares resulting in increased costs and/or a reduction in inventory levels of other items, resulting in diminished maintenance and emergency restoration responsiveness and effectiveness.

Given the short line lengths, the fact that the Project's new transmission lines will be located on land owned by the Company, and the additional costs and other drawbacks of underground transmission, there is no reason to consider underground transmission for any of the AC or HVDC transmission line segments of the Project.

4.11 NO-BUILD ALTERNATIVE / CONSEQUENCE OF DELAY

The Company considered the impacts of either not building the Project or delaying its in-service date. Major impacts from cancelling or delaying the Project involve increased failure rates and potential catastrophic failures of the existing HVDC Converter Stations, unacceptable increased risk and cost for Minnesota Power's existing and planned renewable generation facilities, negative impacts to Minnesota Power's progress in meeting its renewable and carbon reduction goals, and significant costs for AC network upgrades to mitigate reliability impacts.

4.11.1 No-Build Alternative

It is important to recognize that there is not a true "No-Build" alternative to the Project. If the Project does not move forward, failure rates of the existing HVDC Converter Station equipment will continue to increase, causing outages that impact the reliable and efficient delivery of Minnesota Power's North Dakota wind energy and result in direct cost impacts to Minnesota Power's customers and reliability impacts to the regional transmission system. As these outages increase in frequency and duration, the cost and reliability impacts will continue to grow. With no viable plan to modernize the existing HVDC converters, Minnesota Power would immediately need to determine if it was prudent to invest in relatively short-term fixes to keep the HVDC Line operating on a limited basis or to move on from the HVDC Line entirely and begin to develop alternative AC transmission solutions.

As discussed in Section 4.8.2, the alternative transmission solutions required to facilitate continued delivery of Minnesota Power's zero fuel cost North Dakota wind energy, mitigate system impacts caused by the retirement of the HVDC Line, and replace the grid support provided by the VSC HVDC converters would come at a substantially higher cost and greater human and

environmental impacts than the HVDC Modernization Project. Given that the alternative AC transmission solutions include multiple regional-scale 345 kV transmission lines, there would likely be prolonged exposure to outages of the HVDC Line during the 10 or more years it would take to develop these projects. At some point during that time, it may become impossible to continue operating the HVDC Line at its full capacity, leading to extended outages and associated impacts to Minnesota Power's customers and regional reliability.

Were Minnesota Power to choose to invest in relatively short-term fixes to keep the HVDC Line operating on a limited basis, these fixes would result in significant risk of stranded investment as the regional transmission system develops. Targeted replacements of the existing control system, converter transformers, and thyristor valves could serve to keep the existing LCC HVDC system running for several more decades at its existing capacity. These replacements would not bring the additional grid-supporting attributes associated with VSC technology, and therefore additional investments in STATCOMs, synchronous condensers, or other solutions may become necessary as the clean energy transition continues to challenge the historical operating conditions of the grid. As MISO continues to advance proactive long-range transmission planning solutions to position the grid for the future of clean energy, VSC HVDC solutions will inevitably begin to play a major role in the regional grid. At that point, Minnesota Power's short-term investments in keeping its existing LCC HVDC system may have to be replaced before the end of their useful asset life by a VSC HVDC upgrade similar to the Project to continue reliable operation of the Square Butte HVDC corridor and provide the best value for Minnesota Power's customers and the region. As stated above, there is no true "no-build" alternative given the responsibility Minnesota Power bears to its customers and for the reliability of the transmission system. If the Project does not move forward, there will be cost impacts to Minnesota Power's customers in the near term from increased exposure to HVDC outages, substantial additional long-term cost for alternative projects to address reliability issues created by retirement of the HVDC Line, and lost opportunity to efficiently provide long-term bulk power transfer and grid support solutions for Minnesota Power and the region.

4.11.2 Consequence of Delay

If the Project is delayed, Minnesota Power's customers will have increased exposure to HVDC outage impacts, and the ability to meet even the 2028 to 2030 in-service date for the Project may become compromised. Further delay of the Project could lead to significant and extended outages, as discussed in Chapter 3.0. These outages come with potentially significant costs to Minnesota Power's customers due to their impact on the reliable and efficient delivery of Minnesota Power's North Dakota wind energy facilities, as discussed in Section 2.2.4. Given the age and condition of existing HVDC Converter Stations, three general outage scenarios exist, all with of which have significant impacts on Minnesota Power's customers:

1. **Continued Short-Duration Outages:** Component failure rates continue to grow over time, resulting in increases in short-duration outages similar to what have been occurring in recent years (see Figure 3.2.2-1). In addition, given the age of the existing assets, it's likely that extended-duration outages may occur due to more significant equipment failures. Eventually a failure will occur that cannot be repaired, resulting in one of the extended outage situations discussed below.

2. **Extended Outage of a Single Pole:** Many of the scenarios discussed in Section 3.2 would result in failures in the control system, thyristor valves, or converter transformers that render it impossible to continue operating the HVDC system at its full capacity. At that point, HVDC system operations would be reduced to one

pole, de-energizing the pole with the failed equipment. Equipment from the failed pole would then be utilized to fix any failures in the operating pole in order to keep it running as long as possible. Under these operating constraints, the capacity of the HVDC system would be indefinitely limited to 275 MW, or half of its current total capacity.

3. **Extended Outage of Both Poles:** There are equipment failure scenarios whereby repair would not be feasible and, as a result, it would be impossible to continue operating either pole of the HVDC system. In that case, the entire 550-MW capacity of the HVDC system would be unavailable until the Project could be completed or until Minnesota Power could procure, engineer, and construct a project to repair the existing HVDC Converter Stations. Current estimates indicate that a six-month outage could cost between $25-40 million. For delays longer than six months, replacement energy costs could be $100 million/year or more, and there would be major delays in Minnesota Power's carbon and renewable energy progress. Minnesota Power's wind deliveries, totaling about 2,000,000 MWh/year, are vital to meeting Company and State of Minnesota carbon reduction and clean electricity goals.

While the most likely scenario is continued short-duration outages with the ability to repair and restore the HVDC system to full capacity, further delays to the Project in-service date will increase the risk of realizing one of the extended outage scenarios described above, along with the attendant costs and reliability impacts.

The Company has carefully assessed the present condition of the Square Butte HVDC Converter Stations, the future operating risks (e.g., continued aging of the assets, availability of spare parts), and the implications of future outages and concluded that the orderly replacement of the Converter Station equipment is the only prudent utility plan. This will minimize catastrophic outage risk and help assure efficient delivery of the Company's renewable, carbon-free energy resources. The risks that would be borne by Minnesota Power's customers and the potential impacts to regional reliability if the Project is cancelled or delayed further are unacceptable.

5.0 ROUTE SELECTION PROCESS

5.1 SUMMARY OF ROUTE SELECTION PROCESS AND GUIDING FACTORS

5.1.1 Route Development Process Summary

Minnesota Power used a comprehensive siting and vetting process to identify route options for the Project. Based on the applicable Minnesota Statutes and Rules, potential state, federal, and local permits or approvals necessary for the Project, and the purpose and need for the Project, Minnesota Power identified a Proposed Route for consideration by the Commission. The route development process leading to the identification of the Proposed Route is discussed in detail in Section 5.2.2.

The term "Proposed Route" includes, consistent with the definitions of "route" and "HVTL" in Minnesota rules, the Project's proposed HVTLs and associated facilities, including the new segment of ±250 kV HVDC transmission line, the two new parallel segments of 230 kV LHVTL, the new segment of 345 kV LHVTL, the new St. Louis County 345 kV/230 kV Substation, and the new HVDC Converter Station.

5.1.2 Routing Factors

The factors for route development are set forth in Minn. Stat. § 216E.03, subd. 7 and Minn. R. 7850.4100 and these factors directed Minnesota Power's route development process.

Minn. Stat. § 216E.03, subd. 7(a) provides that the Commission's route permit determinations "must be guided by the state's goals to conserve resources, minimize environmental impacts, minimize human settlement and other land use conflicts, and ensure the state's electric energy security through efficient, cost-effective power supply and electric transmission infrastructure." Subdivision 7(e) of the same section requires the Commission to "make specific filings that it has considered locating a route for a high-voltage transmission line on an existing high-voltage transmission route and the use of parallel existing highway right-of-way and, to the extent those are not used for the route, the Commission must state the reasons."

In addition to the statutory factors noted above, Minn. Stat. § 216E.03, subd. 7(b) and Minn. R. 7850.4100 provide factors that the Commission will consider in determining whether to issue a route permit for a high voltage transmission line. These routing factors from Minn. R. 7850.4100 are:

A. effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services;

B. effects on public health and safety;

C. effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining;

D. effects on archaeological and historic resources;

E. effects on the natural environment, including effects on air and water quality resources and flora and fauna;

F. effects on rare and unique natural resources;

G. application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity;

H. use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries;

I. use of existing large electric power generating plant sites;

J. use of existing transportation, pipeline, and electrical transmission systems or rights-of-way;

K. electrical system reliability;

L. costs of constructing, operating, and maintaining the facility which are dependent on design and route;

M. adverse human and natural environmental effects which cannot be avoided; and

N. irreversible and irretrievable commitments of resources.

In 2023, the Minnesota Legislature amended Minn. Stat. § 216E.03, subd. 7(b) to also include the following considerations when designating routes:

- Evaluation of the benefits of the proposed facility with respect to (i) the protection and enhancement of environmental quality, and (ii) the reliability of state and regional energy supplies;

- Evaluation of the proposed facility's impact on socioeconomic factors; and

- Evaluation of the proposed facility's employment and economic impacts in the vicinity of the facility site and throughout Minnesota, including the quantity and quality of construction and permanent jobs and their compensation levels. The commission must consider a facility's local employment and economic impacts and may reject or place conditions on a site or route permit based on the local employment and economic impacts.

Minnesota Power used these statutory and rule routing criteria, routing experience, engineering considerations, and stakeholder feedback to develop the Proposed Route for the Project. To minimize impacts to humans and the environment, Minnesota Power first identified routing opportunities and constraints.

Opportunities are resources or conditions that create a potential for transmission line development. They include pre-existing linear infrastructure or other features (e.g., roads, transmission lines, and public land survey divisions of land) along which Project development would be particularly compatible. Opportunities also facilitate Project development by reducing impacts on constraints. Furthermore, Minn. R. 7850.4100 requires the Commission to consider when issuing a route permit the use or paralleling of existing rights-of-way (e.g., transportation corridors, pipelines, and electrical transmission lines), survey lines, natural division lines, and agricultural field boundaries, where practicable.

Constraints are resources or conditions that could limit or prevent transmission line development. Avoiding those resources or conditions is a goal, but not necessarily a requirement, of the routing process. Constraints might include areas restricted by regulations, or areas where impacts to resources would be difficult to mitigate. Constraints can include, for example: existing land uses such as homes, religious facilities, and schools; federal, state, and locally designated environmental protection areas; sensitive habitats or areas; cultural resources such as national landmarks and archaeological sites; and public infrastructure such as airports and aeronautical and commercial telecom structures. It is important for the routing process to account for the fact that Project development may affect constraints differently.

In addition, technical considerations will affect the routing process. These include specific engineering requirements, standards, system objectives, and opportunities for efficiency associated with construction of the Project. For example, the nature of the proposed Project—the modernization of existing facilities—necessitates that the route be located adjacent or as close to those existing facilities as practical. Other engineering objectives may include line entrance into the substations; minimizing the overall line length; good access for construction, inspections and maintenance; and minimizing the need for "special" structures. These technical guidelines are specific to the Project and inform the technical limitations related to Project design, land requirements, and reliability concerns.

The Proposed Route was identified because it takes advantage of Routing Opportunities, such as co-location with existing transmission lines and the existing infrastructure in need of modernization, existing access routes for construction and maintenance, land available for purchase by Minnesota Power, and the minimization of impacts to resources (routing factors) identified in Minnesota Rule 7850.4100. Additionally, the identification, avoidance, and minimization of impacts to Routing Constraints is discussed in detail in Chapter 7.0 of this application.

5.2 ROUTE DEVELOPMENT PROCESS

5.2.1 Project Study Area

Minnesota Power identified a Project Study Area that would help guide the corridor development process. The purpose of identifying a Study Area for the Project was to establish boundaries and limits for the information-gathering process (e.g., identifying environmental and land use resources, routing constraints, and routing opportunities) and the subsequent development of a proposed route for the Project. The Project Study Area was initially developed based on proximity to existing infrastructure and the proposed substation and Converter Station sizes. Further consideration was given to major physiographic features, jurisdictional boundaries, sensitive land uses and ownerships, existing utility corridors, and the availability of land for permanent ownership by Minnesota Power. In subsequent evaluations, the Study Area was reviewed and revised to best suit routing requirements and Project needs. The Project Study Area is shown on Map 1.

5.2.2 Project Route

Minnesota Power developed the Proposed Route by reviewing data, meeting with stakeholders, and performing broad environmental and engineering analyses on the Project Study Area.

In general, the Project Route was developed by considering the following:

- Existing Minnesota Power facilities to be modernized as a result of this Project;
- Existing rights-of-way (transmission lines, roads);
- Availability of sufficient areas of land for purchase by Minnesota Power;
- Avoidance of densely populated areas;
- Avoidance of major environmental / natural features;
- Maximizing transmission system efficiency and reliability; and
- Minimizing the distance between Project facilities and existing facilities to be modernized, and between individual Project components.

The Proposed Route is generally 0.5 mile wide, 0.7 mile long, parallel to the existing HVDC Line, and immediately west of Minnesota Power's Arrowhead Substation. The Proposed Route is shown in Map 1. The width of the Proposed Route provides flexibility in the routing process to take advantage of practical routing opportunities and to promote the avoidance of routing constraints.

5.2.3 Public Participation and Stakeholder Involvement in the Process

The Project Study Area was presented to the public at two open houses in November 2022 and in January 2023. In addition, individual Tribal, local, state, and federal agencies were introduced to the Project during the fall and winter of 2022-2023. These meetings provided information about the Project to key stakeholders and allowed them to provide comments that would be used in the next steps of the routing process. See Chapter 8.0 for a summary of public and agency comments.

5.3 ROUTE REFINEMENT AND ANALYSIS

Based on feedback from stakeholders and the public, as well as Technical Guidelines, Routing Constraints, and Routing Opportunities, Minnesota Power identified a single Proposed Route as identified in Map 1. The Proposed Route maximizes the need for Project proximity to existing Minnesota Power facilities near the Arrowhead Substation in need of modernization. The Proposed Route will include land owned in fee by Minnesota Power to the extent possible, while avoiding Routing Constraints to the extent practicable.

6.0 RIGHT-OF-WAY ACQUISITION, CONSTRUCTION, RESTORATION, MAINTENANCE, AND OPERATION

6.1 PROJECT SCHEDULE AND SEQUENCING, INCLUDING PROPERTY ACQUISITION AND WIDTH OF RIGHT-OF-WAY REQUIRED

6.1.1 Substations

The new HVDC Converter Station and the new St. Louis County Substation are proposed to be located on property owned by Minnesota Power, pending the completion of ongoing landowner negotiations. The modifications necessary at the existing Arrowhead Substation are not anticipated to require a physical expansion of the fenced substation.

6.1.2 Transmission Line Right-of-Way Width and Acquisition

As previously discussed, Minnesota Power plans to purchase and own in fee simple all the land required for Project construction and operation, in which case no “right-of-way” as such would be required. However, at the time of filing this application with the Commission, landowner negotiations were still ongoing for some required Project parcels. Map 2 shows the Project parcels that are proposed to be purchased and those for which acquisition is complete as of the filing date of this application.

Whether transmission lines are located on land owned in fee by Minnesota Power or within easements acquired for Project operation, right-of-way widths will still be established in design and indicated on drawings for purposes of placement of proposed lines relative to each other and to guide ongoing maintenance and adjacent use. Generally, lines will utilize the minimum right-of-way widths per voltage class as indicated in Table 2.1.2-1. For the three lines, this will include all three voltage classes in the Table, varying from 120 to 150 feet. Additional right-of-way width beyond these values may be required as needed based on design requirements. Reduction in these right-of-way width values will only be considered on a case-by-case basis as necessary.

6.1.3 Communication Infrastructure Modifications

Modifications to communications infrastructure in the Proposed Route will be completed as part of the Project to facilitate utility communications between Project facilities. Communications infrastructure additions are anticipated to occur in the following areas:

- Include OPGW on new 345 kV line HVDC Converter Station to St Louis County Substation
- Include OPGW on both new 230 kV lines from St Louis County Substation to Arrowhead Substation

6.2 CONSTRUCTION, MITIGATION AND RESTORATION PRACTICES, INCLUDING WORKFORCE REQUIRED

6.2.1 Substation

Details regarding the modifications necessary at the existing Arrowhead and new St. Louis County substations and HVDC Terminal are provided in Section 2.1.1.

Substation construction will be performed in compliance with the applicable NESC, Occupational Safety and Health Act, and state and local regulations. Minnesota licensed professional engineers will complete designs as required by Minnesota Statutes and Rules. Contractors will be committed to safe working practices. The local conditions of the substation sites will be considered in the final design of the substations. All designs will comply with all applicable safety codes and Minnesota Power standards.

The substation modifications will be designed to allow future maintenance to be done with the minimum impact on substation operation and the necessary clearance from energized equipment to ensure safety.

Industry-specific best management practices ("BMPs") and standard construction and mitigation practices developed from experience with past projects will be used. BMPs will be determined based on the specific construction design, prohibitions, maintenance guidelines, inspection procedures, and other activities involved in constructing the substations. In some cases, activities will be modified to incorporate a BMP for construction that will assist with minimizing impacts on sensitive environments. In some cases, certain BMPs may be specifically required by permit conditions such as the Route Permit and NPDES Construction Stormwater Permit.

When construction activities are completed, Minnesota Power will restore the remainder of the construction sites in accordance with the restoration procedures described in Section 6.3.

6.2.2 Transmission Line

Affected and immediately adjacent landowners will be notified of Project schedule and construction activities, prior to the start of the construction phase of the Project. The first phase of construction activities will involve survey staking of the transmission line alignment and/or pole locations, followed by removal of trees and other vegetation from the full width of the construction right-of-way. Tree species that endanger safe and reliable operation of the transmission facilities will be removed. Low-growing brush will be cleared initially; however, it will generally be allowed

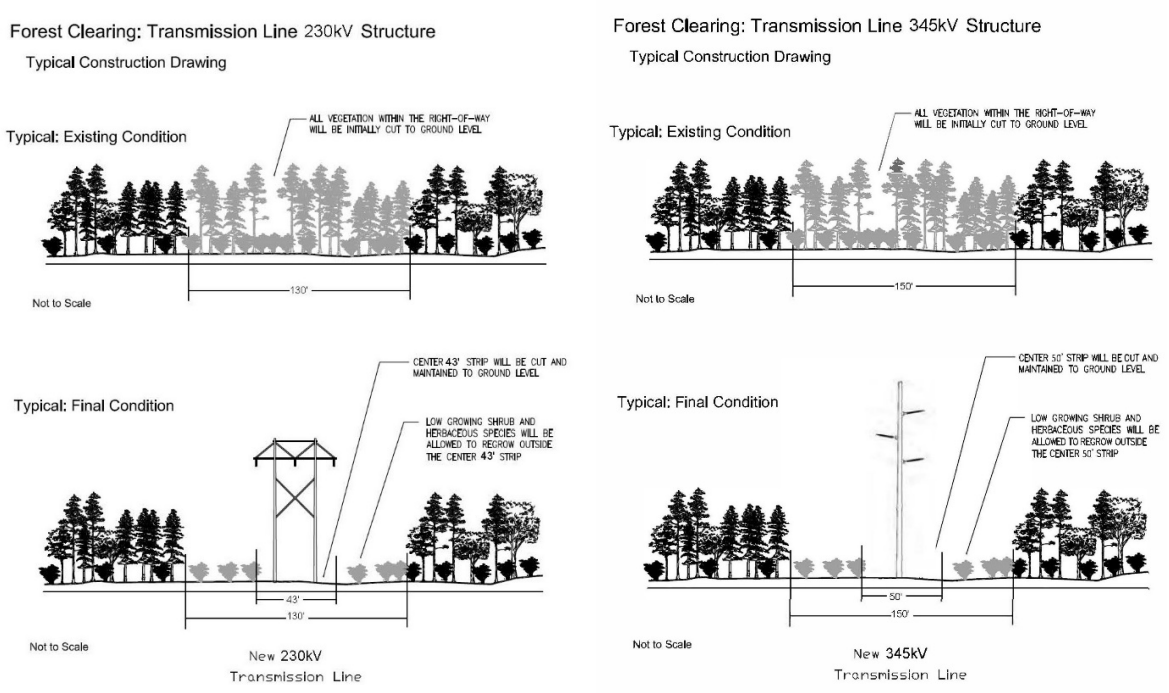
to reestablish at the outer limits of the right-of-way area for the ±250 kV HVDC transmission line, the 230 kV LHVTL, and the 345 kV LHVTL.

The NESC states that vegetation that may damage ungrounded supply conductors should be pruned or removed. Trees beyond the right-of-way area that are in danger of falling into the energized transmission line, called “danger trees”, will be removed or trimmed to eliminate the hazard as shown in Figure 6.2.2-1. Danger trees generally are those that are dead, weak, or leaning towards energized conductors.

All material resulting from the clearing operations will be either chipped on site and spread on the right-of-way or removed and disposed as specified in Minnesota Power’s project construction plans.

The final survey staking of pole locations may occur after the vegetation has been removed, prior to structure installation.

Figure 6.2.2-1 – Standard Vegetation Management Practices



Structure installation and stringing of conductor wire is the second phase of construction. Underground utilities are identified through the required One Call process to minimize conflicts with the existing utilities along the routes.

Transmission line structures are typically designed for installation at existing grades. Because of this, minimal grading and leveling will be needed at structure sites unless it is necessary to provide a reasonably level area for construction access and activities. In situations where there is concern with safe access for construction operations and equipment installation, minor grading of the immediate area may be necessary.

Minnesota Power will employ standard construction practices that were developed from experience with past projects in addition to industry-specific BMPs. BMPs address right-of-way clearance, erecting transmission line structures, and stringing transmission lines. BMPs for the Project will be based on the specific construction design, prohibitions, maintenance guidelines, inspection procedures, and other activities involved in constructing the line. Construction schedules are sometimes modified to incorporate a BMP that will minimize impacts on sensitive environments. For example, for construction in or near wetlands, BMPs such as matting, or winter construction may be used. Section 7.5.2 describes potential water resources and wetland crossings anticipated for the Project. In areas where construction occurs close to waterways, BMPs help prevent soil erosion and ensure that equipment fueling and maintenance occur at locations away from waterways.

Steel pole structures are expected to be foundation supported with the drilled concrete pier foundations being the predominant foundation type. Concrete pier foundations have not yet been designed but could be expected to vary from 4 to 12 feet. Other foundation types such as, but not limited to, direct embedded and helical piers could also be used as necessary.

Minnesota Power will begin to install the conductors by establishing stringing setup areas after structures have been erected. These stringing setup areas will be located at the end of the new transmission line and occupy approximately 100-foot by 500-foot areas. Access to each structure is needed to secure the conductor wire to the insulators and to install shield wire clamps once final sag is established for stringing operations. To ensure conductors will not be damaged or contact existing energized conductors or other cables, temporary guard structures are installed, as needed, over existing distribution or communication lines, roads, or other obstructions after any necessary notifications are made or permits obtained.

6.2.3 Workforce Required

Approximately 150 to 175 workers will be required for construction of the HVDC Modernization Project in Minnesota, depending on the construction sequencing and time of the year. This workforce includes vegetation maintenance crews, transmission line and substation construction workers, safety supervisors, environmental support, and other on- and offsite support staff. Minnesota Power will work with local governments in the Project area to meet any specific local employment obligations. Minnesota Power has a strong relationship with the Building Trades and is committed to working with organized labor on this project. Evidence of this strong relationship is demonstrated by the letters of support submitted for the DOE Smart Grid grant application for this project from the Laborers' International Union of North America, International Union of Operating Engineers, and the North Central States Regional Council of Carpenters. The Minnesota Tribal Contractors Council also submitted a letter of support for the DOE grant application.

6.3 RESTORATION PROCEDURES

6.3.1 Substation

The HVDC Converter Stations and St. Louis County Substation will require ground disturbance during construction (see Map 1). Minnesota Power will restore the remainder of the site upon completion of the HVDC Converter Station and St. Louis County Substation construction activities. Restoration activities post-construction will include removing and disposing of debris; removing all temporary facilities, including staging and laydown areas; installing appropriate erosion control measures; reseeding disturbed areas with a seed mixture certified as free of

noxious or invasive weeds; and restoring the areas to their original condition to the extent possible. Where soil compaction has occurred, construction crews or the restoration contractor will use techniques to reduce the compaction.

6.3.2 Transmission Lines

Limited ground disturbances at the structure sites may occur during construction. Areas for staging or temporary storage of materials and equipment will be determined based on property acquisition. A previously disturbed or developed area that includes sufficient space to lay down material and preassemble certain structural components or hardware and store construction equipment is preferred. Property immediately adjacent to the right-of-way or parts of the right-of-way may be used for structure laydown and framing prior to installation. Stringing setup areas used to store conductors and equipment are necessary for stringing operations. Disturbed areas will be restored to their original condition to the extent practicable.

Restoration activities post-construction will include removing and disposing of debris; removing all temporary facilities, including staging and laydown areas; installing appropriate erosion control measures; reseeding disturbed areas with a seed mixture certified as free of noxious or invasive weeds; and restoring the areas to their original condition to the extent possible. Where soil compaction has occurred, construction crews or the restoration contractor will use techniques to reduce the compaction.

6.4 OPERATIONS AND MAINTENANCE PRACTICES

6.4.1 HVDC Converter Station and St. Louis County Substation

To keep the HVDC Converter Station and St. Louis County Substation functioning in accordance with accepted operating parameters and NESC requirements, routine maintenance is required. Periodic servicing coinciding with manufacturer recommendations is needed for HVDC converters and auxiliary equipment, transformers, circuit breakers, batteries, protective relays, and other equipment. Substation locations and outdoor equipment areas at the HVDC Converter Station also need vegetation control and drainage maintenance.

Costs associated with O&M of the transmission lines and substations are provided in Section 2.2.2. Final costs will be dependent on final location, vegetation management requirements, natural disaster and storm damages, structure types, age of facilities, and other variables.

6.4.2 Transmission Line

The Project's new transmission lines will be designed and maintained in accordance with the NESC and North American Electric Reliability Corporation ("NERC") requirements. Overall, transmission lines are highly reliable and unplanned outages are infrequent. High voltage transmission lines are seldom retired and have estimated service lives that are very long. Maintenance and asset renewal of transmission line components is necessary on a regular basis for longer term reliable operation.

Periodically, the right-of-way of a completed transmission line must be accessed to conduct inspections, perform maintenance, and repair damage. To ensure continued integrity, regular maintenance and inspections will be performed during the life of the transmission line. Minnesota Power will generally inspect the transmission lines annually as part of normal practices. These inspections will be limited to the right-of-way and to areas where obstructions or terrain may

require off-right-of-way access. If issues are identified during inspection, repairs will be performed, and damage restored.

Vegetation within the right-of-way that interferes with the operation and maintenance of the transmission line will be removed. Native shrubs that will not interfere with the safe operation and maintenance of the transmission line will be allowed to reestablish in the outer edge of the right-of-way. Minnesota Power's practices require inspection of 230 kV transmission lines annually. Inspection of 345 kV and HVDC assets may occur on a more frequent basis. Right-of-way maintenance practices include a combination of mechanical and hand clearing and herbicide application where appropriate to remove or control vegetation growth. Noxious weed control with herbicides will be conducted as needed around structures and anchors.

6.4.3 Workforce Required

The HVDC Converter Station in Minnesota currently employs two fulltime workers. Two to three workers are anticipated to be necessary for the new HVDC Converter Station after the HVDC Modernization Project is completed. Two to four workers are typically required to perform inspections. For the life of the facility, regular maintenance and inspections will be performed to ensure a safe and reliable system. Annual inspections will be conducted on foot, by motorized vehicle, or by aerial methods.

6.5 ADDITIONAL HUMAN AND ENVIRONMENTAL IMPACT CONSIDERATIONS

6.5.1 Electric and Magnetic Fields

Electric and magnetic fields ("EMF") are invisible lines of force that are present anywhere electricity is produced or used, including around electric appliances and any wire that is conducting electricity. The term "EMF" is typically used to refer to electric and magnetic fields that are coupled together; however, for the lower frequencies associated with power lines, electric and magnetic fields are relatively decoupled and should be described separately. Electric fields are the result of electric charge, or voltage, on a conductor. The intensity of an electric field is related to the magnitude of the voltage on the conductor and is typically described in terms of kilovolts per meter ("kV/m"). Magnetic fields are the result of the flow of electricity, or current, traveling through a conductor. The intensity of a magnetic field is related to the magnitude of the current flow through the conductor and is typically described in units of magnetic flux density expressed as Gauss ("G") or milliGauss ("mG"). Electric and magnetic fields are found anywhere there are energized, current-carrying conductors, such as near transmission lines, distribution lines, substation transformers, household electrical wiring, and common household appliances.

6.5.1.1 Electric Fields

Voltage on any wire produces an electric field in the area surrounding the wire. The voltage on the conductors of a transmission line produces an electric field extending from the energized conductors to other nearby objects, such as the ground, structures, vegetation, buildings, and vehicles. The intensity of transmission line electric fields is proportional to the voltage of the line, and rapidly decreases with distance from the transmission line conductors. The presence of trees, buildings, and other solid structures nearby can also significantly reduce the magnitude of the electric field. Because the magnitude of the voltage on a transmission line is near-constant, the magnitude of the electric field will be near-constant for each of the proposed transmission lines, regardless of the power flowing on the line.

When an electric field reaches a nearby object, such as a vehicle or a metal fence, it induces a voltage on the object. The magnitude of the induced voltage is dependent on many factors, including the object's capacitance, shape, size, orientation, location, resistance to ground, and weather conditions. If the object is insulated or semi-insulated from the ground and a person touches it, a small current would pass through the person's body to the ground. This might be accompanied by a spark discharge and mild shock, similar to what can occur when a person walks across a carpet and touches a grounded object, like a doorknob, or another person.

The main concern with induced voltage is not the magnitude of the voltage induced, but the current that would flow through a person to the ground should the person touch the object. To ensure that any such spark discharge associated with transmission line induced voltage does not reach unsafe levels, the NESC requires that any discharge be less than five milliamperes. The Project will be designed consistent with this NESC requirement.

There is no federal standard for transmission line electric fields. The Commission, however, has historically imposed a maximum electric field limit of eight kV/m measured at one meter above ground for new transmission projects.[12] As demonstrated below, the electric field associated with the Project will be within the Commission's eight kV/m limit.

The predicted intensity of electric fields associated with the various structure configurations of the Project is given in Table 6.5.1-1 for the edge of right-of-way and at the location where the maximum electric field will be experienced. Because electric fields are particularly dependent on the voltage of the transmission line, the values in Table 6.5.1-1 were calculated at the lines' maximum continuous operating voltage. Maximum continuous operating voltage is defined for the Project as the nominal voltage plus 10 percent, in this case either 253 kV (for nominally 230 kV lines) or 380 kV (for nominally 345 kV lines). Values were calculated assuming minimum conductor-to-ground clearance (that is, at mid-span) and a height of one meter above ground. The maximum calculated electric field among all possible configurations is 6.26 kV/m, which is within the Commission's eight kV/m limit.

Table 6.5.1-1 – Calculated Electric Fields (kV/M) for Proposed Project

		Edge of ROW	Maximum Overall		
Structure Type	Line Voltage	Intensity (kV/m)	Intensity (kV/m)	Distance from ROW Centerline (feet)	ROW Width (feet)
230 kV Single-Circuit H-Frame	253 kV	1.24	5.51	23	130
230 kV Single Circuit H-Frames (2x Parallel)	253 kV	1.28	5.56	73	230
230 kV Double-Circuit	253 kV	0.15	4.10	14	130
345 kV Single-Circuit Monopole	380 kV	0.55	6.26	14	150

6.5.1.2 Magnetic Fields

Current passing through any conductive material, including a wire, produces a magnetic field in the area around the material. The current flowing through the conductors of a transmission line produces a magnetic field that extends from the energized conductors to other nearby objects. The intensity of the magnetic field associated with a transmission line is proportional to the amount

[12] *In the Matter of the Route Permit Application for a 345 kV Transmission Line from Brookings County, S.D. to Hampton*, Docket No. ET2/TL-08-1474, Order Granting Route Permit (Sept. 14, 2010) (adopting the Administrative Law Judge's Findings of Fact, Conclusions, and Recommendation [Finding ¶ 194]).

of current flowing through the line's conductors, and rapidly decreases with the distance from the conductors. Unlike electric fields, magnetic fields are not significantly impacted by the presence of trees, buildings, or other solid structures nearby. Because the actual power flow on a transmission line could potentially vary widely throughout the day depending on electrical system conditions, the actual magnetic field level in the vicinity of the transmission line could also vary widely from hour to hour.

There are currently no Minnesota regulations pertaining to magnetic field exposure. The Commission has acknowledged that Florida, Massachusetts, and New York have established standards for magnetic field exposure.[13] To provide context for the calculated magnetic field levels associated with the Project, magnetic field levels associated with some common household electric appliances are provided in Table 6.5.1-2.

Table 6.5.1-2 – Table of Magnetic Fields of Common Electric Appliances

Appliance	6 Inches from Source	1 Foot from Source	2 Feet from Source
Hair Dryer	300 mG	1 mG	
Electric Shaver	100 mG	20 mG	
Can Opener	600 mG	150 mG	20 mG
Electric Stove	30 mG	8 mG	2 mG
Television	N/A	7 mG	2 mG
Portable Heater	100 mG	20 mG	4 mG
Vacuum Cleaner	300 mG	60 mG	10 mG
Copy Machine	90 mG	20 mG	7 mG
Computer	14 mG	5 mG	2 mG

The predicted intensity of magnetic fields associated with the various structure configurations of the Project are given in Table 6.5.1-3 and Table 6.5.1-4 below, for the edge of right-of-way and at the location where the maximum magnetic field will be experienced. Because magnetic fields are particularly dependent on the current flowing on the transmission line, magnetic field information is provided for two conditions: the maximum continuous rating of the Project's transmission lines, shown in Table 6.5.1-3, and the projected peak loading of the Project's transmission lines when placed into service, shown in Table 6.5.1-4. Maximum continuous rating is defined for the Project as the maximum allowable current flow based on the most limiting series element of the transmission facility as determined by the Company's Facility Ratings Methodology. Projected peak loading for the Project was derived from power system modeling of the Project under system normal conditions when the HVDC Line is scheduled at its maximum capacity. Values were calculated assuming minimum conductor-to-ground clearance (that is, at mid-span) and a height of one meter aboveground. Plots of the lateral magnetic field profile for each configuration are provided in Appendix M.

[13] *In the Matter of the Route Permit Application for the North Rochester to Chester 116 kV Transmission Line Project*, Docket No. E-002/TL-11-800, Order at 20 (Sept. 12, 2012).

Table 6.5.1-3 – Calculated Magnetic Fields (mG) for Proposed Project (Maximum Continuous Rating)

		Edge of ROW	Maximum Overall		
Structure Type	Line Current	Intensity (mG)	Intensity (mG)	Distance from ROW Centerline (feet)	ROW Width (feet)
230 kV Single-Circuit H-Frame	3000 A	148.62	730.97	6	130
230 kV Single Circuit H-Frames (2x Parallel)	3000 A	170.37	693.34	60	230
230 kV Double-Circuit	3000 A	50.94	448.45	0	130
345 kV Single-Circuit Monopole	3000 A	136.15	363.59	14	150

Table 6.5.1-4 – Calculated Magnetic Fields (mG) for Proposed Project (Projected Peak Loading)

		Edge of ROW	Maximum Overall		
Structure Type	Line Current	Intensity (mG)	Intensity (mG)	Distance from ROW Centerline (feet)	ROW Width (feet)
230 kV Single-Circuit H-Frame	1017	51.22	251.91	6	130
230 kV Single Circuit H-Frames (2x Parallel)	1017	58.71	238.94	60	230
230 kV Double-Circuit	1017	12.63	154.54	0	130
345 kV Single-Circuit Monopole	1356	62.84	167.06	14	150

6.5.1.3 EMF and Health Effects

Significant research has been performed since the 1970s to determine whether exposure to power frequency magnetic fields causes biological responses and health effects. Reviews of this research by public health agencies such as the U.S. National Cancer Institute, the U.S. National Institute of Environmental Health Sciences, and the World Health Organization do not show that exposure to electric power EMF causes or contributes to adverse health effects. For instance, in 2016, the U.S. National Cancer Institute concluded that:

> Numerous epidemiologic studies and comprehensive reviews of the scientific literature have evaluated possible associations between exposure to non-ionizing EMFs and risk of cancer in children (12-14). (Magnetic fields are the component of non-ionizing EMFs that are usually studied in relation to their possible health effects.) Most of the research has focused on leukemia and brain tumors, the two most common cancers in children. Studies have examined associations of these cancers with living near power lines, with magnetic fields in the home, and with exposure of parents to high levels of magnetic fields in the workplace. No consistent evidence for an association between any source of non-ionizing EMF and cancer has been found.[14]

Minnesota, Wisconsin, and California have also all performed literature reviews or research to examine this issue. In 2002, Minnesota formed an Interagency Working Group to evaluate EMF research and develop policy recommendations to protect the public health from any potential

[14] NATIONAL CANCER INSTITUTE, Electromagnetic Fields and Cancer (updated Jan. 3, 2019), available at https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/electromagnetic-fields-fact-sheet.

problems arising from EMF effects associated with high-voltage transmission lines. The Working Group included staff from a number of state agencies and published its findings in *A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options.* The Working Group summarized its findings as follows:

> Research on the health effect of EMF has been carried out since the 1970s. Epidemiological studies have mixed results—some have shown no statistically significant association between exposure to EMF and health effects, some have shown a weak association. More recently, laboratory studies have failed to show such an association, or to establish a biological mechanism for how magnetic fields may cause cancer. A number of scientific panels convened by national and international health agencies and the United States Congress have reviewed the research carried out to date. Most concluded that there is insufficient evidence to prove an association between EMF and health effects; however, many of them also concluded that there is insufficient evidence to prove that EMF exposure is safe.[15]

Based on findings like the Working Group and U.S. National Cancer Institute, the Commission has consistently found that "there is insufficient evidence to demonstrate a causal relationship between EMF exposure and any adverse human health effects."[16]

The potential impacts of electric fields include interference with the operation of pacemakers and Implantable Cardioverter/Defibrillators ("ICDs"). Interference with implanted cardiac devices can occur if the electric field intensity is high enough to induce sufficient body currents to cause interaction. Generally, the response depends on the make and model of the device in addition to the individual's height, build and physical orientation with respect to the electric field. Pacemaker manufacturers such as Medtronic and Guidant have indicated that modern cardiac devices are considerably less susceptible to interactions with electric fields than older "unipolar" designs. A 2005 study (Scholten et al.) concludes that the risk of interference inhibition of unipolar cardiac pacemakers from high voltage power lines in everyday life is small. In 2007, Minnesota Power and Xcel Energy conducted studies with Medtronic to evaluate the impact of the electric fields associated with existing 115 kV, 230 kV, 345 kV, and 500 kV transmission on implantable medical devices. The analysis was based on real life public exposure levels under actual transmission lines in Minnesota; no adverse interaction with pacemakers or ICDs occurred (University of Minnesota Power Systems Conference Proceedings, 2007). The analysis concluded that, although interaction may be possible in unique situations, device interaction due to typical public exposure would be rare.

In the unlikely event a pacemaker is impacted, the effect is typically temporary asynchronous pacing. The pacemaker would return to its normal operation when the person moves away from the source of the interference.

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15 Minnesota Department of Health, 2002. A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options.

16 *In the Matter of the Application for a HVTL Route Permit for the Tower Transmission Line Project*, Docket No. ET-2, E015/TL-06-1624, Findings of Fact, Conclusions of Law and Order Issuing a Route Permit to Minnesota Power and Great River Energy for the Tower Transmission Line Project and Associated Facilities (August 1, 2007); see also In the Matter of the Route Permit Application by Great River Energy and Xcel Energy for a 345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota, Docket No. ET-2/TL-08-1474, Order Issuing Route Permit (Sept. 14, 2010); OAH Docket No. 7-2500-20283-2, ALJ Findings of Fact, Conclusions and Recommendation at Finding 216 (April 22, 2010 and amended April 30, 2010) ("there is no demonstrated impact on human health and safety that is not adequately addressed by the existing State standards for exposure"); *In the Matter of the Application of Xcel Energy for a Route Permit for the Lake Yankton to Marshall Transmission Line Project in Lyon County*, Docket No. E002/TL-07-1407, Findings of Fact, Conclusions of Law and Order Issuing a Route Permit to Xcel Energy for the Lake Yankton to Marshall Transmission Project at 7-8 (Aug. 29, 2008).

6.5.2 Stray Voltage

"Stray voltage" is a condition that can occur on the electric service entrances to structures from distribution lines—not transmission lines. More precisely, stray voltage is a voltage that exists between the neutral wire of the service entrance and grounded objects in buildings such as barns and milking parlors. The U.S. Department of Agriculture ("USDA") further defines stray voltage as a small voltage (less than 10 volts) measured between two points that can be simultaneously contacted by an animal (USDA, 1991).

Since stray voltage is present when a voltage exists between the neutral wire of an electrical service entrance and grounded objects in buildings, transmission lines do not, by themselves, create stray voltage because the lines do not connect directly to businesses or residences. Transmission lines can, however, induce stray voltage on a distribution circuit that is parallel and immediately under the transmission line. The Project will not parallel any distribution lines.

6.5.3 Corona-Induced Ozone and Nitrogen Oxide Emissions

Corona, in the context of transmission lines, refers to the breakdown or ionization of air within a few centimeters of conductors. Corona occurs when the electric field intensity, or surface gradient, on the conductor exceeds the breakdown strength of air. Usually, a water droplet or some imperfection such as a sharp edge or scratch on the conductor is necessary to cause corona. Corona may result in a visible violet glow, hissing noise, and production of ozone gas in the air surrounding overhead transmission line conductors (CH2M Hill, 2012). Corona also produces ozone, which is created by chemical reactions between oxides of nitrogen and volatile organic compounds (U.S. Environmental Protection Agency ["EPA"], 2022a). Ozone is produced in the air surrounding the conductor from the operation of transmission lines (Electric Power Research Institute, 1982). The Company typically engineers transmission lines to limit corona, as it also signifies a loss of electricity (CH2M Hill, 2012).

In general, monitored concentrations of ozone due to corona discharge from transmission lines show no significant incremental ozone concentrations at ground level, and minimal (0 to 8 part per billion ["ppb"]) concentrations at an elevation nearer to the transmission line (Jeffers, 1999). Typically, these concentrations are detected only during heavy corona discharge in foul weather conditions. Additional testing has shown that production of nitrogen oxide due to corona discharges is approximately one-fourth of the production of ozone due to corona discharges (Jeffers, 1999).

Ozone also forms in the lower atmosphere from lightning discharges, and from reactions between solar ultraviolet radiation and air pollutants. The natural production rate of ozone is directly proportional to temperature and sunlight, and inversely proportional to humidity. Thus, humidity or moisture, the same factor that increases corona discharges from transmission lines, inhibits the natural production of ozone. Ozone is a very reactive form of oxygen molecules and combines readily with other elements and compounds in the atmosphere. Because of its reactivity it is relatively short-lived.

Both the State and federal governments currently have regulations regarding permissible concentrations of ozone and oxides of nitrogen. The National and State Ambient Air Quality Standards for ozone is 0.070 parts per million ("ppm") on an eight-hour averaging period per Minnesota Rules 7009.0080 and 7009.0090. The national and state standard for nitrogen dioxide ("NO_2"), one of several oxides of nitrogen, is 100 ppb and the annual standard is 53 ppb. The State of Minnesota is currently in compliance with the federal standards for ozone and NO_2. The

operation of the proposed transmission lines would not create any potential for the concentration of these pollutants to exceed ambient air standards.

6.5.4 Radio and Television Interference

Generally, transmission lines do not cause interference with radio, television, or other communication signals and reception. While it is rare in everyday operations, four potential sources for interference do exist, including gap discharges, corona discharges, and shadowing and reflection effects.

Gap discharge interference is the most commonly noticed form of power line interference with radio and television signals, and also typically the most easily fixed. Gap discharges are usually caused by hardware defects or abnormalities on a transmission or distribution line causing small gaps to develop between mechanically connected metal parts. As sparks discharge across the gap, they create the potential for electrical noise. The degree of interference depends on the quality and strength of the transmitted communication signal, the quality of the receiving antenna, and the distance between the receive and the power line. Gap discharges are usually a maintenance issue, since they tend to occur in areas where gaps have formed due to broken or ill-fitted hardware (e.g., clamps, insulators, brackets). Because gap discharges are a hardware issue, they can be repaired relatively quickly once the issue has been identified. Corona from transmission line conductors can also generate electromagnetic noise at the same frequencies that radio and television signals are transmitted. The air ionization caused by corona generates audible noise, radio noise, light, heat, and small amounts of ozone as noted in Section 6.5.3. The potential for radio and television signal interference due to corona discharge relates to the magnitude of the transmission line-induced radio frequency noise compared to the strength of the broadcast signals. Because radio frequency noise, like electric and magnetic fields, becomes significantly weaker with distance from the transmission line conductors, very few practical interference problems related to corona-induced radio noise occur with transmission lines. In most cases, the strength of the radio or television broadcast signal within a broadcaster's primary coverage area is great enough to prevent interference.

If interference from transmission line corona associated with the Project does occur for an AM radio station within a station's primary coverage area where good reception existed before the Project was built, satisfactory reception can be obtained by appropriate modification of (or addition to) the receiving antenna system. The situation is unlikely, however, because AM radio frequency interference typically occurs immediately under a transmission line and dissipates rapidly with increasing distance from the line. FM radio receivers usually do not pick up interference from transmission lines because:

- Corona-generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (88-108 Megahertz ["MHz"]), and

- The interference rejection properties inherent in FM radio systems make them virtually immune to amplitude type disturbances.

The potential for television interference due to radio frequency noise caused by transmission lines is very low now that the United States has completed the transition to digital broadcasting. Digital reception is in most cases considerably more tolerant of noise than analog broadcasts. Due to the higher frequencies of television broadcast signals (54 MHz and above) a transmission line seldom causes reception problems within a station's primary coverage area. In the rare situation

where the Project may cause interference within a station's primary coverage area, the problem can usually be corrected with the addition of an outside antenna.

Shadowing and reflection effects are typically associated with large structures, such as high buildings, that may cause reception problems by disturbing broadcast signals and leading to poor radio and television reception. Although the occurrence is rare, a transmission structure or the conductor can create a "shadow" on adjoining properties that obstructs or reduces the transmitted signal. Structures may also cause a "reflection" or scattering of the signal. Reflected signals from a structure result in the original signal "breaking" into two or more signals. Multipath reflection or "scattering" interference can be caused by the combination of a signal that travels directly to the receiver and a signal reflected by the structure that travels a slightly longer distance and is received slightly later by the receiver. If one signal arrives with significant delay relative to the other, the picture quality of digital television broadcast signals may be impacted. With digital broadcasts, the picture can become pixelated or freeze and become unstable. The most significant factors affecting the potential for signal shadow and multipath reflection are structure height above the surrounding landscape and the presence of large flat metallic facades. Television interference due to shadowing and reflection effects is rare but may occur when a large transmission structure is aligned between the receiver and a weak distant signal, creating a shadow effect. In the rare situation where the Project may cause interference within a station's primary coverage area, the problem can usually be corrected with the addition of an outside antenna. If television or radio interference is caused by or from the operation of the proposed facilities in those areas where good reception was available prior to construction of the Project, Minnesota Power will evaluate the circumstances contributing to the impacts and determine the necessary actions to restore reception to the present level, including the appropriate modification of receiving antenna systems if necessary.

6.5.5 Noise

An audible hissing and crackling sound can also be produced by corona on transmission lines and electrical equipment when applied voltage exceeds a certain value. This sound is typically only within the threshold of human hearing during rainy or foggy conditions and is often imperceptible due to background noise (CH2M Hill, 2012).

The main source of audible noise associated with the Project will be the HVDC Converter Station. Noise contributions from the HVDC Converter Station are highly dependent on the layout of buildings and equipment within the fence. The most significant sources of noise within the Converter Station are the converter transformers with integrated cooling fans, followed by the outdoor components of the valve cooling system, smoothing reactors, and other electrical equipment. Noise emissions from indoor equipment are not expected to propagate outside the building envelope. The Project will be designed to ensure that audible noise at the nearest receptor does not exceed State noise standards based on the applicable noise area classifications. If studies conducted during design of the Project indicate potential for the noise standards to be exceeded, the Company will incorporate noise-control measures within the design of the Converter Station, or otherwise implement measures to comply with the standards. The impacts and mitigation of audible noise for the Project are discussed further in Section 7.2.3.

6.5.6 Visual Impacts

Because the Project is located adjacent to an existing ±250 kV line and is within the same vicinity as an existing substation and multiple high voltage AC transmission lines, aesthetic impacts are

anticipated to be minimal. The existing ±250 kV transmission line and substation have been in place for many years and are in a rural, sparsely populated area.

Where tree clearing is needed, there will be a noticeable visual impact to the landscape. However, because the Project is collocated within an area of existing transmission lines, the existing maintained right-of-way will minimize visual impacts. Minnesota Power will place emphasis on preserving the natural landscape whenever practical and implementing construction and operation practices to prevent any unnecessary disturbance of the natural surroundings in the vicinity of the work.

7.0 ENVIRONMENTAL ANALYSIS OF ROUTE

7.1 ENVIRONMENTAL SETTING

The Project Study Area is located in Section 31, Township 50N, Range 15W, and Section 36, Township 50N, Range 16W. The City of Hermantown and Solway Township are the two residential communities surrounding the Project Study Area in St. Louis County.

The Project Study Area is within the North Shore Highlands Subsection of the Northern Superior Uplands section of the Laurentian Mixed Forest Province as defined by the Minnesota Department of Natural Resources ("MnDNR") Ecological Classification System. This subsection is located adjacent to Lake Superior, and parallels the Highland Moraine associated with the lake, 20 to 25 miles inland. Lake Superior is the main feature in this region and moderates the climate throughout the year. Pre-settlement vegetation in this area included primarily pine, fir, and aspen-birch forest, along with conifer bogs and swamps. Today's landscape is still dominated by forest. Forest management, recreation, and tourism are the dominant economic activities (MnDNR, 2022a).

The environmental setting within several miles of the Project Study Area includes forested areas, pockets of open agricultural areas, rural residential development, and hydrologic features, including streams, wetlands, and small ponds. Many of the streams in this area run directly from the highland to Lake Superior. The terrain is gently rolling to steep hills (MnDNR, 2022a).

The Project Study Area is defined in Section 5.2.1 as the area initially reviewed for route development based on proximity to existing infrastructure and the proposed substation size. Further consideration was given to major physiographic features, jurisdictional boundaries, sensitive land uses and ownerships, and existing utility corridors. Existing conditions in the Project Study Area and potential human, economic, historic, jurisdictional, and environmental impacts in the Proposed Route are described within this chapter.

Existing right-of-way associated with two transmission lines, along with township and county roads are present within the Project Study Area (see Map 3). The term Project Study Area includes the Proposed Route, which consists of the area of the proposed HVDC Modernization Project facilities, including the segment of ±250 kV HVDC transmission line to connect the existing HVDC line to the new HVDC Converter Station; the 230 kV transmission line from the Arrowhead Substation to the proposed St. Louis County Substation; the St. Louis County Substation; the new HVDC Converter Station; and the new 345 kV transmission line connecting the new HVDC Converter Station to the new 345 kV/230 kV St. Louis County Substation.

7.2 HUMAN SETTLEMENT

The Project Study Area is located approximately 0.25 mile north of the southern border of St. Louis County within Minnesota's Arrowhead Region. The Proposed Route is located partially within the city limits of Hermantown, west of the existing Minnesota Power Arrowhead Substation, and partially within Solway Township, west of Hermantown. The Proposed Route is south of Morris Thomas Road W (County Road 56) and east of Sandberg Road (Township Road 5610). The City of Hermantown is a suburb of Duluth and has a population of 10,221 people (City of Hermantown, 2022a). The eastern part of Hermantown is moderately residential with large lots and occasional subdivisions. The western part of Hermantown is characterized as rural residential. Both the City of Hermantown and Solway Township are in St. Louis County. Solway Township is largely rural and is the location of the unincorporated community of Munger (Solway Township, 2022).

7.2.1 Proximity to Residences and Businesses

7.2.1.1 Existing Environment

Residences are located along most of the roads within and adjacent to the Project Study Area. The residential character of the area is low density and rural/suburban, with houses and other nonresidential structures on large, wooded lots. As of February 2023, there are ten residences within the Project Study Area, including six houses within the Proposed Route (see Map 4a).

7.2.1.2 Impacts on Residences and Businesses

Minnesota Power will purchase or acquire easements for all land within the Proposed Route and current residents within the Proposed Route will relocate prior to the start of the Project. Therefore, no private residence impacts are anticipated as a result of construction and operation of the Project. Because the proposed Project is an extension of the existing Arrowhead Station, no significant impacts are anticipated to residences near the Proposed Route.

The nearest business is over 0.75 mile away from the Proposed Route, no impacts to businesses are anticipated.

7.2.1.3 Mitigation

Because there will be no new impacts to occupied residential buildings or businesses, no additional mitigation is proposed.

7.2.2 Public Health and Safety

7.2.2.1 Existing Environment

During construction and operation of the proposed Project, public safety will be a priority. Safety concerns may include slow moving construction equipment on public roads, construction equipment crossing public roads, wire pulling across public roads and near public areas, and vegetation clearing operations.

The proposed Project will be designed in compliance with state and the NESC requirements regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials, and right-of-way widths. Safeguards will be implemented for construction and

operation of the proposed Project transmission lines and Substations. Construction and/or contract crews will comply with state and NESC standards regarding installation of facilities and standard construction practices.

Minnesota Power's established safety procedures, as well as industry safety procedures, will be followed during construction of the Project and after installation of the transmission line, including clear signage during all construction activities. The proposed high-voltage transmission lines will be equipped with switching devices and the proposed substation will contain circuit breakers and relays at the transmission line terminations. These devices are intended to make, carry, and break line currents under normal conditions and in specified abnormal conditions such as a short circuit or fault. The circuit breakers stop the specified current and can protect other equipment and the extended power system from damaging currents and more extensive outages; however, any electrical facility which becomes isolated by operation of circuit breakers should not be considered de-energized or safe. Downed power lines and other damaged electrical equipment should always be assumed to be energized and dangerous.

7.2.2.2 Impacts on Public Health and Safety

No adverse impacts to public health and safety are anticipated because of the proposed Project. Minnesota Power will ensure that safety requirements are met during construction and operation of the transmission line and substation. During active construction, measures will be made to ensure the safety of local residents, including but not limited to signage where active construction is occurring, flaggers at roads, and barriers around active construction zones. Additionally, when crossing roads during stringing operations, guard structures will be used to provide safeguards for the public.

7.2.2.3 Mitigation

Because no negative impacts to public health and safety are anticipated, no mitigation is proposed.

7.2.3 Audible Noise

Noise is generally considered to be unwanted sound that may be an annoyance, loud or disruptive to hearing. it may be comprised of a variety of sounds of different intensities across the entire frequency spectrum. Noise is measured in units of decibels on the A-weighted scale ("dBA"). Because human hearing is not equally sensitive to all frequencies of sound, the most noticeable frequencies of sound are given more "weight" in most measurement schemes. The A-weighted decibel scale corresponds to the sensitivity range for human hearing. A noise level change of 3 dBA is barely perceptible to human hearing. A 5-dBA change in noise level, however, is clearly noticeable. A 10-dBA change in noise level is perceived as doubling (or halving) of noise loudness. For reference, Table 7.2.3-1 shows noise levels in dBA associated with common, everyday sources, providing context for the Project noise levels discussed later in this section.

Table 7.2.3-1 – Common Noise Sources and Levels

Sound Pressure Levels (dBA)	Common Indoor and Outdoor Noises
120	Rock Concert
100	Construction Noise
80	Typical City Traffic
60	Conversational Speech
40	Nighttime Urban Setting

Sound Pressure Levels (dBA)	Common Indoor and Outdoor Noises
30	Nighttime Rural Setting
10	Threshold of Human Hearing

Source: Minnesota Pollution Control Agency ("MPCA"), 2015

The Minnesota Pollution Control Agency ("MPCA") has established standards for the maximum noise allowable in certain areas based on the type of activities occurring in the area. Within the Proposed Route, the most limiting standard is 50 dBA (nighttime limit) in any residential land use location. The daytime and nighttime noise standards by Noise Area Classifications ("NAC") are provided in Table 7.2.3-2 Minn. R. 7030.0040). Noise standards are expressed using the L_{50} and L_{10} statistical descriptors, which represent the range of permissible dBA within a one-hour period. The L_{50} noise level represents the level exceeded 50 percent of the time, or for 30 minutes in an hour. The L_{10} noise level represents the level exceeded 10 percent of the time, or for 6 minutes in an hour. NACs are categorized by the type of land use activities at a location and the sensitivity of those activities to noise. Residential-type activities including homes; churches; camping and picnicking areas; public, health, and education services; and hotels are included in NAC-1. Commercial-type activities including transit terminals and retail, business, and government services are included in NAC-2. Industrial-type activities including manufacturing, fairgrounds and amusement parks, agriculture, and forestry activities are included in NAC-3. NAC 4 is for undeveloped or unused land.

Table 7.2.3-2 – MPCA Noise Limits by Noise Area Classification

	Daytime		Nighttime	
Noise Area Classification	L_{10}	L_{50}	L_{10}	L_{50}
1	65	60	55	50
2	70	65	70	65
3	80	75	80	75

Source: MPCA, 2015

7.2.3.1 Existing Environment

There is an existing HVDC Converter Station and AC transmission substation adjacent to the eastern boundary of the Proposed Route. Noise from substations primarily comes from the transformers during normal operation processes. Transformer noise is nearly constant and is present whenever the transformer is energized. Some variation in noise is associated with the operation of cooling fans or pumps. The size and voltage of power transformers are the primary factors influencing noise levels.

The existing transmission lines in the Proposed Route produce noise under certain conditions. The level of noise depends on conductor conditions, voltage level, and weather conditions. Operational noise levels produced by transmission lines are generally less than outdoor background levels and are therefore not usually perceivable. Proper design and construction of the transmission lines in accordance with industry standards helps to ensure that noise impacts are minimized. Noise emissions from transmission lines can sound like sizzles, crackles, or hissing noises during periods of high humidity. Noise levels and sounds are typically weather dependent. The sounds are caused by the ionization of the moist air near the wires. Though this noise is audible to those very close to the transmission lines, it quickly dissipates with distance and is easily drowned out by typical background noises. Ionization in foggy conditions can also cause a corona, which is a luminous blue discharge of light usually where the wires connect to

the insulators (Public Service Commission of Wisconsin, 2013). During dry weather, audible noise from transmission lines is barely perceptible.

7.2.3.2 Impacts from Audible Noise

Audible noise will occur as part of the construction and operation phases of the Project. Noise-sensitive land uses within the vicinity of the Project primarily include residential homes.

Construction

Heavy construction equipment operation and increased vehicle traffic due to construction personnel will be the main source of the noise. Construction noise will be primarily limited to daytime hours and will be temporary in nature. Instances such as outages, operational limitations, customer schedules or other factors may cause construction to occur outside of daytime hours or on weekends. Minnesota Power will work with local governments if construction becomes necessary outside of these hours as well as maintaining compliance with noise standards. Heavy equipment will also be equipped with sound attenuation devices such as mufflers to minimize the daytime noise levels.

Operation

The main source of audible noise during operation of the Project will be the HVDC Converter Station. Noise contributions from the HVDC Converter Station are highly dependent on the layout of buildings and equipment within the fence. The most significant sources of noise within the Converter Station are the converter transformers with integrated cooling fans, followed by the outdoor components of the valve cooling system, smoothing reactors and other electrical equipment. Noise emissions from indoor equipment are not expected to propagate outside the building envelope. Transformer noise is nearly constant and is present whenever the transformer is energized. Variations in transformer noise may occur due to the operation of cooling pumps and fans at higher loading levels. In addition to transformers, valve cooling system components, smoothing reactors, and other outdoor electrical equipment may contribute to audible noise. Valve cooling system noise will vary with the operation of the HVDC system, generally producing more noise at higher transfer levels where cooling requirements become more significant. Noise from other electrical equipment, including smoothing reactors, will generally be constant and present whenever the equipment is energized.

Transmission line conductors also produce noise under certain conditions. The level of noise depends on conductor conditions, voltage level, and weather conditions. Operational noise levels produced by a transmission line are generally less than outdoor background levels and are therefore not usually perceivable. Proper design and construction of the transmission line in accordance with industry standards will help to ensure that noise impacts are minimized.

Noise emissions from transmission line conductors generally occur during heavy rain and wet conductor conditions. In foggy, damp or rainy weather, transmission lines can create a crackling sound due to corona discharges—the small amount of electricity ionizing the moist air near the conductors. During heavy rain the background noise level of the rain is usually greater than the noise from the transmission line. As a result, people do not normally hear noise from a transmission line during heavy rain. During light rain, dense fog, snow and other times where there is moisture in the air, transmission lines will produce audible noise equal to approximately household background levels. During dry weather, audible noise from transmission lines is barely perceptible. Several other factors, including conductor voltage, shape and diameter, and surface

irregularities such as scratches, nicks, dust, or water drops can affect a conductor's electrical surface gradient and therefore its corona and noise performance.

7.2.3.3 Impacts and Mitigation

The Project HVDC Converter Station will be designed to ensure that it does not exceed noise standards at the nearest receptor locations (estimated to be approximately 1,500 feet from the HVDC Converter Station) during operation, based on the applicable NACs. If studies conducted during the design of the Project indicate potential for standards to be exceeded, the Company will incorporate noise-control measures within the design of the Converter Station to the extent practicable. Regularly performing proper maintenance practices on converter transformer components such as the cooling fans and pumps generally abate common noise issues.

Construction noise will be temporary and primarily limited to daytime hours. Instances such as outages, operational limitations, customer schedules or other factors may cause construction to occur outside of daytime hours or on weekends. Minnesota Power will work with local governments if construction becomes necessary outside of these hours as well as maintaining compliance with noise standards. Heavy equipment will also be equipped with sound attenuation devices such as mufflers to minimize the daytime noise levels.

The predicted L_{50} audible noise levels associated with the various structure configurations of the transmission lines are given in Table 7.2.3-3 for the edge of right-of-way. Because transmission line audible noise is primarily related to the electric field, and electric fields are particularly dependent on the voltage of the transmission line, the values in Table 7.2.3-3 were calculated at the lines' maximum continuous operating voltage. Maximum continuous operating voltage is defined for the Project as the nominal voltage plus 10 percent, in this case either 253 kV (for nominally 230 kV lines) or 380 kV (for nominally 345 kV lines). Values were calculated assuming minimum conductor-to-ground clearance (that is, at mid-span) and a height of one meter above ground.

As indicated in Table 7.2.3-2 above, the most stringent noise standard is the nighttime L_{50} limit for the land use category that includes residential areas (NAC-1). The NAC-1 nighttime limit is 50 dBA. The calculated L_{50} values at the edge of right-of-way for the Project presented in Table 7.2.3-3 below demonstrate that the audible noise associated with transmission lines will be within the most stringent limitations outside the right-of-way and areas immediately adjacent to it, and no mitigation is necessary.

Table 7.2.3-3 – Calculated L_{50} Audible Noise (dBA) for Proposed Project

Structure Type	Line Voltage	Edge of ROW L_{50} Noise (dBA)
230 kV Single-Circuit H-Frame	253 kV	35.49
230 kV Single Circuit H-Frames (2x Parallel)	253 kV	36.93
230 kV Double-Circuit	253 kV	41.54
345 kV Single-Circuit Monopole	380 kV	50.17

7.2.4 Aesthetics

7.2.4.1 Existing Environment

The Project will primarily be constructed on property owned by Minnesota Power within the Proposed Route, and generally surrounded by deciduous forest. Within this area, there is existing utility infrastructure.

The new St. Louis County Substation and HVDC Converter Station will be new features in the Proposed Route that may be visible off-site where there are open vegetated areas or maintained transmission corridors through the trees. The Arrowhead substation modifications will occur at an existing substation owned by Minnesota Power and are anticipated to occur entirely within the existing fenceline. Right-of-way tree clearing, clearing for the new substation and HVDC terminal, and construction activities associated with Project construction may be visible throughout the Proposed Route. The new HVDC Converter Station will be aesthetically similar to the current HVDC Converter Station, though considerably larger in size. Figure 7.2.4-1 shows an example of an existing VSC HVDC terminal provided by the HVDC OEM.

Figure 7.2.4-1 – Example of the Proposed HVDC Terminal

There are existing transmission lines within the Proposed Route. A portion of the new transmission line construction is proposed to be adjacent to existing transmission lines. The current land use within the Proposed Route consists of forested areas, with additional smaller areas of cropland and rural residential development, bounded on the east by the existing Arrowhead Substation and on the west by Sandberg Road. The new transmission lines will be new features that may be visible from some viewpoints in the general area of the Proposed Route. See Chapter 2.0 for anticipated structure types, heights, and spans.

Impacts on Aesthetics

Right-of-way clearing and substation and Converter Station construction will have the most visual impacts in areas close to roads and residential areas. Minnesota Power identified a Proposed Route that contains existing utility infrastructure. The proposed Project will be constructed in an area containing areas of forest, cropland, and rural residential development, along with existing right-of-way for the ±250 kV HVDC line. The right-of-way will be maintained for the existing ±250 kV transmission lines, but additional tree clearing may be necessary during construction.

Mitigation

The Project represents the expansion of an existing use in and adjacent to the Proposed Route, that is, utility infrastructure including several transmission lines and the Arrowhead Station. Aesthetic impacts will primarily be caused by the removal of trees for Project construction and the additional infrastructure on the landscape. To limit the aesthetic impacts that may be caused by the Project, Minnesota Power will maintain existing trees when practical to serve as a physical and visual barrier to the new Project facilities.

7.2.5 Socioeconomics and Environmental Justice

7.2.5.1 Existing Environment

The Project Study Area is located in St. Louis County in northeast Minnesota. The socioeconomic setting of the Project Study Area was evaluated on a regional level comparing data from the State of Minnesota; St. Louis County; the cities of Duluth, Hermantown, and Proctor; and Solway Township. Data gathered from the 2010 and 2020 U.S. Census are summarized in Table 7.2.5-1 (US Census, 2022).

Table 7.2.5-1 – Socioeconomic Characteristics within the Project Study Area

Location	Population 2010	Population 2020	Median Household Income	Population below poverty level (%)
State of Minnesota	5,303,925	5,706,494	$74,382	9.3%
St. Louis County	200,226	200,231	$64,959	13.8%
City of Duluth	86,265	86,697	$61,944	18.5%
City of Hermantown	9,414	10,221	$80,500	4.9%
City of Proctor	3,057	3,120	$61,176	4.1%
Solway Township	1,944	2,016	$85,625	2.6%

An environmental justice analysis for the Project was completed using the methodology in Minn. Stat. § 216B.1691, subd. 1(e) (rev. 2023), which provides:

"Environmental justice area means an area in Minnesota that, based on the most recent data published by the United States Census Bureau, meets one or more of the following criteria:

(1) 40 percent or more of the area's total population is nonwhite;

(2) 35 percent or more of households in the area have an income that is at or below 200 percent of the federal poverty level;

(3) 40 percent or more of the area's residents over the age of five have limited English proficiency; or

(4) the area is located within Indian country, as defined in United State Code, title 18, section 1151."[17]

The Project is in census tract 111.02. This census tract was analyzed for environmental justice areas, consistent with the above referenced statute. For this analysis, census tracts are the best approximation of a geographic area where adverse impacts can occur from the Project. St. Louis County was used as a reference population for the census tract.

Table 7.2.5-2 identifies the minority populations, low-income populations, and populations with a language other than English spoken at home for St. Louis County and census tract 111.02. The most recent available data was used: U.S. Census 2021 American Community Survey 5-Year Estimate Data File# DP05, File# B03002, File# S1701, and File# DP02.

Table 7.2.5-2 – Environmental Justice Data for Census Tract Where Project is Located

County / Census Tract	2021 Population	Percent Total Minority [a]	Percent of Population at or Below 200 Percent of Federal Poverty Level	Language Other Than English Spoken at Home (2017-2021)
St. Louis County	200,311	9.0%	29.5%	3.5%
Census Tract 111.02	5,454	8.0%	16.7%	1.5%

[a] "Minority" refers to people who reported their ethnicity and race as something other than White, non-Hispanic.

Sources: U.S. Census Bureau, 2021a; 2021b; 2021c; 2021d

No federally recognized Tribal Areas are crossed by the Project. As presented in Table 7.2.5-2, The Project is not in an environmental justice community under the definition provided in Minn. Stat. § 216B.1691, subd. 1(e).

Additionally, Minnesota Power conducted an environmental justice analysis in accordance with the U.S. Environmental Protection Agency ("USEPA") Federal Interagency Working Group on Environmental Justice ("EJ") and National Environmental Policy Act ("NEPA") Committee's publication, Promising Practices for EJ Methodologies in NEPA Reviews (Promising Practices) given that analyses in prior Route Permit Applications have utilized this methodology.

Using this methodology, Minnesota Power first used the USEPA's Environmental Justice Screening Tool ("EJScreen") as an initial step to gather information regarding minority and/or low-income populations; potential environmental quality issues; environmental and demographic indicators; and other important factors. The USEPA recommends that screening tools, such as EJScreen, be used for a "screening-level" look and a useful first step in understanding or highlighting locations that may require further review. EJScreen was used to evaluate the proposed Project plus a 0.25-mile buffer (EPA, 2022b). The tool's output is included in Appendix I and suggests the nearby population's exposure to environmental hazards is similar to or less than the state and national average exposure values across a range of many variables.

[17] Although this statute does not prescribe requirements for a route permit application, Minnesota Power employs this methodology here consistent with the methodology used by EERA in a recently issued EA. *See* Docket No. ET2/22-235.

Next, Minnesota Power used the guidance provided in Promising Practices to determine whether the Project would be located in a census block group with an environmental justice population. Promising Practices defines minority populations as people who reported their ethnicity and race as something other than White, non-Hispanic. Following the recommendations set forth in Promising Practices, the 50 percent and the meaningfully greater analysis methods were used to identify minority populations. Using this methodology, minority populations are defined where either (a) the aggregate minority population of the block groups in the affected area exceeds 50 percent; or (b) the aggregate minority population in the block group affected is 10 percent higher than the aggregate minority population percentage in the county. The guidance also directs low-income populations to be identified based on the annual statistical poverty thresholds from the U.S. Census Bureau. Using Promising Practices' low-income threshold criteria method, low-income populations are identified as block groups where the percent of low-income population in the identified block group is equal to or greater than that of the county. St. Louis County is the comparable reference community to ensure that all affected environmental justice communities are properly identified.

Table 7.2.5-3 identifies the minority populations by race and ethnicity and low-income populations within Minnesota, St. Louis County, and census tract 111.02, block group 4, where the Project is located. Data from U.S. Census 2021 American Community Survey 5-Year Estimate Data File# B03002 and File# B17017 were analyzed at the block group level for the analysis.

Table 7.2.5-3 – Minority Populations by Race and Ethnicity and Low-Income Populations within the Project Area

State / County / Census Block Group	% White	% Black/ African American	% American Indian or Alaskan Native	% Asian	% Native Hawaiian/ Pacific Islander	% Some Other Race	% Two or More Races	Hispanic or Latino	% Total Minority [a]	% Below Poverty Level
Minnesota	80.7%	6.6%	0.9%	5.0%	0.0%	2.1%	4.6%	5.6%	21.7%	9.2%
St. Louis County	91.4%	1.6%	1.8%	1.1%	0.0%	0.5%	3.6%	1.9%	9.5%	14.0%
Census Tract 111.02, Block Group 4	96.2%	0.0%	1.3%	1.4%	0.0%	0.0%	1.1%	2.5%	6.2%	8.4%

[a] "Minority" refers to people who reported their ethnicity and race as something other than White, non-Hispanic.

Sources: U.S. Census Bureau, 2021b; 2021e

As presented in Table 7.2.5-3, based on the analysis, the block group where the Project is proposed is not considered an environmental justice community.

7.2.5.2 Impacts on Socioeconomics

Local and regional impacts to socioeconomics and environmental justice would be minor due to the short-term timeframe of construction of the proposed Project. Revenue may increase for local businesses from purchases made by utility personnel and contractors during construction. Long-term societal benefits of the proposed Project will include increased property tax revenue of approximately $14.5 million for Minnesota counties (i.e., Wilkin, Ottertail, Becker, Hubbard, Wadena, Cass, Crow Wing, Aitkin, and St. Louis counties) in which the HVDC system is located and continued clean, reliable electric service to local customers supporting the local economy.

During the construction phase, activities will provide a seasonal influx of additional dollars into the communities with labor procured from local employment resources and construction materials purchased from local vendors where practicable.

7.2.5.3 Mitigation

There are no environmental justice communities impacted by the Project, so no environmental justice impacts are anticipated. Because negative socioeconomic impacts associated with construction activities are anticipated to be short-term to the local communities, no mitigation is proposed. The project will enable the continued delivery of renewable energy to all customers from varying socioeconomic backgrounds.

7.2.6 Cultural Values

7.2.6.1 Existing Environment

Cultural values include those shared community attitudes expressed within a given area, where they provide a framework for community unity. The Project Study Area is rural in nature with an economy based on tourism, recreation, and logging. Mining, manufacturing, shipping, and service industries are concentrated in urban areas to the east, namely in Duluth and its surrounding communities.

Tourism is primarily a factor of natural amenities, including lakes, rivers, and state and national forests, which attract local and regional recreational users. These amenities are important to the identity of the area and provide opportunities for recreational activities such as fishing, hunting, hiking, and snowmobiling. The regional iron mining industry of the Iron Range is a historically important economic factor and is still valued today in the Project vicinity. Like the mining industry, logging and manufacture of wood products, including paper, lumber, and household goods, have been valued industries for generations of area residents.

7.2.6.2 Impacts on Cultural Values

Construction of the Project is not expected to conflict with local cultural values. The area is rural in nature with an economy based on tourism, recreation, and logging and is anticipated to remain so after construction. The area is already used for electric system infrastructure, including an existing HVDC Line, an HVDC terminal, the Arrowhead Substation, and associated facilities. All proposed facilities will be constructed on privately owned lands and therefore no public recreation or tourism will be affected. No commercial logging or mining currently happens on lands within the Proposed Route. None of these aspects of the culture of the area are anticipated to be significantly impacted or changed as a result of the construction and operation of the Project.

7.2.6.3 Mitigation

No impacts to cultural values are expected, therefore no mitigation is proposed.

7.2.7 Recreation

7.2.7.1 Existing Environment

Common recreational activities within St. Louis County include hunting, biking, hiking, snowmobiling, alpine and Nordic skiing, fishing, and camping. There are three recreational areas within one mile of the Proposed Route as described below.

One perennial designated trout stream is located on the east side of the Proposed Route. The stream is surrounded by private land within the Proposed Route. A MnDNR Forestry parcel, designated as Other Forest Land, is located 0.25 mile west of the Proposed Route (see Map 4b). A recreational snowmobile trail is located approximately one mile north-northeast of the Proposed Route, within the City of Hermantown.

The Midway River Aquatic Management Area ("AMA") is approximately 0.8 mile east of the Project and is part of an AMA made up of six subunits. This is an easement AMA, which is on private property and is acquired specifically to allow angling access. All other uses require landowner permission. Midway River is a MnDNR designated Trout Stream (MnDNR, 2023).

7.2.7.2 Impacts on Recreation

Construction of the Project is not anticipated to disrupt nearby recreational activities. Minnesota Power and their construction contractor will use signs informing the public of construction in the area and any restricted access to transportation routes during construction. The Applicant will coordinate with the MnDNR, U.S. Fish and Wildlife Service ("USFWS"), Hermantown Parks and Recreation Department, and Solway Township to ensure construction of the Project will not cause any significant impacts to nearby natural resources and trout streams. Because the portion of the designated trout stream in the Proposed Route is surrounded by land privately owned by Minnesota Power, and for safety purposes related to operation of the Project and other existing utility infrastructure, no public angling would be allowed. Section 7.5.2.5 further discusses impacts on rivers and streams crossed by the proposed route.

7.2.7.3 Mitigation

No impacts to local recreational activities are expected, therefore no mitigation is proposed. None of the recreational areas outside of the Proposed Route are likely to be impacted by Project activities. As stated above, Minnesota Power will work with the MnDNR and other agencies to avoid and minimize impacts to the designated trout stream.

7.2.8 Public Services and Transportation

7.2.8.1 Existing Environment

The Proposed Route is located in a forested, agricultural, and rural residential area where public services such as electricity, natural gas, and water systems, along with fire protection and law enforcement are available.

Town Road 889 is located within the Proposed Route, entering on the north from Morris Thomas Road and traveling south to several former residences. Roadways adjacent to the Proposed Route include Morris Thomas Road (County Road 56) and Sandberg Road (Township Road 5610). No public transportation services are available in the vicinity of the Project.

7.2.8.2 Impacts on Public Services and Transportation

Minnesota Power will coordinate with the Minnesota Department of Transportation ("MnDOT") to confirm that construction of the Project will not interfere with routine roadway maintenance. Temporary, infrequent localized traffic delays may occur when heavy equipment enters and exits local roadways near the Project or equipment and materials are delivered to the Project construction site. To minimize traffic impacts, Minnesota Power will coordinate with local road authorities to schedule large material and or equipment deliveries to avoid periods when traffic volumes are high whenever practical. Traffic control barriers and warning devices will also be used when appropriate. Safety requirements to maintain flow of public traffic will be followed at all times and construction operations will be conducted to offer the least practical obstruction and inconvenience to public travel. Temporary access for construction of the transmission line would be along existing transmission line right-of-way and on Minnesota Power property. Temporary access for construction of the substation would be on Minnesota Power property or right-of-way. Immediate impacts to Town Road 889 may include increased use as an access road for vehicles and equipment associated with Project transmission line and substation construction. Future use of the road will be determined by Minnesota Power upon completion of the Project.

Minnesota Power will coordinate any planned outages associated with the Project to avoid and/or minimize disruptions to service in the area. Specific standards are required for the design and operating process of transmission lines and associated facilities. These standards and mitigation are outlined in NERC, Federal Energy Regulatory Commission, and NESC, which aid in the compatibility of new construction with existing utilities. All existing utilities will also be identified and marked prior to construction using public and private utility locator services. Because the Project will primarily be constructed on land owned by Minnesota Power and a portion follows existing electric utility right-of-way, no permanent impacts to utility services or other public services are anticipated; temporary interruptions of the HVDC Line will occur during the commissioning of the new HVDC Converter Stations, but Minnesota Power does not anticipate that its customers will observe any impacts to their utility service as a result of these efforts.

7.2.8.3 Mitigation

Because the coordination and safety procedures outlined above will be implemented during Project construction and significant impacts to utilities and Town Road 889 during and after Project construction are not expected, no mitigation is proposed.

7.3 LAND-BASED ECONOMIES

7.3.1 Agriculture

7.3.1.1 Existing Environment

While most land in St. Louis County is forested, some land is put to agricultural uses. Most agricultural land in the county is cultivated cropland, with some hay and pastureland. The USDA 2017 Census of Agriculture for St. Louis County indicates that there are 779 farms within the county, which is an increase of 14 percent from 2012. The average farm size in St. Louis County is 178 acres and there is a total of 138,753 acres of farmland in the county. In 2017, the total market value of products sold from farms in St. Louis County was over $16 million, which is a 5 percent decrease from 2012 (USDA, 2017).

Prime farmland is defined by the NRCS as land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops, and is also available for these uses. There is no prime farmland within the Proposed Route; therefore, there will be no impacts to prime farmland.

The NRCS classifies farmland of statewide importance as lands other than prime farmland that are used for production of specific high-value food and fiber crops, such as tree nuts, fruits, and vegetables. Farmland of statewide importance is similar to prime farmland but with minor shortcomings such as greater slopes or less ability to store soil moisture. The Proposed Route includes approximately 14 acres of land classified as farmland of statewide importance. The areas within the Proposed Route that were formerly used for agriculture, primarily hay production, have been out of production for several years and are currently lying fallow. The degree to which any areas classified as farmland of statewide importance will be converted to other uses by the Project will be determined based on a final design. However, because the land within the Proposed Route will be owned or otherwise managed by Minnesota Power for the primary use of the proposed Project, it is unlikely that such lands will return to agricultural production.

7.3.1.2 Impacts on Agriculture

Based on the preliminary Project design, the Proposed Route includes approximately 41.6 acres of agricultural land previously used for pasture or hay production Based on the preliminary Project design, the substation will permanently impact up to 4 acres of land previously used for agriculture and the transmission lines will impact up to 3.5 acres of agricultural land.

7.3.1.3 Mitigation

Minnesota Power will limit impacts to agricultural production to the extent practical. Because Minnesota Power will own or manage through easements all lands within the Proposed Route, and because no active agricultural uses exist within the Proposed Route at this time, no impacts will occur to active agricultural land. As a result, Minnesota Power anticipates that an Agricultural Impact Mitigation Plan will not be required.

7.3.2 Forestry

7.3.2.1 Existing Environment

According to St. Louis County (St. Louis County, 2022a), the production of wood and paper products is a major industry within the county. Based on aerial photographs and site reconnaissance, there are no commercial forestry activities within the Proposed Route as of the time of this application.

7.3.2.2 Impacts on Forestry

Because there are no known commercial forestry operations within the Proposed Route, the Project will have no impacts on commercial forestry operations.

7.3.2.3 Mitigation

No impacts to forestry are anticipated; therefore, no mitigation is proposed.

7.3.3 Tourism

7.3.3.1 Existing Environment

No local, state, or federal parks or recreation areas are located within one mile of the Project Study Area. The nearest snowmobile trail is approximately one mile north/northeast of the Study Area. No tourism attractions are located within one mile of the Project Study Area.

7.3.3.2 Impacts on Tourism

No tourism attractions are located within one mile of the Project Study Area; therefore, impacts on tourism are not anticipated.

7.3.3.3 Mitigation

No impacts to tourism are anticipated; therefore, no mitigation is proposed.

7.3.4 Mining

7.3.4.1 Existing Environment

Based on aerial photographs, site reconnaissance, and data from the Aggregate Source Information System (MnDOT, 2023), two mines/gravel pits are located west and north of the Project Study Area, and one is located within the Project Study Area, but outside of the Proposed Route (see Map 5).

Mine 69367 is an inactive aggregate source, which indicates a source that is either depleted or at least unavailable for future use (If future circumstances make such sources available, the status may be changed).

Mine 69368 is an aggregate pit, which indicates an aggregate source that is owned and managed by MnDOT. Based on a review of aerial photographs, there was historically an aggregate pit at this location; however, one is not currently present.

Mine 69581 is a commercial aggregate, which indicates an identified commercial source of aggregate that has been assigned a source number in order to facilitate tracking of test results when the source is used on MnDOT or county projects.

7.3.4.2 Impacts on Mining

No mining operations are present within the Proposed Route; therefore, impacts are not anticipated.

7.3.4.3 Mitigation

No impacts to mining are anticipated; therefore, no mitigation is proposed.

7.4 ARCHAEOLOGICAL AND HISTORIC RESOURCES

7.4.1 Existing Environment

Information on known archaeological and historic resources was gathered in August 2022 from the Minnesota State Historic Preservation Office ("SHPO") and the Minnesota Office of the State Archaeologist ("OSA"), both in St. Paul. This desktop investigation queried the area within one mile of the Project Study Area. The SHPO and OSA datasets stem from previous professional cultural resources surveys and otherwise reported archaeological and architectural sites, also known as historic structures. Sites in these datasets typically include, but are not limited to, Native American mounds and earthworks, prehistoric burial grounds and habitation sites, remains of EuroAmerican home- and farmsteads, logging camps or other industrial land use, and standing buildings, bridges, or other features of the built environmental or infrastructure. Sites not included in these datasets may include locations known to Native Americans to have cultural importance.

7.4.1.1 Previously Recorded Archaeological Sites

No previously recorded archaeological sites are in the Proposed Route or within one mile of the Project Study Area.

7.4.1.2 Fond du Lac THPO-Identified Resources

On November 17, 2022, the Applicant solicited comments from the Tribal Historic Preservation Office ("THPO") of the Fond du Lac Band of Lake Superior Chippewa ("FDL") regarding places of cultural importance that were known to exist within the Project Study Area. The FDL THPO indicated that a potential, unconfirmed trail may be present in the very southwest of the Project Study Area, but outside of the Proposed Route.

7.4.1.3 Previously Recorded Historic Resources

US Highway 2 is the single previously recorded historic resource within one mile of the Project Study Area. There is no indication that this historic resource is eligible for inclusion on the National Register of Historic Places.

7.4.1.4 Conventional Archaeological Survey

In September 2022, the Applicant sponsored a conventional archaeological survey of those portions of the Study Area where landowner permission was available, amounting to 142 acres (or 40 percent) of the total 357 acres within the Study Area (as shown in Map 6 – Privileged and Confidential, in Appendix P). Of the surveyed acres, 66.2 acres are within the Proposed Route. Site 21SL1274, a historic period occupation, was identified and recommended not eligible for inclusion on the National Register of Historic Places ("NRHP") (Merjent, 2023). The Applicant provided the survey report to the SHPO and OSA for review on May 5, 2023. The results of the SHPO's review and concurrence in the report's findings will be provided to the MPUC after they are received by Minnesota Power.

The Applicant plans to sponsor conventional archaeological survey of any additional parcels that may eventually serve as Project workspace, plus the remaining unsurveyed parcels, as landowner permissions are granted or parcels are acquired. These surveys are anticipated to occur in the summer or fall of 2023. The Applicant will provide any additional reports to the SHPO and OSA and request comment on report adequacy, resource-specific NRHP eligibility recommendations,

and (if applicable) measures for avoidance, minimization, or mitigation of adverse effects to NRHP-eligible resources.

7.4.2 Impacts

Based on the September 2022 field investigation, no sites eligible for inclusion on the NRHP would be adversely affected by Project construction, operations, or maintenance (within the 142 acres surveyed). As noted above, the Applicant plans to sponsor conventional archaeological survey of additional and remaining parcels as landowner permissions are granted.

Impacts on the unconfirmed trail, identified by the FDL THPO, are unanticipated because it is located outside of the Proposed Route.

7.4.3 Mitigation

Should an NRHP-eligible site be identified in other Project workspaces during preconstruction surveys, the Applicant will coordinate with SHPO and OSA to avoid, minimize, or mitigate adverse effects. Such efforts may be achieved through, but not limited to, Project design changes (avoidance), engineering or construction controls (minimization), or data recovery excavation (mitigation).

Conventional archaeological surveys are designed to identify NRHP-eligible sites. Not all isolated artifacts or other ephemeral evidence of human occupation, or even human remains, are identifiable during conventional archaeological surveys. While not expected, in the event archaeological materials and/or human remains are identified during Project construction activities, such activities will cease in the immediate area, and a professional archaeologist will be contacted to investigate the find. In the event of a confirmed archaeological site, steps will be taken to record and evaluate the site in consultation with SHPO and the OSA. If the site is determined to be eligible for inclusion on the NRHP, consultation among these parties will determine any procedures for avoidance, minimization, or mitigation. Should human remains be identified, the procedures as outlined in Minnesota Statutes Chapter 307, “Private Cemeteries” will be followed in coordination with the OSA and Minnesota Indian Affairs Council. In addition, an Unanticipated Discovery Plan will be prepared.

7.5 NATURAL ENVIRONMENT

7.5.1 Air Quality

7.5.1.1 Existing Environment

Existing air quality in the Project Study Area is good and intermittently impacted by emissions from traffic on nearby roads, farm vehicles, and home heating systems. No significant emissions occur from the existing utility infrastructure within and adjacent to the Project Study Area.

In Minnesota, air quality is tracked using air quality monitoring stations across the State. The MPCA uses data from these monitors to calculate the Air Quality Index (“AQI”), on an hourly basis, for ozone, particulate matter 2.5 microns or less in diameter (“$PM_{2.5}$”), sulfur dioxide, NO_2, and carbon monoxide. The pollutant with the highest AQI value for a particular hour sets the overall AQI for that hour. The AQI is used to categorize the air quality of a region as one of five levels of quality: good, moderate, unhealthy for sensitive groups, unhealthy, or very unhealthy (MPCA, 2021b).

The Project is located nearest to the air quality monitor in Duluth, Minnesota. This station monitors for ozone and $PM_{2.5}$. The AQI for Duluth for the past five years is provided in Table 7.5.1-1 (MPCA, 2021c).

Table 7.5.1-1 – Days in Each Air Quality Index Category (Duluth, Minnesota)

Year	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy
2021	332	25	0	0	0
2020	338	28	0	0	0
2019	342	23	0	0	0
2018	330	30	0	0	0
2017	342	21	0	0	0

Source: MPCA, 2021c.

Air quality has been considered good for the majority of the past five reported years in Duluth. Since 2017, the largest number of days classified as moderate occurred in 2018. Only three days were unhealthy for sensitive groups in the last five years. No days have been classified as unhealthy or very unhealthy.

7.5.1.2 Air Quality Impacts

Emissions from fossil fuel combustion in the heavy equipment during construction of the Project, as well as fugitive dust emissions from the vehicles traveling on- and off-road, will contribute a negligible amount of air emissions on a temporary basis.

The only potential air emissions from a transmission line or conductors within the substation result from corona, which may produce ozone and oxides of nitrogen. Refer to Section 6.5.3 for a discussion of ozone and nitrogen oxide emissions. The use of sulfur hexafluoride ("SF_6") circuit breakers within the stations also has the potential for temporary, localized air quality impacts if an accidental release was to occur.

Temporary and localized air quality impacts caused by construction vehicle emissions and fugitive dust from right-of-way clearing and construction activities are expected to occur. Exhaust emissions from diesel equipment will vary during construction but will be minimal and temporary. The magnitude of emissions is influenced heavily by weather conditions and the specific construction activity taking place.

No impacts to air quality are anticipated due to the operation of the substation or transmission line.

7.5.1.3 Greenhouse Gas Emissions and Climate Change

During construction of the transmission line, switching and Converter Stations, small amounts of air pollutants, including greenhouse gasses ("GHGs"), would be temporarily generated. The largest source of GHG emissions during construction is the combustion of fuels such as gasoline or diesel by construction equipment. These construction emissions would be temporary in nature, would fall off rapidly with distance from construction areas, and are not anticipated to result in long-term impacts. Once the construction activities are completed, construction-related emissions would cease. Additionally, the proposed project will be used to support existing and new

renewable electricity generation which may displace higher carbon emitting electricity generating sources.

Climate change could result in an increased risk of flooding in the Project area, increased temperatures, extreme weather events such as high winds, and excessive rainfall; however, the Project location has been identified to be resistant to the effects of climate change due to Project infrastructure being sited outside of the 100-year floodplain and on upland areas to minimize susceptibility. In addition, transmission towers and the buildings associated with the Project will be designed to withstand extreme weather events, including high winds, and will increase electric service reliability within the Project area. As a result, the Project is not anticipated to contribute to any long-term GHG emissions or climate change impacts. Nor is the Project anticipated to be impacted by the effects of climate change.

Total GHG emissions for project construction are estimated to be approximately 9,019 tons of carbon dioxide ("CO_2"). Most emissions are due to the use of construction equipment and semi-trucks and trailers. Using EPA emissions factors, Table 7.5.1-2 shows a preliminary estimate of the emission estimates for the greenhouse gas emissions of CO_2, methane ("CH_4"), and nitrous oxide ("N_2O")

Table 7.5.1-2 – Preliminary Emission Estimates for Greenhouse Gas Emissions

Fuel Type	Estimated Fuel Use (US Ggal)	Heating Value (mmBtu/gal)	CO2 Emission Factor (kG/mmBtu)	Total CO2 Emissions in kG	CH4 Emission Factor (kG/mmBtu)	Total CH4 Emissions in kG	N2O Emission Factor (kG/mmBtu)	Total CH4 Emission in kG
Distillate No.1	800,800.00	0.139	73.25	8,153,545.40	0.003	333.93	0.0006	66.79
Global Warming Potential	...	...	...	1.00	...	25	...	298
CO2e (kG)	...	...	...	8,153,545	...	8,348	...	19,902
CO2e as Tons	...	...	...	8,988	...	9	...	22
Total CO2e Tons	9,019							

Currently, there are no Minnesota-specific thresholds of significance for determining impacts of GHG emissions from an individual project on global climate change. In the absence of such a threshold, Minn. R. 4410.4300, Subp. 15(B), establishes a mandatory category requiring preparation of an EAW for stationary source facilities generating 100,000 tons of GHGs per year as the threshold to aid in determining if potential significant environmental effects might exist. A reasonable conclusion is that a project with GHG emissions below 100,000 tons per year does not have the potential to result in significant GHG effects. Potential impacts due to construction GHG emissions are anticipated to be negligible.

Once operational, the Project will generate minimal GHG emissions. Emissions that do occur would result from vehicle usage to and from the transmission lines and substation for O&M activities. GHG emissions for Project O&M are estimated to be approximately 440 tons of CO_2 annually.

Another potential source of GHG emissions during operation of the Project stems from the use of SF_6-containing equipment, such as high-voltage circuit breakers. The use of such equipment within high-voltage transmission systems is extremely common because of the substance's stability and effectiveness at insulating electrical equipment. SF_6 is a highly potent GHG. For this reason, equipment containing SF_6 is designed to avoid emissions to the atmosphere. One of the best ways to avoid SF_6 emissions is to maintain or replace old equipment. The use of modern SF_6 equipment also supports system reliability and efficiency. Potential impacts due to operational GHG emissions are anticipated to be negligible.

7.5.1.4 Mitigation

Because no significant impacts to air quality are anticipated from the operation of the new or existing substations or the HVDC Converter Station, no mitigation is proposed with respect to operational impacts. The transmission lines and associated structures included in the Project will be designed to remove points of potential corona concentrations to minimize potential losses.

Construction best management practices for dust control including the use of wetting unpaved roads and right-of-way access points will be implemented and equipment idling will be minimized to reduce any short-term air quality impacts.

7.5.2 Water Resources

Hydraulic features within the Project Study Area include groundwater, wetlands, waterways, waterbodies, and floodplains (see Maps 8a, b and c). The Proposed Route is located entirely within the St. Louis River watershed (HUC 04010201).

7.5.2.1 Groundwater

Existing Environment

The MnDNR divides the State of Minnesota into six groundwater provinces, which are based on bedrock, glacial geology, and with unique combinations of sources and availability for drinking water, industry, and agriculture. The Project Study Area is located within the Central Province, which is characterized by a thick glacial sediment; however, sand and gravel aquifers are common. The deeper, fractured crystalline bedrock is characterized by poor aquifer properties and is of limited use as an aquifer (MnDNR, 2022e).

Based on the Minnesota County Well Index, four domestic wells are currently located within the Proposed Route (Minnesota Department of Health, 2023) (see Map 7a). Details for each well are provided in Table 7.5.2-1.

Table 7.5.2-1 – Wells Within the Proposed Route

Unique Well ID	Use	Date Drilled	Depth	Aquifer
786235	Domestic	11/20/2011	244 feet	Quaternary buried artesian aquifer
751462	Domestic	11/12/2007	215 feet	Quaternary buried artesian aquifer
143009	Domestic	12/15/1977	137 feet	Quaternary buried artesian aquifer
160987	Domestic	07/11/1979	125 feet	Quaternary buried artesian aquifer

A sole source aquifer (“SSA”) or principal source aquifer area is one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer, where contamination of the aquifer could create a significant hazard to public health, and where there are no alternative water sources that could reasonably be expected to replace the water supplied by the aquifer (EPA, 2016). The closest EPA-designated SSA is approximately 59 miles southwest of the Proposed Route.

Under the U.S. Safe Drinking Water Act (“SDWA”), each state is required to develop and implement a Wellhead Protection Program to identify the land and recharge areas contributing to

public supply wells and prevent the contamination of drinking water supplies. The SDWA was updated in 1986 with an amendment requiring the development of a broader-based Source Water Assessment Program, which includes the assessment of potential contamination to both groundwater and surface water through a watershed approach. A Wellhead Protection Area ("WHPA") encompasses the area around a drinking water well where contaminants could enter and pollute the well. The closest WHPA is located approximately 4.6 miles southeast of the Project Study Area.

Impacts on Groundwater

Existing domestic groundwater wells currently exist within the proposed route. As part of Project construction of these wells will be sealed in accordance with Minnesota Department of Health regulations. A groundwater well for minimal appropriation will be required at the HVDC Converter Station for sanitary water and fire suppression (a second well may be required depending on fire suppression requirements). However, equipment cooling will be via a closed loop cooling system. Minimal impacts to groundwater from operational appropriation are anticipated with the Project.

Structure foundations will generally range from 25 feet to 60 feet in depth. All foundation materials will be non-hazardous. Any effects on water tables would be localized and short term and would not affect hydrologic resources. Prior to construction, geotechnical investigations will be completed to help identify shallow depth to groundwater resource areas, which may require special foundation designs. Minnesota Power will continue to work with landowners to identify springs and wells near the Proposed Route.

Mitigation

No impacts to groundwater are anticipated; therefore, no mitigation is proposed.

7.5.2.2 Floodplains

Existing Environment

A floodplain is any land area susceptible to being inundated by floodwaters from any source, and is usually flat, or nearly flat, land adjacent to a river or stream that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which includes areas covered by the flood but that do not experience strong current. Floodplains function to prevent damage to downstream areas by detaining debris, sediment, water, and ice. The Federal Emergency Management Agency ("FEMA") delineates floodplains and determines flood risks in areas susceptible to flooding. FEMA designates floodplain areas based on the percent chance of a flood occurring in that area every year. These designations include the 100-year floodplain, which has a 1 percent chance of flooding each year, and the 500-year floodplain, which has a 0.2 percent chance of flooding each year.

At the state level, the MnDNR oversees the administration of the state floodplain management program by promoting and ensuring sound land use development in areas to promote the health and safety of the public, minimize loss of life, and reduce economic losses caused by flood damages. The MnDNR also oversees the national flood insurance program for the state of Minnesota. Floodplains are also regulated at the local level by each county. Associated ordinances allow for utility transmission lines as a conditional use for floodway and floodplain districts.

Impacts on Floodplains

Within the Project Study Area, a 100-year floodplain is associated with West Rocky Run Creek (see Map 7b). Minnesota Power will place new transmission line structures outside of the floodplain area, although lines will span it. During construction, approximately 0.84 acre within the floodplain could experience temporary impacts from construction vehicles, access routes, structure work areas, and wire pull sites. The temporary impacts are not anticipated to alter the flood storage capacity of the floodplain.

Mitigation

No permanent impacts to floodplains are anticipated; therefore, no mitigation is proposed.

7.5.2.3 Impaired Waters

Existing Environment

Under Section 303(d) of the Clean Water Act ("CWA"), the MPCA assesses all waters of the state and creates a list of impaired waters every two years. The listings are based on water quality monitoring of lakes and major streams and are used to set pollutant reduction goals needed to restore waters to the extent that they meet water quality standards for designated uses, which are referred to as total maximum daily loads. The list, known as the 303(d) list, is based on violations of water quality standards. In Minnesota, the MPCA has jurisdiction over determining 303(d) waters. These waters are described as "impaired." The 303(d) list was approved by the EPA on April 29, 2022.

The Proposed Route includes one impaired waterbody, West Rocky Run Creek (AUID 04010201-625), which is listed as having an impaired designated use of aquatic life, due to *Escherichia coli* (MPCA, 2022) (see Map 7b).

Impacts on Impaired Waters

Minnesota Power will place new transmission line structures outside of the impaired waterbody and transmission lines will span the waterbody. Direct impacts to impaired surface waters are not anticipated, and no Project activities are likely to exacerbate the existing impairment for *E. coli*. Minnesota Power will employ best management practices during construction and in compliance with local and state permits to prevent erosion and sedimentation near surface waters.

Mitigation

No impacts to impaired waters are anticipated; therefore, no mitigation is proposed.

7.5.2.4 Lakes and Other Waterbodies

Existing Environment

Based on a review of aerial photography and field survey results, no lakes are present within the Project Study Area. Several small ponds are present within the Project Study Area but there are no non-wetland waterbodies of any kind within the Proposed Route. Pike Lake, the closest lake, is approximately six miles north of the Project Study Area.

Impacts on Waterbodies

No waterbodies are present within the Proposed Route; therefore, impacts are not anticipated.

Mitigation

No impacts to waterbodies are anticipated; therefore, no mitigation is proposed.

7.5.2.5 Rivers and Streams (Waterways)

Existing Environment

Waterways include rivers, streams, and other watercourses that move water across the landscape within a defined path. Public Waters are wetlands, water basins, and watercourses of significant recreational or natural resource value in Minnesota as defined in Minn. Stat. § 103G.005. The MnDNR has regulatory jurisdiction over these waters, which are identified on the MnDNR Public Waters Inventory ("PWI") maps. In addition to Public Waters, certain surface waters in Minnesota are designated as trout streams or trout lakes by the State of Minnesota, according to Minn. Stat. § 6264.0050. By definition, trout streams and trout lakes are considered Public Waters and are regulated by the MnDNR. One waterway, West Rocky Run Creek, is located within the Proposed Route (see Map 7b) and will be crossed by the two parallel 230 kV transmission lines. West Rocky Run Creek is a designated trout stream and a Minnesota Public Water.

Impacts on Rivers and Streams

Trout rely on coldwater habitat. As a result, clearing of trees along designated trout streams and their tributaries may result in adverse warming of the stream water. Shade provided by trees and shrubs is important to minimize thermal impacts to trout streams. The Applicant will work with the MnDNR to obtain proper licenses and approvals for Public Water crossings by the proposed Project and to identify appropriate measures to minimize temperature-related impacts to the stream.

Through the license approval process, Minnesota Power and the MnDNR will determine the appropriate mitigation or avoidance measures for Public Water crossings, including trout streams. Avoidance measures may include timing restrictions, including no in-water work between September 15th and June 30th. In addition, special clearing setbacks may be required when working near the trout stream. Where practicable, a 75-foot vegetated buffer will be maintained adjacent to trout streams, except for a 20-foot-wide travel path. In locations where clearing activities must take place within the 75-foot buffer, hand clearing techniques will be used to minimize impacts to soils and existing vegetation. Rootstock of woody vegetation will remain in place to avoid impacts to soils and allow existing vegetation to regrow quicker.

Through the National Pollutant Discharge Elimination System ("NPDES") permitting process the Project will be required to comply with Section 23.1 of the Construction General Permit MNR100001, which includes designated trout streams within the definition of special waters. BMPs such as redundant perimeter controls and the stabilization of exposed soils immediately upon completion of work within the 75-foot buffer will be implemented to minimize erosion near MnDNR designated trout streams.

Mitigation

No permanent impacts to waterbodies are anticipated; therefore, no mitigation is proposed.

7.5.2.6 Wetlands

Existing Environment

Wetlands are important resources for flood abatement, wildlife habitat, and water quality. Wetlands that are hydrologically connected to the nation's navigable streams are protected under Section 404 of the federal CWA and most wetlands in Minnesota are protected under the state Wetland Conservation Act ("WCA"). The USFWS National Wetlands Inventory ("NWI") is a publicly available GIS database that provides information regarding the potential existence of wetlands. NWI data should be used as a reference only and may be inconsistent with wetland conditions on the ground.

Wetland types within the NWI data are classified using the Cowardin wetland habitat classification system. The Cowardin classification system is hierarchical and defines wetland habitats based on vegetative and sediment class along with water regime.

In August and September 2022, Merjent completed a wetland and other waters delineation of approximately 142 acres ("Survey Area") within the Project Study Area, or 66.2 acres within the Proposed Route. The Survey Area was defined based on landowner permissions and encompassed portions of the Proposed Route. Additional detail can be found in the Wetland and Other Waters delineation report, which is included as Appendix I. Areas that were not surveyed in 2022 will be surveyed in 2023, pending land acquisition by Minnesota Power or landowner permissions.

Based on field delineations and NWI data where field delineations are incomplete, approximately 16.13 acres of wetlands may be present within the Proposed Route (see Map 7c). Details on wetland types are included in Table 7.5.2-2.

Table 7.5.2-2 – Delineated Wetlands and NWI Wetlands Within the Proposed Route

Wetland Type	Delineated	NWI
PEM	5.24	0.38
PFO	2.06	-
PSS	2.43	5.82
PUB	0.04	0.03
R3UBH	-	0.12
TOTAL	**9.77**	**6.35**

Impacts on Wetlands

Based on the preliminary Project design, permanent impacts to wetlands may result from construction of the substation (see Table 7.5.2-3). The Converter Station is not anticipated to impact wetlands, based on NWI data; however, field delineations will occur in 2023. Temporary fill impacts to wetlands may occur in the form of the placement of temporary construction matting along access routes, transmission line structure work areas, and wire pull sites. Transmission structures will be sited outside of wetlands, so permanent impacts are not anticipated (see Table 7.5.2-3).

Table 7.5.2-3 – Potential Impacts on Wetlands and Other Waters

Wetland Type	Delineated	NWI
Substation (Permanent impacts based on preliminary design)		
PEM	0.34	-
PSS	0.41	-
Subtotal	**0.75**	**0.00**
Transmission Line (Temporary impacts based on preliminary design)		
PEM	0.93	-
PFO	0.34	-
PSS	-	0.38
PUB	-	0.03
R3UBH	-	0.01
Subtotal	**1.27**	**0.42**
TOTAL	**2.02**	**0.42**

The Applicant will continue to minimize wetland impacts to the extent possible. Minnesota Power will continue to coordinate with U.S. Army Corps of Engineers ("USACE") and will apply for a permit once design details are available. Minnesota Power will also coordinate with the Local Governmental Unit to confirm compliance with the WCA.

Mitigation

Minnesota Power will work with the USACE to determine mitigation ratios, if necessary. Mitigation typically occurs in the form of wetland replacement credits for permanent impacts to wetland areas.

Minnesota Power believes that the Project will qualify for the Utility Exemption from preparing a Wetland Replacement Plan under WCA; see Section 9.2.5 for additional details.

7.5.3 Flora and Fauna

7.5.3.1 Flora

Existing Environment

Vegetation communities in the Project Study Area currently include agricultural land, deciduous forest, transmission line rights-of-way, and residential lawns. The Project Study Area lies within the Laurentian Mixed Forest Province as defined by the Ecological Classification System of Minnesota and more specifically within the North Shore Highlands Subsection. Pre-European settlement vegetation consisted mainly of fire-dependent forests such as aspen-birch forest with white pine-red pine forest, mixed hardwood-pine forest, and conifer bogs and swamps. Mixed hardwood-pine forests, which included sugar maples (*Acer saccharum*), was found mainly on ridges made of clay lake plain. The northern half of the subsection was dominated by aspen-birch forest with little pine forest mixed in (MnDNR, 2022a).

Currently, the majority of the subsection remains forested. However, after extensive logging, white and red pine forests were replaced by quaking aspen (*Populus tremuloides*) and paper birch (*Betula papyrifera*). There has been little to no mining or agriculture in this area though the subsection is home to ports for iron ore and agricultural commodities (MnDNR 2022b).

Impacts on Flora

Impacts on existing vegetation are anticipated due to construction and operation of the proposed Project. The disturbance would be minimized by using the existing road system to the extent practical, traveling within the right-of-way as appropriate, and not building new roads unless necessary. Further, the transmission line may span sensitive resources, such as streams and wetlands to the extent practical. Last, the Project facilities are mostly being constructed in proximity to existing utility infrastructure. Impacts on specific land cover types are discussed in Section 7.6.3 – Land Cover, impacts from right-of-way clearing are discussed in Section 6.2.2, and operations and maintenance activities are discussed in Section 6.4.

Construction within the Proposed Route could lead to the introduction or spread of invasive species and noxious weeds. Construction activities that could potentially lead to the introduction of invasive species include ground disturbance that leaves soils exposed for extended periods, introduction of topsoil contaminated with weed seeds, vehicles importing weed seed from a contaminated site to an uncontaminated site, and conversion of landscape type, particularly from forested to open settings.

Mitigation

Potential impacts due to invasive species and noxious weeds can be mitigated by:

- Revegetating disturbed areas using weed-free seed mixes and using weed-free straw and hay for erosion control.
- Removal of invasive species/noxious weeds via herbicide and manual means.
- Cleaning and inspecting construction vehicles to remove dirt, mud, plant, and debris from vehicles prior to arriving at and leaving construction sites.

Minnesota Power will prepare a vegetation management plan for the Project prior to construction in consultation with the Minnesota Vegetation Management Working Group. The plan will include measures to mitigate the introduction of invasive species and noxious weeks to the Proposed Route.

7.5.3.2 Fauna

Existing Environment

Wildlife species in St. Louis County include bald eagles, woodcock, ruffed grouse, wild turkeys, white-tailed deer, black bear, beaver, muskrat, river otter, grey wolf, rabbits, squirrels, red and gray fox, raccoon, migratory waterfowl (geese, ducks, trumpeter swans, herons, raptors), and various birds (meadowlarks, sparrows, thrushes, various woodpeckers, shore birds) (MnDNR, 2022c). Several of these species are likely to be present within the Project Study Area.

The National Audubon Society works to identify, monitor, and protect habitat for bird species throughout the United States, in part by designating sites as Important Bird Areas (“IBA”). IBAs are designated when they meet certain criteria, including providing habitat for at least one of the following (National Audubon Society [“NAS”], 2022):

- Species of conservation concern (e.g., threatened and endangered species);

- Range-restricted species (species vulnerable because they are not widely distributed);
- Species that are vulnerable because their populations are concentrated in one general habitat type or biome; and/or
- Species, or groups of similar species (such as waterfowl or shorebirds), that are vulnerable because they occur at high densities due to their congregatory behavior.

Audubon works to identify and implement conservation strategies within IBAs to minimize the effects of habitat loss on birds and, by extension, other species (NAS, 2022).

No IBAs are located within the Project Study Area.

7.5.3.3 Impacts on Fauna

There is minimal potential for the displacement of wildlife and loss of habitat from construction of the proposed Project. Wildlife that inhabits natural areas could be impacted in the short-term within the immediate area of construction. The distance that animals will be displaced will depend on the species. Additionally, these animals will be typical of those found in forested rural settings and should not incur population level effects due to construction.

Due to the confined nature of the Project, impacts to raptors, waterfowl and other bird species are anticipated to be minimal.

Where practical the Project will consider the Avian Powerline Interaction Committee ("APLIC") recommendations to reduce electrocution and collisions with transmission line conductors.

Mitigation

Impacts on fauna species are anticipated to be temporary in nature and APLIC design recommendations will be considered in the Project design where practicable.

7.6 ZONING AND LAND USE

7.6.1 Zoning

7.6.1.1 Existing Environment

The Proposed Route intersects both the City of Hermantown and Solway Township zoning ordinances. Solway Township zoning is managed by St. Louis County. Within the City of Hermantown, the Proposed Route is zoned Rural Residential, S1 (City of Hermantown, 2022b). The Solway Township portion of the Proposed Route is zoned Residential, RES-3 (St. Louis County, 2022). Zoning information for the Proposed Route is shown on Map 8. The Proposed Route also contains a Natural Environment Shoreland Overlay Zone (City of Hermantown, 2022b) that covers West Rocky Run, a Minnesota Public Water and perennial designated trout stream. Activity near, in, or across West Rocky Run may require additional review and permitting due to the Shoreland Zoning designation.

7.6.1.2 Impacts on Zoning

Construction and operation of the Project will not require a zoning change due to the preemption of local land use laws that is granted with LHVTL Route Permits.

7.6.1.3 Mitigation

In accordance with Minn. Stat. § 216E.10, subd. 1, after the Commission approves a route, local zoning, building, and land use regulations are preempted; therefore, no mitigation is anticipated.

7.6.2 Land Use

7.6.2.1 Existing Environment

Current land use within the Proposed Route is mainly forested, agricultural, utility corridor, and rural residential (Google Earth, 2022). The Proposed Route includes existing transmission line infrastructure rights-of-way, and the Arrowhead Substation is adjacent to the eastern boundary of the Proposed Route.

7.6.2.2 Impacts on Land Use

Land use for utility infrastructure would increase by approximately 43.5 acres as a result of the Project and would be the primary impact to land use. Although a large majority of the Proposed Route is forested, commercial forestry is not an active commercial activity; therefore, no impacts to forestry land use activities would occur. Minor impacts to agricultural land use (less than five acres) may occur depending on final Project design. See Section 7.3 – Land Based Economies for additional information on impacts to agricultural and forest lands.

7.6.2.3 Mitigation

Minnesota Power will minimize impacts to existing land uses to the extent practical. See Section 7.3 – Land Based Economies for additional information on Land Use mitigation.

7.6.3 Land Cover

7.6.3.1 Existing Environment

Based on U.S. Geological Survey Gap Analysis Project data, the total acreage of each land cover type within the Proposed Route is provided in Table 7.6.3-1 and shown on Map 9. The table includes land cover by specific type and identifies a summary acreage of those covers included in forested land cover as a separate row.

Table 7.6.3-1 – Land Cover Within Proposed Route

Land Cover Type	Acres	Percentage of Total
Forest and Shrubs	112.94	64.06
Developed	36.59	20.76
Cropland	24.31	13.79
Grassland	2.44	1.39
TOTAL	**176.28**	**100.00**

7.6.3.2 Impacts on Land Cover

As previously stated, the Project will be constructed entirely on property owned or managed by Minnesota Power within the Proposed Route. Within this area, there is existing utility infrastructure, including existing transmission lines. Impacts on forested and rural developed land will be the most obvious impact to overall land cover within the Proposed Route. Approximately 26 acres of forested land will be cleared as a result of the proposed Project construction. Tree clearing will occur per Minnesota Power standards and based on consultation with USFWS. Secondary impacts include impacts to approximately 14 acres of rural developed land and three acres of cropland.

Table 7.6.3-2 – Land Cover Impacts from Project

Land Cover Type	Impact (Acres)	Percentage of Total
Forest and Shrubs	26.24	60.35
Developed	13.85	31.85
Cropland	3.39	7.80
Grassland	0.00	0.00
TOTAL	**43.48**	**100.00**

7.6.3.3 Mitigation

Minnesota Power will minimize impacts to land cover to the extent practical. See Section 7.3 – Land Based Economies for additional information on Land Use and associated Land Cover Impacts and Mitigation.

7.7 RARE AND UNIQUE RESOURCES

7.7.1 Existing Environment

7.7.1.1 Threatened and Endangered Species

On behalf of Minnesota Power, Merjent submitted a formal Natural Heritage Review Request (2022-0070) on November 11, 2022 (see Appendix J) through the MnDNR's Minnesota Conservation Explorer ("MCE").

Merjent also reviewed the USFWS Information for Planning and Conservation ("IPaC") website for a list of federally threatened and endangered species, candidate species, and designated critical habitat that may be present within the Project Study Area (USFWS, 2022a).

State Listed Species

An automated response provided by the MnDNR on November 11, 2022 indicated that no state-listed endangered or threatened species have been documented within the vicinity of the Project Study Area (see Appendix J).

Federally Listed Species

Based on the official species list provided by the USFWS (see Appendix J), four federally listed species and one candidate species have been previously documented within the vicinity of the

Project Study Area (see Table 7.7.1-1). No federally designated critical habitat is present within the Project Study Area.

Table 7.7.1-1 – Federally Listed Species Previously Documented within the Project Area

Common Name	Scientific Name	Federal Status
Northern long-eared bat	*Myotis septentrionalis*	Endangered
Canada lynx	*Lynx canadensis*	Threatened
Gray wolf	*Canis lupus*	Threatened
Tricolored bat	*Perimyotis subflavus*	Proposed Endangered
Piping Plover	*Charadrius melodus*	Endangered
Monarch butterfly	*Danaus plexippus*	Candidate

Northern Long-eared Bat

The range of the northern long-eared bat stretches across much of the eastern and Midwestern United States. During summer, the bats roost singly or in colonies under bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places such as caves and mines. This species is thought to be opportunistic in selecting roosts, using tree species based on the tree's ability to retain bark or provide cavities or crevices. It has also been found, rarely, roosting in structures such as barns and sheds. In winter, northern long-eared bats use caves and mines as hibernacula (USFWS, 2023a).

Canada Lynx

Canada lynx are most likely to occur in Minnesota after populations of snowshoe hare decline significantly in Canada (a cyclical occurrence). Lynx are primarily found in boreal forests (USFWS, 2023c); in Minnesota, this habitat is dominated by spruce (*Picea* spp.), fir (*Abies* spp.), and pine (*Pinus* spp.). Lynx may also use transitional zones where boreal forest gives way to northern hardwood forest where hardwood species, including birch (*Betula* spp.), aspen (*Populus* spp.), and willow (*Salix* spp.) are interspersed among conifers. Lynx use these areas for hunting and traveling between preferred patches of boreal and mixed conifer-hardwood forest types (MnDNR 2023b).

Gray Wolf

A habitat generalist, the gray wolf originally occupied most habitat types in North America. They show no preference for one cover type over another and successfully utilize alpine, forest, grassland, shrubland, and woodland habitats across their range (USFWS, 2023d). Once thought to require wilderness areas with little to no human disturbance, recent range expansions have demonstrated the species' ability to tolerate higher rates of anthropogenic development than previously thought. Given abundant prey and low rates of human-caused mortality, wolves can survive in proximity to human-dominated environments (MnDNR, 2023c).

Piping Plover

The Great Lakes Population of Piping Plovers nests along sandy gravel shorelines of large lakes and rivers in the upper Midwest, including the shores of Lake Superior near Duluth, Minnesota (MnDNR, 2023d). The species can also be found in sand and gravel mine sandpits, lake shore housing developments, and reservoir shorelines. Piping Plovers overwinter along the Gulf of Mexico and southern Atlantic coast (USFWS, 2023e).

Tricolored Bat

The tricolored bat is one of the smallest bats species native to North America. Ranging from the eastern and central United States into portions of southern Canada, Mexico, and into Central America. The species is named for its unique fur that appears darker on the tips and base, and lighter in the middle, ranging from yellow to orange in color, but may also appear silver-gray to brown and black. Average adults measure 3 to 3.5 inches in length.

The species overwinters in caves and mines where available. However, throughout much of its range in the southern United States, roadside culverts, tree cavities, and abandoned water wells may also serve as suitable overwintering habitat.

During the active season (generally, April 1 to October 31), the species may be found roosting among leaf clusters (live and dead) on living or recently dead deciduous hardwood trees. Roost choice may also vary by region: the species utilizes Spanish moss in the southern portion of its range and "bony beard" lichen plants (*Usnea trichodea*) in the north. The species has also been observed roosting in eastern red cedar trees and pine needles as well as within manmade structures such as barns and bridges (USFWS, 2023f).

On September 13, 2022, the USFWS published a proposed rule listing the tricolored bat as federally endangered under the Endangered Species Act ("ESA"). A final rule is expected in October 2023 (USFWS, 2022d).

Monarch Butterfly

The monarch butterfly is a large butterfly with an approximate 3-4-inch wingspan and characterized by bright orange coloring on the wings, with distinctive black borders and veining. The species can be found in a wide variety of habitats including prairies, grasslands, urban gardens, road ditches, and agricultural fields, provided a supply of nectaring plants are available for adult foraging and milkweed plants are present for laying eggs and as a food source for caterpillars (USFWS, 2022c).

On December 17, 2020, the USFWS published the result of its 12-month review of the monarch butterfly and determined that listing the species under the ESA was "warranted but precluded," meaning the species meets the criteria for listing as an endangered or threatened species, but the USFWS cannot currently implement the listing because there are other listing actions with a higher priority. The species is now a candidate for listing; however, candidate species are not protected under the ESA (USFWS, 2020). The USFWS has added the monarch to the updated national listing workplan and, based on its listing priorities and workload, intends to propose listing the monarch in Fiscal Year 2024, if listing is still warranted at that time, with a possible effective date within 12 months of the proposed rule (USFWS, 2022c). The USFWS will also conduct an annual status review to determine if changes in prioritization are necessary.

7.7.2 Impacts

7.7.2.1 Northern Long-eared Bat

Potential impacts to individual northern long-eared bats may occur if clearing or construction takes place when the species is breeding, foraging, or raising pups in its summer habitat. Bats may be injured or killed if occupied trees are cleared during this active window. Tree clearing activities conducted when the species is in hibernation and not present on the landscape will not result in

direct impacts to individual bats but could result in indirect impacts due to removal of suitable foraging and roosting habitat (USFWS, 2023a).

In Minnesota, the species is most likely to be found in forested wetlands and riparian areas (MnDNR, 2023e); however, individual trees, fence rows, or small wooded lots (fewer than 10 acres) that are greater than 1,000 feet from forested or wooded areas are considered unsuitable for the species, as are pure stands of less than three-inch diameter-at-breast-height trees that are not mixed with larger trees and trees found in highly developed urban areas (USFWS, 2022e). Potentially suitable roosting and foraging habitat is present in the Proposed Route.

Based on the USFWS Determination Key ("Dkey") for the northern long-eared bat, the Project *may affect, but is not likely to adversely affect* the species (see Attachment K). With that determination of effect, a "Consistency Letter" (see Attachment K) was generated that will support the lead federal agency in consultation with the USFWS. The Applicant will commit to the minimization and avoidance measures outlined in the Dkey and therefore no impacts are anticipated.

7.7.2.2 Canada Lynx

Suitable habitat for the Canada lynx is present within the Project Study Area; however, due to the transient nature of the Canada lynx and the development within the Project Study Area it is unlikely that the Canada lynx would persist within the Proposed Route. The Applicant will support the lead federal agency in consultation with the USFWS to develop necessary avoidance and mitigation measures for this species.

7.7.2.3 Gray Wolf

Suitable habitat for the gray wolf is present within the Project Study Area; however, due to the transient nature of the gray wolf and the development within the Project Study Area, it is unlikely that the gray wolf would persist within the Proposed Route. The Applicant will support the lead federal agency in consultation with the USFWS to develop necessary avoidance and mitigation measures for this species.

7.7.2.4 Piping Plover

Suitable habitat for the Piping Plover is not present within the Project Study Area; therefore, impacts are not anticipated, and no mitigation is proposed.

7.7.2.5 Tricolored Bat

Potential impacts to individual tricolored bats may occur if clearing or construction takes place when the species is roosting in its summer habitat, in trees outside of hibernacula. Bats may be injured or killed if occupied trees are cleared during this active window. Tree clearing activities conducted when the species is in hibernation and not present on the landscape will not result in direct impacts to individual bats but could result in indirect impacts due to removal of suitable roosting habitat (USFWS, 2021).

Suitable habitat for the tricolored bat is present within the Proposed Route. Minnesota Power will support the lead federal agency to conference on any necessary tricolored bat avoidance or mitigation measures.

7.7.2.6 Monarch Butterfly

Suitable habitat for monarchs may be present within the Project Study Area. If the USFWS determines the species should be listed and protections for the species will coincide with Project planning, permitting, and/or construction, the Applicant will review Project activities for potential impacts to the species, develop appropriate avoidance and mitigation measures, and consult with the USFWS as appropriate.

7.7.3 Mitigation

Minnesota Power will support the lead federal agency to consult with the USFWS to develop necessary avoidance and mitigation measures for the northern long-eared bat, Canada lynx, gray wolf, and tricolored bat. Minnesota Power will coordinate with the lead federal agency in the event that the monarch is proposed for listing.

Impacts on state-listed species are not anticipated; therefore, no mitigation is proposed.

7.7.4 Natural Resource Sites

7.7.4.1 Existing Environment

There are no MnDNR Wildlife Management Areas ("WMA") and MnDNR Scientific and Natural Areas ("SNA") in the Project Study Area. Additionally, there are no MnDNR Minnesota Biological Survey areas of Biological Significance ("SOBS") located within the Project Study Area. The nearest SOBS, Midway Peatland, is approximately 1.6 miles south of the Project Study Area. The nearest WMA, Canosia WMA, is located approximately 8.5 miles north of the Project Study Area. The nearest SNA, Hemlock Ravine, is located approximately 7 miles south of the Project Study Area.

In addition, the MnDNR's Natural Heritage Review Request (2022-0070) automatically generated letter indicated that no ecologically significant areas have been documented within the vicinity of the Project (see Appendix J).

7.7.4.2 Impacts

No natural resource sites are located within the Proposed Route; therefore, impacts are not anticipated.

7.7.4.3 Mitigation

No natural resource sites will be impacted by the Project; therefore, no mitigation is proposed.

7.8 PHYSIOGRAPHIC FEATURES

7.8.1 Topography

7.8.1.1 Existing Environment

The Proposed Route is located within the North Shore Highlands Subsection of the Northern Superior Uplands section of the Laurentian Mixed Forest Province as defined by the MnDNR Ecological Classification System (MnDNR, 2022a). The North Shore Highlands subsection which

has gently rolling to steep topography, occupies the area adjacent to Lake Superior. In this area, bedrock outcroppings are common, and soils are shallow. Ground and end moraines from the Superior lobe glacier cover a large portion of the subsection (Hobbs et al., 1982). In the southern half of the subsection, the glacial clay lake plain forms a broad band along the Lake Superior shoreline. The clay lake plain is flat to rolling, with steep, narrow ravines along waterbodies and outwash deposits along the western edge of the subsection.

Elevations along the Proposed Route range from 1,276 to 1,500 feet above sea level (MnDNR, 2022d). Slopes of variable grades are present throughout the Proposed Route, (see Map 10a).

7.8.1.2 Impacts on Topography

The proposed substation and HVDC Converter Station will require grading and leveling for construction access and activities and therefore will have localized impacts on topography. Best management practices, along with sediment stabilization and erosion control methods as required by the Project's NPDES Construction Stormwater Permit will be utilized during construction activities to minimize and control erosion and sedimentation. Ground disturbance will be minimized where practical, and disturbed ground will be re-stabilized as soon as practical after construction activities cease.

Transmission line structures are typically designed for installation at existing grades. Because of this, minimal grading and leveling will be needed at structure sites unless it is necessary to provide a reasonably level area for construction access and activities. Construction of the transmission lines will have minimal to no impact on the topography of the area.

7.8.1.3 Mitigation

Because construction of the Project will have only localized impacts to the topography of the area, no mitigation is proposed.

7.8.2 Geology

7.8.2.1 Existing Environment

The area of the Project Study Area has thin glacial drift over the entire subsection and large areas of exposed bedrock near the surface. The underlying bedrock consists of Upper Precambrian basalt, rhyolite, gabbro, diabase, anorthosite, granite, sandstone, and shale. (Morey et al., 1976) Bedrock within the Proposed Route is part of the Animikie Group. The Animikie Group is a geologic group composed of sedimentary and metasedimentary rock and was deposited between 2,500 and 1,800 million years ago during the Paleoproterozoic era. This group of formations is geographically divided into the Gunflint, the Mesabi, the Vermillion, and the Cuyuna Ranges. The Mesabi Range is located largely in St. Louis County. The bedrock unit of the Animikie Group in Proposed Route is the Thomson Formation once deformed, consisting of Paleoproterozoic Virginia, Thompson, and Rove Formations, mudstone, and greywacke (Jirsa et al., 2011) (see Map 10b).

7.8.2.2 Impacts on Geology

Construction of the Project will not alter the geology of the region because construction methods will not cause significant bedrock and geologic structure modification.

7.8.2.3 Mitigation

No alteration of the geologic structure of the region will occur due to Project construction; therefore, no mitigation is proposed.

7.8.3 Soils

7.8.3.1 Existing Environment

USDA soils data was reviewed to determine soil type within the approximately 176 acre Proposed Route (USDA; 2023) (see Map 10c). The majority of the Proposed Route (approximately 154 acres) is classified as course-loamy soil, 65 acres of which is considered Farmland of Statewide Importance. Table 7.8.3-1 below contains additional information about each soil type in the Proposed Route.

Table 7.8.3-1 – Soil Types within the Proposed Route

Soil ID	Soil Type	Farmland Designation	Acres	Percent of Total
F144D	Aldenlake-Ahmeek complex, 8 to 18 percent slopes	Not prime farmland	51.76	29.36
F121B	Aldenlake sandy loam, 2 to 8 percent slopes	Farmland of statewide importance	48.5	27.51
F145F	Ahmeek-Aldenlake complex, 18 to 45 percent slopes	Not prime farmland	22.99	13.04
F137B	Normanna-Canosia-Hermantown complex, 0 to 8 percent slopes	Farmland of statewide importance	16.07	9.12
F142A	Canosia loam, 0 to 2 percent slopes	Not prime farmland	13.96	7.92
1020A	Bowstring and Fluvaquents, loamy, 0 to 2 percent slopes, frequently flooded	Not prime farmland	10.91	6.19
F117D	Rollins sandy loam, 8 to 18 percent slopes	Not prime farmland	4.84	2.75
GP	Pits, gravel-Udipsamments complex	Not prime farmland	4.09	2.32
F151A	Tacoosh mucky peat, dense substratum, 0 to 1 percent slopes	Not prime farmland	2.44	1.38
F154A	Urban land-Hermantown-Canosia complex, 0 to 3 percent slopes	Not prime farmland	0.55	0.31
F136A	Hermantown silt loam, 1 to 3 percent slopes	Farmland of statewide importance	0.19	0.11
		TOTAL	**176.30**	**100.00**

Impacts on Soils

Construction of the proposed Project will not have significant impacts on the overall soil profile of the area except where side slopes may be excavated to provide a flat construction surface. Such areas will be identified during the detailed design process prior to construction. Potential impacts during construction may include the compaction of soil and the exposure of soil to wind and water during construction activities. These impacts should be short term in nature and minimal during and after construction activities. There should be no long-term impacts to the soil profile because of this Project. Approximately 44 acres of the 176-acre Proposed Route will be temporarily impacted by construction activities. Of the 44 acres, approximately 14 acres are designated as Farmland of Statewide Importance. Table 7.8.3-2 below contains additional information about each soil type impacted by the Project, along with the Farmland Designation.

Table 7.8.3-2 – Farmland Designation within the Proposed Route

Soil ID	Soil Type	Farmland Designation	Acres
F121B	Aldenlake sandy loam, 2 to 8 percent slopes	Farmland of statewide importance	10.84
F137B	Normanna-Canosia-Hermantown complex, 0 to 8 percent slopes	Farmland of statewide importance	2.92
F144D	Aldenlake-Ahmeek complex, 8 to 18 percent slopes	Not prime farmland	12.12
F142A	Canosia loam, 0 to 2 percent slopes	Not prime farmland	8.47
1020A	Bowstring and Fluvaquents, loamy, 0 to 2 percent slopes, frequently flooded	Not prime farmland	1.38
F117D	Rollins sandy loam, 8 to 18 percent slopes	Not prime farmland	3.26
GP	Pits, gravel-Udipsamments complex	Not prime farmland	4.08
F154A	Urban land-Hermantown-Canosia complex, 0 to 3 percent slopes	Not prime farmland	0.21
F145F	Ahmeek-Aldenlake complex, 18 to 45 percent slopes	Not prime farmland	0.19
		TOTAL	**43.48**

Approximately 13 acres of soil may have permanent impacts from the proposed construction of the Project substation and Converter Station. Less than three acres of these soils are designated as Farmland of Statewide Importance. Table 7.8.3-3 contains additional information on the soils impacted by the proposed substation and Converter Station.

Table 7.8.3-3 – Soils Impacted by Substation and Converter

Soil ID	Soil Type	Farmland Designation	Acres
F121B	Aldenlake sandy loam, 2 to 8 percent slopes	Farmland of statewide importance	2.87
F137B	Normanna-Canosia-Hermantown complex, 0 to 8 percent slopes	Farmland of statewide importance	0.10
F144D	Aldenlake-Ahmeek complex, 8 to 18 percent slopes	Not prime farmland	3.16
F142A	Canosia loam, 0 to 2 percent slopes	Not prime farmland	3.32
F117D	Rollins sandy loam, 8 to 18 percent slopes	Not prime farmland	2.02
GP	Pits, gravel-Udipsamments complex	Not prime farmland	1.57
		TOTAL	**13.05**

Steep slopes are shown on Map 10a and include a hillside in the southwest portion of the Proposed Route and a streambank associated with West Rocky Run Creek. Impacts to the streambanks will largely be avoided because the proposed 230 kV lines will span the creek. Steep slopes in the southwest part of the Proposed Route will be avoided to the extent possible, but portions may be excavated and flattened to accommodate an even construction surface. Future project designs and grading plans will identify these areas so that impacts can be minimized. NRCS SSURGO data does not have erodibility information for this area.

Best management practices and erosion control methods will be implemented during all construction activities to protect soils and minimize and control erosion and sedimentation. Groundcover protecting soils will be left undisturbed whenever practical. Minnesota Power's construction stormwater SWPPP will be developed prior to construction and will designate soil erosion and sedimentation control and management methods and temporary soil storage locations. Disturbed groundcover will be re-stabilized as soon as practical after construction activities cease in accordance with the Vegetation Management Plan.

7.8.3.2 Mitigation

Because long term impacts to soils are not anticipated, mitigation is not proposed.

7.9 UNAVOIDABLE IMPACTS

The design, construction, and operation of the Proposed Route will use the procedures and process described in this Application to specifically mitigate potential impacts. Minimal impacts from construction activities are unavoidable and could include short-term traffic delays, soil compaction and erosion, vegetative clearing, wetland conversion, visual impacts, habitat loss, warming of the trout stream, disturbance and displacement of wildlife, and loss of land use for other purposes. Nominal impacts include conversion of forested land to cleared right-of-way, wetland fill impacts, visual impacts, and seasonal maintenance of tall growing vegetation.

The Project will require only minimal commitments of resources that are irreversible and irretrievable. Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations. Irreversible commitments of resources are those that result from the use or destruction of a specific resource that cannot be replaced within a reasonable timeframe. Irretrievable resource commitments are those that result from the loss in value of a resource that cannot be restored after the action.

Those commitments that do exist are primarily related to construction. Construction resources include aggregate resources, concrete, steel, and hydrocarbon fuel. Concrete and steel at the existing facility will be recycled to the greatest extent practicable in the event existing foundations are removed. During construction, vehicles necessary for these activities would be deployed on site and would need to travel to and from the construction area, consuming hydrocarbon fuels. Other resources would be used in structure construction, structure placement, and other construction activities.

8.0 AGENCY, TRIBAL, AND PUBLIC OUTREACH

8.1 AGENCY AND TRIBAL OUTREACH

As part of the pre-application process, Minnesota Power initiated outreach to federal, tribal, state, and local agencies through in-person meetings and project notification letters. Appendix J provides copies of correspondence and meeting notes from discussions with agency representatives.

In November 2022, Minnesota Power attended meetings with local government agencies to provide preliminary project details and a timeline of major milestones. Minnesota Power also requested input with respect to the resources under their jurisdiction as well as the identification of federal and state permits and/or approvals that may be required for the Project.

In November 2022, Minnesota Power met with the Fond du Lac Band of Lake Superior Chippewa to review the Project and request input with respect to resources of interest that may be located within and near the Project Study Area.

On November 30, 2022, Minnesota Power sent a letter to each local government unit (“LGU”) within which the Proposed Route is located, as required by Minn. Stat. § 216E.03, subd. 3a. A copy of the letter and affidavit of mailing is available in Appendix F.

In December 2022, Minnesota Power mailed Project introduction letters with maps of the Project Study Area to federal, tribal, state, and local agencies whose constituents may have an interest in the proposed Project. The letter introduced the Project and requested agency input regarding

public and environmental resources that may be located within the Project Study Area, or resources that could potentially be affected by the proposed Project.

A summary of communications with tribes and public agencies is included below. Minnesota Power will continue to meet with federal, tribal, state, and local agencies as the Project moves forward. Table 8.1-1 identifies agencies that were contacted through meetings or a notification email outside of the public outreach outlined in Section 8.2 and the date that the consultation was conducted.

Table 8.1-1 – Agency and Tribal Contacts

Tribe or Agency	Date and Type of Communication
U.S. Fish and Wildlife Service	December 16, 2022, Introduction letter
U.S. Army Corps of Engineers	December 16, 2022, Introduction letter
U.S. Department of Agriculture – Natural Resources Conservation Services	December 16, 2022, Introduction letter
Fond du Lac Band of Lake Superior Chippewa	November 17, 2022, In-person meeting
Tribal Historic Preservation Offices and Tribal Government Contacts	December 22, 2022
MN Dept. of Commerce – Energy Environmental Review and Analysis	November 21, 2022, conference call; December 16, 2022, Introduction letter
MN Public Utilities Commission Staff	November 21, 2022, conference call; December 16, 2022, Introduction letter
Minnesota Department of Natural Resources – Ecological Services	December 16, 2022, Introduction letter
Minnesota Department of Natural Resources – Lands and Minerals	December 16, 2022, Introduction letter
Minnesota Department of Natural Resources – Parks and Trails	December 16, 2022, Introduction letter
Minnesota Department of Agriculture	December 16, 2022, Introduction letter
Minnesota Pollution Control Agency	December 16, 2022, Introduction letter
Minnesota State Historic Preservation Office	December 16, 2022, Introduction letter
Minnesota State Historic Preservation Office	December 16, 2022, Introduction letter
NRCS – Duluth Service Center	December 16, 2022, Introduction letter
St. Louis County	November 30, 2022, local government unit (LGU) Notice Letter
City of Hermantown	November 9, 2022, In-person meeting; Nov. 30, 2022, LGU Notice Letter;
Solway Township	November 15, 2022, In-person meeting; Nov. 30, 2022, LGU Notice Letter;
South St. Louis Soil and Water Conservation District	December 16, 2022, Introduction letter
State Legislators (Natalie Zeleznikar, Grant Hauschild, Pete Stauber)	November 30, 2022, LGU Notice Letter;
Federal Legislators (Amy Klobuchar, Tina Smith)	November 30, 2022, LGU Notice Letter;

8.1.1 Federal Agencies

8.1.1.1 U.S Army Corps of Engineers

The USACE will be consulted regarding potential impacts to Waters of the United States as the Project's design becomes better defined in relation to the delineated features identified during field surveys in 2022 and 2023.

8.1.1.2 U.S. Fish and Wildlife Service

The USFWS will be consulted regarding potential impacts to federally listed species as the Project's design becomes better defined.

8.1.2 Tribal Nations

8.1.2.1 Fond du Lac Band of Lake Superior Chippewa

Minnesota Power met with the FDL THPO Evan Schroeder on November 17, 2022. The Project was introduced with a summary of the proposed activities and timeline. FDL stated there was the potential for a historic trail in the southwest corner of the Project Study Area and had some general project questions.

8.1.3 State Agencies

8.1.3.1 Minnesota Department of Commerce – Energy Environmental Review and Analysis and Minnesota Public Utilities Commission Staff

Minnesota Power held an informational conference call with staff members from the DOC EERA and the Commission on November 21, 2022. Minnesota Power provided an overview of the proposed Project, Project need, Project scope, the anticipated schedule for submitting a combined Certificate of Need and Route Permit application, and the Project construction and completion schedule. Additionally, Minnesota Power provided more detail on the bidirectional capabilities for the HVDC Line as a result of the HVDC Modernization Project and that Minnesota Power would be seeking one Route Permit for the combined Project facilities.

8.1.3.2 Minnesota Department of Natural Resources

The MnDNR participates in the Commission review process, MCE concurrence, and PWI crossings. These discussions included the following:

- On behalf of Minnesota Power, Merjent submitted a formal Natural Heritage Review Request (2022-0070) on November 11, 2022 (see Appendix J) through the MnDNR's MCE.

- On behalf of Minnesota Power, Merjent submitted introduction letters December 16, 2023.

8.1.4 Local Government Units

8.1.4.1 City of Hermantown

Minnesota Power met with John Mulder, the City Administrator of the City of Hermantown on November 9, 2022. Minnesota Power provided an overview of the proposed Project and a summary of the proposed activities and timeline. The City had some general Project layout and land acquisition questions.

8.1.4.2 Solway Township

Minnesota Power met with the Solway Town Board Chair, Town Supervisors, Town Clerk, and Town Treasurer on November 15, 2022. Minnesota Power provided an overview of the proposed Project and a summary of the proposed activities and timeline. The Township had some general Project layout and noise questions.

8.2 PUBLIC OUTREACH

8.2.1 Open Houses

On November 22, 2022, Minnesota Power hosted an open house at Midway Township Town Hall. Landowners located within 0.25 mile of the Project Study Area received a mailer inviting them to the open house. See Appendix K for open house materials. Staff from Minnesota Power were on hand to describe the proposed Project and answer questions from attendees.

On January 11, 2023 and April 19, 2023, Minnesota Power hosted open houses at the Solway Township Town Hall. Landowners within Solway Township received a mailer inviting them to the open house. See Appendix K for open house materials. Staff from Minnesota Power were on hand to describe the proposed Project and answer questions from attendees.

8.2.2 Key Communication Channels

Additional information about the Project can be found on the Company's website at: https://www.mnpower.com/Company/Transmission.

9.0 REQUIRED PERMITS, APPROVALS, AND CONSULTATIONS

The North Dakota HVDC Terminal Modernization will require a Certificate of Corridor Compatibility and Route Permit from the North Dakota Public Service Commission ("ND PSC"). In addition, the project will require a National Pollutant Discharge Elimination System permit from the North Dakota Department of Health ("ND DOH") prior to beginning construction. These permits will be obtained by Minnesota Power through separate ND PSC and ND DOH permitting processes.

The Minnesota HVDC Modernization Project will require a Certificate of Need and Route Permit from the Commission as well as several other permits from state and federal agencies and LGUs to construct the Project. These permits are dependent on the final route selected and construction conditions. A list of the local, state, and federal permits that may be required for this Project is provided in Table 9.0-1.

Table 9.0-1 – Minnesota Permit and Approval List

Permit, Approval, or Consultation	Administering Agency
Local Approvals	
Road Crossing/Right-of-Way (Utility) Permit	St. Louis County
Oversize/Overweight Permit	St. Louis County
Driveway/Access Permits	St. Louis County, City of Hermantown
Land Alteration Permit	St. Louis County
Wetlands Permits	St. Louis County, City of Hermantown
Minnesota State Approvals	
Endangered Species Consultation	MnDNR – Ecological and Water Resources Division

Permit, Approval, or Consultation	Administering Agency
Licenses to Cross Public Waters	MnDNR – Lands and Minerals Regional Operations
National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit	Minnesota Pollution Control Agency (MPCA)
Section 401 Clean Water Act (CWA) Water Quality Certification	MPCA
Wetland Conservation Act (WCA) Wetland Replacement Plan	Board of Water and Soil Resources, Soil and Water Conservation District
Minn. Stat. Ch. 138 (Minnesota Field Archaeology Act and Minnesota Historic Sites Act)	Minnesota SHPO, Office of State Archaeologist, and Minnesota Indian Affairs Council
Oversize and/or Overweight Permit	MnDOT
Federal Approvals	
Section 404 of the CWA Discharge of Dredged or Fill Material in Waters of the U.S. Permit	United States Army Corps of Engineers (USACE)
Spill Prevention, Control, and Countermeasures Plan	US Environmental Protection Agency (EPA)
Endangered Species Act Consultation	United States Fish and Wildlife Service
Section 106 of National Historic Preservation Act Consultation	USACE, Minnesota SHPO
Part 7460 Airport Obstruction Evaluation	Federal Aviation Administration (FAA)
Other Approvals	
Crossing Permits/Agreements/Approvals	Other utilities such as pipelines, railroads

9.1 LOCAL APPROVALS

After the Commission approves a route and any appropriate design engineering is completed, the Applicant will work with LGUs to obtain any of the above approvals if necessary. In accordance with Minn. Stat. § 216E.10, subd. 1, after the Commission approves a route, local zoning, building, and land use regulations are preempted. Minnesota Power will work with LGUs to obtain the necessary permits in the required timeframe for Project construction.

Permits required in Solway Township, such as driveway permits, are obtained through the St. Louis County permitting authorities.

9.1.1 Road Crossing/Right of Way Permits

St. Louis County, Zoning Ordinance No. 62, outlines requirements for setbacks from utilities and roads. Permits may be required to cross or occupy county or city road right-of-way. Minnesota Power and its contractors will work with St. Louis County should a road right-of-way need to be crossed or occupied once the Commission approves a route for the Project and more detailed transmission engineering is completed.

9.1.2 Oversize/Overweight Load Permits

St. Louis County, Ordinance No. 13 is an ordinance relating to seasonal and other weight and load restrictions on all highways under the jurisdiction of St. Louis County. The Oversize/Overweight permit allows for truck/trailer/load combinations that exceed the maximum dimensions and weight specified in state law to operate on county roads. Minnesota Power and its contractors will work with St. Louis County should oversize/overweight load permits be required for the construction of the Project.

9.1.3 Driveway/Access Permits

In accordance with St. Louis County, Zoning Ordinance No. 62 and City of Hermantown Ordinance, Chapter 10, authorization for driveway or private road access to any parcel or lot from any public roadway shall be obtained from the appropriate road authority. These permits may be required to construct access roads or driveways from county or city roadways. Minnesota Power and its contractors will work with St. Louis County or the City of Hermantown should an access road or driveway be needed from a county or city roadway.

9.1.4 Erosion Control and Fill Permit

Construction stormwater and erosion control for the Project is regulated by the MPCA and is discussed further in Section 9.2.3.

9.1.5 Land Alteration Permit

In accordance with St. Louis County, Zoning Ordinance No 62, land alteration permits are required for filling, grading, or excavating on shoreland. Construction of the Project is not expected to require a land alteration permit. However, if such a permit is required, Minnesota Power will obtain any required permits from St. Louis County once the Commission approves a route for the Project and more detailed engineering is available.

9.1.6 Wetlands Permits

Wetland permits may be required for construction or alteration within wetland areas. St. Louis County Zoning Ordinance No 62 states that the County Planning and Community Development Department is responsible for administration and enforcement of the Minnesota Wetland Conservation Act ("WCA") in accordance with Minn. R. ch. 8420 outside the municipalities. In accordance with City of Hermantown Zoning Code, Chapter 21, the City of Hermantown enforces and administers the WCA with respect to property located within the City. WCA permitting requirements are further outlined in Section 9.2.5.

9.2 STATE APPROVALS

9.2.1 Endangered Species Consultation

The MnDNR Natural Heritage and Nongame Research Program collects, manages, and interprets information about nongame species. Merjent, on behalf of Minnesota Power, submitted a formal Natural Heritage Review Request 2022-0070) on November 11, 2022 (see Appendix J) through the MnDNR's MCE. An automated response provided by the MnDNR on November 11, 2022, indicated that no state-listed endangered or threatened species have been documented within the vicinity of the Project (see Appendix J).

9.2.2 License to Cross Public Waters

The MnDNR Division of Lands and Minerals regulates utility crossings over, under, or across any state land or public water identified on the Public Waters and Wetlands Maps. A license to cross Public Waters is required under Minn. Stat. § 84.415, and Minn. R. ch. 6135, because the proposed parallel 230 kV transmission lines would cross a MnDNR Public Water. The Applicant will work with the MnDNR to obtain the license once sufficient engineering work is completed to support the MnDNR application process.

9.2.3 NPDES Permit

Minnesota's construction stormwater permit is an extension of the NPDES Stormwater Program, which is part of the Federal Clean Water Act. MPCA administers this federal program as well as the related State Disposal System ("SDS") permit program. The state's combined NPDES/SDS construction stormwater permit fulfills federal and state requirements by requiring permittees to control runoff. In accordance with Minnesota Administrative Rules, Chapter 7090, an NPDES permit from the MPCA is required for stormwater discharges associated with construction activities disturbing one or more acres of land. A requirement of the permit is to develop and implement a Stormwater Pollution Prevention Plan ("SWPPP"), which includes BMPs to minimize discharge of pollutants into Waters of the U.S. Construction of the Project will disturb more than one acre of land. Minnesota Power will develop a comprehensive SWPPP for the Project and obtain any required permits from the MPCA, and associated permits from the City of Hermantown and St. Louis County once the Commission approves a route for the Project. The Project does not meet the definition of an industrial facility, nor expect activities defined as "Industrial Activities" per the NPDES Stormwater Program, therefore, no Industrial Stormwater permit will be required.

9.2.4 Section 401 Water Quality Certification

A Section 401 Water Quality Certification ("WQC") under the federal CWA is necessary to obtain a federal permit for a project that could result in a discharge to navigable waters. A Section 401 WQC is a part of the Section 404 process and would be obtained with the joint applications for WCA and the Section 404 permit. While the CWA is a federal statue, the MPCA has delegated authority under the Act to administer the Section 401 WQC process in Minnesota.

9.2.5 Wetland Conservation Act

The Minnesota Board of Water and Soil Resources administers the state WCA, under Minn. R. ch. 8420. In accordance with these rules, A Federal Approval Exemption for Utilities ("Exemption") is available and states that a replacement plan is not required for wetland impacts resulting from the construction, maintenance, or repair of utility lines and associated facilities when certain conditions are met. The proposed Project may require federal approval for anticipated permanent and temporary impacts to wetlands from Project construction. If approval is required and the Applicant applies for USACE permits (a joint application with the Section 404 permit) or for a USACE non-reporting general permit, the Project may meet the conditions of the Exemption. The use of the Exemption will be evaluated, if applicable once more detailed transmission engineering and design is completed.

If the Federal Approval Exemption does not apply to the Project and if a Wetland Replacement Plan is required under WCA, the Local Governmental Units will oversee the process as described in Section 9.1.6 above.

9.2.6 Minnesota Field Archaeology Act (MS 138.31-.42) and Minnesota Historic Sites Act (MS 138.661-138.669)

These statutes direct state agencies to coordinate with the Minnesota Historical Society ("MHS"), the SHPO (housed under the Department of Administration), and the OSA to consider effects to significant historic and archaeological resources and establish measures to avoid, reduce or mitigate adverse impacts, when considering an administrative action such as the approval of a Certificate of Need and Route Permit from the Commission. The Applicant will coordinate with the SHPO and OSA to develop a record of the conventional archaeological survey and each

agency's review. The Applicant will provide this same record to facilitate federal agency permit review under Section 106 of the National Historic Preservation Act (such as USACE Section 404 CWA Permit, if required).

9.2.7 Oversize and/or Overweight Permit

In accordance with Minnesota Commercial Truck and Passenger Regulations, Section 05, an Oversize and/or Overweight permit is required by MnDOT when a vehicle is transporting an oversize/overweight load on Minnesota trunk highways. If the Project requires the transport of oversize or overweight loads, the Applicant and its contractors will work with MnDOT to obtain any required permits.

9.3 FEDERAL APPROVALS

9.3.1 Section 404 CWA Permit

A Section 404 permit is required from the USACE under the federal CWA for discharges of dredged or fill material into waters of the United States. Once the Commission approves a final route and a more detailed design of the substation construction and transmission line is completed, the Applicant will determine if impacts exceed the permitting threshold. If impacts exceed the permitting threshold, the Applicant will apply for any required permits.

9.3.2 Spill Prevention, Control and Countermeasure Plan

A non-transportation related facility is subject to Spill Prevention, Control and Countermeasure Plan ("SPCC") regulations if the total aboveground storage capacity exceeds 1,320 gallons or the underground oil storage capacity exceeds 42,000 gallons and the facility could reasonably expect to discharge oil into or upon the navigable waters of the United States. SPCC plans are prepared and implemented according to EPA regulations Title 40, Code of Federal Regulations, Part 112. Minnesota Power's new substation and HVDC Converter Station are anticipated to have a total aboveground oil storage capacity of over 1,320 gallons; therefore, SPCC regulations apply, and an SPCC plan will be developed for the project before oil-filled equipment is brought onsite.

9.3.3 Endangered Species Act Consultation

Minnesota Power reviewed the USFWS IPaC website for a list of federally threatened and endangered species, candidate species, and designated critical habitat that may be present within the Project Study Area (see Section 7.7). The Applicant will work with the USFWS regarding Project-specific construction considerations after the Commission approves a route for the Project, and the mechanism for consultation will be based on whether there is a federal nexus. The Applicant will work with the USFWS to comply with the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act, to identify any areas that may require marking transmission line shield wires, and/or to use alternate structures to reduce the likelihood of avian collisions and electrocution to the extent practical.

9.3.4 Part 7460 Airport Obstruction Evaluation

A Federal Aviation Administration ("FAA") notice and approval is required for structures 200 feet above ground level or those that may exceed an imaginary surface extending outward and upward at certain slopes from nearby airports as defined in the Code of Federal Regulations Chapter 77.9. Form 7460-1 shall be submitted to the FAA for notice of construction at least 45 days before

the start date of proposed construction. The FAA Notice Criteria Tool screens Project structures for proximity to airports and slope ratio to assist in determination of exceedances requiring filing of Notice to FAA. If notice is required, following construction completion, as built information will be submitted using Form 7460-2.

10.0 APPLICATION OF RULE CRITERIA

10.1 CERTIFICATE OF NEED CRITERIA

Pursuant to Minn. Stat. § 216B.243, the Commission has established criteria under Minnesota Rule 7849.0120 that it will apply to determine whether an applicant has established that a new proposed high voltage transmission line is needed and shall be granted a Certificate of Need. Minnesota Power has described in this application the reasons why the Commission should grant a Certificate of Need to build the Project, which includes: (1) denial of the HVDC Modernization Project would result in an increase in outages of the HVDC system that is critical to connecting renewable resources from North Dakota to Minnesota customers; (2) there is no reasonable and prudent alternative to the HVDC Modernization Project; and (3) the Project is important to achieving the state's goals of ensuring 100 percent of the electricity consumed in Minnesota is carbon free by 2040. Those reasons are summarized here.

10.1.1 Denial would Adversely Affect the Energy Supply

Denial of a Certificate of Need for the Project would adversely affect the future adequacy, reliability, or efficiency of energy supply to Minnesota Power and its customers in the region, which includes a unique mix of industrial customers vital to Minnesota and the regional economy. As detailed in Chapters 2.0 and 3.0, the existing HVDC Converter Station is reaching the end of its anticipated operational life and many of the original equipment is falling into obsolescence with replacement or refurbished parts no longer readily available in the event of failure. The HVDC Modernization Project includes the construction of major transmission and system upgrades that will enhance reliability and provide the continued operation of an important renewable resource connection between Minnesota and North Dakota.

10.1.2 No Reasonable and Prudent Project Alternative

As discussed in Chapter 4.0, a more reasonable and prudent alternative was not demonstrated by the work study and analysis conducted by Minnesota Power. Minnesota Power evaluated multiple Project alternatives including: 1) size alternatives (different voltages or conductor arrays, AC/DC, and double-circuit); 2) generation alternatives; and 3) no build alternatives. After evaluating these alternatives, Minnesota Power concluded that none of these alternatives is a more reasonable and prudent alternative to the proposed Project.

10.1.3 Project will Provide Benefits to Society in a Manner Compatible with Protecting the Environment

The Project is needed to provide transmission reliability and grid strength and stability solutions to accommodate a transition away from coal-fired baseload generation to increasingly lower-carbon and renewable sources of energy, which lowers emissions and benefits the environment. The Project will also benefit Minnesota Power customers by modernizing aged infrastructure that is experiencing increasing operational concerns and ensuring an adequate power supply for years to come. In addition, consistent with the Commission's routing criteria, the proposed Project will be sited in a manner compatible with protecting the natural and socioeconomic environment.

10.1.4 Project will Comply with all Applicable Requirements

Minnesota Power has identified the other permits and approvals that may be required for the Project in Chapter 9.0. Minnesota Power has demonstrated that it will comply with all applicable requirements and obtain all necessary permits.

10.2 ROUTE PERMIT FACTORS

According to Minn. Stat. § 216E.02, subd. 1, it is the policy of the state of Minnesota to locate high voltage transmission lines in an orderly manner that minimizes adverse human and environmental impacts and ensures continuing electric power system reliability and integrity. Under Minn. R. 7850.4000, the Commission's rules require that applicants for route permits meet applicable standards and factors under Minn. Stat. §§ 216E.03 and 216E.04, and under other Minnesota law and Commission rules. The Commission shall issue a route permit for a high voltage transmission line that is consistent with state goals to conserve resources, minimize environmental impacts and impacts to human settlement, minimize land use conflicts, and ensure the state's electric energy security through efficient, cost-effective transmission infrastructure.

The Proposed Route for the Project meets these factors by utilizing land owned in fee by Minnesota Power to the extent possible, collocating adjacent to the existing Arrowhead Station to minimize the amount of new transmission, consolidates transmission corridors to reduce impacts to established residences, and upgrading existing transmission infrastructure.

10.3 CONCLUSION AND REQUEST FOR COMMISSION APPROVAL

For all the reasons set forth in this Application and as supported by the Appendices hereto, Minnesota Power respectfully requests that the Commission issue a Certificate of Need and Route Permit authorizing construction of the Project.

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Appendix A

Certificate of Need Checklist

HVDC Upgrade Project
Certificate of Need Application
Completeness Checklist

Authority	Required Information	Location in Application
Minn. R. 7829.2500, Subp. 2	Brief summary of filing on separate page sufficient to apprise potentially interested parties of its nature and general content	Filing Summary
Minn. R. 7849.0200, Subp. 2	Title Page and Table of Contents	Title Page and Table of Contents
Minn. R. 7849.0200, Subp. 4	Cover Letter	Cover Letter
Minn. R. 7849.0220, Subp. 3	Joint Ownership and Multiparty use	N/A
Minn. R. 7849.0240	Need summary and additional considerations	
Subp. 1	Summary of the major factors that justify the need for the proposed facility	§§ 1.2, 3.1., 3.2, 3.3, 3.4
Subp. 2	Relationship of the proposed facility to the following socioeconomic considerations:	—
A.	Socially beneficial uses of the output of the facility	§ 3.11
B.	Promotional activities that may have given rise to the demand for the facility	§ 3.9
C.	Effects of the facility in inducing future development	§ 3.10
Minn. R. 7849.0260	Proposed LHVTL and Alternatives	—
A.	A description of the type and general location of the proposed line, including:	—
(1)	Design voltage	§ 2.1
(2)	Number, sizes and types of conductors	§ 2.1

Authority	Required Information	Location in Application
(3)	Expected losses under projected maximum loading and under projected average loading in the length of the line and at terminals or substations	§ 3.7
(4)	Approximate length of the proposed line	§ 2.1
(5)	Approximate locations of DC terminals or AC substations on a map	§ 2.1, Appendix L
(6)	List of likely affected counties	§ 7.2
B.	Discussion of the available alternatives including:	—
(1)	New generation	§ 4.2
(2)	Upgrading existing transmission lines	§ 4.4
(3)	Transmission lines with different voltages or conductor arrays	§§ 4.3, 4.7
(4)	Transmission lines with different terminals or substations	§ 4.5
(5)	Double circuiting of existing transmission lines	§ 4.6
(6)	If facility for DC (AC) transmission, an AC (DC) transmission line	§ 4.8
(7)	If proposed facility is for overhead (underground) transmission, an underground (overhead) transmission line	§ 4.10
(8)	Any reasonable combination of alternatives (1) – (7)	Chapter 4
C.	For the facility and for each alternative in B, a discussion of:	—
(1)	Total cost in current dollars	§ 2.2.1 and Chapter 4

Authority	Required Information	Location in Application
(2)	Service life	§ 6.4 and Chapter 4
(3)	Estimated average annual availability	§ 2.2.4 and Chapter 4
(4)	Estimated annual O&M costs in current dollars	§ 2.2.2 and Chapter 4
(5)	Estimate of its effect on rates system wide and in Minnesota	§ 2.2.3 and Chapter 4
(6)	Efficiency expressed for a transmission facility as the estimated losses under projected maximum loading and under projected average loading in the length of the transmission line and at the terminals or substations	§ 3.7 and Chapter 4
(7)	Major assumptions made in subitems (1) – (6)	Chapters 2, 3, and 4
D.	A map (of appropriate scale) showing the applicant's system or load center to be served by the proposed LHVTL	§1.1
E.	Such other information about the proposed facility and each alternative as may be relevant to determination of need.	Chapter 4
Minn. R. 7849.0270	Content of Forecast	—
Minn. R. 7849.0270, Subp. 1	Peak demand and annual consumption data within the applicant's service area and system	EXEMPT provided alternative data is supplied
	ALTERNATIVE DATA –Minnesota Power's most recent Annual Electric Utility Forecast Report	§ 3.6, Appendix N
Minn. R. 7849.0270, Subp. 2	Minnesota forecast data; forecast demand data by customer class, peak period, and month; estimated system annual revenue per kilowatt hour; estimated average weekday system load factor by month.	EXEMPT except as noted below and provided alternative data is supplied

Authority	Required Information	Location in Application
	ALTERNATIVE DATA –Minnesota Power's most recent Annual Electric Utility Forecast Report	§ 3.6, Appendix N
	Subp. 2 (E) – Alternative explanation of how wholesale electricity costs are spread and general financial effect on Minnesota Power customers.	§ 2.2.3
Minn. R. 7849.0270, Subp. 3	Detail of the forecast methodology used in subp. 2.	EXEMPT provided alternative data is supplied
Minn. R. 7849.0270, Subp. 4	Discussion of database used in current forecasting.	EXEMPT provided alternative data is supplied
Minn. R. 7849.0270, Subp. 5	Discussion of each essential assumption made in forecast preparation and sensitivity to variations in assumptions.	EXEMPT provided alternative data is supplied
Minn. R. 7849.0270, Subp. 6	Coordination of forecasts.	EXEMPT provided alternative data is supplied
	ALTERNATIVE DATA FOR SUBPS. 3-6 – Minnesota Power's most recent Annual Electric Utility Forecast Report	§ 3.6, Appendix N
Minn. R. 7849.0280	System Capacity	—
	Description of ability of existing system to meet demand forecast including:	—
A.	Power planning programs	Appendix N and Appendix O
B.	Seasonal firm purchases and sales	EXEMPT
C.	Seasonal participation purchases and sales	EXEMPT
D.	Load and generation capacity data requested in subitems 1-13 for summer and winter seasons for each forecast year, including anticipated purchases, sales, and capacity retirements and additions except those that depend on a not yet issued certificate of need.	EXEMPT

Authority	Required Information	Location in Application
E.	Summer and winter season load generation and capacity in years subsequent to application contingent on proposed facility	EXEMPT
F.	Summer and winter season load generation and capacity including all projected purchases, sales and generation in years subsequent to application	EXEMPT
G.	List of proposed additions and retirements in generating capacity for each forecast year subsequent to application	EXEMPT
H.	Graph of monthly adjusted net demand and capability with difference between capability and maintenance outages plotted	EXEMPT
I.	Appropriateness and method of determining system reserve margins	EXEMPT
Minn. R. 7849.0290	Conservation Programs	—
A.	Persons responsible for energy conservation and efficiency programs	EXEMPT provided alternative data is supplied
B.	List of energy conservation and efficiency goals and objectives	EXEMPT provided alternative data is supplied
C.	Description of programs considered, implemented and rejected	EXEMPT provided alternative data is supplied
D.	Description of major accomplishments in conservation and efficiency	EXEMPT provided alternative data is supplied
E.	Description of future plans with respect to conservation and efficiency	EXEMPT provided alternative data is supplied
F.	Quantification of the manner by which these programs impact the forecast	EXEMPT provided alternative data is supplied
	ALTERNATIVE DATA FOR A-F – Minnesota Power will provide a summary of its 2021 Integrated Resource Plan and Conservation Improvement Program filings.	Appendix O
Minn. R. 7849.0300	Consequence of Delay	EXEMPT from three levels of demand
Minn. R. 7849.0310	Required Environmental Information	

Authority	Required Information	Location in Application
Minn. R. 7849.0330	Transmission Facilities	—
	Data for each alternative that would require LHVTL construction including:	—
A.	For overhead transmission lines	—
(1)	Schematics showing dimensions of support structures	§ 2.1, Appendix M
(2)	Discussion of electric fields	§ 6.5
(3)	Discussion of ozone and nitrogen oxide emissions	§§ 6.5, 7.5
(4)	Discussion of radio and television interference	§ 6.5
(5)	Discussion of audible noise	§ 7.2
B.	For underground transmission facilities:	N/A
(1)	Types and dimensions of cable systems	N/A
(2)	Types and qualities of cable system materials	N/A
(3)	Heat released in kW per foot of cable	N/A
C.	Estimated right-of-way required for the facility	§ 6.1
D.	Description of construction practices	§ 6.2
E.	Description of O&M practices	§ 6.4
F.	Estimated workforce required for construction and O&M	§§ 6.2, 6.4

Authority	Required Information	Location in Application
G.	Description of region between endpoints in likely area for routes emphasizing a three mile radius of endpoints including:	—
(1)	Hydrological features	§§ 7.1, 7.5
(2)	Vegetation and wildlife	§§ 7.1, 7.5
(3)	Physiographic regions	§§ 7.1, 7.5, 7.6
(4)	Land use types	§ 7.6
Minn. R. 7849.0340	No-Facility Alternative	EXEMPT from three levels of demand

Appendix B

Route Permit Checklist

HVDC Modernization Project
Route Permit Application (Alternative Review)
Completeness Checklist

Authority	Required Information	Location in Application
Minn. Stat. § 216E.04, subds. 2(3), 2(4); H.F. No. 7 (2023) Minn. R. 7850.2800, subp. 1(C), 1(D)	**Alternative Review of Applications.** Alternative review is available for **high voltage transmission lines of between 100 and 200 kV and for high voltage transmission lines in excess of 200 kV and less than 30 miles in length.**	§ 2.1
Minn. Stat. § 216E.04, subd. 4	**Notice of application.** Upon submission of an application under this section, the applicant shall provide the same notice as required by section 216E.03, subdivision 4.	To be provided
Minn. R. 7850.2800, subp. 2	**Notice to PUC.** An applicant for a permit for one of the qualifying projects in subpart 1, who intends to follow the procedures of parts 7850.2800 to 7850.3700, shall notify the PUC of such intent, in writing, at least ten days before submitting an application for the project.	Appendix G
Minn. R. 7850.3100	**Contents of Application (Alternative Review).** The applicant shall include in the application the same information required in part 7850.1900, except the applicant need not propose any alternative sites or routes to the preferred site or route. If the applicant has rejected alternative sites or routes, the applicant shall include in the application the identity of the rejected sites or routes and an explanation of the reasons for rejecting them.	No alternative sites or routes were considered and rejected for the Project.
Minn. R. 7850.1900, subp. 2	**Route permit for HVTL.** An application for a route permit for a high voltage transmission line shall contain the following information:	
	A. a statement of proposed ownership of the facility at the time of filing the application and after commercial operation;	§ 1.1
	B. the precise name of any person or organization to be initially named as permittee or permittees and the name of any other person to whom the permit may be transferred if transfer of the permit is contemplated;	§ 1.1

Authority	Required Information	Location in Application
	C. at least two proposed routes for the proposed high voltage transmission line and identification of the applicant's preferred route and the reasons for the preference;	Not required by Minn. R. 7850.3100.
	D. a description of the proposed high voltage transmission line and all associated facilities including the size and type of the high voltage transmission line;	§ 2.1
	E. the environmental information required under subpart 3;	Chapter 7
	F. identification of land uses and environmental conditions along the proposed routes;	§§ 7.1, 7.6
	G. the names of each owner whose property is within any of the proposed routes for the high voltage transmission line;	Appendix Q, Map 2
	H. United States Geological Survey topographical maps or other maps acceptable to the commission showing the entire length of the high voltage transmission line on all proposed routes;	Appendix L, Map 11a
	I. identification of existing utility and public rights-of-way along or parallel to the proposed routes that have the potential to share the right-of-way with the proposed line;	§§ 5.1, 5.2, 5.3, 6.1
	J. the engineering and operational design concepts for the proposed high voltage transmission line, including information on the electric and magnetic fields of the transmission line;	§§ 2.1, 6.5
	K. cost analysis of each route, including the costs of constructing, operating, and maintaining the high voltage transmission line that are dependent on design and route;	§ 2.2
	L. a description of possible design options to accommodate expansion of the high voltage transmission line in the future;	§ 2.1
	M. the procedures and practices proposed for the acquisition and restoration of the right-of-way, construction, and maintenance of the high voltage transmission line;	§§ 6.1, 6.2, 6.3, 6.4
	N. a listing and brief description of federal, state, and local permits that may be required for the proposed high voltage transmission line; and	Chapter 9

Authority	Required Information	Location in Application
	O. a copy of the Certificate of Need or the certified HVTL list containing the proposed high voltage transmission line or documentation that an application for a Certificate of Need has been submitted or is not required.	This Joint Certificate of Need and Route Permit Application
Minn. R. 7850.3100	Identification of rejected route alternatives and explanation for rejection.	No alternative sites or routes were considered and rejected for the Project.
Minn. R. 7850.1900, subp. 3	**Environmental information.** An applicant for a site permit or a route permit shall include in the application the following environmental information for each proposed site or route to aid in the preparation of an environmental impact statement:	
	A. a description of the environmental setting for each site or route;	§ 7.1
	B. a description of the effects of construction and operation of the facility on human settlement, including, but not limited to, public health and safety, displacement, noise, aesthetics, socioeconomic impacts, cultural values, recreation, and public services;	§ 7.2
	C. a description of the effects of the facility on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining;	§ 7.3
	D. a description of the effects of the facility on archaeological and historic resources;	§ 7.4
	E. a description of the effects of the facility on the natural environment, including effects on air and water quality resources and flora and fauna;	§ 7.5
	F. a description of the effects of the facility on rare and unique natural resources;	§ 7.7
	G. identification of human and natural environmental effects that cannot be avoided if the facility is approved at a specific site or route; and	Chapter 7
	H. a description of measures that might be implemented to mitigate the potential human and environmental impacts identified in items A to G	Chapter 7

Authority	Required Information	Location in Application
	and the estimated costs of such mitigative measures.	
Minn. R. 7850.3300 Minn. R. 7850.2100, subp. 2	**Notice of Project.** Notification to persons on PUC's general list, to local officials, and to property owners. Content of notice governed by Minn. R. 7850.2100, subp. 3.	To be provided
Minn. R. 7850.2100, subp. 4	**Publication of notice.** Within 15 days after submission of an application, the applicant shall publish notice in a legal newspaper of general circulation in each county in which a site, route, or any alternative is proposed to be located that an application has been submitted and a description of the proposed project. The notice must also state where a copy of the application may be reviewed.	To be published
Minn. R. 7850.2100, subp. 5	**Confirmation of notice.** Within 30 days after providing the requisite notice, the applicant shall submit to the PUC documentation that all notices required under this part have been given. The applicant shall document the giving of the notice by providing the PUC with affidavits of publication or mailing and copies of the notice provided.	Will file once completed
Minn. R. 7850.4100	**Factors Considered.** In determining whether to issue a permit for a large electric power generating plant or a high voltage transmission line, the commission shall consider the following:	
	A. effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services;	§ 7.2
	B. effects on public health and safety;	§ 7.2
	C. effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining;	§ 7.3
	D. effects on archaeological and historic resources;	§ 7.4
	E. effects on the natural environment, including effects on air and water quality resources and flora and fauna;	§ 7.5
	F. effects on rare and unique natural resources;	§ 7.7

Authority	Required Information	Location in Application
	G. application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity;	§ 2.1, Chapter 7
	H. use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries;	§§ 5.1, 5.2, 5.3
	I. use of existing large electric power generating plant sites;	Not applicable
	J. use of existing transportation, pipeline, and electrical transmission systems or rights-of-way;	§§ 5.1, 5.2, 5.3, 6.1
	K. electrical system reliability;	Chapter 3
	L. costs of constructing, operating, and maintaining the facility which are dependent on design and route;	§ 2.2
	M. adverse human and natural environmental effects which cannot be avoided; and	Chapter 7
	N. irreversible and irretrievable commitments of resources.	§ 7.9
Minn. R. 7850.4300, subps. 1, 2	**Wilderness areas.** No high voltage transmission line may be routed through state or national wilderness areas. **Parks and natural areas.** No high voltage transmission line may be routed through state or national parks or state scientific and natural areas unless the transmission line would not materially damage or impair the purpose for which the area was designated and no feasible and prudent alternative exists. Economic considerations alone do not justify use of these areas for a high voltage transmission line.	No wilderness areas or parks are crossed
Minn. Stat. § 216E.03, subd. 7 (applicable per § 216E.04, subd. 8); H.F. No. 7.	**Considerations in designating sites and routes.** (a) The commission's site and route permit determinations must be guided by the state's goals to conserve resources, minimize environmental impacts, minimize human settlement and other land use conflicts, and ensure the state's electric energy security through efficient, cost-effective	

Authority	Required Information	Location in Application
	power supply and electric transmission infrastructure. (b) To facilitate the study, research, evaluation, and designation of sites and routes, the commission shall be guided by, but not limited to, the following considerations:	
	(1) evaluation of research and investigations relating to the effects on land, water and air resources of large electric power generating plants and high-voltage transmission lines and the effects of water and air discharges and electric and magnetic fields resulting from such facilities on public health and welfare, vegetation, animals, materials and aesthetic values, including baseline studies, predictive modeling, and evaluation of new or improved methods for minimizing adverse impacts of water and air discharges and other matters pertaining to the effects of power plants on the water and air environment;	Chapter 7
	(2) environmental evaluation of sites and routes proposed for future development and expansion and their relationship to the land, water, air and human resources of the state;	§ 2.1, Chapter 7
	(3) evaluation of the effects of new electric power generation and transmission technologies and systems related to power plants designed to minimize adverse environmental effects;	Not applicable
	(4) evaluation of the potential for beneficial uses of waste energy from proposed large electric power generating plants;	Not applicable
	(5) analysis of the direct and indirect economic impact of proposed sites and routes including, but not limited to, productive agricultural land lost or impaired;	§ 7.3
	(6) evaluation of adverse direct and indirect environmental effects that cannot be avoided should the proposed site and route be accepted;	§ 1.5, Chapter 7
	(7) evaluation of alternatives to the applicant's proposed site or route proposed pursuant to subdivisions 1 and 2;	No alternative sites or routes were considered and

Authority	Required Information	Location in Application
		rejected for the Project.
	(8) evaluation of potential routes that would use or parallel existing railroad and highway rights-of-way;	§§ 5.1, 5.2, 5.3
	(9) evaluation of governmental survey lines and other natural division lines of agricultural land so as to minimize interference with agricultural operations;	§ 5.1
	(10) evaluation of the future needs for additional high-voltage transmission lines in the same general area as any proposed route, and the advisability of ordering the construction of structures capable of expansion in transmission capacity through multiple circuiting or design modifications;	§ 2.1
	(11) evaluation of irreversible and irretrievable commitments of resources should the proposed site or route be approved;	§ 1.5
	(12) when appropriate, consideration of problems raised by other state and federal agencies and local entities;	Chapter 8
	(13) evaluation of the benefits of the proposed facility with respect to (i) the protection and enhancement of environmental quality, and (ii) the reliability of state and regional energy supplies;	Chapters 3 and 7
	(14) evaluation of the proposed facility's impact on socioeconomic factors; and	§§ 6.2, 6.4, 6.5, Chapter 7
	(15) evaluation of the proposed facility's employment and economic impacts in the vicinity of the facility site and throughout Minnesota, including the quantity and quality of construction and permanent jobs and their compensation levels. The commission must consider a facility's local employment and economic impacts, and may reject or place conditions on a site or route permit based on the local employment and economic impacts.	§§ 6.2, 6.4

Appendix C

Applicant's Exemption Request

minnesota power
AN ALLETE COMPANY

30 West Superior Street
Duluth, MN 55802-2093
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November 30, 2022

VIA E-FILING

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

Re: *In the Matter of the Application of Minnesota Power for the HVDC Modernization Project*
MPUC Docket No. E015/CN-22-607

Dear Mr. Seuffert:

Minnesota Power respectfully submits this Request for Exemptions from Certain Certificate of Need Application Content Requirements to the Minnesota Public Utilities Commission pursuant to Minnesota Rule 7849.0200, Subp. 6.

If you have any questions regarding this filing, please contact me at (218) 723-3963 or dmoeller@allete.com.

Yours truly,

David R. Moeller
Senior Regulatory Counsel

Enclosure
cc: Service List

STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION

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

IN THE MATTER OF THE APPLICATION OF MINNESOTA POWER FOR A CERTIFICATE OF NEED FOR THE HVDC MODERNIZATION PROJECT	MPUC Docket No. E015/CN-22-607 **REQUEST FOR EXEMPTIONS FROM CERTAIN CERTIFICATE OF NEED APPLICATION CONTENT REQUIREMENTS**

I. INTRODUCTION

Minnesota Power (or the "Company") respectfully submits this request for exemptions from certain content requirements for a Certificate of Need application for the High-Voltage Direct-Current ("HVDC") Modernization Project, (the "HVDC Modernization Project" or "Project"), pursuant to Minn. R. 7849.0200, subp. 6. Minnesota Power intends to file a combined Application for a Certificate of Need and Route Permit for the Project pursuant to Minn. Stat. §§ 216B.243 and 216E.03 in the first quarter of 2023.

The Project involves modernizing and upgrading both HVDC terminals for the 465-mile-long HVDC transmission line ("HVDC Line") and interconnecting the upgraded HVDC terminals to the existing alternating-current ("AC") transmission system. These HVDC terminals are currently located near the Arrowhead Substation in Hermantown, Minnesota and the Center Substation in Center, North Dakota. In order to modernize the HVDC terminals and implement the latest technology, new buildings and electrical infrastructure need to be constructed on a new site near the existing HVDC terminals. In Minnesota, to connect the new HVDC terminal to the existing AC system, the Project would require the construction of a new St Louis County 345 kilovolt ("kV")/230 kV substation located less than one mile west of the current Arrowhead Substation. The new HVDC terminal would be connected to the St Louis County Substation by less than one mile of 345 kV large high-voltage transmission line ("LHVTL")[1] and the new St Louis County Substation would be connected to the existing Arrowhead Substation by two parallel 230 kV LHVTLs less than one mile in length. Additionally, a short portion of the existing ±250 kV HVDC Line

[1] As defined by Minn. Stat. § 216B.2421, subd. 2(2); Minn. R. 7849.0010, subp. 14. The exemption found in Minn. Stat. 216B.243, subd. 8(a)(4) for "a high-voltage transmission line of one mile or less required to connect a new or upgraded substation to an existing, new, or upgraded high-voltage transmission line" does not apply because the proposed LHVTL in Minnesota is greater than one mile in length.

in Minnesota will need to be reconfigured to terminate at the new HVDC terminal. The Project is currently scheduled to be in service in 2027.

The HVDC Modernization Project is needed to modernize aging HVDC assets, continue to position the transmission grid for clean energy transition, and improve the reliability of the transmission system in Minnesota and North Dakota. The existing HVDC terminal has operated for 45 years, 15 years in excess of its 30-year design life. In recent years Minnesota Power has experienced HVDC terminal outages due to failures in the control system, power electronics, transformers, and other components. Based on experience with other electric system components, the failure rate is expected to increase in both frequency and duration, which is of particular concern for the existing HVDC system because of limited parts availability. The orderly replacement of the HVDC terminal equipment is prudent to ensure continuous efficient delivery (and potential expansion) of Minnesota Power's renewable, carbon-free energy resources into the future.

In addition to the replacement of the existing HVDC terminals, the new HVDC technology implemented for the Project will be designed to provide voltage regulation, frequency response, blackstart capability, and bidirectional power transfer capability; all of which will enable Minnesota Power and the region to continue to support our clean energy transition.

A Certificate of Need is required under Minn. Stat. § 216B.243 before a high voltage transmission line of the voltage and length proposed for the Project is constructed. Minnesota Power believes that certain Certificate of Need application content requirements in Minn. R. Ch. 7849 should be modified to better address the nature of this Project. These rules were broadly drafted to encompass the content requirements for both LHVTLs, like the Project, and large generation facilities. This petition seeks exemptions to those requirements that are not applicable to a transmission line project. The Minnesota Public Utilities Commission ("Commission") has previously allowed similar adjustments for other transmission line projects.[2] Therefore, Minnesota Power respectfully requests that the Commission grant exemptions from certain requirements as provided under Minn. R. 7849.0200, subp. 6. In lieu of some content requirements, Minnesota Power proposes to submit alternative information that it believes will better inform the Commission's decision regarding the need for the Project.

II. BACKGROUND

In early 2010, Minnesota Power finalized its purchase of a 465 mile, ±250 kV HVDC line with HVDC terminals located in Center, North Dakota, and Hermantown, Minnesota. After

[2] *See In re Application of Minnesota Power for a Certificate of Need for the Duluth Loop Reliability Project in St. Louis Cnty.*, Docket No. E-015/CN-21-140, Order Approving Notice Plan and Granting Variances and Exemptions (May 17, 2021); *In re Request of Minnesota Power for a Certificate of Need for the Great Northern Transmission Line*, Docket No. E-015/CN-12-1163, Order Approving Notice Plan, Granting Variance Request, and Approving Exemption Request (Feb. 28, 2013); *In re Application of Great River Energy and Minnesota Power for a Certificate of Need for a 115 kV High Voltage Transmission Line in St. Louis and Carlton Counties*, Docket No. E-002/CN-10-973, Order Approving Exemptions and Proposed Provision of Alternative Data (Nov. 2, 2010).

a contested case proceeding, the Commission approved the Company's purchase of the HVDC Line from the Square Butte Cooperative, finding the proposed transactions associated with the acquisition to be reasonable, prudent, and in the public interest.[3] This HVDC system is shown in Figure 1.

Figure 1. Existing HVDC Line Path Map

The HVDC Line and its HVDC terminals at the Center and Arrowhead substations were built in the 1970s to bring electricity from the coal-fired Milton R. Young 2 ("Young 2") generating station in Center, North Dakota, directly to Minnesota Power's customers. Minnesota Power's purchase of the HVDC Line in 2010 cleared the way for the line to be repurposed to facilitate the delivery of wind power generated in North Dakota directly to Minnesota Power's customers. Minnesota Power subsequently purchased and developed a portfolio of approximately 600 MW of North Dakota wind that now relies on the HVDC Line for reliable and efficient transmission deliverability. In recent years, Minnesota Power has been evaluating the need for modernization of the HVDC terminals to extend the life and expand the usefulness of the HVDC Line.

The Center and Arrowhead HVDC terminals were originally designed by General Electric ("GE") for a 30 year operating lifetime. They have now been operating reliably for over 45

[3] *See In re Minnesota Power's Petition to Purchase Square Butte Cooperative's Transmission Assets and for Restructuring Power Purchase Agreements from Milton R. Young Unit 2 Generating Station*, Docket No. E-015/PA-09-526, Order Granting Petition with Conditions (Dec. 21, 2009).

years, 15 years in excess of their original design life. The main components of the HVDC terminals include power electronics (thyristor valves) and their associated cooling system, converter transformers, smoothing reactors, harmonic filters and reactive resources to complete the conversion between AC and direct current ("DC"), as well as the control system that governs the operation of the line. The original vendor, GE, left the HVDC business in the 1980s and in recent years it has been increasingly difficult to procure spare parts for the components of the HVDC terminals as the technology has become obsolete and the original designers are well into retirement. Minnesota Power has researched reverse engineering solutions to this technology issue, but has had limited results and thus spare and replacement parts for the HVDC terminals are becoming increasingly limited. As component failures continue to occur and spare parts are consumed, the risk of extended outages due to failures in the HVDC terminals will continue to grow. At some point, one or both poles may be rendered inoperable due to critical component failures.

Modernizing the HVDC terminals by replacing the original HVDC terminal equipment with the latest HVDC technology will greatly reduce the frequency and duration of outages due to component failures in the HVDC terminals. In addition to replacement of the existing HVDC terminals, the new HVDC technology implemented for the Project will be designed to provide value-added support to the grid which will enable Minnesota Power and the regional to continue to support our clean energy transition.

A. Need for Replacement of Existing HVDC Terminals

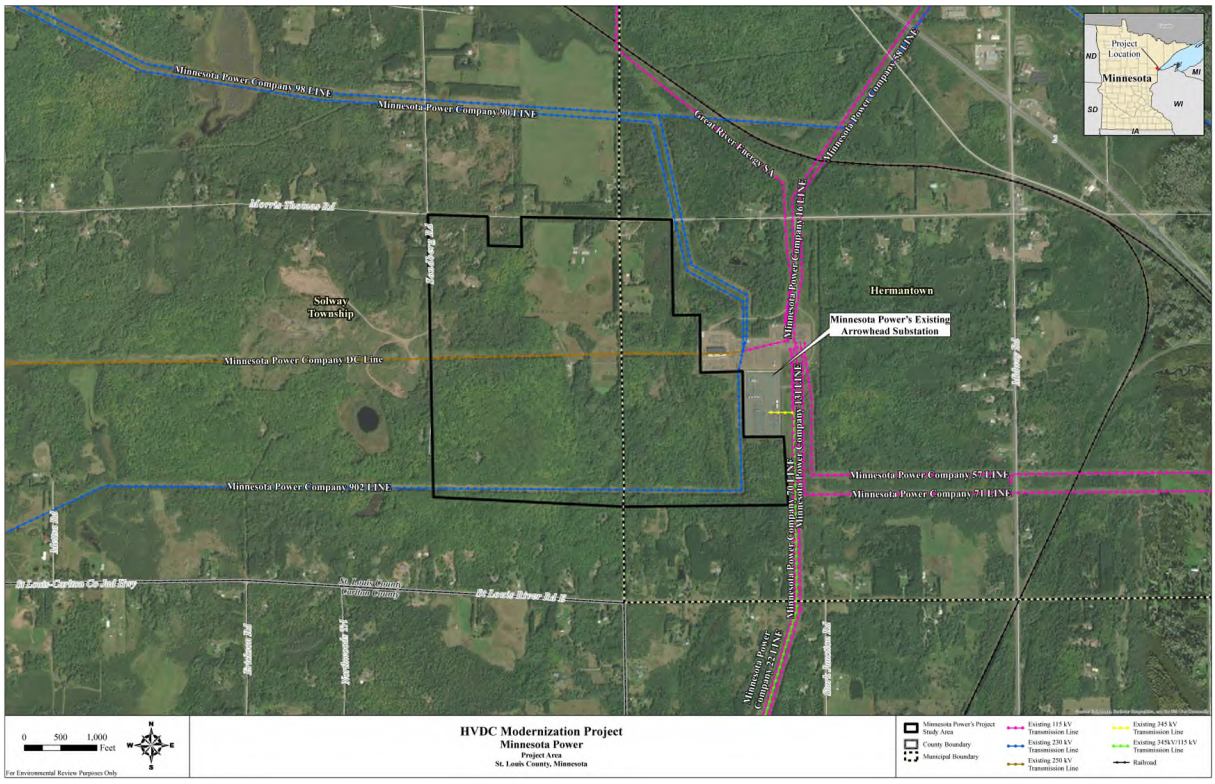
The HVDC Line connecting energy-rich North Dakota to northeastern Minnesota is increasingly valuable for bringing renewable energy from North Dakota to customers in the Company's service territory. As noted above, the existing HVDC terminal equipment is now over 45 years old, well past its original design life. While the HVDC Line equipment has been reliable for most of its history, forced (unplanned) and scheduled outage hours have increased significantly in the last five years. This is of particular concern for the HVDC system because of limited parts availability for equipment such as pulse transformers, racking, filters, and control equipment. As the frequency and duration of outages due to HVDC terminal equipment failures increases, so does the risk of significant impacts to Minnesota Power's ability to efficiently deliver its North Dakota wind generation to customers in Northeastern Minnesota.

The Company's current risk assessment, which is updated annually based on current market prices, has seen significant increases in forward energy market prices for replacement energy. In addition to the high forward market prices, MISO (and neighboring markets like SPP) are seeing unprecedented congestion between generation and load, which the HVDC Line helps to mitigate for Minnesota Power's wind generation assets. The Company expects future years to show higher replacement energy prices as more baseload coal units retire and grid congestion patterns continue to change.

The HVDC Modernization Project will mitigate risks associated with HVDC terminal equipment outages by replacing the aging HVDC infrastructure with newer and more

reliable HVDC terminal equipment. A visual overview of the HVDC Modernization Project area in Minnesota is provided in Figure 2.

Figure 2: HVDC Modernization Project – Minnesota Portion



The HVDC Modernization Project is currently in the MISO MTEP Appendix B (MTEP Project #4295) and has been reported in the Minnesota Biennial Transmission Projects Report since 2013 under tracking number 2013-NE-N16. Minnesota Power currently anticipates that the HVDC Modernization Project will be completed and placed in service by the end of 2027.

B. Upgrades to HVDC Terminals Will Provide Value-Added Grid Support

The Company proposes to upgrade the HVDC terminals with technology that provides greater grid support functionality to the surrounding transmission system while also being more flexible and adaptable to navigate rapidly-changing system conditions. The orderly replacement of the HVDC terminal equipment is prudent to ensure continuous efficient delivery (and potential expansion) of Minnesota Power's renewable, carbon-free energy resources into the future. This new technology and optionality will enhance the value of the HVDC converter stations for the local and regional power grid in the near-term and over the next several decades.

C. AC Transmission Needed for the HVDC Modernization Project

To complete the modernization and upgrade of the Company's HVDC facilities and keep the existing HVDC Line in service as much as possible to serve its customers and the region, the Company must develop new HVDC terminals on both ends of the line at the Center and Arrowhead substations. As part of the HVDC Modernization Project, the existing ±250 kV HVDC Line will be rerouted to the new HVDC terminals so that the existing HVDC terminals can be retired. To interconnect the new HVDC terminals to the existing AC transmission system in Minnesota, a new St Louis County 345 kV/230 kV substation will be constructed. The HVDC terminal will be connected to St Louis County Substation by a new 345 kV transmission line, and the St Louis County Substation will be connected to the existing Arrowhead Substation by two parallel 230 kV lines. The new sites will also be designed to accommodate future expansion of the HVDC system and support regional extra-high voltage AC transmission development.

In Minnesota, the Company determined that the most suitable parcels for relocation of the HVDC terminals are located west of the existing Arrowhead Substation. This site is preferable due to its proximity to the existing Arrowhead Substation, the existing HVDC terminal, and the existing HVDC line

III. LEGAL STANDARD AND SUMMARY OF EXEMPTION REQUESTS

Minn. R. 7849.0220, subp. 2, part 7849.0240, and parts 7849.0260 to 7849.0340 specify the content requirements for Certificate of Need applications for LHVTL projects. The Commission has authority to grant exemptions from the requirements of Minnesota Rules Chapter 7849 pursuant to Minn. R. 7849.0200, subp. 6, which provides:

> Before submitting an application, a person is exempted from any data requirement of parts 7849.0010 to 7849.0400 if the person (1) requests an exemption from specified rules, in writing to the commission, and (2) shows that the data requirement is unnecessary to determine the need for the proposed facility or may be satisfied by submitting another document. A request for exemption must be filed at least 45 days before submitting an application. The commission shall respond in writing to a request for exemption within 30 days of receipt and include the reasons for the decision. The commission shall file a statement of exemptions granted and reasons for granting them before beginning the hearing.

Based on the standard set forth in this rule, the Commission may grant exemptions when the data requirements: (1) are unnecessary to determine need in a specific case; or (2) can be satisfied by submitting documents other than those required by the rules.[4] For the

[4] *In re Application for a Certificate of Need for the Appleton – Canby 115 kV Line*, Docket No. E-017/CN-06-0677, Order Granting Exemptions and Approving Notice Plan (Aug. 1, 2006).

Project, Minnesota Power requests that the Commission grant exemptions from the following rules as they are either unnecessary to determine the need for the Project or can be satisfied by submitting alternative data:

Minnesota Rules	Scope of Exemption
Minn. R. 7849.0270, subps. 1-6 (Peak Demand and Annual Consumption Forecast; System Revenue Requirements)	Request exemption from providing forecasting and capacity information for Minnesota Power's system and to provide forecast information from Minnesota Power's most recent Annual Forecast Report ("AFR"). Request exemption from providing system revenue requirements and provide explanation of how MISO spreads wholesale electricity costs and a general estimate of rate impact of Project on Minnesota Power customers.
Minn. R. 7849.0280 (System Capacity)	Request full exemption from providing a discussion of the ability of the existing system to meet the forecasted demand for electrical energy identified in response to Minn. R. 7849.0270.
Minn. R. 7849.0290 (Conservation)	Request exemption from discussing conservation programs and their effect on the forecast information required by Minn. R. 7849.0270. Minnesota Power proposes to provide substitute information on its conservation efforts from its most recent Conservation Improvement Plan and Integrated Resource Plan filings.
Minn. R. 7849.0300 (Consequences of Delay)	Request to be exempt from providing analysis using three confidence levels. Minnesota Power proposes to provide substitute data regarding potential impacts caused by delay in implementing the Project.
Minn. R. 7849.0340 (No Facility Alternative)	Request to be exempt from providing analysis using three confidence levels. Minnesota Power proposes to provide substitute data regarding potential impacts caused by no build alternative.

Each of these requests is discussed in more detail below. This request is being made at least 45 days prior to submitting an application for a Certificate of Need as required by Minn. R. 7849.0200, subp. 6.[5]

IV. REQUESTED EXEMPTIONS

A. Minn. R. 7849.0270, subps. 1-6– Peak Demand and Annual Consumption Forecast and System Revenue Requirements

1. Rule 7849.0270, subp. 1 – Peak Demand and Annual Consumption Data

Minn. R. 7849.0270, subp. 1 requires information concerning peak demand and annual consumption for the applicant's entire service area and system. The Project is not proposed to address growing peak demand or system capacity issues. Instead, the Project is designed to upgrade and modernize the existing infrastructure of the HVDC terminals to assure reliability for the coming decades given the age of the infrastructure and the increasing failure rates of certain critical components, while ensuring expandability options for future development. Minnesota Power will provide forecast information from its most recent AFR filed on June 24, 2022 in Docket No. E999/PR-22-11.

2. Rule 7849.0270, subps. 2(A) and 2(B) – Customer Annual Consumption Data

Minn. R. 7849.0270, subps. 2(A) and 2(B) requires an applicant to estimate the number of customers and the amount of energy consumed annually by nine classes of customers (residential, commercial, industrial, farming, etc). Energy consumption data is not relevant to establishing the need for a proposed Project. Transmission systems must be sized so that they have sufficient capacity to operate reliably during periods of peak demand. It is the demand for power during peak times, not the amount of power consumed annually, that is key to determining the need for transmission facilities. Since energy consumption data has no direct impact on transmission planning, the Commission should exempt Minnesota Power from providing this data and accept substitute data in the form of AFR forecast information.[6]

3. Minn. R. 7849.0270, subps. 2(C) and 2(D) – System Demand and Peak Demand

Minn. R. 7849.0270, subp. 2(C) seeks an estimate of the demand for power in the system at the time of annual system peak demand. Minn. R. 7849.0270, subp. 2(D) calls for

[5] A proposed completeness checklist of the Certificate of Need requirements, reflecting this exemption request, is provided at Attachment A.

[6] *In re Application of Minnesota Power for a Certificate of Need for the Duluth Loop Reliability Project in St. Louis Cnty.*, Docket No. E-015/CN-21-140, Order Approving Notice Plan and Granting Variances and Exemptions (May 17, 2021); *In re Application of Great River Energy and Minnesota Power for a Certificate of Need for a 115 kV High Voltage Transmission Line in St. Louis and Carlton Counties*, Docket No. E-002/CN-10-973, Order Approving Exemptions and Proposed Provision of Alternative Data (Nov. 2, 2010).

monthly system peak demand data. Instead of the information called for in Minn. R. 7849.0270, subps. 2(C) and (D), the Company proposes to provide data actually utilized in studying and planning the Project and AFR forecast information.

4. Minn. R. 7849.0270, subp. 2(E) – System Revenue Requirements

Minn. R. 7849.0270, subp. 2(E) requires an estimate of the "annual revenue requirement per kilowatt-hour for the system in current dollars." Minnesota Power proposes to provide the general rate impact of the Project on Minnesota Power's customers. The Commission has previously granted similar exemption requests for other transmission projects.[7]

5. Minn. R. 7849.0270, subp. 2(F) – Weekday Load Factor

Minn. R. 7849.0270, subp. 2(F) requires an applicant's average system weekday load factor for each month. Minnesota Power requests an exemption from this requirement because load factor is not a relevant consideration when evaluating the need for a transmission facility. Load factor is a measure of how demand varies over time and is relevant to the need determination for new generation. Load factor has no bearing on the need for a new transmission line. Rather, transmission capacity must be designed to meet peak demand and other system power flow circumstances. This is done to ensure there is sufficient transmission capacity to meet lower levels of instantaneous demand. Thus, Minnesota Power respectfully requests an exemption from this requirement which the Commission has granted in the past for other transmission projects.[8]

6. Minn. R. 7849.0270, subps. 3-6 – Forecast Methodology, Data Base, Assumptions, and Coordination of Forecasts

Minn. R. 7849.0270, subps. 3-6 require the applicant to detail the forecast methodology employed, identify the database used for the forecast, detail the assumptions made in preparing the forecasts provided under subpart 2 of the same Rules part, and a description of load forecast coordination efforts with other systems. As stated above, the need for transmission facilities is not prompted by energy consumption, but rather, by demand during peak times. Thus, instead of providing energy consumption forecasts, Minnesota Power believes that the Company's most recent AFR will better enable the Commission to evaluate the need for this Project. The AFR discusses forecast

[7] *In re Application of Minnesota Power for a Certificate of Need for the Duluth Loop Reliability Project in St. Louis Cnty.*, Docket No. E-015/CN-21-140, Order Approving Notice Plan and Granting Variances and Exemptions (May 17, 2021); *In re Application of Great River Energy and Minnesota Power for a Certificate of Need for a 115 kV High Voltage Transmission Line in St. Louis and Carlton Counties*, Docket No. ET2,E-015/CN-10-973, Order Approving Exemptions and Proposed Provision of Alternative Data (Nov. 2, 2010).

[8] *In re Application of Minnesota Power for a Certificate of Need for the Duluth Loop Reliability Project in St. Louis Cnty.*, Docket No. E-015/CN-21-140, Order Approving Notice Plan and Granting Variances and Exemptions (May 17, 2021); *In re Request of Minnesota Power for a Certificate of Need for the Great Northern Transmission Line*, Docket No. E-015/CN-12-1163, Order Approving Notice Plan, Granting Variance Request, and Approving Exemption Request (Feb. 28, 2013); *In the Matter of the Application of Great River Energy and Minnesota Power for a Certificate of Need for a 115 kV High Voltage Transmission Line in St. Louis and Carlton Counties*, Docket No. ET2,E-015/CN-10-973, Order Approving Exemption Request (Nov. 2, 2010).

methodology, databases, forecast assumptions, and coordination of forecasts with other systems. Minnesota Power respectfully requests an exemption from this requirement, which the Commission has granted in the past for other transmission projects.[9]

In sum, Minnesota Power requests an exemption from the data requirements of Minn. R. 7849.0270, subps. 1-6 and will provide the relevant AFR forecast information. This substitute information is better tailored to the need for the Project and will assist the Commission in evaluating whether the Project is needed.

B. Minn. R. 7849.0280 – System Capacity

Minn. R. 7849.0280 pertains to system capacity and generation data. The general purpose of this section is to provide a discussion of the ability of the existing system to meet the forecasted demand for electrical energy in response to Minn. R. 7849.0270. Part 7849.0280 (A) through (I) pertain to an examination of generation adequacy and do not address transmission planning considerations. Minnesota Power therefore requests that the Commission grant an exemption from part 7849.0280 (A) through (I). The Commission has previously granted exemption requests from part 7849.0280 in several other transmission line Certificate of Need dockets where issues of transmission adequacy, rather than generation adequacy, were at issue.[10]

C. Minn. R. 7849.0290 – Conservation

Minnesota Power requests an exemption from Minn. R. 7849.0290, which relates to conservation programs the applicant has in place and their effect on the forecast information called for in Minn. R. 7849.0270. This rule is intended to ensure that regulated load serving utilities fully consider conservation as well as generation when planning for future needs of their customers.[11] Minnesota Power's conservation and efficiency information is examined in detail in the resource planning process. All of the information requested by Minn. R. 7849.0290 is contained in Minnesota Power's Integrated Resource Plan and Conservation Improvement Plan ("CIP") filings.[12] Instead of replicating that information in this application, Minnesota Power proposes to present a summary of these filings. This will allow interested parties to pursue their investigation into this issue further through those materials if they wish. The Commission has granted Minnesota Power an

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[9] *See, e.g.*, *In re Application of Minnesota Power for a Certificate of Need for the Duluth Loop Reliability Project in St. Louis Cnty.*, Docket No. E-015/CN-21-140, Order Approving Notice Plan and Granting Variances and Exemptions (May 17, 2021).

[10] *In re Application of Minnesota Power for a Certificate of Need for the Duluth Loop Reliability Project in St. Louis Cnty.*, Docket No. E-015/CN-21-140, Order Approving Notice Plan and Granting Variances and Exemptions (May 17, 2021); *In re Application of Great River Energy and Minnesota Power for a Certificate of Need for a 115 kV High Voltage Transmission Line in St. Louis and Carlton Counties*, Docket No. ET2,E-015/CN-10-973, Order Approving Exemptions and Proposed Provision of Alternative Data (Nov. 2, 2010).

[11] *In re Application of Rapids Power LLC for a Certificate of Need for its Grand Rapids Cogeneration Project*, Docket No. IP4/CN-01-1306, Order Granting Exemptions from Filing Requirements at 6 (Oct. 9, 2001).

[12] *See* Docket Nos. E-015/RP-21-33 and E-015/CIP-20-476.

exemption from this requirement in prior dockets and it is appropriate to do so here as well.[13]

D. Minn. R. 7849.0300 – Consequences of Delay and Minnesota Rule 7849.0340 – No Facility Alternative

Minn. R. 7849.0300 requires detailed information regarding the consequences of delay on three specific statistically-based levels of demand and energy consumption. Similarly, Minn. R. 7849.0340 requires a discussion of the impact on existing generation and transmission facilities at the three levels of demand specified in part 7849.0300 for the no-build alternative. While Minnesota Power will discuss the consequences of delay and a no build alternative in its application, there is no need to discuss these items in terms of three levels of demand. Rather, as noted above, for transmission planning purposes, the relevant inquiry is whether the system can meet peak demand. The Commission has approved similar partial exemption requests from the requirements of Minn. R. 7849.0300 and 7849.0340 in other transmission line Certificate of Need dockets.[14]

V. CONCLUSION

Minnesota Power respectfully requests that the Commission grant the requested exemptions to allow Minnesota Power to provide information in its application that is relevant to determining the need for the HVDC Modernization Project without imposing unnecessary filing burdens.

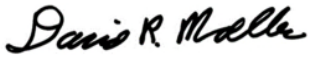
[13] *In re Application of Minnesota Power for a Certificate of Need for the Duluth Loop Reliability Project in St. Louis Cnty.*, Docket No. E-015/CN-21-140, Order Approving Notice Plan and Granting Variances and Exemptions (May 17, 2021); *In re Request of Minnesota Power for a Certificate of Need for the Great Northern Transmission Line*, Docket No. E015/CN-12-1163, Order Approving Notice Plan, Granting Variance Request, and Approving Exemption Request (Feb. 28, 2013).

[14] *In re Request of Minnesota Power for a Certificate of Need for the Great Northern Transmission Line*, Docket No. E-015/CN-12-1163, Order Approving Notice Plan, Granting Variance Request, and Approving Exemption Request (Feb. 28, 2013); *In re Application of Northern States Power Company d/b/a Xcel Energy and Great River Energy for a Certificate of Need for the Upgrade of the Southwest Twin Cities (SWTC) Chaska Area 69 kV Transmission Line to 115 kV Capacity*, Docket No. E-002/CN-11-826, Order Granting The Company' Exemption Request (Nov. 4, 2011).

November 30, 2022

Respectfully submitted,

MINNESOTA POWER



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ATTORNEYS FOR MINNESOTA POWER

HVDC Modernization Project
Certificate of Need Application
Completeness Checklist

Authority	Required Information	Location in Application
Minn. R. 7829.2500, Subp. 2	Brief summary of filing on separate page sufficient to apprise potentially interested parties of its nature and general content	
Minn. R. 7849.0200, Subp. 2	Title Page and Table of Contents	
Minn. R. 7849.0200, Subp. 4	Cover Letter	
Minn. R. 7849.0220, Subp. 3	Joint Ownership and Multiparty use	N/A
Minn. R. 7849.0240	Need summary and additional considerations	
Subp. 1	Summary of the major factors that justify the need for the proposed facility	
Subp. 2	Relationship of the proposed facility to the following socioeconomic considerations:	—
A.	Socially beneficial uses of the output of the facility	
B.	Promotional activities that may have given rise to the demand for the facility	
C.	Effects of the facility in inducing future development	
Minn. R. 7849.0260	Proposed LHVTL and Alternatives	—
A.	A description of the type and general location of the proposed line, including:	—
(1)	Design voltage	
(2)	Number, sizes and types of conductors	

Authority	Required Information	Location in Application
(3)	Expected losses under projected maximum loading and under projected average loading in the length of the line and at terminals or substations	
(4)	Approximate length of the proposed line	
(5)	Approximate locations of DC terminals or AC substations on a map	
(6)	List of likely affected counties	
B.	Discussion of the available alternatives including:	
(1)	New generation	
(2)	Upgrading existing transmission lines	
(3)	Transmission lines with different voltages or conductor arrays	
(4)	Transmission lines with different terminals or substations	
(5)	Double circuiting of existing transmission lines	
(6)	If facility for DC (AC) transmission, an AC (DC) transmission line	
(7)	If proposed facility is for overhead (underground) transmission, an underground (overhead) transmission line	
(8)	Any reasonable combination of alternatives (1) – (7)	
C.	For the facility and for each alternative in B, a discussion of:	—
(1)	Total cost in current dollars	
(2)	Service life	

Authority	Required Information	Location in Application
(3)	Estimated average annual availability	
(4)	Estimated annual O&M costs in current dollars	
(5)	Estimate of its effect on rates system wide and in Minnesota	
(6)	Efficiency expressed for a transmission facility as the estimated losses under projected maximum loading and under projected average loading in the length of the transmission line and at the terminals or substations	
(7)	Major assumptions made in subitems (1) – (6)	
D.	A map (of appropriate scale) showing the applicant's system or load center to be served by the proposed LHVTL	
E.	Such other information about the proposed facility and each alternative as may be relevant to determination of need.	
Minn. R. 7849.0270	Content of Forecast	—
Minn. R. 7849.0270, Subp. 1	Peak demand and annual consumption data within the applicant's service area and system	EXEMPT provided alternative data is supplied
	ALTERNATIVE DATA –Minnesota Power's most recent Annual Electric Utility Forecast Report	
Minn. R. 7849.0270, Subp. 2	Minnesota forecast data; forecast demand data by customer class, peak period, and month; estimated system annual revenue per kilowatt hour; estimated average weekday system load factor by month.	EXEMPT except as noted below and provided alternative data is supplied
	ALTERNATIVE DATA –Minnesota Power's most recent Annual Electric Utility Forecast Report	
	Subp. 2 (E) – Alternative explanation of how wholesale electricity costs are	

Authority	Required Information	Location in Application
	spread and general financial effect on Minnesota Power customers.	
Minn. R. 7849.0270, Subp. 3	Detail of the forecast methodology used in subp. 2.	EXEMPT provided alternative data is supplied
Minn. R. 7849.0270, Subp. 4	Discussion of database used in current forecasting.	EXEMPT provided alternative data is supplied
Minn. R. 7849.0270, Subp. 5	Discussion of each essential assumption made in forecast preparation and sensitivity to variations in assumptions.	EXEMPT provided alternative data is supplied
Minn. R. 7849.0270, Subp. 6	Coordination of forecasts.	EXEMPT provided alternative data is supplied
	ALTERNATIVE DATA FOR SUBPS. 3-6 – Minnesota Power's most recent Annual Electric Utility Forecast Report	
Minn. R. 7849.0280	System Capacity	—
	Description of ability of existing system to meet demand forecast including:	—
A.	Power planning programs	EXEMPT
B.	Seasonal firm purchases and sales	EXEMPT
C.	Seasonal participation purchases and sales	EXEMPT
D.	Load and generation capacity data requested in subitems 1-13 for summer and winter seasons for each forecast year, including anticipated purchases, sales, and capacity retirements and additions except those that depend on a not yet issued certificate of need.	EXEMPT
E.	Summer and winter season load generation and capacity in years subsequent to application contingent on proposed facility	EXEMPT

Authority	Required Information	Location in Application
F.	Summer and winter season load generation and capacity including all projected purchases, sales and generation in years subsequent to application	EXEMPT
G.	List of proposed additions and retirements in generating capacity for each forecast year subsequent to application	EXEMPT
H.	Graph of monthly adjusted net demand and capability with difference between capability and maintenance outages plotted	EXEMPT
I.	Appropriateness and method of determining system reserve margins	EXEMPT
Minn. R. 7849.0290	Conservation Programs	—
A.	Persons responsible for energy conservation and efficiency programs	EXEMPT provided alternative data is supplied
B.	List of energy conservation and efficiency goals and objectives	EXEMPT provided alternative data is supplied
C.	Description of programs considered, implemented and rejected	EXEMPT provided alternative data is supplied
D.	Description of major accomplishments in conservation and efficiency	EXEMPT provided alternative data is supplied
E.	Description of future plans with respect to conservation and efficiency	EXEMPT provided alternative data is supplied
F.	Quantification of the manner by which these programs impact the forecast	EXEMPT provided alternative data is supplied
	ALTERNATIVE DATA FOR A-F – Minnesota Power will provide a summary of its 2021 Integrated Resource Plan and Conservation Improvement Program filings.	
Minn. R. 7849.0300	Consequence of Delay	EXEMPT from three levels of demand

Authority	Required Information	Location in Application
Minn. R. 7849.0310	Required Environmental Information	
Minn. R. 7849.0330	Transmission Facilities	—
	Data for each alternative that would require LHVTL construction including:	—
A.	For overhead transmission lines	—
(1)	Schematics showing dimensions of support structures	
(2)	Discussion of electric fields	
(3)	Discussion of ozone and nitrogen oxide emissions	
(4)	Discussion of radio and television interference	
(5)	Discussion of audible noise	
B.	For underground transmission facilities:	N/A
(1)	Types and dimensions of cable systems	N/A
(2)	Types and qualities of cable system materials	N/A
(3)	Heat released in kW per foot of cable	N/A
C.	Estimated right-of-way required for the facility	
D.	Description of construction practices	
E.	Description of O&M practices	

Authority	Required Information	Location in Application
F.	Estimated workforce required for construction and O&M	
G.	Description of region between endpoints in likely area for routes emphasizing a three mile radius of endpoints including:	—
(1)	Hydrological features	
(2)	Vegetation and wildlife	
(3)	Physiographic regions	
(4)	Land use types	
Minn. R. 7849.0340	No-Facility Alternative	EXEMPT from three levels of demand

IN THE MATTER OF THE APPLICATION OF MINNESOTA POWER FOR THE HVDC MODERNIZATION PROJECT

MPUC DOCKET NO. E015/CN-22-607

CERTIFICATE OF SERVICE

Roshelle L. Herstein certifies that on the 30th day of November, 2022, on behalf of Minnesota Power, she efiled a true and correct copy of **Request for Exemption from Certain Certificate of Need Application Content Requirements** via eDockets (www.edockets.state.mn.us) by uploading the same to Docket No. E015/CN-22-607. Said document was also served as designated on the attached service list on file with the Minnesota Public Utilities Commission, designated as "PPSA General List 7850.2100-1A Permit Filings."

/s/ Roshelle L. Herstein
Roshelle L. Herstein

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Appendix D

Applicant's Notice Plan Petition

minnesota power
AN ALLETE COMPANY

30 West Superior Street
Duluth, MN 55802-2093
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November 30, 2022

VIA E-FILING

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

Re: *In the Matter of the Application of Minnesota Power for the HVDC Modernization Project*
MPUC Docket No. E015/CN-22-___

Dear Mr. Seuffert:

Minnesota Power respectfully submits this Notice Plan for approval by the Minnesota Public Utilities Commission ("Commission") pursuant to Minnesota Rule 7829.2550. In accordance with Minnesota Rule 7829.2550, Subp. 1, copies of this Notice Plan have been provided to the Minnesota Department of Commerce, the Minnesota Office of Attorney General Residential Utilities and Antitrust Division, and to persons listed on the "General List of Persons Interested in Power Plans and Transmission Lines" as maintained by the Commission under Minnesota Rule 7850.2100, Subp. 1(A). If you have any questions regarding this filing, please contact me at (218) 723-3963 or dmoeller@allete.com.

Yours truly,

David R. Moeller
Senior Regulatory Counsel

Enclosure
cc: Service List

STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION

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

IN THE MATTER OF THE APPLICATION OF MINNESOTA POWER FOR A CERTIFICATE OF NEED FOR THE HVDC MODERNIZATION PROJECT

MPUC Docket No. E015/CN-22-___

NOTICE PLAN PETITION

Public Comments on this Notice Plan Petition can be submitted to the Minnesota Public Utilities Commission until 4:30 p.m. on December 20, 2022.

Replies to Comments can be submitted to the Minnesota Public Utilities Commission until 4:30 p.m. on January 9, 2023.

The Minnesota Public Utilities Commission's address is: Minnesota Public Utilities Commission, 121 7th Place East, Suite 350, St. Paul, MN 55101-2147

I. INTRODUCTION

Minnesota Power (or the "Company") submits this Notice Plan for approval by the Minnesota Public Utilities Commission ("Commission") pursuant to Minn. R. 7829.2550.

Minnesota Power intends to submit a combined application for a Certificate of Need and a Route Permit to modernize and upgrade its existing High-Voltage Direct-Current ("HVDC") terminal near the Arrowhead Substation located in Hermantown Minnesota (the HVDC Modernization Project" or "Project"). The Project would require modernizing and upgrading both HVDC terminals for the 465-mile-long HVDC transmission line ("HVDC Line") and interconnecting the upgraded HVDC terminals to the existing alternating-current ("AC") transmission system. These HVDC terminals are currently located near the Arrowhead Substation in Hermantown, Minnesota and the Center Substation in Center, North Dakota. In order to modernize the HVDC terminals and implement the latest technology, new buildings and electrical infrastructure need to be constructed on a new site near the existing HVDC terminals. In Minnesota, to connect the new HVDC terminal to the existing AC system, the Project would require the construction of a new St Louis County 345 kilovolt ("kV")/230 kV substation located less than one mile west of the current Arrowhead Substation. The new HVDC terminal would be connected to the St Louis County Substation by less than one mile of 345 kV large high-voltage transmission line ("LHVTL")[1] and the new St Louis County Substation would be connected to the existing Arrowhead Substation by two parallel 230 kV LHVTLs less than one mile in length. Additionally, a short portion of the existing ±250 kV HVDC Line in Minnesota will need to be reconfigured to terminate at the new HVDC terminal. The Project is currently scheduled to be in service in 2027.

The HVDC Modernization Project is needed to modernize aging HVDC assets, continue to position the transmission grid for clean energy transition, and improve the reliability of the transmission system in Minnesota and North Dakota. The existing HVDC terminal has operated for 45 years, 15 years in excess of its 30-year design life. In recent years Minnesota Power has experienced HVDC terminal outages due to failures in the control system, power electronics, transformers, and other components. Based on experience with other electric system components, the failure rate is expected to increase in both frequency and duration, which is of particular concern for the existing HVDC system because of limited parts availability. The orderly replacement of the HVDC terminal equipment is prudent to ensure continuous efficient delivery (and potential expansion) of Minnesota Power's renewable, carbon-free energy resources into the future.

In addition to the replacement of the existing HVDC terminals, the new HVDC technology implemented for the Project will be designed to provide voltage regulation, frequency response, blackstart capability, and bidirectional power transfer capability; all of which will

[1] As defined by Minn. Stat. § 216B.2421, subd. 2(2); Minn. R. 7849.0010, subp. 14. The exemption found in Minn. Stat. 216B.243, subd. 8(a)(4) for "a high-voltage transmission line of one mile or less required to connect a new or upgraded substation to an existing, new, or upgraded high-voltage transmission line" does not apply because the proposed LHVTL in Minnesota is greater than one mile in length.

enable Minnesota Power and the region to continue to support our clean energy transition.

The proposed Project area and the existing transmission system are shown in **Attachment A.**

A Certificate of Need is required to be granted under Minn. Stat. § 216B.243 before a high voltage transmission line of the voltage and length proposed for the Project is constructed. Minn. R. 7829.2550 requires a Notice Plan to be submitted for review by the Commission at least three months before filing a Certificate of Need application under Minn. Stat. § 216B.243. Minnesota Power, therefore, submits this Notice Plan for the Commission's approval.

II. NOTICE PLAN PROPOSAL

This Notice Plan is prepared as an initial step in the Certificate of Need regulatory process. Preparation of a Notice Plan, and its review and approval by the Commission, will ensure that interested persons are aware of the proceeding and have the opportunity to participate. The area proposed to be included in notices under this plan ("Notice Area") is depicted in **Attachment A**.

The Notice Area is approximately one to 1.5 miles wide. In general, the Notice Area is a one square mile area with a quarter-mile buffer on each side, centered on the existing Arrowhead and proposed St. Louis County Substations within the Project area.

While the Notice Plan is the first step in the regulatory process, Minnesota Power has already begun gathering stakeholder, agency, tribal, and public input on possible route alternatives. This outreach has included:

- a meeting with the City of Hermantown (11/09/22),
- a meeting with Solway Township (11/15/22),
- a meeting with Fond du Lac Band of Chippewa (11/17/22),
- a public open house on (11/22/22),
- direct mailing to all landowners within a ¼ mile of the project area, and
- Project information available on the Company's website.[2]

With this proposed Notice Plan, the Company will continue public outreach and provide the notices listed below in compliance with Minn. R. 7829.2550.

A. Direct Mail Notice

Attachment A includes a letter that will be mailed to landowners, residents, local units of government, elected officials, tribal government contacts, and agencies within the Notice Area.

[2] *See* mnpower.com/EnergyForward.

1. Landowners

Minn. R. 7829.2550, subp. 3(A), requires an applicant for a Certificate of Need to provide direct mail notice to all landowners likely to be affected by the proposed transmission lines. Minnesota Power proposes to provide direct mail notice to all landowners who own property within the Notice Area. Minnesota Power has obtained landowner names and addresses within the Notice Area using tax records from the St. Louis County geospatial ("GIS") data hub.

2. Mailing Addresses

Minn. R. 7829.2550, subp. 3(B), requires an applicant for a Certificate of Need to provide direct mail notice to all mailing addresses in the area that are likely to be affected by the proposed transmission line. Minnesota Power proposes to provide direct mail notice to all residential and commercial mailing addresses within the Notice Area. Minnesota Power has obtained a list of mailing addresses in the Notice Area from the St. Louis County GIS data hub.

3. Tribal Government Officials

Minn. R. 7829.2550, subp. 3(C) requires an applicant for a Certificate of Need for a high voltage transmission line to provide direct mail notice to tribal governments whose jurisdictions are reasonably likely to be affected by the proposed transmission line. Minnesota Power has assembled a list of tribal organizations and other tribal government officials and administrators in Northern Minnesota and this list is included in **Attachment B**. Minnesota Power will provide direct mail notice to the tribal organizations and other tribal government officials and administrators listed in **Attachment B**.

4. Local Governments

Minn. R. 7829.2550, subp. 3(C), requires an applicant to provide direct mail notice to governments of towns, cities, home rule charter cities, and counties whose jurisdictions are reasonably likely to be affected by the proposed transmission line. Minnesota Power proposes to provide direct mail notice to lead administration personnel in the towns, cities, and counties. The notice will also be provided to the elected officials of those local units of government and to those State Senators and State Representatives whose districts are within the Notice Area. A complete list of these government recipients is included in **Attachment B**.

B. Newspaper Notice.

Minn. R. 7829.2550, subp. 3(D), requires an applicant to publish notice in newspapers in the areas that may be affected by the transmission line. Minnesota Power proposes to place notice advertisements in the following newspapers in St. Louis County:

Duluth News Tribune
Hermantown Star
Proctor Journal

In addition to the Notice Plan newspaper notice requirement, Minn. R. 7829.2500, subp. 5 requires that after a Certificate of Need application is filed that an applicant publish newspaper notice of the filing in a newspaper of general circulation throughout the state. Minnesota Power proposes to publish a notice in the StarTribune, which is newspaper of general circulation throughout the state.

C. Notice Content

Minn. R. 7829.2550, subp. 4 sets forth the information that must be incorporated into the notice letter including: a map showing the end points of the line and existing transmission facilities in the area; right-of-way requirements for the proposed line and a statement of intent to acquire property rights for the right-of-way; notice that the transmission upgrade cannot be constructed unless the Commission certifies that it is needed; Commission contact information; utility website information that includes its biennial transmission projects report; a statement that the Minnesota Department of Commerce, Energy Environmental Review and Analysis ("EERA") will prepare an environmental report; an explanation of how to get on the Project's mailing list; and a list of applicable regulatory laws and rules that govern the request for Project approval. Minnesota Power's proposed notice mailing meets these requirements.

The map (**Attachment A**) that will be included with the notice letter will depict the entire transmission line corridor area including end points, existing transmission lines and substations, counties, townships, and notable landmarks to aid in orientation. The map that will be sent with the notice letter will be updated from the enclosed figure in Attachment A to show the routes the Company is likely to propose in its Route Permit application. The Company will provide a copy of this updated map to Commission and Department of Commerce staff for review prior to mailing.

D. Distribution of Notice Plan Filing

As required under Minn. R. 7829.2550, subp. 1, this Notice Plan filing has been sent to the EERA, the Office of the Attorney General – Residential Utilities Division, and to those parties listed on the "General List of Persons Interested in Power Plants and Transmission Lines" as maintained on eDockets.

E. Notice Timing

Minn. R. 7829.2550, subp. 6, requires the applicant to implement the Notice Plan within 30 days of its approval by the Commission. Minnesota Power requests that the Commission vary the Notice Plan implementation rule requirement to allow notice to more closely coincide with the filing of the Certificate of Need application. Therefore, Minnesota Power requests that the Commission grant a variance and direct the notices identified in this Notice Plan to occur no more than 60 days and no less than two weeks prior to the filing of the Certificate of Need application.

The three requirements for a rule variance under Minn. R. 7829.3200, subp. 1 are: (1) enforcement of the rule would impose an excessive burden upon the applicant or others

affected by the rule; (2) granting the variance would not adversely affect the public interest; and (3) granting the variance would not conflict with standards imposed by law. These three requirements are met here. The notice requirements would burden all parties by separating notice provided to interested stakeholders from the start of the proceeding. Further, granting a variance would neither adversely affect the public interest nor conflict with standards imposed by law. The Commission has approved similar variance requests in other Certificate of Need dockets.[3]

F. Project Service List

Pursuant to Minn. R. 7829.0700, subp. 1, the Company requests that the following persons be placed on the Commission's Official Service List for this matter, and requests electronic service for these persons:

Dan McCourtney
Environmental and Land Manager
Minnesota Power
30 West Superior Street
Duluth, MN 55802
218.355.3515
dmccourtney@mnpower.com

David R. Moeller
Senior Regulatory Counsel
Minnesota Power
30 West Superior Street
Duluth, MN 55802
(218) 723-3963
dmoeller@allete.com

Kodi Jean Verhalen
Taft Stettinius & Hollister LLP
2200 IDS Center
80 South 8th Street
Minneapolis, MN 55402-2157
(612) 977-8591
kverhalen@taftlaw.com

Valerie T. Herring
Taft Stettinius & Hollister LLP
2200 IDS Center
80 South 8th Street
Minneapolis, MN 55402-2157
(612) 977-8501
vherring@taftlaw.com

Peter Madsen
Taft Stettinius & Hollister LLP
2200 IDS Center
80 South 8th Street
Minneapolis, MN 55402-2157
(612) 977-8355
pmadsen@taftlaw.com

[3] *In re Application of Minnesota Power for a Certificate of Need for the Duluth Loop Reliability Project in St. Louis Cnty.*, Docket No. E015/CN-21-140, Order Approving Notice Plan and Granting Variances and Exemptions at 3, 6 (May 17, 2021); (In *the Matter of the Application of Byron Solar Project, LLC for a Certificate of Need for the up to 200 MW Byron Solar Project and 345 kV Transmission Line in Olmstead and Dodge Counties, Minnesota*, Docket No. IP-7041/CN-20-764, ORDER APPROVING NOTICE PLAN, APPROVING EXEMPTION REQUESTS, AND GRANTING VARIANCES (Jan. 15, 2021).

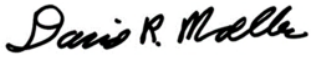
III. CONCLUSION

Minnesota Power respectfully requests that the Commission: (1) approve this Notice Plan prepared in advance of the filing of a Certificate of Need application to construct the Project; and (2) grant the variance from the 30-day implementation notice contemplated in Minn. R. 7829.2550, subp. 6, and modify the time for implementation of the Notice Plan to no more than 60 days and no less than two weeks prior to the filing of the Certificate of Need application.

November 30, 2022

Respectfully submitted,

MINNESOTA POWER



David R. Moeller
Senior Regulatory Counsel
30 West Superior Street
Duluth, MN 55802
dmoeller@allete.com
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Kodi Jean Verhalen
Valerie T. Herring
Peter Madsen
Taft Stettinius & Hollister LLP
2200 IDS Center
80 South 8th Street
Minneapolis, MN 55402-2157
(612) 977-8400
kverhalen@taftlaw.com
vherring@taftlaw.com
pmadsen@taftlaw.com

ATTORNEYS FOR MINNESOTA POWER

Example Notice Letter

____, 2023

NOTICE OF PROPOSED TRANSMISSION LINE PROJECT

Re: In the Matter of the Application for a Certificate of Need and Route Permit for the HVDC Modernization Project
MPUC Docket Nos. E015/CN-22-___; E015/TL-22-___

PLEASE TAKE NOTICE that Minnesota Power (also the "Company") is applying to the Minnesota Public Utilities Commission (also "Commission") for a Certificate of Need and Route Permit to modernize and upgrade its existing High-Voltage Direct-Current ("HVDC") terminal near the Arrowhead Substation in Hermantown Minnesota (the HVDC Modernization Project" or "Project").

Project Description

Minnesota Power intends to submit a combined application for a Certificate of Need and a Route Permit to modernize and upgrade its existing High-Voltage Direct-Current ("HVDC") terminal near the Arrowhead Substation located in Hermantown Minnesota (the HVDC Modernization Project" or "Project"). The Project would require modernizing and upgrading both HVDC terminals for the 465-mile-long HVDC transmission line ("HVDC Line") and interconnecting the upgraded HVDC terminals to the existing alternating-current ("AC") transmission system. These HVDC terminals are currently located near the Arrowhead Substation in Hermantown, Minnesota and the Center Substation in Center, North Dakota. In order to modernize the HVDC terminals and implement the latest technology, new buildings and electrical infrastructure need to be constructed on a new site near the existing HVDC terminals. In Minnesota, to connect the new HVDC terminal to the existing AC system, the Project would require the construction of a new St Louis County 345 kilovolt ("kV")/230 kV substation located less than one mile west of the current Arrowhead Substation. The new HVDC terminal would be connected to the St Louis County Substation by less than one mile of 345 kV large high-voltage transmission line ("LHVTL")[4] and the new St Louis County Substation would be connected to the existing Arrowhead Substation by two parallel 230 kV LHVTLs less than one mile in length. Additionally, a short portion of the existing ±250 kV HVDC Line in Minnesota will need to be reconfigured to terminate at the new HVDC terminal.

The Project will be designed to provide voltage regulation, frequency response, blackstart capability, and bidirectional power transfer capability; all of which will enable

[4] As defined by Minn. Stat. § 216B.2421, subd. 2(2); Minn. R. 7849.0010, subp. 14. The exemption found in Minn. Stat. 216B.243, subd. 8(a)(4) for "a high-voltage transmission line of one mile or less required to connect a new or upgraded substation to an existing, new, or upgraded high-voltage transmission line" does not apply because the proposed LHVTL in Minnesota is greater than one mile in length.

Minnesota Power and the region to continue to support our clean energy transition. The Project is currently scheduled to be in service in 2027.

A map of the area under consideration for the proposed Project is attached to this letter as **Figure 1**.

Project Need

The HVDC Modernization Project is needed to modernize aging HVDC assets, continue to position the transmission grid for clean energy transition, and improve the reliability of the transmission system in Minnesota and North Dakota. The existing HVDC terminal has operated for 45 years, 15 years in excess of its 30-year design life. In recent years Minnesota Power has experienced HVDC terminal outages due to failures in the control system, power electronics, transformers, and other components. Based on experience with other electric system components, the failure rate is expected to increase in both frequency and duration, which is of particular concern for the existing HVDC system because of limited parts availability. The orderly replacement of the HVDC terminal equipment is prudent to ensure continuous efficient delivery (and potential expansion) of Minnesota Power's renewable, carbon-free energy resources into the future.

Further information on the Project need is available on the Minesota Power's website: www. mnpower.com/EnergyForward.com.

Regulatory Review Process

Before Minnesota Power can construct the Project, the Commission must determine whether the Project is needed (Certificate of Need) and if so, will determine the route along which the Project will be built (Route Permit).

The Certificate of Need process is governed by Minnesota law, including Minnesota Statutes section 216B.243, and Minnesota Rules Chapter 7849, specifically Rules 7849.0010 to 7849.0400 and 7849.1000 to 7849.2100. A copy of the Certificate of Need application, once submitted, can be obtained by visiting the Commission's website at https://mn.gov/puc/ in Docket No. E015/CN-22-___.

In addition to certifying the need for the Project, the Commission must also grant a Route Permit for the Project. The routing of the Project is governed by Minnesota law, including Minnesota Statutes Chapter 216E and Minnesota Rules Chapters 4410 and 7850. A copy of the Route Permit application, once submitted, can be obtained by visiting the Commission's website in Docket No. E015/TL-22-___.

The Commission will not make these determinations until it has completed a thorough review process that encourages public involvement and analyzes the impacts of the Project and various route alternatives. This process includes preparation of an Environmental Assessment ("EA") on the Project by the Minnesota Department of Commerce's Energy Environmental Review and Analysis ("EERA") staff.

Minnesota Power will submit an application for a Route Permit with one proposed route for the associated transmission lines. Other routes can be proposed to be evaluated during the scoping process. The Commission and the EERA staff will decide which routes get studied and considered for approval. Routes that have been shown at public meetings are preliminary and subject to change. In addition, other, new routes may also be studied and considered for approval.

The Commission will review all of the data from the public process and will decide if the Project is needed and which route should be approved. Selection of a final route by the Commission will be based on an evaluation of the routes guided by the factors identified in Minnesota Statutes section 216E.03, Minnesota Rules part 7850.4100, and stakeholder input received during the regulatory process.

The table below provides a high-level summary of the major steps in the regulatory process.

Summary of Regulatory Schedule Following Minnesota Law

Action	Approximate Date
Pre-Application study and public meetings and stakeholder outreach	Fall/Winter 2022-2023
Certificate of Need and Route Permit Applications submitted to Commission	Winter 2023
Informational and Scoping Meetings (public meeting and comment)	Spring 2023
Draft Environmental Assessment Issued (public meeting and comment period)	Summer 2023
Public Hearings (public meeting and comment period)	Summer 2023
Commission Decision	Fall 2023

Right-of-Way for the Project

Before beginning construction, Minnesota Power will acquire property rights for the right-of-way, through either fee acquisition of property or an easement that will be negotiated with the landowner for each parcel. Minnesota Power anticipates acquiring easements with a typical right-of-way of approximately 150 feet wide for the 345kV transmission line, 130 feet wide for each 230 kV transmission line, and 150 feet wide for the ±250 kV HVDC Line. Where these transmission lines parallel existing lines, less new right-of-way may be required because the new transmission line may share a portion of the existing right-of-way.

Additional Information and Mailing Lists

To subscribe to the Project's Certificate of Need docket and to receive email notifications when information is filed in that docket, please visit https://mn.gov/puc/, click on "eDockets," then click on "Go to eDockets Project Database," and then click on "eFiling Home/Login" in the left menu. Then, click on the "Subscribe to Dockets" button, enter your email address and select "Docket Number" from the Type of Subscriptions dropdown box, then select "[22]" from the first Docket number drop down box and enter "[___]" in the second box before clicking on the "Add to List" button. You must then click the "Save" button at the bottom of the page to confirm your subscription to the Project's Certificate of Need docket. These same steps can be followed to subscribe to the Project's Route Permit docket (22-___).

If you would like to have your name added to the Project Route Permit proceeding mailing list (MPUC Docket No. E015/TL-22-___) you may register by contacting the public advisor in the consumer affairs office at the Commission at consumer.puc@state.mn.us, or (651) 296-0406 or 1-800-657-3782. Please be sure to note: 1) how you would like to receive notices (regular mail or email) and 2) your complete mailing or email address. You may also find information about the Project on the Department of Commerce's webpage at https://mn.gov/eera/web/page/home/ by clicking "Transmission Lines" and locating the Project in the list. Please be aware that the Project may not be listed at this location until the Route Permit application is submitted.

A separate mailing list is maintained for the Certificate of Need proceeding. To be placed on the Project Certificate of Need mailing list (MPUC Docket No. E015/CN-22-___), mail, fax, or email Robin Benson at Minnesota Public Utilities Commission, 121 7th Place E., Suite 350, St. Paul, MN 55101-2147, Fax: 651-297-7073 or robin.benson@state.mn.us.

If you have questions about the state regulatory process, you may contact the Minnesota state regulatory staff listed below:

Minnesota Public Utilities Commission
Bret Eknes
121 7th Place East, Suite 350
St. Paul, Minnesota 55101
(651) 296-7124
1-800-657-3782
bret.eknes@state.mn.us
https://mn.gov/puc/

Minnesota Department of Commerce EERA
Bill Storm
85 7th Place East, Suite 280
St. Paul, Minnesota 55101
(651) 539-1844
1-800-657-3710
bill.storm@state.mn.us
https://mn.gov/eera/

Please visit the Minnesota Power's website at:
www.mnpower.com/EnergyForward.com for more information.

Project phone and e-mail addresses are:

Project Phone Number – (218) 355-3515

Project E-mail Address – askus@mnpower.com

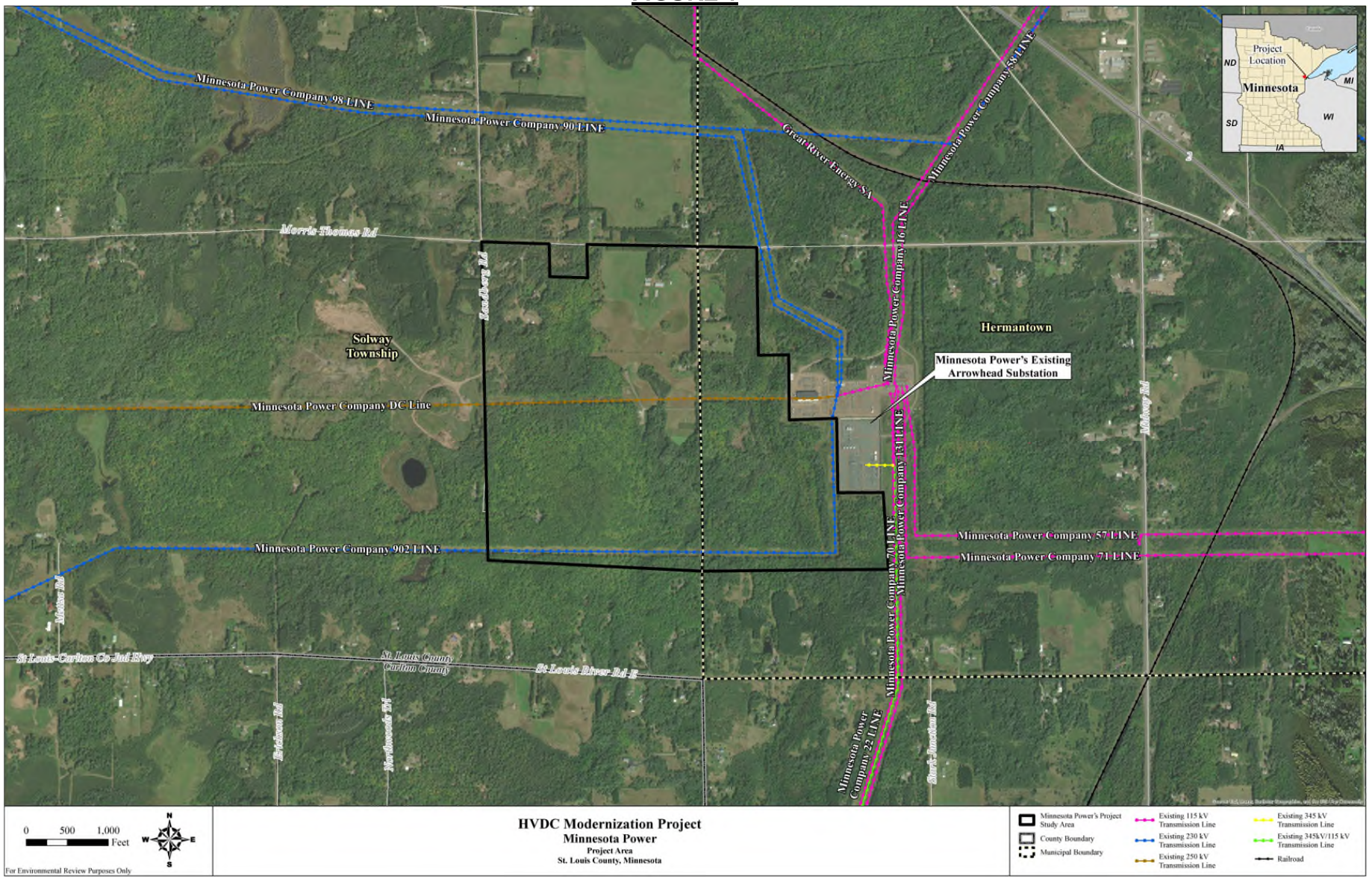
Transmission Planning Process in Minnesota

Minnesota Statutes section 216B.2425 requires that each electric transmission-owning utility in the state file a biennial transmission planning report with the Commission in the fall of odd-numbered years. These reports provide information on the transmission planning process used by utilities in the state of Minnesota and information about other transmission line projects. The 2021 Biennial Transmission Planning Report is available at: www.minnelectrans.com. The 2021 Biennial Transmission Planning Report was submitted on October 29, 2021.

Sincerely,

Dan McCourtney
Environmental & Land Manager
Minnesota Power

FIGURE 1


Minnesota Power Company 98 LINE
Minnesota Power Company 90 LINE
Great River Energy SA
Minnesota Power Company 58 LINE
Project Location
ND
Minnesota
MI
SD
WI
IA
Morris-Thomas Rd
Lundberg Rd
Solway Township
Hermantown
Minnesota Power Company 16 LINE
Minnesota Power's Existing Arrowhead Substation
Minnesota Power Company DC Line
Midway Rd
Minnesota Power Company 133 LINE
Minnesota Power Company 57 LINE
Minnesota Power Company 71 LINE
Minnesota Power Company 902 LINE
Minnesota Power Company 70 LINE
Mellon Rd
St Louis-Carlton Co Jnt Hwy
St. Louis County
Carlton County
St Louis River Rd E
Rice Lake Rd
Northwoods Rd
Minnesota Power Company 22 LINE
Stark Junction Rd
0 500 1,000 Feet
N
W
E
S
For Environmental Review Purposes Only
HVDC Modernization Project
Minnesota Power
Project Area
St. Louis County, Minnesota
Minnesota Power's Project Study Area
County Boundary
Municipal Boundary
Existing 115 kV Transmission Line
Existing 230 kV Transmission Line
Existing 250 kV Transmission Line
Existing 345 kV Transmission Line
Existing 345kV/115 kV Transmission Line
Railroad

HVDC MODERNIZATION PROJECT CERTIFICATE OF NEED NOTICE PLAN STAKEHOLDER CONTACT LIST

ORGANIZATION	NAME	TITLE	ADDRESS	CITY	STATE	ZIP CODE
Federal Agencies						
Federal Aviation Administration	Jacob Martin	Program Manager for the District	6020 28th Avenue South, Suite 102	Minneapolis	MN	55450-2700
U.S. Army Corps of Engineers	Kris Laman	Project Manager - Regulatory Office	600 South Lake Avenue, Suite 211	Duluth	MN	55802
U.S. Bureau of Indian Affairs	Alan Fogarty	Acting Superintendent	5600 American Blvd West, Suite 500	Bloomington	MN	55437
U.S. Fish and Wildlife Service	Shauna Marquardt	Ecological Services Field Office	4101 American Blvd East	Bloomington	MN	55425
Tribal Organizations						
1854 Treaty Authority	Marne Kaeske	Cultural Preservation Specialist	4428 Haines Road	Duluth	MN	55811
1854 Treaty Authority	Sonny Myers	Executive Director	4428 Haines Road	Duluth	MN	55811
Duluth Indigenous Commission	Susanne Kelly	Senior Planner	411 West First Street, Room 160	Duluth	MN	55802
Bois Forte Band of Chippewa	Cathy Chavers	Chairwoman	5344 Lakeshore Drive	Nett Lake	MN	55772
Bois Forte Band of Chippewa	Jaylen Strong	Tribate Historic Preservation Officer	206 West 4th Street #204	Duluth	MN	55806
Fond du Lac Band of Lake Superior Chippewa	Kevin Dupuis	Chairman	1720 Big Lake Road	Cloquet	MN	55720
Fond du Lac Band of Lake Superior Chippewa	Jill Hoppe	Tribate Historic Preservation Officer	1720 Big Lake Road	Cloquet	MN	55720
Grand Portage Band of Lake Superior Chippewa	Robert Deschampe	Chairman	PO Box 428	Grand Portage	MN	55605
Grand Portage Band of Lake Superior Chippewa	Mary Ann Gagnon	Tribate Historic Preservation Officer	PO Box 428	Grand Portage	MN	55605
Leech Lake Band of Ojibwe	Faron Jackson	Chairman	190 Sailstar Drive NW	Cass Lake	MN	56633
Leech Lake Band of Ojibwe	Amy Burnette	Tribate Historic Preservation Officer	115 6th Street NW, Suite E	Cass Lake	MN	56633
Mille Lacs Band of Ojibwe	Melanie Benjamin	Chief Executive	43408 Oodena Drive	Onamia	MN	56359
Mille Lacs Band of Ojibwe	Terry Kemper	THPO	43408 Oodena Drive	Onamia	MN	56359
Mille Lacs Band of Ojibwe	Terry Kemper	Interim Tribate Historic Preservation Officer	43408 Oodena Drive	Onamia	MN	56359
Red Lake Nation	Kade Ferris	Archaeologist	PO Box 274	Red Lake	MN	56671
Red Lake Nation	Darrell Seki	Chairman	PO Box 550	Red Lake	MN	56671
White Earth Nation	Michael Fairbanks	Chairman	35500 Eagle View Road	Ogema	MN	56569
White Earth Nation	Jaime Arsenault	Tribate Historic Preservation Officer	PO Box 418	White Earth	MN	56591
State Agencies						
Minnesota Board of Water and Soil Resources	David Demmer	Wetland Specialist	394 South Lake Avenue, Room 403	Duluth	MN	55802
Minnesota Board of Water and Soil Resources	Ryan Hughes	Northern Region Manager	394 South Lake Avenue, Room 403	Duluth	MN	55802
Minnesota Department of Commerce	Bill Storm	Project Manager	85 7th Place, Suite 500	St. Paul	MN	55101-2198
Minnesota Department of Natural Resources	Margi Coyle	Regional Environmental Assessment Ecologists	500 Lafayette Road	St. Paul	MN	55155
Minnesota Department of Natural Resources	Cynthia Warzecha	Energy Projects Review	500 Lafayette Road	St. Paul	MN	55155
Minnesota Department of Transportation	Don Berre	Office of Aeronautics	395 John Ireland Blvd	St. Paul	MN	55155
Minnesota Department of Transportation	Stacy Kotch-Egstad	Utility Routing and Siting Coordinator	395 John Ireland Blvd	St. Paul	MN	55155
Minnesota Indian Affairs Council	Melissa Cerda	Sr Cultural Resources Specialist	1819 Bemidji Avenue North, Suite 2	Bemidji	MN	56601
Minnesota Office of State Archaeologist	David Mather	National Register Archaeologist	State Historic Preservation Office Administration Building #203 50 Sherburne Avenue	St. Paul	MN	55155
Minnesota Pollution Control Agency	Jeff Udd	Duluth Region Manager	525 Lake Avenue South, Suite 400	Duluth	MN	55802
Minnesota Pollution Control Agency	Hans Neve	Pollution Control Program Adminstrator	520 Lafayette Road North	St. Paul	MN	55155
Minnesota Public Utilities Commission	Mike Kaluzniak	Energy Facilities Permitting	121 7th Place East, Suite 350	St. Paul	MN	55101
Minnesota Public Utilities Commission	Scott Ek	Energy Facilities Permitting	121 7th Place East, Suite 350	St. Paul	MN	55101
Minnesota Public Utilities Commission	Bret Eknes	Energy Facilities Supervisor	121 7th Place East, Suite 350	St. Paul	MN	55101
Minnesota State Historic Preservation Office	Sarah Beimers	Environmental Review Manager	50 Sherburne Avenue #203	St. Paul	MN	55155
Office of Attorney General	Keith Ellison	Attorney General	445 Minnesota Street, Suite 1400	St. Paul	MN	55101
Office of the State Archaeologist	Amanda Gronhovd	State Archaeologist	328 West Kellogg Blvd	St. Paul	MN	55102
County Commissioners						
St. Louis County	Annie Harala	Commissioner (1st District)	100 North 5th Avenue West	Duluth	MN	55802
St. Louis County	Patrick Boyle	Commissioner (2nd District)	100 North 5th Avenue West	Duluth	MN	55802
St. Louis County	Ashley Grimm	Commissioner (3rd District)	100 North 5th Avenue West, Room 202	Duluth	MN	55802
St. Louis County	Paul McDonald	Commissioner (4th District)	100 North 5th Avenue West	Duluth	MN	55802
St. Louis County	Keith Musolf	Commissioner (5th District)	100 North 5th Avenue West	Duluth	MN	55802
St. Louis County	Keith Nelson	Commissioner (6th District)	100 North 5th Avenue West	Duluth	MN	55802
County Agencies						
St. Louis County	Kevin Gray	Administrator	100 North 5th Avenue West, Room 202	Duluth	MN	55802
St. Louis County	Matthew Johnson	Planning & Community Development Director	100 North 5th Avenue West	Duluth	MN	55802
St. Louis County	Jim Foldesi	Public Works Director/Highway Engineer	100 North 5th Avenue West	Duluth	MN	55802
St. Louis County	Matthew Johnson	Economic Development Director	320 West 2nd Street, Suite 301	Duluth	MN	55802
St. Louis County Historical Society	JoAnne Coombe	Executive Director	506 West Michigan Street	Duluth	MN	55802
South St. Louis County Soil and Water Conservation District	Tim Beaster	Conservation Specialist	100 North 5th Avenue West	Duluth	MN	55802
South St. Louis County Soil and Water Conservation District	R.C. Boheim	District Manager	215 North 1st Avenue East, Room 301	Duluth	MN	55802
Cities						
City of Hermantown	Wayne Boucher	Mayor	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	John Geiessler	Council Member	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	Gloria Nelson	Council Members	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	Bonnie Engseth	City Clerk	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	John Mulder	City Manager / Administrator	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	Joe Wicklund	Communications & Community Engagement Mgr.	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	Eric Johnson	Community Development Director	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	Paul Senst	Public Works Director	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	Josh Bergstad	Wetland LGU	5105 Maple Grove Road	Hermantown	MN	55811
Townships						
Solway Township	Scott Welsh	Town Board Chair	4029 Munger Shaw Road	Cloquet	MN	55720
Solway Township	Tami McGregor	Township Clerk	4029 Munger Shaw Road	Cloquet	MN	55720
State and Federal Legislators						
State Representative	Natalie Zeleznikar	House District 03B	343 State Office Building	St. Paul	MN	55155
State Senator	Grant Hauschild	Senate District 03	Minnesota Senate Bldg, Room 2221 95 University Avenue West	St. Paul	MN	55155
US House of Representatives	Pete Stauber	Representative - MN 8th District	5094 Miller Trunk Hwy, Suite 900	Hermantown	MN	55811
US Senate	Amy Klobuchar	US Senator	Olcott Plaza, Room 105 820 9th Street North	Virginia	MN	55792
US Senate	Tina Smith	US Senator	60 Plato Blvd, Suite #220	St. Paul	MN	55107

IN THE MATTER OF THE APPLICATION OF MINNESOTA POWER FOR THE HVDC MODERNIZATION PROJECT

MPUC DOCKET NO. E015/CN-22-___

CERTIFICATE OF SERVICE

Roshelle L. Herstein certifies that on the 30th day of November, 2022, she filed and served a true and correct copy of Minnesota Power's **Notice Plan Petition** via eDockets (www.edockets.state.mn.us) by uploading the same to Docket No. E015/CN-22-___. Said document was also served as designated on the attached list on file with the Minnesota Public Utilities Commission, designated as "PPSA General List 7850.2100-1A Permit Filings" and was sent to the Office of Attorney General – Residential Utilities Division via email at residential.utilities@ag.state.mn.us.

/s/ Roshelle L. Herstein
Roshelle L. Herstein

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Appendix E

Commission Orders on Exemption Request and Notice Plan

BEFORE THE MINNESOTA PUBLIC UTILITIES COMMISSION

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

David R. Moeller
Senior Regulatory Counsel
Minnesota Power
30 West Superior Street
Duluth, MN, 55802

SERVICE DATE: February 1, 2023

DOCKET NO. E-015/CN-22-607

In the Matter of the Application of Minnesota Power for a Certificate of Need for the HVDC Modernization Project

The above entitled matter has been considered by the Commission and the following disposition made:

Approved the Applicant's requests for exemption from the required data conditioned upon the provision of the proposed alternative data, with the exceptions of requiring the Applicant to provide data for Minnesota Rules 7849.0280 subpart A for the applicable load area and for Minnesota Rules 7849.0270, subp 2(C) and 2(D), for which the Department requests that the Applicant further explain what kinds of data Minnesota Power proposes to provide when it references "data actually utilized in studying and planning the Project."

This decision is issued by the Commission's consent calendar subcommittee, under a delegation of authority granted under Minn. Stat. § 216A.03, subd. 8 (a). Unless a party, a participant, or a Commissioner files an objection to this decision within ten days of receiving it, it will become the Order of the full Commission under Minn. Stat. § 216A.03, subd. 8 (b).

The Commission agrees with and adopts the recommendations of the Department of Commerce, which are attached and hereby incorporated into the Order.

BY ORDER OF THE COMMISSION

Will Seuffert
Executive Secretary

To request this document in another format such as large print or audio, call 651.296.0406 (voice). Persons with a hearing or speech impairment may call using their preferred Telecommunications Relay Service or email consumer.puc@state.mn.us for assistance.

COMMERCE DEPARTMENT

December 12, 2022

Will Seuffert
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, Minnesota 55101-2147

RE: **Comments of the Minnesota Department of Commerce, Division of Energy Resources**
Docket No. E015/CN-22-607

Dear Mr. Seuffert:

Attached are the comments of the Minnesota Department of Commerce, Division of Energy Resources (Department) in the following matter:

> Exemption Request Petition for the Application of Minnesota Power for a Certificate of Need for the HVDC Modernization Project.

The Petition was filed on behalf of Minnesota Power on November 30, 2022 by:

> David R. Moeller
> Senior Regulatory Counsel
> Minnesota Power
> 30 West Superior Street
> Duluth, MN, 55802

The Department recommends that the Minnesota Public Utilities Commission (Commission) **approve the most of the Applicant's proposed exemption requests, with modification, and requests the Applicant provide further explanation regarding some of the proposed alternative data.** The Department is available to answer any questions the Commission may have.

Sincerely,

/s/ MICHAEL N. ZAJICEK
Rates Analyst

MNZ/ja
Attachment

Before the Minnesota Public Utilities Commission

Comments of the Minnesota Department of Commerce
Division of Energy Resources

Docket No. E015/CN-22-607

I. INTRODUCTION

On November 30, 2022, Minnesota Power (MP or the Applicant) filed a *Notice Plan Petition for the Application of Minnesota Power for a Certificate of Need for the HVDC Modernization Project* (Notice Petition). The Notice Petition provided the Applicant's proposed Notice Plan to communicate its intent to modernize the High-Voltage Direct-Current (HVDC) terminals by construct new buildings and electrical infrastructure on a new site near the existing terminals. This would additionally require the construction of a new 345/230 kV substation less than one mile from the existing Arrowhead Substation, which would be connected by a less than one mile 345 kV large high-voltage transmission line (LHVTL) and two parallel 230 kV LHVTL less than one mile in length. Finally, a small portion of existing line would need to be reconfigured to terminate at the new HVDC terminal. The Minnesota Public Utilities Commission (Commission) has not yet ruled on the Notice Petition.

Also, on November 30, 2022, MP filed an *Exemption Request Petition for the Application of Minnesota Power for a Certificate of Need for HVDC Modernization Project* (Exemption Petition) in order to obtain exemptions from certain data requirements of Minnesota Rules part 7849. Below are the Comments of the Minnesota Department of Commerce, Division of Energy Resources, Energy Regulation and Planning (Department) on the Exemption Petition.

II. DEPARTMENT ANALYSIS

A. BACKGROUND

The Applicant proposes to modernize the existing HVDC system that extends for 465 miles from Arrowhead Substation in Hermantown, Minnesota, to Center Substation in Center, North Dakota. This project involves replacing the HVDC substation infrastructure in Minnesota as the current facilities are 15 years passed their 30-year design life. MP states that due to the age of the facilities more outages are occurring, and failure rates of components are increasing in frequency and duration. Additionally, MP states replacement components are becoming increasing limited due to age. As listed in the Exemption petition, the proposed project includes:

- Construction of new buildings and electrical infrastructure near the existing HVDC terminals;
- Construction of a new St Louis County 345 kV/230 kV substation located less than one mile from the current Arrowhead Substation;
- Less than one mile of 345 kV large high-voltage transmission line (LHVTL) connecting the new St Louis County Substation to the new HVDC terminal buildings;

- Two parallel 230 kV LHVTLs less than on mile in length connecting the new St Louis County Substation and the Arrowhead Substation; and
- Reconfiguring a small portion of the existing HVDC line in Minnesota so that it will terminate at the new HVDC terminal.

Minnesota Statutes §216B.2421, subd. 2 (2) defines a large energy facility (LEF) as "any high-voltage transmission line with a capacity of 200 kilovolts or more and greater than 1,500 feet in length." In turn, Minnesota Statutes §216B.243, subd. 2 states "[n]o large energy facility shall be sited or constructed in Minnesota without the issuance of a certificate of need by the Commission." Since the project calls for almost a mile of 345 kV of transmission line construction and almost a mile of two parallel 230 kv, the Department concludes that the proposed project qualifies as a LEF and a Certificate of Need (CN) is required. The Department notes that Minnesota Statutes §216B.243, subd. 8(a)(4) discussing cases where this statue does not apply states "a high voltage transmission line of one mile or less required to connect a new or upgraded substation to an existing, new, or upgraded high-voltage transmission line" does not apply as the total amount of LHVTL is greater than one mile in length. Minnesota Rules part 7849 includes the filing requirements for a CN for an electric transmission facility.

The Exemption Petition states that the project will:

- Reduce the frequency of unplanned outages;
- Improve grid support functionality; and
- Accommodate future expansion of the HVDC system;

B. APPLICANT'S REQUEST

In the Exemption Petition, the Applicant requests exemption from providing data relevant to the following portions of Minnesota Rules:

- 7849.0270, subps. 1, System Wide Data;
- 7849.0270, subps. 2(A) and 2(B), Customer Class Information;
- 7849.0270, subp. 2(C) and 2(D), System Demand and Peak Demand;
- 7849.0270, subp. 2(E), System Revenue Requirements;
- 7849.0270, subp. 2(F), Weekly Load Factor;
- 7849.0270, subps. 3-6, Forecast Methodology, Data Base Assumptions, and Coordination of Forecasts;
- 7849.0280, System Capacity;
- 7849.0290, Conservation; and
- 7849.0300, Consequences of Delay and 7849.0340, Alternative of No Facility.

Minnesota Rules 7849.0200, subp. 6 states:

> Before submitting an application, a person is exempted from any data requirement of this chapter if the person (1) requests an exemption from specified rules, in writing to the commission and
> (2) shows that the data requirement is unnecessary to determine the need for the proposed facility or may be satisfied by submitting another document.

The Department examines each specific exemption request separately. The required criterion is whether the Applicant has shown that "the data requirement is unnecessary to determine the need for the proposed facility or may be satisfied by submitting another document" as noted above.

C. ANALYSIS OF EXEMPTION REQUESTS

1. Minnesota Rules 7849.0270, subp. 1

This rule requires an applicant to provide information regarding peak demand and annual consumption for the applicant's entire system. The Applicant requests an exemption from this requirement as the project is designed to upgrade and modernize the existing infrastructure to assure reliability due to the increasing failure rates of components, rather than address peak demand or annual consumption. Instead, the Applicant proposes to provide forecast information from its most recent annual forecast report.

The Department agrees that the data the Applicant proposes to provide is appropriate, and that peak demand and annual consumption data will not be useful as neither is causing the need for the Project.

In summary, the Department recommends that the Commission approve the Applicant's proposed exemption to Minnesota Rules 7849.0270, subp. 1 conditioned upon the provision of the proposed alternative data.

2. Minnesota Rules 7849.0270, subps. 2(A) and 2(B)

These rules require an applicant to predict the number of customers and the amount of energy consumed annually by nine classes of customers. These requirements were crafted to examine the construction of new transmission lines to connect new sources of electricity to new sources of demand. MP states that energy consumption data is not relevant to establishing the need for the proposed transmission line, as it must be sized for the peak energy demand, not annual demand. The Applicant requested an exemption to Minnesota Rules 7849.0270, subps. 2(a) and 2(b), proposing to instead provide data from its most recent annual forecast report.

The Department agrees that the methodology that the Applicant proposes to use is appropriate and that the annual customer and energy consumption information is not relevant in this case. The Department agrees that the Applicant's proposed substitute data is reasonable.

In summary, the Department recommends that the Commission approve the Applicant's proposed exemption to Minnesota Rules 7849.0270, subps. 2(A) and 2(B), conditioned upon the provision of local substation load data and annual forecast report information.

3. Minnesota Rules 7849.0270, subp. 2(C) and 2(D)

Minnesota Rule 7849.0270, subp. 2(C) requires an applicant to estimate the demand for power in the applicant's system at the time of the annual system peak demand, provided by customer class, while Minnesota Rule 7849.0270, subp. 2(D) calls for monthly system peak demand data. The Department notes that, as discussed above, the applicant has already requested exemptions from the customer class data requirement. The Applicant proposed to provide data used in studying and planning the Project and annual forecast report information.

The Department agrees that data from the annual forecast report is relevant, however it is unclear what data the Company intends to provide when it references the "data actually utilized in studying and planning the Project." In the past the Department has generally agreed that local load data, typically the actual historical load for local substations and annual forecast information is appropriate.

The Department requests that the Applicant explain further in reply comments what data it proposes to provide as an alternative to the required data on demand for system and peak demand.

4. Minnesota Rules 7849.0270, subp. 2(E), System Revenue Requirements

This rule requires "the estimated annual revenue requirement per kilowatt hour for the system in current dollars" for each forecast year. The Applicant proposed to provide information on the general rate impact of the Project on MP customers.

The Department agrees that the data the Applicant proposes to provide is a reasonable substitute to the system revenue data requirements. As this project is needed for reliability concerns, it is not particularly necessary for the Department's analysis. However, as the Department has noted in previous exemption request comments,[1] this information is useful to show the impact of the project to non-technical audiences, and thus the Department apricates the alternative information proposed by the Applicant.

[1] See Docket Nos. ET-2,E002/CN-06-1115, E017,E015/CN-07-1222, and ET2,E015/CN-10-973

In summary, the Department recommends that the Commission approve the Applicant's proposed exemption to Minnesota Rules 7849.0270, subp. 2(E) conditioned upon the provision of the proposed alternative data.

5. Minnesota Rules 7849.0270, subp. 2(F), Weekday Load Factor

This rule requires the Applicant to provide its average system weekday load factor for each month. The Applicant requested this exemption because they concluded that load factor is not a relevant measure when evaluating the need for a transmission facility.

The Department agrees with the Applicant that load factor is not relevant in assessing the need for the proposed project and thus recommends that the Commission approve the Applicant's proposed exemption to Minnesota Rules 7849.0270, subp. 2(F).

6. Minnesota Rules 7849.0270, subps. 3-6, Forecast Methodology

These rules require the Applicant to provide detailed information on the forecast methodology employed, identification of databases, details on the assumptions made in preparing the forecasts provided under Subpart 2 of the same rule, and a description of load forecast coordination efforts with other systems. The Applicant requested this exemption because the Project is not prompted by electrical consumption, but rather by demand during peak times. The Applicant proposed to instead provide data from its most recent annual forecast report, which discusses forecast methodology, databases, forecast assumptions, and coordination of forecasts with other systems.

The Department agrees that the data the Applicant's proposed to provide would allow the evaluation of the claimed need in the proposed load area. The proposed data is more relevant given the Applicant's stated reasons for the need for the proposed Project.

In summary, the Department recommends that the Commission approve the Applicant's proposed exemption to Minnesota Rules 7849.0270, subps. 3-6 conditioned upon the provision of the proposed alternative data.

7. Minnesota Rules 7849.0280, System Capacity Information

This rule requires the applicant to provide information that describes the ability of its existing system to meet forecasted demand; in essence, load and capability information. The Commission has noted in the past that much of Minn. Rule 7849.0280 pertains to electric generators.[2] The Applicant notes that

[2] Id.

subparts A through I of the rule apply to generators and not transmission proposals. The Applicant requests an exemption from Rule 7849.0280.

The Department agrees that information relating to the affected load area for the Project is more relevant and that aspects of the rule relating to generators are not applicable. However, the Applicant requests an exemption from the entire rule, rather than just the portions that do not apply. For instance in Docket No. ET2,E015/CN-10-973 the Commission did not grant an exemption to subpart's A, although the Commission allowed data on the "applicable load area" instead, and H. The Applicant does not provide any reason why those specific requirements should be exempted in this case, however the Department agrees that the data for subpart H appears to be more focused for generators, and does not appear applicable to the analysis of the certificate of need in this case. Therefore, the Department recommends that the Commission approve the Applicant's proposed exemption to Minnesota Rules 7849.0280 for parts B though G and I, but require the Applicant to provide data on subpart A for the applicable load area.

8. Minnesota Rules 7849.0290, Conservation Programs

This rule requires the applicant to provide conservation program information and quantification of the impact of conservation programs on forecast data. The Applicant notes that all of MP's conservation efficiency information is examined in detail in the resource planning process and all of the information requested is already contained in MP's Integrated Resource Plan and Conservation Improvement Plan filings.[3] MP proposes to present a summary of those filings rather than replicate the data in the instant docket.

The Department agrees that a summary of the relevant information is sufficient and notes the Commission has granted a similar exemption for MP in the past.[4] Thus, the Department recommends that the Commission approve the Applicant's proposed exemption to Minnesota Rules 7849.0290 conditioned upon the provision of the proposed alternative data.

9. Minnesota Rules 7849.0300, Consequences of Delay, and 7849.0340, No-Facility Alternative

Minnesota Rule 7849.0300 requires detailed information regarding the consequences of delay on three specific statistically based levels of demand and energy consumption. Minnesota Rule 7849.0340 requires a discussion of what the impact would be on existing generation and transmission facilities at the three levels of demand specified in part 7849.0300 for the no-build alternative. As the project is

[3] Docket Nos. E015/RP-21-33 and E015/CIP-20-476.

[4] Docket No. E015/CN-12-1163.

needed specifically due to peak demand issues, the Applicant requests an exemption so as to only provide data at the peak demand level.

The Department agrees with the Applicant that the proposed data, focusing on peak demand is relevant to the claimed need and that the other data is extraneous. Therefore, the Department recommends that the Commission grant the exemption to Minnesota Rules 7849.0300 and 7849.0340 requiring the Applicant to only provide the required information for the peak demand level.

III. DEPARTMENT RECOMMENDATION

The Department recommends that the Commission approve the Applicant's requests for exemption from the required data conditioned upon the provision of the proposed alternative data, with the exceptions of requiring the Applicant to provide data for Minnesota Rules 7849.0280 subpart A for the applicable load area and for Minnesota Rules 7849.0270, subp 2(C) and 2(D), for which the Department requests that the Applicant further explain what kinds of data MP proposes to provide when it references "data actually utilized in studying and planning the Project."

COMMERCE DEPARTMENT

December 12, 2022

Will Seuffert
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, Minnesota 55101-2147

RE: **Comments of the Minnesota Department of Commerce, Division of Energy Resources**
Docket No. E015/CN-22-607

Dear Mr. Seuffert:

Attached are the comments of the Minnesota Department of Commerce, Division of Energy Resources (Department) in the following matter:

> Notice Plan Petition for the Application of Minnesota Power for a Certificate of Need for the HVDC Modernization Project.

The Petition was filed on behalf of Minnesota Power on November 30, 2022 by:

> David R. Moeller
> Senior Regulatory Counsel
> 30 West Superior Street
> Duluth, MN, 55802

The Department recommends that the Minnesota Public Utilities Commission (Commission) **approve the Company's proposed notice plan.** The Department is available to answer any questions the Commission may have.

Sincerely,

/s/ MICHAEL N. ZAJICEK
Rates Analyst

MNZ/ja
Attachment

Before the Minnesota Public Utilities Commission

Comments of the Minnesota Department of Commerce
Division of Energy Resources

Docket No. E015/CN-22-607

I. INTRODUCTION

On November 30, 2022, Minnesota Power (MP or the Applicant) filed a *Notice Plan Petition for the Application of Minnesota Power for a Certificate of Need for the HVDC Modernization Project* (Notice Petition). The Notice Petition provided the Applicant's proposed Notice Plan to communicate its intent to modernize the High-Voltage Direct-Current (HVDC) terminals by construct new buildings and electrical infrastructure on a new site near the existing terminals. This would additionally require the constructure of a new 345/230 kV substation less than one mile from the existing Arrowhead Substation, which would be connected by a less than one mile 345 kV large high-voltage transmission line (LHVTL) and two parallel 230 kV LHVTL less than one mile in length. Finally, a small portion of existing line would need to be reconfigured to terminate at the new HVDC terminal.

According to MP, the project is needed to modernize aging HVDC assets that are 15 years past their 30-year design life. Modernizing the HVDC system by replacing the terminals will improve reliability, reduce the frequency of outages, and the new facility will be designed to provide further services such as additional voltage regulations, frequency response, blackstart capability, and bidirectional power transfer capability. The Notice Petition includes a draft notice for landowners and residents, elected officials, tribal government contacts, and agencies within the Notice Area.

Below are the Comments of the Minnesota Department of Commerce, Division of Energy Resources, Energy Regulation and Planning (Department) on the Notice Petition.

II. DEPARTMENT ANALYSIS

The Department's Energy Environmental Review and Analysis Staff (EERA) may provide its own recommendations regarding the content of the notice letter; the following comments are the Department's Division of Energy Resources, Energy Regulation and Planning analysis on whether the Applicant's notice plan meets the statutory requirements.

A. TYPES OF NOTICE

Minnesota Rules 7829.2550, subp. 3 requires the following types of notice:

- direct mail notice, based on county tax assessment rolls, to landowners reasonably likely to be affected by the proposed transmission line;

- direct mail notice to all mailing addresses within the area reasonably likely to be affected by the proposed transmission line;
- direct mail notice to tribal governments and to the governments of towns, statutory cities, home rule charter cities, and counties whose jurisdictions are reasonably likely to be affected by the proposed transmission line; and
- newspaper notice to members of the public in areas reasonably likely to be affected by the proposed transmission line.

Regarding landowner and resident notice, the Applicant proposed to provide notice to landowners in the notice area via names and addresses obtained using County GIS data, which includes tax record information. The Department concludes that this is reasonable.

Regarding newspaper notice, the Applicant listed and selected three local newspapers to the newspaper notice list, and for the requirement for notice of the project in a newspaper of general circulation throughout the state Minnesota Power proposes to publish a notice in the StarTribune. The Department concludes that the Applicant's proposed plan for newspaper notice is reasonable.

Regarding governmental notice, the Department's review of the Applicant's list of governments proposed to receive notice complies with the requirements of the rule.

Regarding tribal governments, the Department's review of the Applicant's list of tribal governments proposed to receive notice complies with the requirements of the rule.

In summary, the Department concludes that the Applicant's Notice Plan for residents, landowners, newspapers, and governmental entities is reasonable after any recommended additions by EERA staff.

B. CONTENT OF NOTICE

Minnesota Rules 7829.2550, subp. 4 requires the notices to provide the following information:

- a map showing the end points of the line and existing transmission facilities in the area;
- a description of general right-of-way requirements for a line of the size and voltage proposed and a statement that the applicant intends to acquire property rights for the right-of-way that the proposed line will require;
- a notice that the line cannot be constructed unless the Minnesota Public Utilities Commission (Commission) certifies that it is needed;
- the Commission's mailing address, telephone number, and website;
- if the applicant is a utility subject to chapter 7848, the address of the website on which the utility applicant will post or has posted its biennial transmission projects report required under that chapter;

- a statement that the Environmental Quality Board[1] will be preparing an environmental report on each high-voltage transmission line for which certification is requested;
- a brief explanation of how to get on the mailing list for the Environmental Quality Board's proceeding; and
- a statement that requests for certification of high-voltage transmission lines are governed by Minnesota law, including specifically chapters 4410 and 7849, and Minnesota Statutes, section 216B.243.

The Department reviewed the cover letters and maps provided by the Applicant and concludes that the Applicant's proposal for the resident/landowner notice, governmental notice, and newspaper notice generally contains the required information and is acceptable after any edits recommended by EERA staff.

C. NOTICE TIMING

Minnesota Rules 7829.2550, subp. 6, requires the applicant to implement the Notice Plan within 30 days of its approval by the Commission. Regarding the timing of the implementation of the proposed Notice Plan, the Applicant requested that the Commission modify the notice implementation rule in order to allow implementation no more than 60 days and no less than two weeks prior to the filing of the Certificate of Need (CN) petition. The Commission has ordered a similar approach, in several dockets.[2]

Minnesota Rules 7829.3200 governs such variance requests and establishes the following criteria:

1. enforcement of the rule would impose an excessive burden upon the applicant or others affected by the rule;
2. granting the variance would not adversely affect the public interest; and
3. granting the variance would not conflict with standards imposed by law.

[1] The Department notes that while the statutes have changed regarding routing authority and location of the staff preparing the environmental report, Minnesota Rules have not yet been updated to reflect these changes.

[2] Examples include:
- November 3, 2006 in Docket No. E002, ET2, et al/CN-08-1115;
- November 29, 2007 in Docket No. E017, E015, ET6/CN-07-1222;
- November 12, 2008 in Docket No. E002/CN-08-992;
- January 26, 2010 in Docket No. E002/CN-09-1390; and
- August 17, 2010 in Docket No. E002/CN-10-694.
- February 4, 2013 in Docket No. E002/CN-12-1235
- January 15, 2021 in Docket No. IP-7041/CN-20-764

The Department concludes that enforcement of the rule would burden all parties involved by separating the provision of notice from the start of the proceeding. Granting the variance would not adversely affect the public interest since the Applicant's proposal would more closely tie the implementation of notice to the beginning of the CN proceeding. The Department is not aware that the variance would conflict with standards imposed by law. Therefore, the Department recommends that the Commission approve the Applicant's request to implement the notice plan no more than 60 days and no less than two weeks prior to the filing of the CN petition.

III. DEPARTMENT RECOMMENDATIONS

As discussed above, the Department recommends that the Commission approve the Applicant's proposed Notice Plan with any modifications recommended by EERA staff.

Further, the Department recommends that the Commission grant the Applicant a variance to Minnesota Rules 7829.2550, subp. 6 to allow implementation of the Notice Plan no more than 60 days prior to the filing of the CN petition.

CERTIFICATE OF SERVICE

I, Robin Benson, 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

Docket Number: **E-015/CN-22-607**

Dated this **1st** day of **February, 2023**

/s/ Robin Benson

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Sarah	Beimers	sarah.beimers@state.mn.us	Department of Administration - State Historic Preservation Office	50 Sherburne Avenue Suite 203 St. Paul, MN 55155	Electronic Service	No	OFF_SL_22-607_CN-22-607
David	Bell	david.bell@state.mn.us	Department of Health	POB 64975 St. Paul, MN 55164	Electronic Service	No	OFF_SL_22-607_CN-22-607
James J.	Bertrand	james.bertrand@stinson.com	STINSON LLP	50 S 6th St Ste 2600 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_22-607_CN-22-607
David	Birkholz	david.birkholz@state.mn.us	MN Department of Commerce	Suite 500 85 7th Place East St. Paul, MN 551012198	Electronic Service	No	OFF_SL_22-607_CN-22-607
Michelle F.	Bissonnette	michelle.bissonnette@hdrinc.com	HDR Engineering, Inc.	Golden Hills Office Center 701 Xenia Ave S Ste 600 Minneapolis, MN 55416	Electronic Service	No	OFF_SL_22-607_CN-22-607
B. Andrew	Brown	brown.andrew@dorsey.com	Dorsey & Whitney LLP	Suite 1500 50 South Sixth Street Minneapolis, MN 554021498	Electronic Service	No	OFF_SL_22-607_CN-22-607
Christina	Brusven	cbrusven@fredlaw.com	Fredrikson Byron	200 S 6th St Ste 4000 Minneapolis, MN 554021425	Electronic Service	No	OFF_SL_22-607_CN-22-607
PUC	CAO	consumer.puc@state.mn.us	Public Utilities Commission	Consumer Affairs Office 121 7th Place E Suite 350 St. Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607
Generic Notice	Commerce Attorneys	commerce.attorneys@ag.state.mn.us	Office of the Attorney General-DOC	445 Minnesota Street Suite 1400 St. Paul, MN 55101	Electronic Service	Yes	OFF_SL_22-607_CN-22-607
Bill	Cook	bcook@rpu.org	Rochester Public Utilities	4000 East River Road NE Rochester, MN 55906	Electronic Service	No	OFF_SL_22-607_CN-22-607

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
John	Crane	johncranefishing@gmail.com	Fishing	1250 Wee Gwaus DR SW Bemidji, MN 56601	Electronic Service	No	OFF_SL_22-607_CN-22-607
George	Crocker	gwillc@nawo.org	North American Water Office	PO Box 174 Lake Elmo, MN 55042	Electronic Service	No	OFF_SL_22-607_CN-22-607
Thomas	Davis	atdavis1972@outlook.com	-	1161 50th Ave Sherburn, MN 56171	Electronic Service	No	OFF_SL_22-607_CN-22-607
Patricia	DeBleeckere	tricia.debleeckere@state.mn.us	Public Utilities Commission	121 7th Pl E St 350 St. Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607
Randall	Doneen	randall.doneen@state.mn.us	Department of Natural Resources	500 Lafayette Rd, PO Box 25 Saint Paul, MN 55155	Electronic Service	No	OFF_SL_22-607_CN-22-607
John E.	Drawz	jdrawz@fredlaw.com	Fredrikson & Byron, P.A.	Suite 4000 200 South Sixth Street Minneapolis, MN 554021425	Electronic Service	No	OFF_SL_22-607_CN-22-607
Cory	Dutcher	cory.dutcher@ge.com	GE Power and Water	1 River Rd. Bldg. 37-413 Schenectady, NY 12345	Electronic Service	No	OFF_SL_22-607_CN-22-607
Kristen	Eide Tollefson	healingsystems69@gmail.com	R-CURE	28477 N Lake Ave Frontenac, MN 55026-1044	Electronic Service	No	OFF_SL_22-607_CN-22-607
Scott	Ek	scott.ek@state.mn.us	Public Utilities Commission	121 7th Place East Suite 350 St. Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607
Kate	Fairman	kate.frantz@state.mn.us	Department of Natural Resources	Box 32 500 Lafayette Rd St. Paul, MN 551554032	Electronic Service	No	OFF_SL_22-607_CN-22-607

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Annie	Felix Gerth	annie.felix-gerth@state.mn.us		Board of Water & Soil Resources 520 Lafayette Rd Saint Paul, MN 55155	Electronic Service	No	OFF_SL_22-607_CN-22-607
Sharon	Ferguson	sharon.ferguson@state.mn.us	Department of Commerce	85 7th Place E Ste 280 Saint Paul, MN 551012198	Electronic Service	No	OFF_SL_22-607_CN-22-607
Karen A	Gebhardt	kageb1@gvtel.com		43901 253rd Ave Leonard, MN 56652-4026	Electronic Service	No	OFF_SL_22-607_CN-22-607
Todd	Green	Todd.A.Green@state.mn.us	Minnesota Department of Labor & Industry	443 Lafayette Rd N St. Paul, MN 55155-4341	Electronic Service	No	OFF_SL_22-607_CN-22-607
Larry	Hartman	Larry.Hartman@state.mn.us	Department of Commerce	85 7th Place East, Suite 280 St. Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607
Valerie	Herring	vherring@taftlaw.com	Taft Stettinius & Hollister LLP	2200 IDS Center 80 S. Eighth Street Minneapolis, MN 55402	Electronic Service	No	OFF_SL_22-607_CN-22-607
Kari	Howe	kari.howe@state.mn.us	DEED	332 Minnesota St, #E200 1ST National Bank Bldg St. Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607
Scott	Johnson	Scott.Johnson@ci.medina.mn.us	City of Medina	2052 County Road 24 Medina, MN 55340-9790	Electronic Service	No	OFF_SL_22-607_CN-22-607
Michael	Kaluzniak	mike.kaluzniak@state.mn.us	Public Utilities Commission	Suite 350 121 Seventh Place East St. Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Tom	Karas	tomskaras@gmail.com		3171 309th Ave NW Cambridge, MN 55008	Electronic Service	No	OFF_SL_22-607_CN-22-607
Bruce	King	Brenda@ranww.org	Realtors, Association of Northwestern WI	Suite 3 1903 Keith Street Eau Claire, WI 54701	Electronic Service	No	OFF_SL_22-607_CN-22-607
Ray	Kirsch	Raymond.Kirsch@state.mn.us	Department of Commerce	85 7th Place E Ste 500 St. Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607
Chad	Konickson	chad.konickson@usace.army.mil	U.S.Army Corps of Engineers	180 5th St # 700 Saint Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607
Chris	Kopel	chrisk@CMPASgroup.org	Central Minnesota Municipal Power Agency	459 S Grove St Blue Earth, MN 56013-2629	Paper Service	No	OFF_SL_22-607_CN-22-607
Stacy	Kotch Egstad	Stacy.Kotch@state.mn.us	MINNESOTA DEPARTMENT OF TRANSPORTATION	395 John Ireland Blvd. St. Paul, MN 55155	Electronic Service	No	OFF_SL_22-607_CN-22-607
Karen	Kromar	karen.kromar@state.mn.us	MN Pollution Control Agency	520 Lafayette Rd Saint Paul, MN 55155	Electronic Service	No	OFF_SL_22-607_CN-22-607
Peter E.	Madsen	pmadsen@taftlaw.com	Taft Stettinius & Hollister LLP	2200 IDS Center 80 South 8th Street Minneapolis, MN 55402	Electronic Service	No	OFF_SL_22-607_CN-22-607
Dawn S	Marsh	dawn_marsh@fws.gov	U.S. Fish & Wildlife Service	Minnesota-Wisconsin Field Offices 4101 American Blvd E Bloomington, MN 55425	Electronic Service	No	OFF_SL_22-607_CN-22-607
Dan	McCourtney	dmccourtney@mnpower.com	Minnesota Power	30 West Superior St Duluth, MN 55802	Electronic Service	No	OFF_SL_22-607_CN-22-607

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
David	Moeller	dmoeller@allete.com	Minnesota Power	30 W Superior St Duluth, MN 558022093	Electronic Service	No	OFF_SL_22-607_CN-22-607
Andrew	Moratzka	andrew.moratzka@stoel.com	Stoel Rives LLP	33 South Sixth St Ste 4200 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_22-607_CN-22-607
Colleen	Mueller	N/A		22186 State Hwy 4 Paynesville, MN 56362	Paper Service	No	OFF_SL_22-607_CN-22-607
Dan	Nelson	Dan.Nelson@ISGinc.com	I&S Group	115 E Hickory St Ste 300 Mankato, MN 56001	Electronic Service	No	OFF_SL_22-607_CN-22-607
Carol A.	Overland	overland@legalectric.org	Legalectric - Overland Law Office	1110 West Avenue Red Wing, MN 55066	Electronic Service	No	OFF_SL_22-607_CN-22-607
Kevin	Peterson	kjp@ibew160.org	IBEW Local 160	1109 Northway Lane NE Rochester, MN 55906	Electronic Service	No	OFF_SL_22-607_CN-22-607
Angela	Piner	angela.piner@hdrinc.com	HDR, Inc.	Suite 600 701 Xenia Avenue South Suite 600 Minneapolis, MN 55416	Electronic Service	No	OFF_SL_22-607_CN-22-607
Larry	Rebman	larryemls@hotmail.com	EMLS, Inc	PO Box 122 Appleton, MN 56208	Electronic Service	No	OFF_SL_22-607_CN-22-607
Generic Notice	Residential Utilities Division	residential.utilities@ag.state.mn.us	Office of the Attorney General-RUD	1400 BRM Tower 445 Minnesota St St. Paul, MN 551012131	Electronic Service	Yes	OFF_SL_22-607_CN-22-607

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Margaret	Rheude	Margaret_Rheude@fws.gov	U.S. Fish and Wildlife Service	Twin Cities Ecological Services Field Office 4101 American Blvd. E. Bloomington, MN 55425	Electronic Service	No	OFF_SL_22-607_CN-22-607
Stephan	Roos	stephan.roos@state.mn.us	MN Department of Agriculture	625 Robert St N Saint Paul, MN 55155-2538	Electronic Service	No	OFF_SL_22-607_CN-22-607
Christine	Schwartz	Regulatory.records@xcelenergy.com	Xcel Energy	414 Nicollet Mall FL 7 Minneapolis, MN 554011993	Electronic Service	No	OFF_SL_22-607_CN-22-607
Will	Seuffert	Will.Seuffert@state.mn.us	Public Utilities Commission	121 7th Pl E Ste 350 Saint Paul, MN 55101	Electronic Service	Yes	OFF_SL_22-607_CN-22-607
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Adam	Sokolski	adam.sokolski@edf-re.com	EDF Renewable Energy	10 Second Street NE Ste 400 Minneapolis, MN 55410	Electronic Service	No	OFF_SL_22-607_CN-22-607
Mark	Strohfus	mstrohfus@grenergy.com	Great River Energy	12300 Elm Creek Boulevard Maple Grove, MN 553694718	Electronic Service	No	OFF_SL_22-607_CN-22-607
Carl	Strohm	cjsmg@sbcglobal.net	SBC Global	105 East Edgewood Ave Indianapolis, IN 46227	Electronic Service	No	OFF_SL_22-607_CN-22-607
Tom	Swafford	tswafford@umsi.us	Utility Mapping Services, Inc	3947 E Calvary Rd Suite 103 Duluth, MN 55803	Electronic Service	No	OFF_SL_22-607_CN-22-607

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Eric	Swanson	eswanson@winthrop.com	Winthrop & Weinstine	225 S 6th St Ste 3500 Capella Tower Minneapolis, MN 554024629	Electronic Service	No	OFF_SL_22-607_CN-22-607
Todd	Tadych	ttadych@atcllc.com	American Transmission Company LLC	5303 Fen Oak Dr Madison, WI 53718	Electronic Service	No	OFF_SL_22-607_CN-22-607
Jayme	Trusty	execdir@swrdc.org	SWRDC	2401 Broadway Ave #1 Slayton, MN 56172	Electronic Service	No	OFF_SL_22-607_CN-22-607
Jen	Tyler	tyler.jennifer@epa.gov	US Environmental Protection Agency	Environmental Planning & Evaluation Unit 77 W Jackson Blvd. Mailstop B-19J Chicago, IL 60604-3590	Electronic Service	No	OFF_SL_22-607_CN-22-607
Kodi	Verhalen	kverhalen@taftlaw.com	Taft Stettinius & Hollister LLP	80 S 8th St Ste 2200 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_22-607_CN-22-607
Caren	Warner	caren.warner@state.mn.us	Department of Commerce	85 7th Place East Suite 280 St. Paul, MN 55101-2198	Electronic Service	No	OFF_SL_22-607_CN-22-607
Cynthia	Warzecha	cynthia.warzecha@state.mn.us	Minnesota Department of Natural Resources	500 Lafayette Road Box 25 St. Paul, Minnesota 55155-4040	Electronic Service	No	OFF_SL_22-607_CN-22-607
Elizabeth	Wefel	eawefel@flaherty-hood.com	Flaherty & Hood, P.A.	525 Park St Ste 470 Saint Paul, MN 55103	Electronic Service	No	OFF_SL_22-607_CN-22-607
Alan	Whipple	sa.property@state.mn.us	Minnesota Department Of Revenue	Property Tax Division 600 N. Robert Street St. Paul, MN 551463340	Electronic Service	No	OFF_SL_22-607_CN-22-607

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Deanna	White	mncwa@cleanwater.org	Clean Water Action & Water Fund of MN	330 S 2nd Ave Ste 420 Minneapolis, MN 55401	Electronic Service	No	OFF_SL_22-607_CN-22-607
Jonathan	Wolfgram	Jonathan.Wolfgram@state.mn.us	Office of Pipeline Safety	445 Minnesota St Ste 147 Woodbury, MN 55125	Electronic Service	No	OFF_SL_22-607_CN-22-607

BEFORE THE MINNESOTA PUBLIC UTILITIES COMMISSION

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

David R. Moeller
Senior Regulatory Counsel
Minnesota Power
30 West Superior Street Duluth, MN, 55802

SERVICE DATE: February 14, 2023

DOCKET NO. E-015/CN-22-607

In the Matter of the Application of Minnesota Power for a Certificate of Need for the HVDC Modernization Project

The above-entitled matter has been considered by the Commission and the following disposition made:

1. **Approved the Applicant's proposed Notice Plan with modifications recommended by EERA staff.**

2. **Granted the Applicant a variance to Minnesota Rules 7829.2550, subp. 6 to allow implementation of the Notice Plan no more than 60 days prior to the filing of the Certificate of Need petition.**

This decision is issued by the Commission's consent calendar subcommittee, under a delegation of authority granted under Minn. Stat. § 216A.03, subd. 8 (a). Unless a party, a participant, or a Commissioner files an objection to this decision within ten days of receiving it, it will become the Order of the full Commission under Minn. Stat. § 216A.03, subd. 8 (b).

The Commission agrees with and adopts the recommendations of the Department of Commerce, which are attached and hereby incorporated into the Order.

BY ORDER OF THE COMMISSION

Will Seuffert
Executive Secretary

To request this document in another format such as large print or audio, call 651.296.0406 (voice). Persons with a hearing or speech impairment may call using their preferred Telecommunications Relay Service or email consumer.puc@state.mn.us for assistance.

COMMERCE DEPARTMENT

December 12, 2022

Will Seuffert
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, Minnesota 55101-2147

RE: **Comments of the Minnesota Department of Commerce, Division of Energy Resources**
Docket No. E015/CN-22-607

Dear Mr. Seuffert:

Attached are the comments of the Minnesota Department of Commerce, Division of Energy Resources (Department) in the following matter:

> Notice Plan Petition for the Application of Minnesota Power for a Certificate of Need for the HVDC Modernization Project.

The Petition was filed on behalf of Minnesota Power on November 30, 2022 by:

> David R. Moeller
> Senior Regulatory Counsel
> 30 West Superior Street
> Duluth, MN, 55802

The Department recommends that the Minnesota Public Utilities Commission (Commission) **approve the Company's proposed notice plan.** The Department is available to answer any questions the Commission may have.

Sincerely,

/s/ MICHAEL N. ZAJICEK
Rates Analyst

MNZ/ja
Attachment

Before the Minnesota Public Utilities Commission

Comments of the Minnesota Department of Commerce
Division of Energy Resources

Docket No. E015/CN-22-607

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Regarding tribal governments, the Department's review of the Applicant's list of tribal governments proposed to receive notice complies with the requirements of the rule.

In summary, the Department concludes that the Applicant's Notice Plan for residents, landowners, newspapers, and governmental entities is reasonable after any recommended additions by EERA staff.

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- a notice that the line cannot be constructed unless the Minnesota Public Utilities Commission (Commission) certifies that it is needed;
- the Commission's mailing address, telephone number, and website;
- if the applicant is a utility subject to chapter 7848, the address of the website on which the utility applicant will post or has posted its biennial transmission projects report required under that chapter;

- a statement that the Environmental Quality Board[1] will be preparing an environmental report on each high-voltage transmission line for which certification is requested;
- a brief explanation of how to get on the mailing list for the Environmental Quality Board's proceeding; and
- a statement that requests for certification of high-voltage transmission lines are governed by Minnesota law, including specifically chapters 4410 and 7849, and Minnesota Statutes, section 216B.243.

The Department reviewed the cover letters and maps provided by the Applicant and concludes that the Applicant's proposal for the resident/landowner notice, governmental notice, and newspaper notice generally contains the required information and is acceptable after any edits recommended by EERA staff.

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1. enforcement of the rule would impose an excessive burden upon the applicant or others affected by the rule;
2. granting the variance would not adversely affect the public interest; and
3. granting the variance would not conflict with standards imposed by law.

[1] The Department notes that while the statutes have changed regarding routing authority and location of the staff preparing the environmental report, Minnesota Rules have not yet been updated to reflect these changes.

[2] Examples include:
- November 3, 2006 in Docket No. E002, ET2, et al/CN-08-1115;
- November 29, 2007 in Docket No. E017, E015, ET6/CN-07-1222;
- November 12, 2008 in Docket No. E002/CN-08-992;
- January 26, 2010 in Docket No. E002/CN-09-1390; and
- August 17, 2010 in Docket No. E002/CN-10-694.
- February 4, 2013 in Docket No. E002/CN-12-1235
- January 15, 2021 in Docket No. IP-7041/CN-20-764

The Department concludes that enforcement of the rule would burden all parties involved by separating the provision of notice from the start of the proceeding. Granting the variance would not adversely affect the public interest since the Applicant's proposal would more closely tie the implementation of notice to the beginning of the CN proceeding. The Department is not aware that the variance would conflict with standards imposed by law. Therefore, the Department recommends that the Commission approve the Applicant's request to implement the notice plan no more than 60 days and no less than two weeks prior to the filing of the CN petition.

III. DEPARTMENT RECOMMENDATIONS

As discussed above, the Department recommends that the Commission approve the Applicant's proposed Notice Plan with any modifications recommended by EERA staff.

Further, the Department recommends that the Commission grant the Applicant a variance to Minnesota Rules 7829.2550, subp. 6 to allow implementation of the Notice Plan no more than 60 days prior to the filing of the CN petition.

CERTIFICATE OF SERVICE

I, Leesa Norton, 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

Docket Number E-015/CN-22-607

Dated this 14th day of February, 2023

/s/ Leesa Norton

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Sarah	Beimers	sarah.beimers@state.mn.us	Department of Administration - State Historic Preservation Office	50 Sherburne Avenue Suite 203 St. Paul, MN 55155	Electronic Service	No	OFF_SL_22-607_CN-22-607
David	Bell	david.bell@state.mn.us	Department of Health	POB 64975 St. Paul, MN 55164	Electronic Service	No	OFF_SL_22-607_CN-22-607
James J.	Bertrand	james.bertrand@stinson.com	STINSON LLP	50 S 6th St Ste 2600 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_22-607_CN-22-607
David	Birkholz	david.birkholz@state.mn.us	MN Department of Commerce	Suite 500 85 7th Place East St. Paul, MN 551012198	Electronic Service	No	OFF_SL_22-607_CN-22-607
Michelle F.	Bissonnette	michelle.bissonnette@hdrinc.com	HDR Engineering, Inc.	Golden Hills Office Center 701 Xenia Ave S Ste 600 Minneapolis, MN 55416	Electronic Service	No	OFF_SL_22-607_CN-22-607
B. Andrew	Brown	brown.andrew@dorsey.com	Dorsey & Whitney LLP	Suite 1500 50 South Sixth Street Minneapolis, MN 554021498	Electronic Service	No	OFF_SL_22-607_CN-22-607
Christina	Brusven	cbrusven@fredlaw.com	Fredrikson Byron	200 S 6th St Ste 4000 Minneapolis, MN 554021425	Electronic Service	No	OFF_SL_22-607_CN-22-607
PUC	CAO	consumer.puc@state.mn.us	Public Utilities Commission	Consumer Affairs Office 121 7th Place E Suite 350 St. Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607
Generic Notice	Commerce Attorneys	commerce.attorneys@ag.state.mn.us	Office of the Attorney General-DOC	445 Minnesota Street Suite 1400 St. Paul, MN 55101	Electronic Service	Yes	OFF_SL_22-607_CN-22-607
Bill	Cook	bcook@rpu.org	Rochester Public Utilities	4000 East River Road NE Rochester, MN 55906	Electronic Service	No	OFF_SL_22-607_CN-22-607

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
John	Crane	johncranefishing@gmail.com	Fishing	1250 Wee Gwaus DR SW Bemidji, MN 56601	Electronic Service	No	OFF_SL_22-607_CN-22-607
George	Crocker	gwillc@nawo.org	North American Water Office	PO Box 174 Lake Elmo, MN 55042	Electronic Service	No	OFF_SL_22-607_CN-22-607
Thomas	Davis	atdavis1972@outlook.com	-	1161 50th Ave Sherburn, MN 56171	Electronic Service	No	OFF_SL_22-607_CN-22-607
Patricia	DeBleeckere	tricia.debleeckere@state.mn.us	Public Utilities Commission	121 7th Pl E St 350 St. Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607
Randall	Doneen	randall.doneen@state.mn.us	Department of Natural Resources	500 Lafayette Rd, PO Box 25 Saint Paul, MN 55155	Electronic Service	No	OFF_SL_22-607_CN-22-607
John E.	Drawz	jdrawz@fredlaw.com	Fredrikson & Byron, P.A.	Suite 4000 200 South Sixth Street Minneapolis, MN 554021425	Electronic Service	No	OFF_SL_22-607_CN-22-607
Cory	Dutcher	cory.dutcher@ge.com	GE Power and Water	1 River Rd. Bldg. 37-413 Schenectady, NY 12345	Electronic Service	No	OFF_SL_22-607_CN-22-607
Kristen	Eide Tollefson	healingsystems69@gmail.com	R-CURE	28477 N Lake Ave Frontenac, MN 55026-1044	Electronic Service	No	OFF_SL_22-607_CN-22-607
Scott	Ek	scott.ek@state.mn.us	Public Utilities Commission	121 7th Place East Suite 350 St. Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607
Kate	Fairman	kate.frantz@state.mn.us	Department of Natural Resources	Box 32 500 Lafayette Rd St. Paul, MN 551554032	Electronic Service	No	OFF_SL_22-607_CN-22-607

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Annie	Felix Gerth	annie.felix-gerth@state.mn.us		Board of Water & Soil Resources 520 Lafayette Rd Saint Paul, MN 55155	Electronic Service	No	OFF_SL_22-607_CN-22-607
Sharon	Ferguson	sharon.ferguson@state.mn.us	Department of Commerce	85 7th Place E Ste 280 Saint Paul, MN 551012198	Electronic Service	No	OFF_SL_22-607_CN-22-607
Karen A	Gebhardt	kageb1@gvtel.com		43901 253rd Ave Leonard, MN 56652-4026	Electronic Service	No	OFF_SL_22-607_CN-22-607
Todd	Green	Todd.A.Green@state.mn.us	Minnesota Department of Labor & Industry	443 Lafayette Rd N St. Paul, MN 55155-4341	Electronic Service	No	OFF_SL_22-607_CN-22-607
Larry	Hartman	Larry.Hartman@state.mn.us	Department of Commerce	85 7th Place East, Suite 280 St. Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607
Valerie	Herring	vherring@taftlaw.com	Taft Stettinius & Hollister LLP	2200 IDS Center 80 S. Eighth Street Minneapolis, MN 55402	Electronic Service	No	OFF_SL_22-607_CN-22-607
Kari	Howe	kari.howe@state.mn.us	DEED	332 Minnesota St, #E200 1ST National Bank Bldg St. Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607
Scott	Johnson	Scott.Johnson@ci.medina.mn.us	City of Medina	2052 County Road 24 Medina, MN 55340-9790	Electronic Service	No	OFF_SL_22-607_CN-22-607
Michael	Kaluzniak	mike.kaluzniak@state.mn.us	Public Utilities Commission	Suite 350 121 Seventh Place East St. Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Tom	Karas	tomskaras@gmail.com		3171 309th Ave NW Cambridge, MN 55008	Electronic Service	No	OFF_SL_22-607_CN-22-607
Bruce	King	Brenda@ranww.org	Realtors, Association of Northwestern WI	Suite 3 1903 Keith Street Eau Claire, WI 54701	Electronic Service	No	OFF_SL_22-607_CN-22-607
Ray	Kirsch	Raymond.Kirsch@state.mn.us	Department of Commerce	85 7th Place E Ste 500 St. Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607
Chad	Konickson	chad.konickson@usace.army.mil	U.S.Army Corps of Engineers	180 5th St # 700 Saint Paul, MN 55101	Electronic Service	No	OFF_SL_22-607_CN-22-607
Chris	Kopel	chrisk@CMPASgroup.org	Central Minnesota Municipal Power Agency	459 S Grove St Blue Earth, MN 56013-2629	Paper Service	No	OFF_SL_22-607_CN-22-607
Stacy	Kotch Egstad	Stacy.Kotch@state.mn.us	MINNESOTA DEPARTMENT OF TRANSPORTATION	395 John Ireland Blvd. St. Paul, MN 55155	Electronic Service	No	OFF_SL_22-607_CN-22-607
Karen	Kromar	karen.kromar@state.mn.us	MN Pollution Control Agency	520 Lafayette Rd Saint Paul, MN 55155	Electronic Service	No	OFF_SL_22-607_CN-22-607
Peter E.	Madsen	pmadsen@taftlaw.com	Taft Stettinius & Hollister LLP	2200 IDS Center 80 South 8th Street Minneapolis, MN 55402	Electronic Service	No	OFF_SL_22-607_CN-22-607
Dawn S	Marsh	dawn_marsh@fws.gov	U.S. Fish & Wildlife Service	Minnesota-Wisconsin Field Offices 4101 American Blvd E Bloomington, MN 55425	Electronic Service	No	OFF_SL_22-607_CN-22-607
Dan	McCourtney	dmccourtney@mnpower.com	Minnesota Power	30 West Superior St Duluth, MN 55802	Electronic Service	No	OFF_SL_22-607_CN-22-607

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
David	Moeller	dmoeller@allete.com	Minnesota Power	30 W Superior St Duluth, MN 558022093	Electronic Service	No	OFF_SL_22-607_CN-22-607
Andrew	Moratzka	andrew.moratzka@stoel.com	Stoel Rives LLP	33 South Sixth St Ste 4200 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_22-607_CN-22-607
Colleen	Mueller	N/A		22186 State Hwy 4 Paynesville, MN 56362	Paper Service	No	OFF_SL_22-607_CN-22-607
Dan	Nelson	Dan.Nelson@ISGinc.com	I&S Group	115 E Hickory St Ste 300 Mankato, MN 56001	Electronic Service	No	OFF_SL_22-607_CN-22-607
Carol A.	Overland	overland@legalectric.org	Legalectric - Overland Law Office	1110 West Avenue Red Wing, MN 55066	Electronic Service	No	OFF_SL_22-607_CN-22-607
Kevin	Peterson	kjp@ibew160.org	IBEW Local 160	1109 Northway Lane NE Rochester, MN 55906	Electronic Service	No	OFF_SL_22-607_CN-22-607
Angela	Piner	angela.piner@hdrinc.com	HDR, Inc.	Suite 600 701 Xenia Avenue South Suite 600 Minneapolis, MN 55416	Electronic Service	No	OFF_SL_22-607_CN-22-607
Larry	Rebman	larryemls@hotmail.com	EMLS, Inc	PO Box 122 Appleton, MN 56208	Electronic Service	No	OFF_SL_22-607_CN-22-607
Generic Notice	Residential Utilities Division	residential.utilities@ag.state.mn.us	Office of the Attorney General-RUD	1400 BRM Tower 445 Minnesota St St. Paul, MN 551012131	Electronic Service	Yes	OFF_SL_22-607_CN-22-607

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Margaret	Rheude	Margaret_Rheude@fws.gov	U.S. Fish and Wildlife Service	Twin Cities Ecological Services Field Office 4101 American Blvd. E. Bloomington, MN 55425	Electronic Service	No	OFF_SL_22-607_CN-22-607
Stephan	Roos	stephan.roos@state.mn.us	MN Department of Agriculture	625 Robert St N Saint Paul, MN 55155-2538	Electronic Service	No	OFF_SL_22-607_CN-22-607
Christine	Schwartz	Regulatory.records@xcelenergy.com	Xcel Energy	414 Nicollet Mall FL 7 Minneapolis, MN 554011993	Electronic Service	No	OFF_SL_22-607_CN-22-607
Will	Seuffert	Will.Seuffert@state.mn.us	Public Utilities Commission	121 7th Pl E Ste 350 Saint Paul, MN 55101	Electronic Service	Yes	OFF_SL_22-607_CN-22-607
Tom	Slukich	tom@nationalconductor.com	National Conductor Constructors	18119 Hwy 371 North Brainderd, MN 56401	Electronic Service	No	OFF_SL_22-607_CN-22-607
Adam	Sokolski	adam.sokolski@edf-re.com	EDF Renewable Energy	10 Second Street NE Ste 400 Minneapolis, MN 55410	Electronic Service	No	OFF_SL_22-607_CN-22-607
Mark	Strohfus	mstrohfus@grenergy.com	Great River Energy	12300 Elm Creek Boulevard Maple Grove, MN 553694718	Electronic Service	No	OFF_SL_22-607_CN-22-607
Carl	Strohm	cjsmg@sbcglobal.net	SBC Global	105 East Edgewood Ave Indianapolis, IN 46227	Electronic Service	No	OFF_SL_22-607_CN-22-607
Tom	Swafford	tswafford@umsi.us	Utility Mapping Services, Inc	3947 E Calvary Rd Suite 103 Duluth, MN 55803	Electronic Service	No	OFF_SL_22-607_CN-22-607

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Eric	Swanson	eswanson@winthrop.com	Winthrop & Weinstine	225 S 6th St Ste 3500 Capella Tower Minneapolis, MN 554024629	Electronic Service	No	OFF_SL_22-607_CN-22-607
Todd	Tadych	ttadych@atcllc.com	American Transmission Company LLC	5303 Fen Oak Dr Madison, WI 53718	Electronic Service	No	OFF_SL_22-607_CN-22-607
Jayme	Trusty	execdir@swrdc.org	SWRDC	2401 Broadway Ave #1 Slayton, MN 56172	Electronic Service	No	OFF_SL_22-607_CN-22-607
Jen	Tyler	tyler.jennifer@epa.gov	US Environmental Protection Agency	Environmental Planning & Evaluation Unit 77 W Jackson Blvd. Mailstop B-19J Chicago, IL 60604-3590	Electronic Service	No	OFF_SL_22-607_CN-22-607
Kodi	Verhalen	kverhalen@taftlaw.com	Taft Stettinius & Hollister LLP	80 S 8th St Ste 2200 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_22-607_CN-22-607
Caren	Warner	caren.warner@state.mn.us	Department of Commerce	85 7th Place East Suite 280 St. Paul, MN 55101-2198	Electronic Service	No	OFF_SL_22-607_CN-22-607
Cynthia	Warzecha	cynthia.warzecha@state.mn.us	Minnesota Department of Natural Resources	500 Lafayette Road Box 25 St. Paul, Minnesota 55155-4040	Electronic Service	No	OFF_SL_22-607_CN-22-607
Elizabeth	Wefel	eawefel@flaherty-hood.com	Flaherty & Hood, P.A.	525 Park St Ste 470 Saint Paul, MN 55103	Electronic Service	No	OFF_SL_22-607_CN-22-607
Alan	Whipple	sa.property@state.mn.us	Minnesota Department Of Revenue	Property Tax Division 600 N. Robert Street St. Paul, MN 551463340	Electronic Service	No	OFF_SL_22-607_CN-22-607

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Deanna	White	mncwa@cleanwater.org	Clean Water Action & Water Fund of MN	330 S 2nd Ave Ste 420 Minneapolis, MN 55401	Electronic Service	No	OFF_SL_22-607_CN-22-607
Jonathan	Wolfgram	Jonathan.Wolfgram@state.mn.us	Office of Pipeline Safety	445 Minnesota St Ste 147 Woodbury, MN 55125	Electronic Service	No	OFF_SL_22-607_CN-22-607

Appendix F

90-day Pre-Application Letter to Local Units of Government and Affidavits of Mailing

AFFIDAVIT OF MAILING

In the Matter of the Application for a Certificate of Need and Route Permit for the HVDC Modernization Project in St. Louis County

PUC Docket No. CN-22-607/TL-22-611

STATE OF MINNESOTA)
) SS.
COUNTY OF HENNEPIN)

I, Daniel S. Flo, hereby certify that on the 30th day of November 2022, I directed to be sent via U.S. Mail a true and correct copy of the 90-Day Pre-Application LGU Notice Letter attached hereto as Exhibit 1 to all Local Government Units on the mailing list attached hereto as Exhibit 2.

MELISSA ADELE DELLWO
NOTARY PUBLIC
MINNESOTA
My Commission Expires 1-31-24

Daniel S. Flo

Subscribed and sworn to before me
this 10th day of January 2023.

Notary Public

minnesota power
AN ALLETE COMPANY

November 30, 2022 **VIA U.S. Mail**

Re: Notice of Availability for Meeting: Meeting Minn. Stat § 216E.03, subd. 3a

In the Matter of the Application of Minnesota Power for a Certificate of Need for the HVDC Modernization Project.
MPUC Docket No. E015/CN-22-607

In the Matter of the Application of Minnesota Power for a Route Permit for the HVDC Modernization Project.
MPUC Docket No. E015/TL-22-611

Dear Local Government Official,

Minnesota Power (also the "Company") is proposing to construct a project known as the HVDC Modernization Project (also the "Project"). The Project involves modernizing and upgrading the existing High Voltage Direct Current ("HVDC") terminals for Minnesota Power's HVDC Line, which are currently located near the Arrowhead Substation in Hermantown, Minnesota and the Center HVDC Substation in Center, North Dakota. This proposed modernization project will require the construction of new terminals and short transmission line segments in both States, near the existing stations. The Minnesota Portion of the HVDC Modernization Project is regulated by the Minnesota Public Utilities Commission ("Commission").

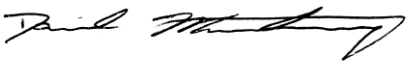
The HVDC Modernization Project is needed to modernize aging HVDC assets, continue to position the transmission grid for clean energy transition, and improve the reliability of the transmission system in Minnesota and North Dakota. The existing HVDC terminal has operated for 45 years, 15 years in excess of its 30-year design life. In recent years Minnesota Power has experienced HVDC terminal outages due to failures in the control system, power electronics, transformers, and other components. The orderly replacement of the HVDC terminal equipment is prudent to ensure continuous efficient delivery (and potential expansion) of Minnesota Power's renewable, carbon-free energy resources into the future.

In order to modernize the HVDC terminals and implement the latest technology, new buildings and electrical infrastructure need to be constructed on a new site near the existing HVDC terminals. In Minnesota, to connect the new HVDC terminal to the existing AC system, the Project would require the construction of a new St Louis County 345 kilovolt ("kV")/230 kV substation located less than one mile west of the current Arrowhead Substation. The new HVDC terminal would be connected to the St Louis County Substation by less than one mile of 345 kV large high-voltage transmission line ("LHVTL") and the new St Louis County Substation would be connected to the existing Arrowhead Substation by two parallel 230 kV LHVTLs less than one mile in length. Additionally, a short portion of the existing ±250 kV HVDC Line in Minnesota will need to be reconfigured to terminate at the new HVDC terminal. The Project is currently scheduled to be in service in 2027.

Two approvals must be obtained from the Commission before high voltage transmission lines and associated facilities like the proposed Project can be built: a Certificate of Need and a Route Permit. In the Certificate of Need proceeding, the Commission determines whether a proposed transmission line project is needed and the appropriate size, configuration, and timing. If the Commission determines that the Project is needed, the Commission will then determine the route for the proposed transmission lines. There are multiple opportunities for public and stakeholder input in these proceedings. Minnesota Power plans to submit a joint application for a Certificate of Need and Route Permit to the Commission in the first quarter of 2023.

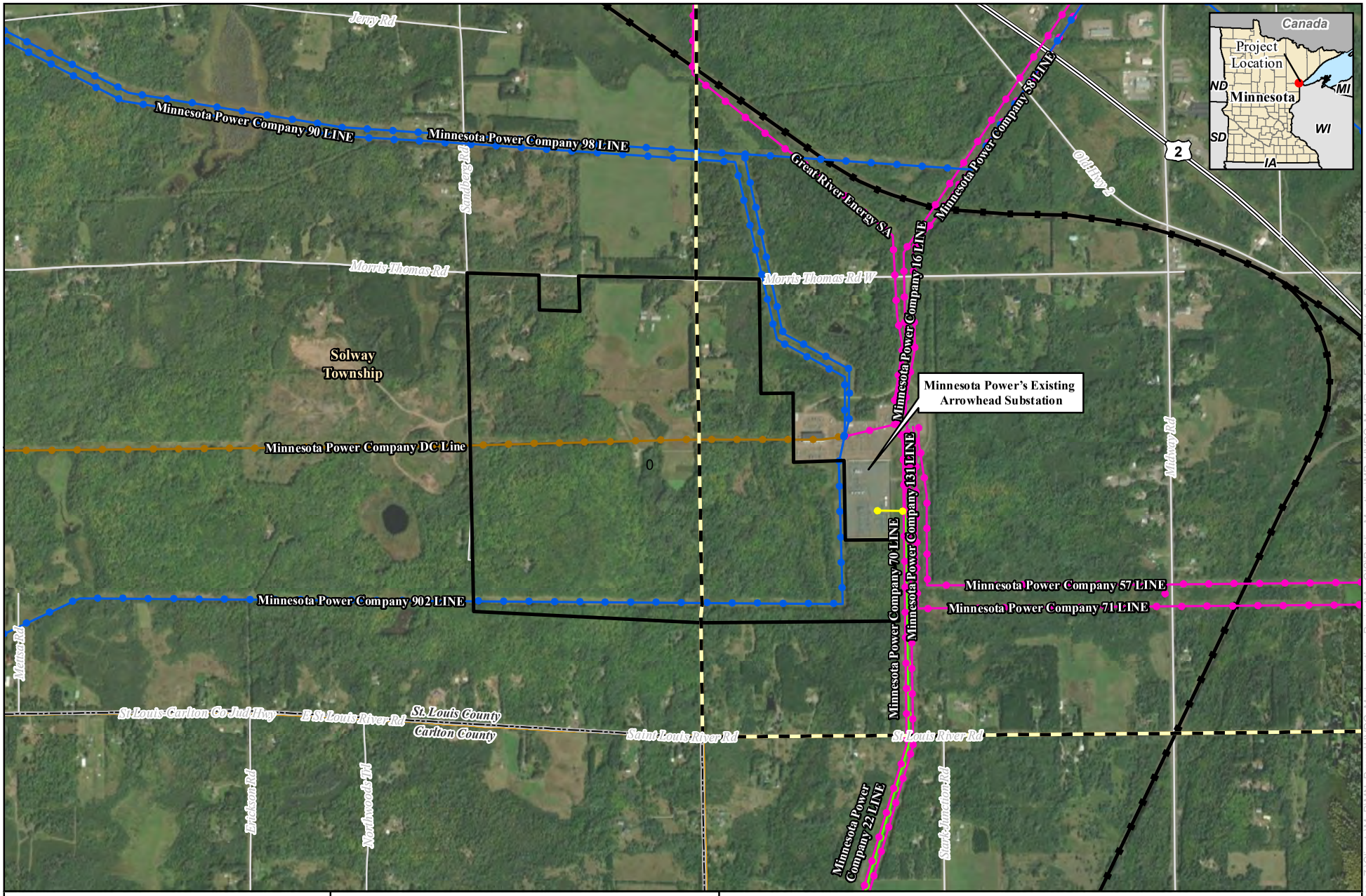
Minnesota Power has started gathering stakeholder, agency, tribal, and public input on the Project through letters, meetings, and open houses. Minnesota Statute § 216E.03, subd. 3b provides local units of government the opportunity to request a consultation meeting regarding the proposed Project prior to the submission of an application to the Commission. If you would like to request a meeting, please contact me at (218) 355-3515 or dmccourtney@mnpower.com. I am happy to discuss any questions that you may have about the Project. Additional information about the Project can also be found on the Company's EnergyForward website at: https://www.mnpower.com/energyforward.

Sincerely,



Dan McCourtney
Environmental and Land Manager
ALLETE Inc.

Enclosures Project Overview Map



0 750 1,500 Feet

1 inch = 1,500 feet

N W E S

For Environmental Review Purposes Only

HVDC Modernization Project

Minnesota Power

Project Area

St. Louis County, Minnesota

- Minnesota Power's Project Study Area
- County Boundary
- Municipal Boundary
- Existing 115 kV Transmission Line
- Existing 230 kV Transmission Line
- Existing 250 kV Transmission Line
- Existing 345 kV Transmission Line
- Existing 345kV/115 kV Transmission Line
- Railroad

Source: Z:\Clients\M_P\MN_Power\HVDC_Modernization_Project\ArcGIS\Public_Meeting\MP_HVDC_ModProj_East_Exhibit_A_Poster_letter.mxd

Date: (11/30/2022)

HVDC MODERNIZATION PROJECT CERTIFICATE OF NEED 90 LGU NOTICE CONTACT LIST

ORGANIZATION	NAME	TITLE	ADDRESS	CITY	STATE	ZIP CODE
County Commissioners						
St. Louis County	Annie Harala	Commissioner (1st District)	100 North 5th Avenue West	Duluth	MN	55802
St. Louis County	Patrick Boyle	Commissioner (2nd District)	100 North 5th Avenue West	Duluth	MN	55802
St. Louis County	Ashley Grimm	Commissioner (3rd District)	100 North 5th Avenue West, Room 202	Duluth	MN	55802
St. Louis County	Paul McDonald	Commissioner (4th District)	100 North 5th Avenue West	Duluth	MN	55802
St. Louis County	Keith Musolf	Commissioner (5th District)	100 North 5th Avenue West	Duluth	MN	55802
St. Louis County	Keith Nelson	Commissioner (6th District)	100 North 5th Avenue West	Duluth	MN	55802
County Agencies						
St. Louis County	Kevin Gray	Administrator	100 North 5th Avenue West, Room 202	Duluth	MN	55802
St. Louis County	Matthew Johnson	Planning & Community Development Director	100 North 5th Avenue West	Duluth	MN	55802
St. Louis County	Jim Foldesi	Public Works Director/Highway Engineer	100 North 5th Avenue West	Duluth	MN	55802
St. Louis County	Matthew Johnson	Economic Development Director	320 West 2nd Street, Suite 301	Duluth	MN	55802
St. Louis County Historical Society	JoAnne Coombe	Executive Director	506 West Michigan Street	Duluth	MN	55802
South St. Louis County Soil and Water Conservation District	Tim Beaster	Conservation Specialist	100 North 5th Avenue West	Duluth	MN	55802
South St. Louis County Soil and Water Conservation District	R.C. Boheim	District Manager	215 North 1st Avenue East, Room 301	Duluth	MN	55802
Cities						
City of Hermantown	Wayne Boucher	Mayor	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	John Geiessler	Council Member	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	Gloria Nelson	Council Members	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	Bonnie Engseth	City Clerk	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	John Mulder	City Manager / Administrator	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	Joe Wicklund	Communications & Community Engagement Mgr.	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	Eric Johnson	Community Development Director	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	Paul Senst	Public Works Director	5105 Maple Grove Road	Hermantown	MN	55811
City of Hermantown	Josh Bergstad	Wetland LGU	5105 Maple Grove Road	Hermantown	MN	55811
Townships						
Solway Township	Scott Welsh	Town Board Chair	4029 Munger Shaw Road	Cloquet	MN	55720
Solway Township	Tami McGregor	Township Clerk	4029 Munger Shaw Road	Cloquet	MN	55720
State and Federal Legislators						
State Representative	Natalie Zeleznikar	House District 03B	343 State Office Building	St. Paul	MN	55155
State Senator	Grant Hauschild	Senate District 03	Minnesota Senate Bldg, Room 2221 95 University Avenue West	St. Paul	MN	55155
US House of Representatives	Pete Stauber	Representative - MN 8th District	5094 Miller Trunk Hwy, Suite 900	Hermantown	MN	55811
US Senate	Amy Klobuchar	US Senator	Olcott Plaza, Room 105 820 9th Street North	Virginia	MN	55792
US Senate	Tina Smith	US Senator	60 Plato Blvd, Suite #220	St. Paul	MN	55107

Appendix G

Notice of Intent to File a Route Permit Application under the Alternative Route Permit Process

November 30, 2022

VIA ELECTRONIC FILING

Will Seuffert
Executive Secretary
Minnesota Public Utilities Commission
350 Metro Square Building
121 Seventh Place East
St. Paul, MN 55101

Re: *Notification of Intent to File a Route Permit Application for the HVDC Modernization Project Pursuant to the Alternative Permitting Process*
MPUC Docket No. E015/TL-22-___

Dear Mr. Seuffert:

In accordance with Minn. R. 7850.2800, subp. 2, Minnesota Power hereby notifies the Minnesota Public Utilities Commission ("Commission") of its intent to submit an application for a Route Permit to modernize and upgrade its existing High-Voltage Direct-Current ("HVDC") terminal near the Arrowhead Substation located in Hermantown Minnesota (the "HVDC Modernization Project" or "Project") following the alternative permitting proceedings set forth in Minn. R. 7850.2800 to 7850.3900.

The Project would require modernizing and upgrading both HVDC terminals for the 465-mile-long HVDC transmission line ("HVDC Line") and interconnecting the upgraded HVDC terminals to the existing alternating-current ("AC") transmission system. These HVDC terminals are currently located near the Arrowhead Substation in Hermantown, Minnesota and the Center Substation in Center, North Dakota. To modernize the HVDC terminals and implement the latest technology, new buildings and electrical infrastructure need to be constructed on a new site near the existing HVDC terminals. In Minnesota, to connect the new HVDC terminal to the existing AC system, the Project would require the construction of a new St Louis County 345 kilovolt ("kV")/230 kV substation located less than one mile west of the current Arrowhead Substation. The new HVDC terminal would be connected to the St Louis County Substation by less than one mile of 345 kV large high-voltage transmission line ("LHVTL")[1] and the new St Louis County Substation would be connected to the existing Arrowhead Substation by two parallel 230 kV LHVTLs less than one mile in length. Additionally, a short portion of the existing ±250 kV HVDC Line in Minnesota will need to be reconfigured to terminate at the new HVDC terminal.

[1] As defined by Minn. Stat. § 216B.2421, subd. 2(2); Minn. R. 7849.0010, subp. 14. The exemption found in Minn. Stat. 216B.243, subd. 8(a)(4) for "a high-voltage transmission line of one mile or less required to connect a new or upgraded substation to an existing, new, or upgraded high-voltage transmission line" does not apply because the proposed LHVTL in Minnesota is greater than one mile in length.

Minnesota Power plans to file a combined Certificate of Need and Route Permit application in the winter of 2023. Minnesota Power will work with Commission and Minnesota Department of Commerce, Energy Environmental Review and Analysis ("EERA") staff to address any comments they may have in order to expedite application acceptance and completion of the environmental assessment.

If you have any questions, please feel free to contact me.

Sincerely,

Dan McCourtney
Environmental & Land Manager
Minnesota Power

cc: Bret Eknes, MPUC
Louise Miltich, DOC-EERA

IN THE MATTER OF THE APPLICATION OF MINNESOTA POWER FOR A ROUTE PERMIT FOR THE HVDC MODERNIZATION PROJECT PURSUANT TO THE ALTERNATIVE PERMITTING PROCESS

MPUC DOCKET NO. E015/TL-22-___

CERTIFICATE OF E-FILING

Roshelle L. Herstein certifies that on the 30th day of November, 2022, she filed a true and correct copy of Minnesota Power's **Notification of Intent to File a Route Permit Application for the HVDC Modernization Project Pursuant to the Alternative Permitting Process** via eDockets (www.edockets.state.mn.us). Said document is also sent via e-mail to the Minnesota Public Utilities Commission and the Minnesota Department of Commerce as follows:

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/s/ Roshelle L. Herstein
Roshelle L. Herstein

Appendix H

EJ Screen Report

EJScreen Report (Version 2.0)

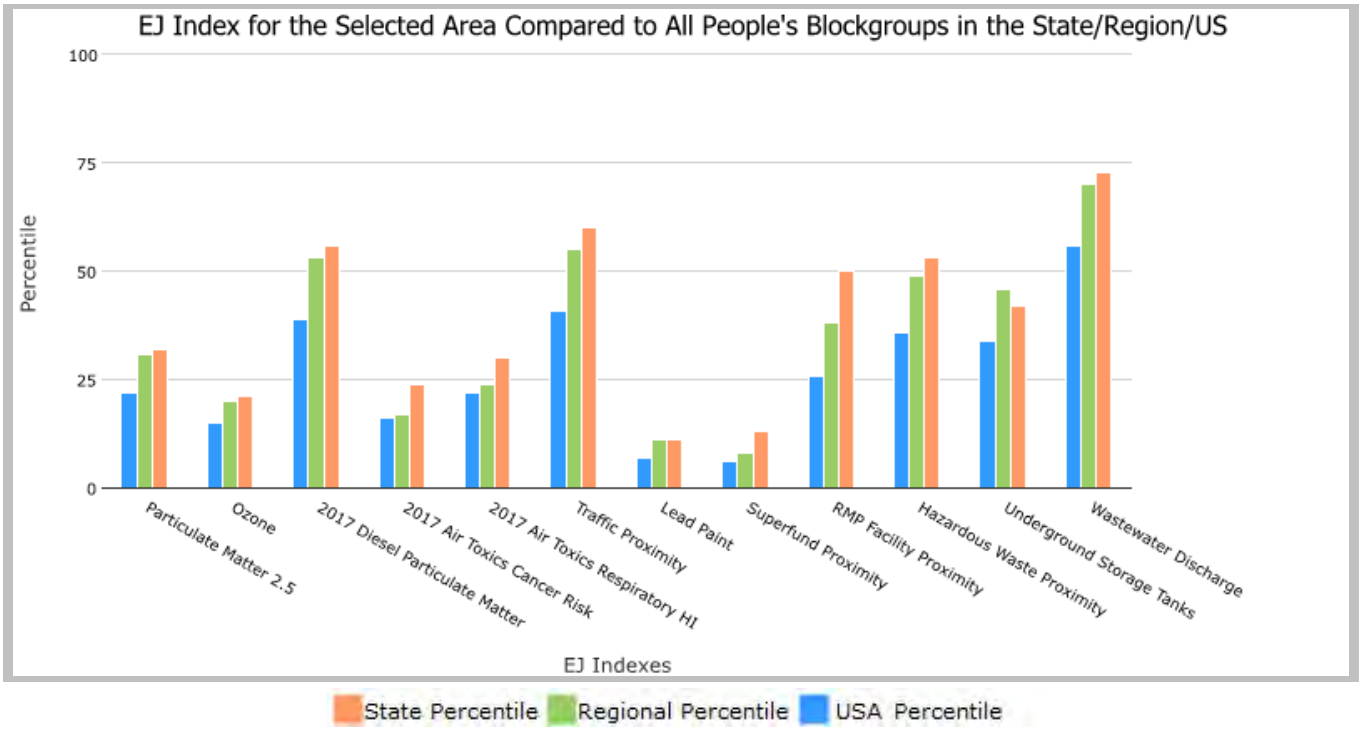
.25 miles Ring around the Area, MINNESOTA, EPA Region 5

Approximate Population: 79

Input Area (sq. miles): 1.49

UMEx Project

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
Environmental Justice Indexes			
EJ Index for Particulate Matter 2.5	32	31	22
EJ Index for Ozone	21	20	15
EJ Index for 2017 Diesel Particulate Matter*	56	53	39
EJ Index for 2017 Air Toxics Cancer Risk*	24	17	16
EJ Index for 2017 Air Toxics Respiratory HI*	30	24	22
EJ Index for Traffic Proximity	60	55	41
EJ Index for Lead Paint	11	11	7
EJ Index for Superfund Proximity	13	8	6
EJ Index for RMP Facility Proximity	50	38	26
EJ Index for Hazardous Waste Proximity	53	49	36
EJ Index for Underground Storage Tanks	42	46	34
EJ Index for Wastewater Discharge	73	70	56



This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

EJScreen Report (Version 2.0)

.25 miles Ring around the Area, MINNESOTA, EPA Region 5

Approximate Population: 79

Input Area (sq. miles): 1.49

UMEx Project

Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0

EJScreen Report (Version 2.0)

.25 miles Ring around the Area, MINNESOTA, EPA Region 5

Approximate Population: 79

Input Area (sq. miles): 1.49

UMEx Project

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Pollution and Sources							
Particulate Matter 2.5 (µg/m^3)	5.16	7.54	0	8.96	0	8.74	1
Ozone (ppb)	34.2	37.8	3	43.5	0	42.6	9
2017 Diesel Particulate Matter* (µg/m^3)	0.0553	0.218	5	0.279	<50th	0.295	<50th
2017 Air Toxics Cancer Risk* (lifetime risk per million)	20	24	56	24	60-70th	29	<50th
2017 Air Toxics Respiratory HI*	0.2	0.29	36	0.3	<50th	0.36	<50th
Traffic Proximity (daily traffic count/distance to road)	18	470	15	610	11	710	12
Lead Paint (% Pre-1960 Housing)	0.26	0.31	53	0.37	44	0.28	59
Superfund Proximity (site count/km distance)	0.14	0.18	67	0.13	80	0.13	77
RMP Facility Proximity (facility count/km distance)	0.14	0.77	20	0.83	20	0.75	24
Hazardous Waste Proximity (facility count/km distance)	0.1	1.5	25	1.8	15	2.2	16
Underground Storage Tanks (count/km^2)	0.14	1.8	39	4.8	25	3.9	25
Wastewater Discharge (toxicity-weighted concentration/m distance)	8.1E-08	0.034	0	9	0	12	0
Socioeconomic Indicators							
Demographic Index	8%	22%	13	28%	8	36%	4
People of Color	2%	20%	5	26%	7	40%	3
Low Income	14%	24%	34	29%	25	31%	23
Unemployment Rate	2%	4%	35	5%	28	5%	24
Linguistically Isolated	0%	2%	55	2%	59	5%	45
Less Than High School Education	3%	7%	27	10%	18	12%	15
Under Age 5	4%	6%	20	6%	27	6%	27
Over Age 64	18%	15%	68	16%	66	16%	69

*Diesel particular matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's 2017 Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

For additional information, see: www.epa.gov/environmentaljustice