Environmental Assessment: HVDC Modernization Project

The Human and Environmental Impacts of Modernizing the High Voltage, Direct Current Converter System for the Square Butte Line and Connecting the System to the Alternating Current Transmission Grid.

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Minnesota Power proposes to modernize the Minnesota terminal of the existing Square Butte high voltage direct current (HVDC) line that runs from North Dakota to Northeast Minnesota by constructing a new terminal, new substation, and three high voltage transmission lines proposed on a new site near the existing Arrowhead Substation in St. Louis County, Minnesota. Minnesota Power must obtain a certificate of need and a route permit from the Minnesota Public Utilities Commission before it can construct the proposed HVDC Modernization project.

Sources

Much of the information used to prepare this environmental assessment comes from the route permit application. Additional sources include new information provided by the applicant, American Transmission company, and information from relevant federal and state environmental review documents for similar projects. Spatial data was used. Information was gathered from multiple site visits. Unless otherwise noted, all URL addresses were current as of February 14, 2024.

Document Availability

This environmental assessment and other materials related to this project are available (1) on the Commerce Department's website: https://mn.gov/commerce/energyfacilities, select *Transmission Lines*, and then select *Minnesota Power HVDC Modernization Project*, and (2) the Commission's website: https://mn.gov/puc, select *eDockets*, enter the year (22) and docket number (611 or 607), and then select *Search*. This document can be made available in alternative formats, that is, large print or audio, by calling (651) 539-1530 (voice).

Project Mailing List

To place your name on the project mailing list contact docketing.puc@state.mn.us or (651) 201-2246 and provide the docket number (22-611), your name, email address, and mailing address. Please indicate how you would like to receive notices—by email or U.S. mail. Placing your name on the project mailing list ensures you receive the most up-to-date information about the project.

How is this document organized?

The Environmental Assessment (EA) addresses the matters identified in the scoping decision.

This EA is based on the applicant's certificate of need (CN) and route permit application, and public scoping comments. It addresses the matters identified in the December 27, 2023, scoping decision (Appendix A).

Chapter 1: Summary briefly describes the state of Minnesota's role; discusses how this EA is organized; and provides a summary of potential impacts and mitigation.

Chapter 2: Regulatory Framework summarizes the regulatory framework, including the CN and route permit processes, the environmental review process, other approvals that might be required for the project, and the criteria the Commission uses to make its decisions.

Chapter 3: Proposed Project and Alternatives describes the project and the alternatives to the project presented in the scope — their design, construction, and operation.

Chapter 4: Potential Impacts and Mitigation that are Similar Between Routing Options describes the environmental setting; details potential human and environmental impacts anticipated to be similar across routing options; and identifies measures to mitigate adverse impacts. It summarizes the cumulative potential effects of the project and other projects as well as listing unavoidable impacts and irreversible and irretrievable commitments of resources.

Chapter 5: Potential Impacts and Mitigation that Vary Between Routing Options details potential human and environmental impacts and mitigative measures anticipated to be different across routing options.

Chapter 6: Routing Factors analyzes the routing factors that the Public Utilities Commission must consider for the project by applying the information available in the route permit application and this EA to the factors listed in Minnesota Rule 7850.4100.

Chapter 7: Alternatives to the Proposed Project discusses the feasibility, availability, and potential impacts of routing alternatives.

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Acronyms and Abbreviations

AADT average annual daily traffic

AC alternating current

ACSR aluminum conductor steel reinforced

ACSS aluminum conductor steel supported

ALJ administrative law judge

AOC area of concern

APLIC Avian Power Line Interaction Committee

AQI Air Quality Index

ARMER Allied Radio Matrix for Emergency Response

ATC American Transmission Company

BMP best management practices

BWSR Board of Water and Soil Resources

CFR Code of Federal Regulations

CN certificate of need

CO carbon monoxide

Commerce Department of Commerce

Commission Public Utilities Commission

CSW Permit construction stormwater permit

dBA A-weighted scale

DC direct current

DNR Department of Natural Resources

DRP draft route permit

DSM demand side management

EA Environmental Assessment

EAW Environmental Assessment Worksheet

EERA Energy Environmental Review and Analysis

EJ environmental justice

ELF extremely low frequency electromagnetic fields

EMF electromagnetic fields

EPA United States Environmental Protection Agency

ER environmental report

FAA Federal Aviation Administration

FEMA Federal Emergency Management Agency

FERC Federal Energy Regulatory Commission

GHG greenhouse gases

HVDC high voltage direct current

HVDC Line existing Minnesota Power owned Square Butte high voltage direct current transmission line

HVTL high voltage transmission line

IPaC Information for Planning and Consultation

kV kilovolt or 1,000 volts

kV/m kilovolts per meter

MBS Minnesota Biological Survey

MDA Department of Agriculture

MDH Minnesota Department of Health

mG milliGuass

MHz megahertz

Minn. R. Minnesota Rule

Minn. Stat. Minnesota Statute

MISO Midcontinent Area Independent System Operator

MnDOT Minnesota Department of Transportation

MPCA Minnesota Pollution Control Agency

MW megawatt

MWI Minnesota Well Index

NA not applicable

NAAQS National Ambient Air Quality Standards

NAC noise area classification

NERC North American Electric Reliability Corporation

NESC National Electrical Safety Code

NEV neutral-to-earth voltage

NHIS Natural Heritage Information System

NLCD National Land Cover Database

NO2 nitrogen dioxide

NRCS Natural Resources Conservation Service

NRHP National Register of Historic Places

NWI National Wetland Inventory

OAH Office of Administrative Hearings

OSA Minnesota Office of the State Archaeologist

PM particulate matter

project Minnesota Power HVDC Modernization Project

PUC Public Utilities Commission

PWI public water inventory

RIM Reinvest in Minnesota Reserve Program

ROI region of influence

ROW right-of-way

SBS Sites of Biodiversity Significance

SF6 sulfur hexafluoride

SHPO State Historic Preservation Office

SO_2 sulfur dioxide

SSURGO Soil Survey Geographic Database

SWPPP stormwater pollution prevention plan

THPO Tribal Historic Preservation Offices

USACE United States Army Corps of Engineers

USFWS United States Fish and Wildlife Service

VMP Vegetation Management Plan

WCA Wetland Conservation Act

Definitions

Several terms used in this document have specific meaning in Minnesota law or regulation. Other terms are defined for clarity.

anticipated alignment is the anticipated location of the structures and transmission line within the right-of-way and route. It is NOT the final alignment. The anticipated alignment is considered the centerline of the project for review purposes only—the structures and transmission line might ultimately be located elsewhere within the route.

associated facilities are buildings, equipment, and other physical structures that are necessary to the operation of a large electric power generating plant or high voltage transmission line (Minnesota Rule 7850.1000, subpart 3).

construction means any clearing of land, excavation, or other action that would adversely affect the natural environment of the site or route but does not include changes needed for temporary use of sites or routes for nonutility purposes, or uses in securing survey or geological data, including necessary borings to ascertain foundation conditions (Minnesota Statute 216E.01, subdivision 3).

distribution line means power lines that operate below 41.6 kilovolts.

high voltage transmission line (HVTL) means a conductor of electric energy and associated facilities designed for and capable of operation at a nominal voltage of 100 kilovolts or more and is greater than 1,500 feet in length (Minnesota Statute 216E.01, subdivision 4).

local vicinity means 1,600 feet from any route segment.

power line means a distribution, transmission, or high voltage transmission line.

project area means the area one mile from any route segment boundary.

right-of-way means the land interest required within a route for the construction, maintenance, and operation of a high voltage transmission line (Minnesota Rule 7850.1000, subpart 15).

route means the location of a high voltage transmission line between two end points. The route may have a variable width of up to one and one-quarter miles (Minnesota Statute 216E.01, subdivision 8).

route segment means a portion of a route (Minnesota Rule 7850.1000, subpart 17).

transmission line means power lines that operate at 41.6 kilovolts and above

Chapter 1: Summary

Minnesota Power (applicant) must obtain a certificate of need (CN) and a route permit from the Minnesota Public Utilities Commission (Commission) before it can construct the proposed Minnesota Power High Voltage Direct Current Modernization Project (project). Minnesota Power proposes to modernize and upgrade the Minnesota terminal of its Square Butte HVDC line (HVDC Line) and interconnect to the existing AC transmission system near its Arrowhead Substation in Hermantown, Minnesota. The project includes the construction of approximately 40 acres of new terminal facilities and high voltage transmission lines (HVTL) to connect those facilities to each other and the existing electrical grid (Appendix B, Map 1).

The new high voltage direct current (HVDC) terminal is proposed to connect to the existing alternating current system by constructing a new St. Louis County 345 kilovolt (kV)/230 kV substation near the current Arrowhead Substation.[1] The new high voltage direct current (HVDC) terminal would be connected to the St. Louis County Substation by less than one mile of 345 kV high voltage transmission line (HVTL). The new St. Louis County substation would be connected to the existing Arrowhead Substation by two parallel 230 kV HVTLs less than one mile in length.[2] Additionally, a short portion of the existing ±250 kV HVDC line will need to be reconfigured to terminate at the new HVDC terminal.[3]

Updates and expansions are required at the other end of the HVDC Line in North Dakota as well, to be regulated by the North Dakota Public Service Commission.[4] The project includes enabling bi-directional transmission while maintaining the same voltage and power transfer capability along the HVDC Line.[5]

The proposed route, which is approximately 0.5 mile wide from north to south and 0.7 mile long from east to west, occupies approximately 40 acres southwest of the City of Hermantown (Appendix B, Map 1). Land acquisition is ongoing, but Minnesota Power expects that the project will not use traditional transmission line easements for right-of-way (ROW) because project facilities will be constructed on land owned by the applicant. Minnesota Power is requesting a route to support the following needs:

- width that is wide enough to provide flexibility to design facilities to minimize system impacts and outages,
- optimize future expandability work with landowners,
- address engineering concerns after a route permit has been issued, and;
- avoid sensitive natural resources, and to manage construction constraints.

The applicant filed a combined CN and route permit application (hereinafter “route permit application” or “application”) on June 1, 2023. The Commission determined that the application was substantially complete on August 8, 2023.

Minnesota Power indicated that the project is needed to modernize aging HVDC assets, which will continue to position the transmission grid for clean energy transition, and improve the reliability of the transmission system. The HVDC Line has been operating for 45 years. Minnesota Power purchased the

[1] Route Permit Application, Section 1.1.
[2] Id.
[3] Id.
[4] Route Permit Application, Section 1.3.
[5] Route Permit Application, Section 1.1.

line in 2010 with the Commission's approval. Due to increased HVDC outages and equipment failure, the orderly replacement of the HVDC terminal equipment is prudent to ensure continuous efficient delivery and expansion of Minnesota Power's renewable energy resources into the future. In addition to the existing HVDC terminal replacement, the new HVDC technology would be designed to provide key reliability attributes including voltage regulation, frequency response, blackstart capability, and bidirectional power transfer capability.

The project is currently scheduled to be placed in service between 2028 and 2030.[6]

The Minnesota Department of Commerce (Commerce) has prepared this environmental assessment (EA) for the proposed project. The EA describes the project, highlights resources affected by the project, and discusses potential human and environmental impacts to these resources. It also discusses ways to mitigate potential impacts. These mitigation strategies can become enforceable conditions of the Commission's route permit.

An EA is not a decision-making document, but rather an information document. The EA is intended to facilitate informed decisions by state agencies, particularly with respect to the goals of the Minnesota Environmental Policy Act: "to create and maintain conditions under which human beings and nature can exist in productive harmony and fulfill the social, economic, and other requirements of present and future generations of the state's people."[7]

What is Minnesota's role?

The applicant needs two approvals from the Commission. Commerce prepared this EA. An administrative law judge will oversee a public hearing.

The applicant needs two approvals from the Commission before the project can be built – a CN and a route permit. A route permit supersedes local zoning, building, and land use rules.[8] However, the Commission's route permit decision must be guided in part by consideration of impacts to local zoning and land use in accordance with the legislative goal to "minimize human settlement and other land use conflicts".[9] In addition, various federal, state, and local approvals may be required for activities related to the construction and operation of the project. These subsequent permits are referred to as *downstream* permits and must be obtained by the applicant prior to constructing the project.

The project requires a CN from the Commission because it meets the definition of *large energy facility* in Minnesota statute, which is any high-voltage transmission line with a capacity of 200 kilovolts or more and greater than 1,500 feet in length.

The project also requires a route permit from the Commission because it meets the definition of *high voltage transmission line* in Minnesota statute, which is a conductor of electric energy and associated facilities designed for and capable of operation at a nominal voltage of 100 kilovolts or more and is greater than 1,500 feet in length.

[6] Route Permit Application, Section 1.3.
[7] Minnesota Statutes 216E.02, subd. 1.
[8] Minnesota Statutes 216E.10, subd. 1.
[9] Minnesota Statutes 216E.03, subd. 7.

This EA studies two route alternatives in addition to the route proposed by the applicant. One of the route alternatives was proposed by Minnesota Power themselves to expand the route width slightly and will be incorporated in this analysis as the proposed project. The other alternative was proposed by American Transmission Company (ATC) and would remove the project substation and instead route the new transmission line from the proposed converter station straight to ATC's existing Arrowhead Substation.

The applicant applied to the Commission for a CN and route permit[10] for the project in June 2023. With this application, the Commission has before it two considerations:

- Is the project needed? Or would another project be more appropriate for the state of Minnesota, for example, a project of a different type or size?
- If the project is needed, what conditions should be placed on the route permit?

To ensure a fair and robust airing of the issues, the Minnesota Legislature set out a process for the Commission to follow when considering CN and route permit applications.[11] In this instance, an EA was prepared, and a public hearing will be held. The goal of the EA is to describe potential human and environmental impacts of the project (*the facts*), whereas the intent of the public hearing is to allow interested persons the opportunity to advocate, question, and debate what the Commission should decide about the project (*what the facts mean*). The record developed during this process—including all public input—will be considered by the Commission when it makes its decisions on the applicant's CN and route permit application.

What is the public's role?

Minnesota needs your help to make informed decisions.

During scoping, you told us your concerns about the project so that we could collect the right facts. At the public hearing, which comes next, you can tell us what those facts mean, and if you think we have represented them correctly in this EA. Your help in pulling together the facts and determining what they mean will help the Commission make informed decisions regarding the project.

What is an Environmental Assessment?

This document is an Environmental Assessment. The Commission will use the information in this document to inform their decisions about issuing a CN and route permit for the project.

This EA contains an overview of affected resources and discusses potential human and environmental impacts and mitigation measures. Energy Environmental Review and Analysis (EERA) staff within Commerce prepare this document as part of the environmental review process. Scoping is the first step in the process. It provides opportunities to provide comments on the content of this environmental assessment, suggest alternatives, and to mitigate potential impacts.

[10] Minnesota Power HVDC Modernization Project, Application to the Minnesota Public Utilities Commission for a Route Permit for a Large Electric Generating Facility, June 1, 2023, eDockets Numbers 20236-196333-02 (through -16) and 20236-196346-02, hereinafter the Route Permit Application.

[11] *See generally* Minnesota Statutes 216B and 216E.

What are the potential impacts of the project?

The project will impact human and environmental resources. Impacts will occur during construction and operation.

A potential impact is the anticipated change to an existing condition caused directly or indirectly by the project.[12] Potential impacts can be positive or negative, short- or long-term, and can accumulate incrementally. Impacts vary in duration and size, by resource, and across locations. The impacts of constructing and operating a project can be mitigated by avoiding, minimizing, or compensating for the adverse effects and environmental impacts of a project.

The context of an impact—in combination with its anticipated on-the-ground effect and mitigation measures—is used to determine an impact intensity level, which can range from highly beneficial to highly harmful. Impacts are grouped by type and summarized below.

The transmission line construction involves both short and long-term impacts. For example, noise impacts will be the highest during construction, but intermittent and temporary. Some impacts may be avoidable; some may be unavoidable but can be mitigated; others may be unavoidable and unable to be mitigated. In general, impacts can be avoided and mitigated by prudent design and construction measures – i.e., by placing structures away from human and environmental resources.

Potential Impacts of Proposed Project

Project-related impacts to human settlement are anticipated to be minimal. Impacts range from short-term and positive, such as increased local expenditures during construction, to long-term and negative, such as changes to viewsheds. Project-related aesthetic impacts are unavoidable, with landscape changes anticipated to be moderate; however, individual reactions to these changes will vary widely as visual impacts are subjective and unique to the individual. Anticipated impacts on property values are expected to be minimal because all properties for the project will be owned by Minnesota Power. The following impacts to human settlement are anticipated to be minimal: public health and safety, public services, socioeconomics, known archaeological and historic resources, operational noise, cultural values, environmental justice, land use and zoning, public services, and recreation.

Impacts to land-based economies, including mining, are anticipated to be minimal. The project is sited in an area where the land has metallic mineral and aggregate potential. The DNR indicated that terms included in a future lease would include requirements that preserve access to minerals in case of future exploration and/or development. Because all properties for the project will be owned by Minnesota Power, impacts to prime farmland or farmland of statewide importance will be minimal. Project areas have not been used for agriculture for many years.

Impacts to natural resources such as air quality and climate change are expected to be short-term and minimal during construction, but beneficial over time because the project will reduce the need for carbon-based electric generation processes and additional transmission infrastructure. Impacts to groundwater, soils, and topography are anticipated to be minimal; such impacts can be mitigated by construction best management practices or through a vegetation management plan. Potential impacts to wildlife and habitat may be positive or negative and are species dependent but are expected to be minimal. Negative impacts to individuals would be highest during construction but would improve once

[12] Minnesota Rule 4410 (analytical practices under Minn. R. 7850 are informed by practices developed under 4410 Rules).

the project is restored. Due to the presence of an impaired trout stream in the area that will experience increased warming from tree clearing for a new right-of-way regardless of routing options, impacts are expected to be moderate.

Potential Impacts of the ATC Alternative

Impacts of the route alternative analyzed in this EA are similar to those of the proposed project and to each other. In some instances, the ATC Alternative offers a means to avoid or mitigate potential impacts, such as with aesthetics due to a Switchyard not being required, however, tradeoffs exist. For instance, although the ATC Alternative utilizes 25 feet of existing right-of-way, it would require a new clearing to cross the trout stream near an already cleared ROW for 230 kV transmission, which could exacerbate impacts.

The ATC Alternative would have less GHG emissions during construction and would cost less. Its infrastructure would also be near less residences, be less noisy during construction, not create new access points off Morris Thomas Road, and be more screened from view. These benefits are incrementally greater than that of the proposed project but are comparable. For instance, operational noise for the proposed project is still expected to be minimal with the Switchyard nearest to residences, whereas construction noise will be a minimal impact.

The ATC Alternative would also require one crossing to the trout stream, creating a similar moderate impact. The infrastructure would be closer to an identified archeological site but would still comply with a 100-meter buffer requested by SHPO. Tree clearing impacts to construct the proposed project and the ATC Alternative are moderate at 34.25 acres and 34.72 acres, respectively. All other impacts are expected to be similar except for aesthetics and cultural values (see Table 24).

What factors guide the Commission's decision?

Minnesota statute and rule identify the factors the Commission must consider when determining whether to issue a CN and route permit.

After reviewing the project record—including public comments—the Commission will make two decisions:

- Does the EA and the record created at the public hearing address the issues identified in the scoping decision?
- If the project is needed, should a route permit be issued for the project, and, if so, what permit conditions are appropriate?

Certificate of Need

The Commission must determine whether the project is needed or if another project would be more appropriate for the state of Minnesota. Minnesota Rule 7849.0120 provides the criteria the Commission must use when determining whether to grant a CN.

A. The probable result of denial would be an adverse effect upon the future adequacy, reliability, or efficiency of energy supply to the applicant, to the applicant's customers, or to the people of Minnesota and neighboring states.

B. A more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record.

C. The proposed facility, or a suitable modification of the facility, will provide benefits to society in a manner compatible with protecting the natural and socioeconomic environments, including human health.

D. The record does not demonstrate that the design, construction, or operation of the proposed facility, or a suitable modification of the facility, will fail to comply with relevant policies, rules, and regulations of other state and federal agencies and local governments.

If the Commission determines the applicant met these criteria, it will grant a CN (with or without conditions). The CN decision determines the type and size of the project but does not determine its location.

Route Permit

If the Commission determines the transmission facility is needed, it must determine where it will be located. Minnesota Statutes 216E.03 lists 12 considerations that guide the study, evaluation, and designation of route permits. Minnesota Rule 7850.4100 further clarifies and expands these considerations by identifying 14 factors the Commission must consider when making a route permit decision.

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 right-of-way (right-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 systems 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.

N. Irreversible and irretrievable commitments of resources.

When the Commission makes a final decision about the route permit, it must determine if the EA and public hearing record address the issues identified in the scoping decision.[13] The Commission must also make specific findings that it has considered locating a route for a new HVTL along an existing HVTL route or parallel to existing highway right-of-way (right-of-way), and, to the extent these are not used, the Commission must state the reason(s).[14]

The Commission must make a final decision on the route permit within 60 days of receiving the ALJ report.[15] A final decision must be made within six months after the Commission's determination the application is complete; however, this time limit may be extended.[16] A route permit decision for this project is anticipated in July 2024.

The Commission may not issue a route permit for a project that requires a CN until a certificate has been approved by the Commission, though these approvals may occur consecutively at the same Commission meeting.

What does the Commission approve in a route permit?

The Commission approves a route and anticipated alignment. The route is a temporary designation; the HVTL must be constructed within the route. The permit also authorizes permittees to obtain permanent right-of-way for the HVTL and any associated facilities.

When the Commission issues a route permit it designates a route and an anticipated alignment (Figure 1).[17] The right-of-way is the area required for safe operation of the HVTL. It must be within the designated route and is the area from which the permittee may obtain easements to construct and operate the HVTL. The route width is typically wider than the actual right-of-way needed for the HVTL. This extra width provides flexibility when constructing the HVTL but is not so wide that it is impossible to determine where the HVTL would be constructed. This makes predicting potential impacts possible. A wider route width also allows permittees to work with landowners to address their concerns and to address engineering issues that may arise after a permit is issued. The route width, in combination with the anticipated alignment, is intended to balance flexibility and predictability.

The HVTL must be constructed within the Commission's designated route and along the anticipated alignment. The anticipated alignment is where the structures and HVTL are expected within the right-of-way and route. It is **not** the final alignment. The anticipated alignment is considered the centerline of the project for review purposes only—the structures and HVTL might ultimately be constructed elsewhere within the route.

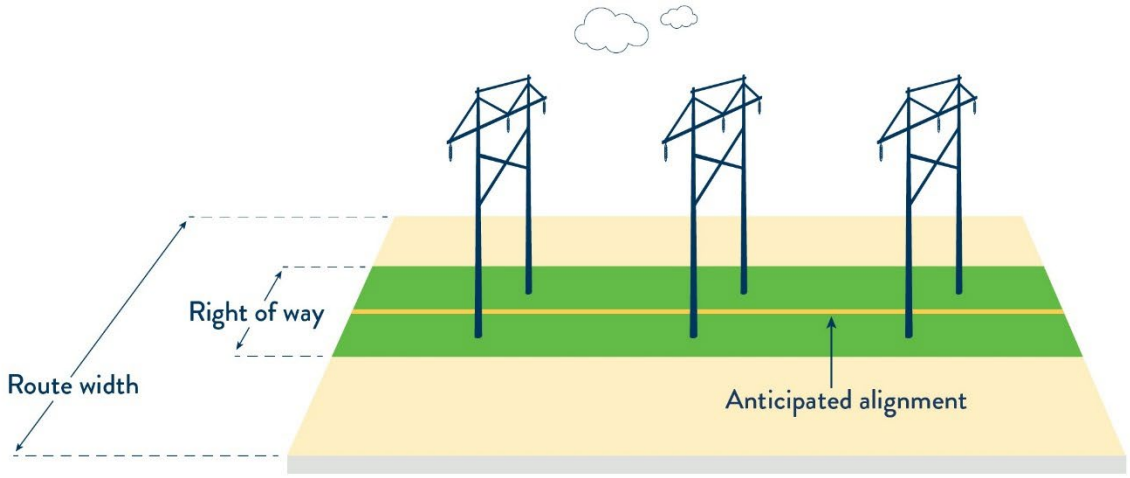
Notwithstanding the previous paragraph, the HVTL must be constructed along the anticipated alignment unless subsequent permissions are requested and approved by the Commission. "Any [right-of-way] modifications within the designated route [must be] located so as to have comparable overall impacts relative to the factors in Minnesota Rule 7850.4100 and shall be specifically identified and documented

[13] Minn. R. 7850.3900, subp. 2.
[14] Minn. Stat. 216E.03, subd. 7(e).
[15] Minn. R. 7850.3900, subp. 1.
[16] Ibid.
[17] Minn. Stat. 216E.01, subd. 8.

in and approved as part of the plan and profile."[18] Modifications to the anticipated alignment generally result from landowner requests or unforeseen conditions.

The route permit also outlines conditions specifying construction and operation standards.[19] A draft route permit is included in Appendix C.

Figure 1: Route and Right-of-Way Illustration



Eminent Domain

The applicant may exercise the power of eminent domain.

At times, negotiated easement agreements for permanent right-of-ways—the land needed for the construction, maintenance, and operation of a HVTL—cannot be reached. Should this occur, the applicant may exercise the power of eminent domain to acquire land for the project. This process is called condemnation.

The eminent domain process involves an independent panel of three court-appointed authorities determining the easement's value, and both the landowner and the applicant are bound by this determination. If the eminent domain process is used, the applicant must obtain at least one appraisal for the property proposed to be acquired.[20]

What's next?

Public hearings will be held in the project area and virtually; you can provide comments at the hearing. The public can provide comments at either hearing or as part of an associated public comment period. An administrative law judge will consolidate public comments and prepare a

[18] Plan and Profile requirements are under the DRP Section 9.1.

[19] *E.g.*, DRP, Section 5.4.2 (stating "the transmission line shall be designed, constructed, and **operated** in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms" (emphasis added)).

[20] Minn. Stat. 117.036, subd. 2.

report and make recommendations for the Commission to consider. The Commission will then review the record and decide whether to grant a CN and a route permit.

An administrative law judge (ALJ) from the Office of Administrative Hearings (OAH) will hold public hearings in the project area and virtually after the EA is complete and available. At either hearing, people may ask questions and submit comments about the project. After the close of the comment period, the ALJ will provide a written report to the Commission summarizing the public hearing and any comments received. The ALJ report may recommend ways to mitigate potential impacts of the project.

The ALJ will also provide the Commission with proposed findings and a recommendation on whether to issue a CN and route permit. The Commission reviews all the information in the project record in determining whether to grant a CN and issue a route permit. The Commission may grant a CN for the project as proposed, grant a CN contingent upon modifications to the project, or deny the CN. The Commission may also place conditions on the granting of a CN. If a CN is granted, the Commission will then decide whether to issue a route permit. Route permits define the location of the project and include conditions specifying mitigation measures. The Commission is expected to make a CN and route permit decision in the summer of 2023.

Where do I get more information?

For additional information don't hesitate to contact Commission or Commerce staff.

If you would like more information or if you have questions, please contact Commerce staff: Jenna Ness (jenna.ness@state.mn.us), (651) 539-1693 or the Commission public advisor: Mike Kaluzniak (publicadvisor.puc@state.mn.us), (651) 201-2257.

The CN application and route permit application can be found on eDockets: https://www.edockets.state.mn.us/EFiling/search.jsp by searching "22" for year and either "607" (CN) or "611" (route permit) for number. Information is also available on the commerce webpage: https://apps.commerce.state.mn.us/eera/web/project/15051.

Chapter 2: Regulatory Framework

This chapter discusses the approvals required from the Commission—a CN and route permit. It further describes the environmental review process and lists the factors the Commission considers when making decisions. The project will also require approvals from other state and federal agencies with permitting authority for actions related to the project. Lastly, it lists topics outside the scope of this EA.

Commission Approvals Required

A CN and route permit are required because the project meets thresholds defined in Minnesota Statute.

The project meets the definition of "large energy facility" as an HVTL with a capacity of 200 kV or more, and as such, requires a Certificate of Need to be issued by the Commission prior to siting or construction.[21]

The project also requires a route permit from the Commission because it meets the definition of "high voltage transmission line" under Minnesota Statute.[22] A transmission line qualifies as an HVTL when it is longer than 1,500 feet and capable of operating at a voltage greater than 100 kV.[23] The definition of HVTL also includes associated facilities, such as substations, buildings, equipment, guy wires, and other physical structures necessary for operation of the HVTL.[24]

Environmental Review

Environmental review informs interested persons about potential impacts and possible mitigation measures associated with the project; environmental review informs Commission decisions.

Minnesota law requires that potential human and environmental impacts be analyzed before the Commission decides whether to grant a CN and a route permit. This analysis is called environmental review.

Certificate of Need

Applications for a CN require preparation of an environmental report (ER).[25] An ER contains "information on the human and environmental impacts of the [project] associated with the size, type, and timing of the project, system configurations, and voltage".[26] It also contains information on system alternatives to the project, as well as mitigation measures.

Route Permits

Minnesota law provides the Commission with two processes to review route permit applications. The alternative process, which applies to high voltage transmission lines in excess of 200 kV and fewer than

[21] Minn. Stat. 216B.2421, Subd. 2 (2) and 216B.243 Subd. 2.
[22] Minn. Stat. 216.03, subd. 2.
[23] Minn. Stat. 216E.01, subd. 4.
[24] Ibid.
[25] Minnesota Rule 7849.1200.
[26] Minn. R. 7849.1500.

five miles in length,[27] requires an EA instead of an environmental impact statement be prepared for the project, and a public hearing instead of the more formal contested-case hearing occur for the project.[28]

Joint Proceeding

When there are multiple applications before the Commission for a single project, the environmental review required for each application may be combined.[29] For this project, the Commission has authorized EERA staff to combine the environmental reviews required for the CN (an ER) and route permit (an EA). Thus, the Department developed a combined EA—an EA that covers applicant proposals in both the CN and route permit applications.

Commerce staff prepared an EA in lieu of an ER. Issues typically analyzed and reviewed in an EA and the system alternatives studied in an ER are combined into a single document. This is the only state environmental review document required for the project.[30]

Public Hearing

A public hearing will be held that allows for oral public comments. Comments may also be written and submitted during an associated comment period.

Minnesota Rule 7850.3800, subpart 1, requires a public hearing be held and a comment period be opened once the EA is complete and available. An ALJ will preside over the public hearing. The public will have the opportunity to speak at the hearing, ask questions, and submit comments. EERA staff will respond to questions and comments about the EA at the public hearing but is not required to revise or supplement the document.[31] Comments received during the hearing and the associated comment period become part of the project record.

After the comment period closes, the ALJ will provide the Commission with a written report summarizing the public hearing and comment period, and any spoken or written comments received. The ALJ will also provide the Commission with proposed findings and a recommendation whether to issue a route permit. The record developed during the environmental review process—including all public input received during the public hearing and comment period—will be considered by the Commission when it makes a route permit decision.

Permitting Steps to Date

The Commission accepted the CN and route permit applications as complete on August 8, 2023.[32] Public information and scoping meetings were held in Solway Township, Minnesota on August 29, 2023 and virtually on August 30, 2023.[33]

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[27] Minnesota Statutes 216E.04, subd. 2(4).

[28] Minnesota Statutes 216E.04, subd. 5; Minn. R. 7850.3700, subp. 1. Applicants are free to elect the alternative process if their project qualifies for it.

[29] Minnesota Rule 7829.1200 and Minnesota Rule 7850.2800 to 7850.3900

[30] Minn. R. 7849.1900, subp. 1; Mnn. R. 7859.3700, subp. 8.

[31] Minn. R. 7850.3800, subp. 4.

[32] Commission Order, August 8, 2023, eDockets Number 20238-198074-02.

[33] Notice of Public Information and Environmental Assessment Scoping Meetings, August 4, 2023, eDockets Number 20238-198002-01.

Application Filing and Acceptance

On June 1, 2023, Minnesota Power filed a combined certificate of need and route permit application with the Commission.[34] Subsequently, the Commission found both applications to be complete. The order also referred the matter to the Office of Administrative Hearings for appointment of an administrative law judge (ALJ) to conduct a public hearing for the project. Commission staff provided a *Sample Route Permit for a High-voltage Transmission Line and Associated Facilities* on January 31, 2024.[35]

Scoping Process

Scoping was the first step in the environmental review process. It helped focus this EA on the most relevant information needed by the Commission to make an informed route permit decision.

In accordance with Minnesota Rule 7850.3700, subpart 2, Commerce and Commission staff initiated the scoping process. The scoping process has two primary purposes: (1) to gather public input as to the impacts and mitigation measures to study in the EA and (2) to focus the EA on those impacts and mitigation measures that will aid in the Commission's decisions on the CN and route permit applications. Staff use the information gathered during scoping to inform the content of the EA. Scoping includes a public meeting and comment period that provide opportunities for interested persons to help develop the scope (or contents) of the EA.[36]

Commerce and Commission staff held public information and scoping meetings in August 2023 – one in-person and one virtual. The meetings provided information to the public about the proposed project, answered questions, and allowed the public an opportunity to suggest alternatives and impacts for consideration during preparation of the EA. A court reporter was present at the meetings to document oral statements. The meeting and associated comment period also provided an opportunity to gather input on potential impacts and mitigative measures that should be studied further in the EA and to solicit potential site or system alternatives.

In addition to the oral comments received at the public meeting, a public comment period, ending on September 13, 2023, gave the public further opportunity to provide input on the project. Comments highlighting or identifying issues of concern, mitigation measures, and alternative routes or route segments for consideration, were considered to develop the final EA scope.

Scoping Comments Received

Scoping comments are compiled and available to view or download.[37]

The public expressed concern about the project, mainly through oral public comments made at the in-person public information and scoping meeting on August 29, 2023.[38] These concerns included but were not limited to:

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[34] Minnesota Power HVDC Modernization Project, Application to the Minnesota Public Utilities Commission for a Route Permit for a Large Electric Generating Facility, June 1, 2023, eDockets Numbers 20236-196333-02 (through -16) and 20236-196346-02, hereinafter the Route Permit Application.

[35] Sample Route Permit, January 31, 2024, eDockets No. 20241-202908-01.

[36] Minn. R. 7850.3700, subp. 2.

[37] Compiled Public Comments, eDockets No. 202310-199399.

[38] Oral Comments on Scope of Environmental Assessment, eDockets No. 20239-198862-01.

- The space the project will take up along with the number of trees to be removed, impacting a rural sense of place;
- Impacts to humans and property bordering the project area;
- Mitigating impacts to nearby federally listed species, wetlands, water bodies, and the trout stream;
- Minnesota Power's facility lifespan, future expansion plans, rate increases, decommissioning of an existing terminal, allowance for public use of project land, assurance for maintenance of a natural buffer for neighbors, construction work timing, and project road access; and
- Generally: aesthetics, noise, light pollution, native revegetation, historic artifacts, dust abatement, and flora and fauna impacts.

Agency comments were received from the Department of Natural Resources (DNR). DNR comments focused on transmission lines routing over a designated trout stream.[39] DNR requested that the applicant coordinate with the agency on the location and number of trout stream crossings, and that the EA analyze impacts to the trout stream. DNR expressed concern for mineral resources and a unique natural resource, the northern goshawk, in the project area. DNR also asked for more project details such as decommissioned components and suggested possible mitigation strategies for the project.

ATC comments focused on an alternative that would eliminate Minnesota Power's proposed St. Louis County substation and instead connect the applicant's new HVDC terminal to the electrical grid by connecting to ATC's existing Arrowhead substation, which is directly south of the applicant's existing Arrowhead substation. They also recommended the EA study impacts that each project facility will have on surrounding resources and land cover types, address cost estimates associated with each project facility, and the proposed alternative, hereinafter the "ATC Alternative".

Consideration of Alternatives and Scoping Decision

The Commission requested two route alternatives be studied in the EA. The scoping decision identified the topics studied in this EA.

This EA studies two route alternatives in addition to the route proposed by the applicant. One of the route alternatives was proposed by Minnesota Power themselves to expand the route width slightly, which will be incorporated in this analysis as the proposed project. The other alternative was proposed by ATC and would remove the project substation and instead route the new transmission line from the proposed converter station straight to ATC's existing Arrowhead Substation.

EERA suggested the ATC Alternative would aid in the Commission's decision on a route permit, and as a result, recommended it be studied in the EA. The Commission ordered the study of the ATC Alternative through a contested case proceeding to resolve outstanding disagreements between ATC and Minnesota Power that require expertise outside of EERA, including the electrical grid's engineering, power flows, and reliability.[40] Thus, the final scoping decision included this input from the Commission, identifying the issues and route segments to be evaluated in this EA.

After considering public comments and direction from the Commission, the Department issued an EA scoping decision on December 27, 2023 (Appendix A).

[39] Scoping Comments of the Minnesota DNR, September 22, 2023, eDockets No. 20239-199095-01.

[40] Order Identifying Alternative Proposal for Environmental Assessment Scope, November 29, 2023, eDockets No. 202311-200811-01.

Issues Outside of Scope

The scoping decision identified several issues that will not be studied.

- Any route, route segment, or alignment alternative not specifically identified for study in the scoping decision.
- Any system alternative not specifically identified for study in the final scoping decision.
- Potential impacts of specific energy sources.
- How landowners are compensated for the project.

Other Permits and Approvals

Other permits and approvals outside of environmental review, the certificate of need, and route permitting are required for the project.

A CN and a route permit from the Commission are the only state permits required for routing the project. A route permit supersedes local planning and zoning and binds state agencies; therefore, state agencies are required to participate in the Commission's permitting process to aid the Commission's decision-making and to indicate routes that are not permittable.[41]

In addition to the route permit, various federal, tribal, state, and local approvals might be required for activities related to construction and operation of the project. These subsequent permits (commonly referred to as "downstream" permits) must be obtained prior to construction. Table 1 lists potential downstream permits that may be required, several of which are discussed below.

Table 1: Potential Permits

Government	Type of Application	Purpose
Federal		
Environmental Protection Agency	Spill Prevention, Control, and Countermeasures Plan	Response plan to respond to a worst-case oil discharge or threat of a discharge.
U.S. Army Corps of Engineers	Section 404 Clean Water Act – Dredge and Fill	Protects water quality by controlling discharges of dredged and fill material.
	Section 106 of National Historic Preservation Act Consultation	Ensures adequate consideration of impacts to significant cultural resources.
U.S. Fish and Wildlife Service	Threatened and Endangered Species Consultation	Consultation to mitigate impacts to federally-listed species.
	Special Use Permit	For work in Waterfowl Production Areas
Federal Aviation Administration	Part 7460 Airport Obstruction Evaluation	To identify structures that exceed thresholds from ground level as defined in CFR 77.9.
Tribal		

[41] Minn. Stat. 216E.10.

Government	Type of Application	Purpose
American Indian Tribes	National Historic Preservation Act Section 106 Coordination	Coordination to prevent impacts to traditional cultural properties.
State		
Department of Natural Resources	State Threatened and Endangered Species Consultation	Consultation to mitigate impacts to state-listed species.
	Water Appropriation Permit	To balance competing management objectives.
	License to Cross Public Lands and Waters	License to prevent impacts associated with crossing public lands and waters
	Public Waters Work Permit	Regulates water development activities below the ordinary high water level in public waters and wetlands.
Pollution Control Agency	Construction Stormwater Permit	Minimizes temporary and permanent impacts from stormwater on one or more acres of land.
	Subsurface Sewage Treatment System Permit	Governs how septic systems are designed, installed, and managed.
	Section 401 Clean Water Act – Water Quality Certification	Ensures project will comply with state water quality standards.
State Historic Preservation Office	National Historic Preservation Act Section 106 Consultation	Ensures adequate consideration of impacts to significant cultural resources.
Department of Labor and Industry	Electrical Inspection	Necessary to comply with state electric codes.
Department of Transportation	Utility Permit	Controls utilities installed along, across, or within highway rights-of-way.
	Driveway Access Permit	Controls access to driveways along highways.
	Oversize/Overweight Permit	Controls use of roads for oversized or overweight vehicles.
Board of Water and Soil Resources	Wetland Conservation Act (WCA)	Coordination with the Board of Water and Soil Resources and Murray County to ensure conservation of wetlands.
Local		
Local Approvals (City of Hermantown and St. Louis County)	Road Crossing, Shoreland Zoning, Driveway, Oversize or Overweight, Wetland, and Land Alteration Permits	Ensures proper use of local roads and lands.

Federal

The U.S. Army Corps of Engineers (USACE) "regulates the discharge of dredged or fill material into waters of the United States, including wetlands".[42] Dredged or fill material, including material that moves from construction sites into these waters, could impact water quality. A permit is required from USACE if the potential for significant adverse impacts exists. The USACE is also charged with Tribal Government coordination on the potential impacts to traditional cultural properties.

[42] U.S. Environmental Protection Agency (October 27, 2015) *Section 404 Permit Program*, retrieved from: http://www.epa.gov/cwa-404/section-404-permit-program.

A permit is required from the U.S. Fish and Wildlife Service (USFWS) for the incidental take[43] of any federally listed threatened or endangered species. The USFWS encourages consultation with project proposers to ascertain a project's potential to impact these species and to identify mitigation measures for the project. The project's specific USFWS review is discussed more in depth in Chapter 4 under Wildlife and Habitat.

State

Potential impacts to state lands and waters, as well as fish and wildlife resources, are regulated by the DNR. Licenses are required to cross state lands or waters.[44] Projects affecting the course, current, or cross-section of lakes, wetlands, and streams that are public waters may require a *Public Waters Work Permit*.[45] Not unlike the USFWS, DNR encourages applicants to consult with the agency to determine if a project has the potential to impact state-listed threatened or endangered species. Additionally, consultation can lead to the identification of measures to mitigate potential impacts associated with the project. The need for a public waters work permit for the project is not anticipated, however, Minnesota Power will work with the DNR to obtain one if its required.

Construction projects that disturb one or more acres of land require a general *National Pollutant Discharge Elimination System / State Disposal System Construction Stormwater Permit* (CSW Permit) from the Minnesota Pollution Control Agency (MPCA). This permit is issued to "construction site owners and their operators to prevent stormwater pollution during and after construction."[46] The CSW Permit requires use of best management practices; development of a Stormwater Pollution Prevention Plan; and adequate stormwater treatment capacity once the project is complete.

Projects must be designed so that stormwater discharged after construction does not violate state water quality standards. Specifically, projects with net increases of one acre or more to impervious surface must be designed to treat water volumes of one-inch multiplied by the net increase in impervious surface.

A Clean Water Act Section 401 *Water Quality Certification* from MPCA might also be required. "Section 401 of the Clean Water Act requires any applicant for a federal license or permit to conduct an activity that may result in a discharge of a pollutant into waters of the United States to obtain a certification from the State in which the discharge originates that the discharge complies the applicable water quality standards."[47] The certification becomes an enforceable condition of the federal permit.

Additionally, MPCA regulates generation, handling, and storage of hazardous wastes.[48]

A permit from the Minnesota Department of Transportation (MnDOT) is required for construction, placement, or maintenance of utility lines adjacent or across trunk highway rights-of-way.[49]

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[43] 16 U.S. § 1532(19) (defining "take" to mean to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in such conduct).

[44] Minnesota Statutes 84.415.

[45] DNR (n.d.) *Requirements for Projects Involving Public Waters Work Permits*, http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/requirements.html.

[46] MPCA. *Construction Stormwater*. (2022). https://www.pca.state.mn.us/business-with-us/construction-stormwater

[47] MPCA. (n.d.) *Clean Water Act Section 401 Water Quality Certifications*, https://www.pca.state.mn.us/water/clean-water-act-section-401-water-quality-certifications.

[48] Minnesota Rules 7045.

[49] Minnesota Rule 8810.3300, subp. 1.

Coordination would be required to construct access roads or driveways from trunk highways.[50] These permits are required to ensure that use of the right-of-way does not interfere with free and safe flow of traffic, among other reasons.[51]

The State Historic Preservation Office (SHPO) is charged with preserving and protecting the state's historic resources. SHPO consults with applicants and state agencies to identify historic resources to avoid and minimize impacts to these resources.[52]

The Minnesota Department of Agriculture (MDA) ensures the integrity of Minnesota's food supply while protecting the health of its environment and the resources required for food production. MDA assists in the development of agricultural impact mitigation plans that outline necessary steps to avoid and mitigate impacts to agricultural lands.

The Board of Water and Soil Resources (BWSR) oversees implementation of Minnesota's *Wetland Conservation Act* (WCA).[53] The WCA is implemented by local units of government.

Tribal

Coordination with Tribal Historic Preservation Offices (THPO) prevents impacts from the project to known traditional cultural properties. THPOs are officially designated by Tribes and serve the same function as a State Historic Preservation Office, but they are not a requirement.[54] Tribes can elect to not participate, but those that do each have coordinators to assist in preservation efforts of Tribal historic properties and cultural traditions. They are also available to advise federal, state and local agencies on the management of Tribal historic properties and instruct municipalities on Section 106 reviews to represent tribal interests.

Local

St. Louis County oversees local implementation of the WCA in the project area. The WCA requires that any person "proposing to impact a wetland to first, attempt to avoid the impact; second, attempt to minimize the impact; and finally, replace any impacted area with another wetland of at least equal function and value."[55]

Commission route permits preempt local zoning, building, and land use rules, regulations, or ordinances promulgated by regional, county, local, and special purpose government; however, coordination with local governments may be required for the issues listed below.

Access/Driveway

Coordination may be required to construct access roads or driveways from county or township roads.

Oversize or Overweight Load

Coordination may be required to move over-width or heavy loads on county or township roads.

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[50] MnDOT *Land Management*. (2022). https://www.dot.state.mn.us/utility/forms.html:.

[51] MnDOT. Utility Accommodation on Trunk Highway Right of Way: Policy OP002. (2017).

[52] Minn. R. 4410.4300, subp. 31.

[53] Minn. R. 8420.

[54] See generally Minnesota Indian Affairs Council, Tribal Historic Preservation Officers, retrieved from: https://mn.gov/indian-affairs/cultural-resources/tribal-historic-preservation-officers-.jsp

[55] Minnesota. Rule. 8420.0100, subp. 2.

ROAD CROSSING AND RIGHT-OF-WAY

Coordination may be required to cross or occupy county or township road rights-of-way.

Regional Transmission Planning

Minnesota's electric grid is part of the high-voltage transmission system that connects the entire eastern two-thirds of the United States. The Federal Energy Regulatory Commission (FERC) has jurisdiction over the planning and operation of most of that system.

FERC implements its policies and regulations through various regional transmission organizations. One of these regional organizations, called the Midcontinent Independent System Operator (MISO), is responsible for planning and operating the high-voltage system in most of the central United States. MISO manages approximately 72,000 miles of transmission lines across 15 states, including most of Minnesota. Minnesota Power is a MISO member.

Every year, MISO evaluates various projects through annual its transmission expansion planning process that aims to build an electric infrastructure to meet local and regional reliability standards, enable competition among wholesale capacity and energy suppliers, and allow for competition among transmission developers.

Electric Safety Codes

If constructed, the project must meet electrical safety code requirements.

The project must meet requirements of the National Electrical Safety Code (NESC).[56] Utilities must comply with the most recent edition of the NESC, as published by the Institute of Electrical and Electronics Engineers, Inc., and approved by the American National Standards Institute, when constructing new facilities or upgrading existing facilities.[57] These standards are designed to safeguard human health "from hazards arising from the installation, operation, or maintenance of conductors and equipment in electric supply stations as well as overhead and underground electric supply lines".[58] They also ensure that facilities and all associated structures are built from materials that will withstand the operational stresses placed upon them over the expected lifespan of the equipment, provided that routine maintenance is performed.

Utilities must also comply with North American Electric Reliability Corporation's (NERC) standards,[59] which define the reliability requirements for planning and operating the electrical transmission grid in North America.[60]

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[56] *See* Minnesota. Statute. 326B.35; Minn. R. 7826.0300, subp. 1 (requiring utilities to comply with the most recent edition of the National Electric Safety Code when constructing new facilities or reinvesting capital in existing facilities)

[57] Minnesota Statute 326B.35.

[58] IEEE Standards Association (n.d.) *2017 – National Electrical Safety Code Brochure*, retrieved from: https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/nesc_2017_brochure.pdf.

[59] Appendix C, Draft Route Permit, Section 4.5.1.

[60] North American Electric Reliability Corporation (2017) *Standards*, http://www.nerc.com/pa/stand/Pages/default.aspx.

Chapter 3: Proposed Project and Alternatives

Minnesota Power proposes to modernize and upgrade the Minnesota terminal of its 465-mile Square Butte HVDC transmission line (HVDC Line) and interconnect the upgraded HVDC terminal to the existing alternating current (AC) transmission system near the Arrowhead Substation in Hermantown, Minnesota. The project includes the construction of approximately 40 acres of new terminal facilities and HVTLs to connect those facilities to each other and the existing electrical grid (Appendix B, Map 1). This chapter describes the project and one route alternative to the project proposed by ATC (ATC Alternative). This includes how they would be constructed, operated, and maintained. **Unless otherwise noted, the source of information for this chapter is the combined certificate of need and route permit application.**

How is the project designed?

The project will help maintain electrical reliability in the area as more renewable energy is added to the grid and is sized to accommodate electric demand growth. Minnesota Power states that the project is critical to their efforts to leverage existing infrastructure to efficiently maintain the current load, gain additional access to renewable resources for customers, and reach the state's goal of 100 percent carbon-free energy by 2040.

The project is south of U.S. Highway 2, north of Interstate 35, and southwest of the City of Hermantown (Appendix B, Maps 2a and 2b). Table 2 summarizes the project location. The project encompasses the construction of roughly 40 acres of new terminal facilities, coupled with the installation of a few miles of HVTLs. These HVTLs serve the purpose of connecting the newly established facilities to each other and integrating them into the existing electrical grid.

Table 2: Project Location

Township	Range	Sections	Township	County
50N	15W	31	Solway	St Louis
50N	16W	36	City of Hermantown	St Louis

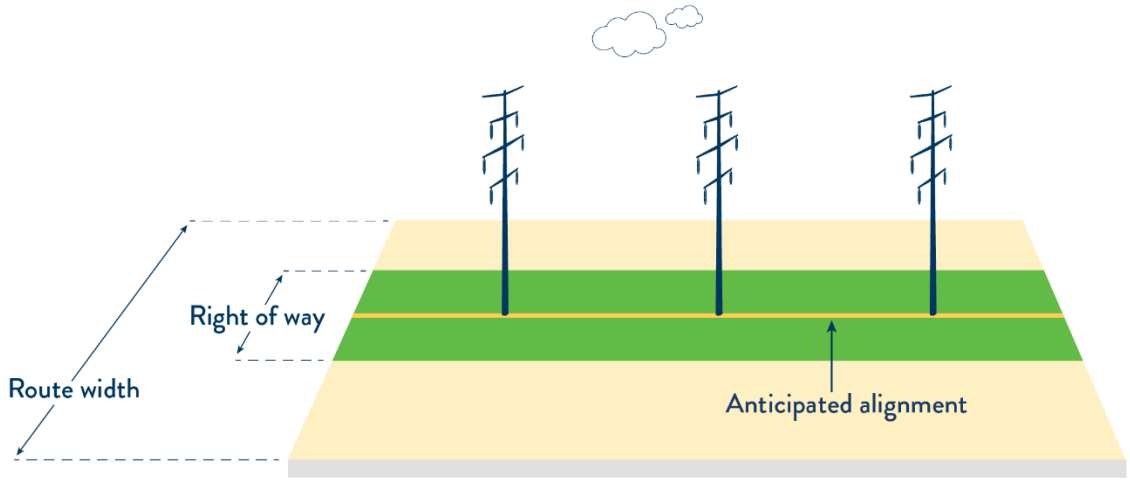
Both the HVTL and substation will be designed in compliance with all applicable standards regarding clearance to ground, clearance to existing utilities, clearance to buildings, strength of materials, and right-of-way widths. Crews will follow standard construction practices and industry safety procedures.

HVTL

Alternating current (AC) transmission lines, such as the proposed project, consist of three separate phases, each phase requiring a conductor to carry the electrical power (see Figure 2). A phase consists of one or more conductors; this project will use two sub-conductors per phase. A typical conductor is a cable consisting of aluminum wires stranded around a core of steel wires. The specific conductors for the project are yet to be determined but will consist of aluminum steel reinforced wire or aluminum steel supported wire in bundled configurations. Each phase is at the end of a separate insulator and physically supported by a structure that holds it above ground. There will be a shield wire strung above the phases to prevent damage from lightning strikes.

Transmission lines are usually either single-circuit (carrying one three-phase conductor set) or double-circuit (carrying two three-phase conductor sets). Structures for the project may be configured as double circuit or double circuit capable as appropriate to facilitate future development. 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. The length of each line will be under 1 mile.

Figure 2: Parts of a Typical Transmission Line



Anticipated support for the steel pole structures will rely primarily on drilled concrete pier foundations. While concrete pier foundation design specifics have not been finalized, potential variations may span from 4 to 12 feet. Additionally, other foundation types may be used, including but not limited to direct embedded and helical piers, may be used based on project needs during development.

Converter Station

The project will require a new HVDC Converter Station to implement the project's new HVDC converters. This terminal will convert direct current (DC) electricity into AC and interconnect to the existing AC transmission system. First, the existing HVDC transmission line will be reconfigured to enter the new Converter Station via a new 250 kV HVDC transmission line. Once operational, the existing 250 kV HVDC transmission line between the proposed Converter Station and the existing Arrowhead Substation would be decommissioned. The Converter Station will convert this voltage to 345 kV AC and send it along a new 345 kV AC transmission line from the Converter Station to the new St. Louis County Switchyard.

The existing converter station will be decommissioned. A new Converter Station is needed because the new HVDC voltage source converter technology is relatively much larger. Second, retrofitting the existing building would require a more extensive outage. Minnesota Power defines decommissioning this existing converter station as leaving the outdoor equipment and buildings in place to maintain the system and removing electrical equipment inside while otherwise keeping the existing equipment there. In general, what's inside the building will be taken out of service.

The HVDC Converter Station will have bi-directional capabilities, an inherent component to modern HVDC systems. The building has more heating, ventilation, and air conditioning; programmable; and solid-state equipment than a standard AC substation. This will include components such as transformers, circuit breakers, batteries, protective relays, converter valves, protection and control systems, valve cooling systems, and building services. The HVDC Converter Station will be fenced in an area approximately 450 by 750 feet for security and safety as required by electric code. The building itself is comprised of a converter hall and a control and protection building contiguously located. Total, they are expected to be 330 feet by 170 feet, the converter hall up to 180 x 270 feet and 82 feet high, and the control and protection building up to 170 x 114 feet and either one story at 16 feet high or two stories at 36 feet high.[61]

Switchyard

A switching station, also known as a switchyard (hereinafter the "Switchyard"), serves as a secure point to safely manage project connection and disconnection to and from the electrical grid as required. The project will require a new St. Louis County 345 kV/230 kV switchyard/substation. This switchyard will step the voltage down from 345 kV to 230 kV, prior to sending it along two new parallel 230 kV AC transmission lines to the existing Minnesota Power Arrowhead Substation. Two parallel lines are proposed to interconnect at different locations, serving dual purposes: enhancing protection and control capabilities while enabling transfer of 550 MW. The double-line deployment approach is essential, as a single line would lack sufficient capacity for this type of transfer. The Switchyard will be a fenced area of approximately five acres for security and safety as required by electric code.

Access Roads

St. Louis County Zoning Ordinance No. 62 and the City of Hermantown Ordinance Chapter 10 require authorization for driveway or private road access to any parcel or lot from any public roadway. Minnesota Power will obtain permission from the appropriate road authority if required to construct access roads or driveways from county or city roadways. The current project layout includes construction of three access roads from the roads directly adjacent to the project from the west, north, and east. One routes to the Converter Station and two route to the Switchyard (Appendix B, Map 3). The ATC Alternative includes two access roads southeast of their existing Arrowhead Substation, which together are roughly the same length as the proposed project's access roads (Appendix B, Map 3).

What alternatives does this EA study?

For the purposes of this EA, the applicant's proposed route includes the expanded route width requested by the applicant during scoping. One alternative offered by ATC is also included for a total of two routes to be studied.

Should the Commission issue a route permit for the project, it must select either the applicant's proposed route or the ATC Alternative. Staff worked with ATC to develop an anticipated alignment and right-of-way along the ATC Alternative route (Appendix B, Map 4). This approach allows for an appropriate comparison with the applicant's proposed route. Should a permit be issued for the project, the permittee can request changes to the anticipated alignment and right-of-way ultimately selected by the Commission. Such modifications "must have comparable overall impacts relative to the factors" used to make the route permit decision.[62]

[61] Minnesota Power Scoping Comments, September 13, 2023, eDockets No. 20239-198914-02.
[62] Minnesota Rule 7850.4100.

Minnesota Power's Proposed Route

Minnesota Power's proposed route includes the route that was originally requested in the route permit application in addition to the expanded route width requested during scoping.

Minnesota Power's project study area for their proposed route is generally bounded by Public Land Survey parcels Town 50 Range 16 Section 36 and Town 50 Range 15 Section 31. Routes for the HVTLs do not pass any roads, private property, or existing transmission lines but will span a trout stream to get to Minnesota Power's existing Arrowhead Substation. The route begins by branching off the current 250 kV Square Butte HVDC transmission line (HVDC Line), then heads into Minnesota Power's existing Arrowhead Substation, which is proposed for removal once the project is operational (Appendix B, Map 1). The new 250 kV HVDC branch off will route through the Converter Station, which will step up to a new 345 kV AC transmission line, enter the new 345/230 kV AC Switchyard, leave with two parallel 230 kV AC lines, and ultimately end at Minnesota Power's existing Arrowhead Substation. Two parallel lines are proposed in order to interconnect at different locations for protection and control purposes, and also to enable transfer of 550 MW which a single line would not be able to carry.

The proposed route width encompasses the entire project and all its facilities, which is approximately 0.5 miles north south and 0.7 miles west east. Minnesota Power is requesting a route width that is wide enough to provide flexibility to design facilities that minimize system impacts and outages, optimize future expandability, address engineering concerns after route permit issuance, avoid sensitive natural resources, and to manage construction constraints. Unlike traditional transmission line projects, Minnesota Power plans to purchase and own in fee simple[63] all the land required for project construction and operation, in which case no right-of-way would be required.

ATC Alternative

The ATC Alternative was proposed for study in this EA during scoping. The alternative changes the placement of all the proposed HVTLs and eliminates the proposed Switchyard. Instead, the proposed new Converter Station would be constructed and a double-circuit 345 kV HVTL would be routed directly to ATC's Arrowhead Substation.

The ATC Alternative deviates from the applicant's proposed route once it reaches the proposed Converter Station. The Converter Station would still be constructed as proposed by Minnesota Power's project. A double-circuit 345 kV HVTL would instead exit the Converter Station by going briefly south until it hits the right-of-way of the current 250 kV HVDC Line that is proposed for removal. Once the right-of-way is reached, the HVTL would share a portion of the existing right-of-way heading east out of the Converter Station until it approaches Minnesota Power's Arrowhead Substation. The HVTL would then require new right-of-way as it goes southeast to enter ATC's Arrowhead Substation (Appendix B, Map 4). This alternative would have to cross an existing Minnesota Power 230 kV HVTL and associated right-of-way near ATC's Arrowhead Substation. The ATC Alternative includes a 150-foot wide right-of way for the double-circuit 345 kV lines and a variable route width with a maximum of 0.91 miles. ATC anticipates that the centerline for the HVTL would be offset from the existing HVDC Line by approximately 110 feet, thus the HVTL would share approximately 25 feet of the existing HVDC Line ROW.

[63] As in a real property held permanently under law as a vested, inheritable, or present possessory interest in land.

If the Commission orders implementation of the ATC Alternative as part of this proceeding, ATC anticipates that Minnesota Power would own and construct the double-circuit 345 kV transmission line between the new Converter Station and ATC's existing Arrowhead Substation as well as the facilities associated with the line entrance into the new Converter Station. Minnesota Power will own in fee all real property on which the double-circuit 345 kV transmission line for the ATC Alternative would be constructed. Therefore, no easements or additional fee ownership of property would be necessary to construct the ATC Alternative.

To construct, ATC would not need to expand its existing Arrowhead Substation as all work would occur within the fence line. ATC would be responsible for constructing adjustments needed within its Arrowhead Substation such as removing capacitor banks that will no longer be needed for voltage stability with the Converter Station's new technology that will provide stability instead. ATC would also install 345 kV circuit breakers, switches, standard shape steel, tubular steel, bus pipe, foundations to support said devices, and control cable in the substation yard. In the control house, ATC would add protective relay panels.

ATC anticipates that nine structures would be required, including four tangent structures and five dead-end structures. Typical structure heights would range from 115 to 180 feet and use a double circuit configuration. Typical spans would be between 700 and 850 feet in length. The poles would use a weather steel finish poles and concrete caisson foundations for the dead-end and tangent structures. A concrete caisson is a cylindrical concrete foundation cast below ground and embedded with reinforcing steel with protruding anchor bolts on top to accept the structure.

Project Construction

HVTL construction practices are similar for both routing options. Minnesota Power anticipates construction will take three to five years to complete. This section summarizes construction sequencing and activities.

Minnesota Power will design, construct, own, and operate the Converter Station and HVTLs under both the proposed project and the ATC Alternative. If the proposed project is pursued, Minnesota Power would also own the Switchyard. No easements or additional fee ownership of property is necessary to construct either option, as Minnesota Power owns all related property.

HVTL

Construction will not begin until the applicant obtains necessary approvals and land rights. Minnesota Power will notify affected and adjacent landowners of the anticipated construction schedule and activities prior to invitation. Schedules may ultimately vary due to permit conditions, weather, and available workforce and materials.

Minnesota Power will follow standard construction practices, including best management practices (BMPs) designed to mitigate impacts. BMPs are based on industry-specific standards and experience with previous projects. BMPs address right-of-way clearance, erecting transmission line structures, and stringing transmission lines. Construction would progress, generally, as follows:

- Survey staking of the transmission line alignment and/or pole locations
- Right-of-way clearing (trees and other vegetation)

- Grading or filling as necessary (transmission structures are typically designed for installation at existing grades)
- Installation of structures and stringing conductor wire
- Drill concrete pier foundations for steel pole structures
- Installation of conductor wires to insulators through stringing setup areas
- Installation of shield wire clamps once final sag is established for stringing operations

Typical construction equipment includes semi and dump trucks, flatbed tractor trucks and trailers, tree removal equipment, mowers, cranes, backhoes, digger-derrick line trucks, track-mounted drill rigs, front-end loaders, bucket trucks, bulldozers, pullers, tensioners, pickup trucks, and concrete trucks. Excavation equipment can be wheel or track driven. Ingress and egress points are depicted on Appendix B, Map 3. Access would be made directly from existing roads that run parallel or perpendicular to the right-of-way to accommodate construction equipment.

Areas for staging or temporary storage of materials and equipment will be determined based on property acquisition. Temporary workspace generally includes a laydown yard(s) used to stage or store material, preassemble structures, vehicles, construction equipment, and supplies. Laydown yards are generally sited on previously disturbed or developed areas. A previously disturbed or developed area that includes sufficient space will be preferred. 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.

Right-of-way Preparation

Before ground disturbance occurs, surveyors will mark the anticipated alignment and right-of-way boundary. Construction begins by removing trees and other vegetation from the right-of-way that will interfere with safe construction and operation of the HVTL. The Commission requires that applicant minimize tree removal to the maximum extent practicable and leave undisturbed low growing species that will not interfere with operation or construction.[64]

Structures are generally installed at existing grade; structure locations will not be graded or leveled unless it is necessary to provide a reasonably level area for construction access and activities. Crews will install erosion control where needed. Prior to structure installation, the HVTL alignment might be surveyed and marked again to guarantee proper placement of structures.

Structure Installation

This phase of construction begins by marking underground utilities using Gopher State One Call. Structures will be delivered to the installation location and crews will install hardware while the structure is on the ground. The structure is then lifted, placed, and secured.

The process of securing a structure depends on its type. Structures can be directly imbedded, supported with a galvanized culvert, or placed on a concrete foundation, also referred to as drill pier foundations. All three foundation types require excavation of a hole to place the foundation. Tubular steel pole structures are expected to be supported on concrete drilled pier foundations, with augured holes up to

[64] Draft Route Permit, Section 5.3.6.

12 feet in diameter. Concrete is poured, usually to one-foot above grade. After the foundation is set, structures are bolted to it.

The ATC Alternative would use concrete caisson foundations. For these, the soil is typically removed with a large diameter drill to create the hole for the concrete. The excavated holes for reinforced concrete caissons may range from five 16 to 12 feet in diameter and 20 to 60 feet in depth, depending on loading and soil conditions. Concrete caissons are formed using the excavated hole or a steel casing, which may or may not be removed as the concrete is being placed. The caisson is reinforced using steel rebar and then an anchor bolt cage is placed into the hole and concrete is poured to final elevation. After the caisson is cured, the structure is placed on the caisson.

The process used to secure the structure, along with the actual diameter and depth of a foundation depends on many factors including structure type, soil conditions, slope, line materials, line tension, and the angle of the lines on the structure. All structure types might generate excess soil. Crews will spread and level excess soil from excavation near the structure or remove it from the site, as requested by the landowner or required by permit conditions. If a structure is located within a wetland, excess soil must be placed in uplands.[65]

Once structures are installed, conductors are strung along the line. Setup areas will be at the end of the new transmission line and occupy approximately 100-foot by 500-foot areas. Puller-tensioner sites are locations where crews will set up equipment to pull in and tension the conductor. 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. Conductors and a shield wire will be strung, tightened, and, once appropriate tension is obtained, secured to each structure. Crews will use temporary guard or clearance structures to protect the conductor and to provide adequate clearance over existing distribution lines, communication lines, waterways, or other potential obstructions.

Lastly, crews will install avian flight diverters on the shield wire in select locations as applicable in coordination with the DNR.[66] Currently, Minnesota Power does not propose to install bird flight diverters for the project, as they claim that there are not any water features or habitat conditions that would concentrate avian use more than the surrounding area. Minnesota Power considers the trout stream too narrow. DNR considers nearby wetlands to also be a large factor to be weighed in this determination. The draft route permit (DRP) includes a standard condition requiring the applicant to coordinate with the DNR to make final determinations.[67]

Switchyard and Converter Station

Land use for utility infrastructure would increase by approximately 43.5 acres because of the project. Following survey, staking, and utility locates through Gopher State One Call, erosion control BMPs will be installed such as, straw wattles, silt fencing, and erosion control blankets/mats. Site access will also be prepared if required.

About 13 acres of soil will be graded and may have permanent impacts to construct the Switchyard and the Converter Station. Tree clearing would occur to install transmission lines that will power the substation and converter station. The site will be re-surveyed to establish equipment and structure

[65] Draft Route Permit, Section 5.3.8.
[66] Draft Route Permit, Section 5.3.15.
[67] Draft Route Permit, Section 5.3.8.

locations. The area will be fenced. Concrete pads and footing for equipment will be installed with a range of depth in foundations.

Equipment, such as circuit breakers, bus work, capacitors, and dead ends, will be delivered, assembled, and installed. Transformers and control equipment will be delivered and installed. The final step involves stringing conductors inside the Switchyard and Converter Station. An outage up to five days on the HVDC Line is needed to interconnect the project. For the ATC Alternative, the centerline for the new HVTL would be offset from the existing HVDC's Line's ROW by 110 feet, which would allow for safe operation of the line during construction of the new ATC Alternative line. This line would require one crossing over the top of the existing HVDC Line and one crossing over the top of the existing 230 kV line that runs north-south, which would require the same temporary outage of up to five days.

Restoration

Removal of equipment and debris from the right-of-way, staging yard(s), and station areas is the first step in restoration. Crews will repair disturbed areas to their original condition to the greatest extent practicable so that all surfaces drain naturally, blend with natural terrain, and facilitate revegetation. Restoration includes removal of debris and all temporary facilities, implementing erosion control measures, implementing any necessary permanent stormwater management system, and reseeding areas disturbed by construction activities to establish permanent vegetation cover that harmonizes with the surrounding area and native plants, including the potential for planting pollinator friendly vegetation. Where soil compaction has occurred, construction crews or the restoration contractor will use techniques to reduce the compaction.

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. If Minnesota Power is unable to acquire all project lands in fee simple ownership, the company will acquire traditional utility rights-of-way via eminent domain for any remaining land required to build and operate the project.

Land Rights

Easements for any aspect of the project, including temporary construction and long-term O&M of the project, are not expected. Unlike traditional transmission line projects, Minnesota Power plans to purchase and own in fee simple all the land required for project construction and operation.

Companies must follow the procedure outlined in Minnesota Statute 84.415 and Minnesota Rules 6135 to cross state-owned land. The Division of Lands and Minerals within DNR grants permission to cross state lands and waters in the form of a crossing license. The license is usually granted for 25 to 50 years and may be renewed when it expires.[68] To apply for an easement the applicant must file an *Application for License to Cross Public Lands and Waters*.[69]

Project Schedule

Minnesota Power anticipates beginning construction of the Minnesota terminal as early as 2024, followed by a construction start for the North Dakota Terminal in 2025, dependent on having all

[68] Department of Natural Resources (n.d.) *Utility Crossing Licenses*, retrieved from: https://www.dnr.state.mn.us/permits/utility_crossing/index.html.

[69] Department of Natural Resources (June 13, 2015) *Application for License to Cross Public Lands and Waters*, retrieved from: http://files.dnr.state.mn.us/lands_minerals/utility/utility_crossing_application.pdf.

required regulatory approvals in place. The Project is scheduled to be in service between 2028 to 2030. Table 3 shows Minnesota Power's estimate of development and construction milestones.

Table 3: Anticipated Project Schedule

Activity	Anticipated Date
**Date range represents potential outcomes based on supplier availability to expedite manufacturing slot reservation.*	
Land Acquisition	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 with Preferred Supplier	Jan 2024
Certificate of Need and Route Permit Issued	July 2024
Other Federal, State, and Local Permits Issued	July – Nov. 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
Execute Firm Contract and Give Final Notice to Proceed with HVDC Manufacturing & Delivery	Feb 2026 – Oct 2026
Construction of HVDC Converter Stations Begins	Feb 2027 – Oct 2027
Project in Service Dec 2028 – Apr 2030a	

The ATC Alternative's schedule was provided in eDockets No. 20242-203435-09. It indicates starting substation design in 2024, procuring material in 2026, construction in late 2028, and coinciding with Minnesota Power's schedule for the transmission line's construction (2024 scoping, construction start in 2026).

Operation and Maintenance

Minnesota Power would be responsible for the operation, maintenance, and, when necessary, repair of the entire project, including the HVTL, Converter Station, and Switchyard.

HVTL

Periodically, the completed transmission line right-of-way must be accessed to conduct inspections, perform maintenance, and repair damage. To ensure continued integrity, regular maintenance and annual inspections will be performed throughout the transmission line service life. Inspection of 345 kV and HVDC assets may occur on a more frequent basis. Annual inspections will be limited to the right-of-way and 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.

Examples of items Minnesota Power may look for during an inspection include pole or component problems such as woodpecker holes, cracked or broken insulators, frayed or damaged conductors, missing or loose hardware, rusted poles, and right-of-way encroachments. Generally, vegetation within the right-of-way that has potential to interfere with HVTL operation will be removed. Native shrubs that will not interfere with the safe HVTL operation will be allowed to reestablish in the outer edge of the

right-of-way. When necessary, problem vegetation will be cleared through a combination of mechanical and hand clearing, along with herbicide application to remove or control vegetation growth. Noxious weed control with herbicides will be conducted as needed around structures and anchors.

Converter Station and Switchyard

A certain amount of maintenance would be required at the Converter Station and Switchyard to ensure proper functioning in accordance with National Electrical Safety Code (NESC) standards. Periodic servicing coinciding with manufacturer recommendations is needed for HVDC converters and auxiliary equipment, transformers, circuit breakers, batteries, protective relays, and other equipment. The Switchyard and outdoor equipment areas at the Converter Station also need vegetation control and drainage maintenance.

Project Costs

Costs are dependent upon routing option. Table 4 below provides cost estimates. These estimates are engineering estimates because regulatory approvals are secured prior to contracting with a vendor and finalizing material orders. In aggregate, the HVDC Modernization Project (both Minnesota and North Dakota portions) is anticipated to cost approximately $660 to $940 million. This estimate includes land and right-of way costs in addition to construction, engineering, materials, permitting, and design costs for the new Switchyard and Converter Station as well as the associated HVTLs.

Switchyard and Converter Station cost estimates do not change based on the route selected. The ATC Alternative is anticipated to cost $39.5 million with a range of $34.9 million to $47.5 million (in 2022 dollars). It is unclear if this information provided by the ATC includes their project as a whole as the only provided cost for the transmission and interconnection facilities. There is likely more cost associated with ATC Alternative construction because it would still require the upgraded Converter Station. Thus, the impact for ATC Alternative is likely a higher effect, but still less than the proposed project. This is the best information EERA can obtain at the time of writing this EA.

Minnesota Power's substation operation and maintenance costs typically range from $50k to $100K annually. The Converter Station operation and maintenance costs are anticipated to be approximately $1 million annually. Right-of-way maintenance, including inspections, are anticipated to be $1,100 per mile for all alternatives.

Table 4: Estimated Proposed Project Costs

Project Component	Cost
HVDC Converter Stations	$590-815 million
Minnesota Interconnection Facilities	$40-70 million
North Dakota Interconnection Facilities	$30-55 million
Total Costs	**$660-940 million**

Decommissioning

The project will be decommissioned at the end of its useful life, and funds collected for removal and restoration are included in the Minnesota Power's depreciation reserve for the facility. Utilities are required to periodically update these costs. The Department of Commerce reviews the proposed costs to ensure that ratepayers are responsible only for reasonable and prudent costs and makes recommendations to the Commission regarding a final decision.

Chapter 4: Potential Impacts and Mitigation that are Similar Between Routing Options

This chapter describes the environmental setting, affected resources, and how potential impacts and mitigative measures are described. It discusses the environmental setting, topics of abbreviated analysis, cumulative potential effects, unavoidable impacts, and irretrievable or irreversible impacts. The bulk of this chapter focuses on potential human and environmental impacts and mitigative measures that are similar between routing options. **Unless otherwise noted, the source of information for this chapter is the combined certificate of need and route permit application.**

Measuring Potential Impacts

Potential impacts are measured on a qualitative scale based on an expected impact intensity level; the impact intensity level takes mitigation into account.

A potential impact is the anticipated change to an existing condition caused either directly or indirectly by the construction and operation of a proposed project. Potential impacts can be positive or negative, short- or long-term, and, in certain circumstances, can accumulate incrementally. Impacts vary in duration and size, by resource, and across locations. This context is summarized below.

Duration

Impacts vary in length. Short-term impacts are temporary and generally associated with construction. Long-term impacts are associated with operation and usually end with decommissioning and reclamation. Permanent impacts extend beyond the decommissioning stage.

Size

Impacts vary in size. To the extent possible, potential impacts are described quantitatively, for example, the number of impacted acres or the percentage of affected individuals in a population.

Uniqueness

Resources vary in type, extent, quality, and quantity. Common resources are those that occur frequently, while uncommon resources are not typically encountered.

Location

Impacts are location dependent. For example, common resources in one location might be uncommon in another.

Direct impacts are caused by the proposed action and occur at the same time and place. An indirect impact is caused by the proposed action but is farther removed in distance or occurs later in time. This EA considers direct and indirect impacts that are reasonably foreseeable, which means a reasonable person would anticipate or predict the impact. Cumulative potential effects are the result of the incremental impacts of the proposed action in addition to other projects in the environmentally relevant area.

This EA analyzes potential impacts of the project on various resources. The context of an impact—in combination with its anticipated on-the-ground effect—is used to determine an overall resource impact level. Impact levels are presented through scaled qualitative descriptors, described further in the

following section. These qualitative terms do not convey value judgments; rather, they serve as a mechanism to establish a shared understanding among readers and facilitate the comparison of potential impacts between different alternatives.

Negligible impacts do not alter an existing resource condition or function and are generally not noticeable to an average observer. These short-term impacts affect common resources.

Minimal impacts do not considerably alter an existing resource condition or function. Minimal impacts might, for some resources and at some locations, be noticeable to an average observer. These impacts generally affect common resources over the short- or long-term.

Moderate impacts alter an existing resource condition or function and are generally noticeable to the average observer. Impacts might be spread out over a large area making them difficult to observe but can be estimated by modeling or related simulation. Moderate impacts might be long-term or permanent to common resources, but generally short- to long-term to uncommon resources.

Significant impacts alter an existing resource condition or function to the extent that the resource is impaired or cannot function. Significant impacts are likely noticeable or predictable to the average observer. Impacts might be spread out over a large area making them difficult to observe but can be estimated by modeling. Significant impacts can be of any duration and affect common or uncommon resources.

Also discussed are opportunities to mitigate by avoiding, minimizing, or compensating for potential impacts. Collectively, these actions are referred to as mitigation.

To avoid an impact means to eliminate it altogether, for example, by not undertaking parts or all of a project, or relocating the project.

To minimize an impact means to limit its intensity, for example, by reducing project size or moving a portion of the project.

To correct an impact means fixing it by repairing, rehabilitating, or restoring the affected resource, or compensating for it by replacing it or providing a substitute resource elsewhere. Correcting an impact can be used when an impact cannot be avoided or further minimized.

Some impacts can be avoided or minimized; some might be unavoidable but can be minimized; others might be unavoidable and unable to be minimized but can be corrected. The level at which an Impacts can be mitigated might change the impact intensity level.

Regions of Influence

Potential impacts to human and environmental resources are analyzed within specific geographic areas called regions of influence (ROI). The ROI is used in this EA as the basis for assessing potential impacts. ROIs vary between resources. As necessary, the EA discusses potential impacts and mitigation measures beyond the identified ROI to provide appropriate context. Also, direct impacts within the ROI might cause indirect impacts outside the ROI. This EA uses the following ROIs:

The anticipated **right-of-way (ROW)** width which is up to 150 feet depending on final structure type; **Route Width** (Project: as proposed by applicants; ATC Alternative: variable with a maximum of 0.91

miles); **Local Vicinity** (1,600 feet); **project area** (one mile); and **St. Louis County**. The ROIs are based on a distance from an anticipated alignment developed from working with the applicant and ATC and extend symmetrically from both sides of the alignment.

The ROI for each resource is the geographic area where the project might exert some influence. **Table 5** summarizes the ROIs used in this EA by resource element. Impacts to resources may extend beyond these distances but are expected to diminish quickly.

Table 5: Regions of Influence

Resource Type	Resource Element	Region of Influence
Human Settlement	Land Use and Zoning and Property Values	Route width
	Aesthetics, Noise, and Recreation	Local vicinity
	Cultural Values and Transportation and Public Services	Project area
	Socioeconomics	County
Human Health and Safety	Electric and Magnetic Fields, Implantable Medical Devices, Stray Voltage, Public Health and Safety	Route width
Land-based Economies	Mining	Route width
Archaeological and Historic Resources	—	Project area
Natural Environment	Groundwater, Soils, Vegetation, Wetlands, Wildlife (except birds), Wildlife Habitat	Route width
	Wildlife (birds), Rare and Unique Resources, Surface Water	Local vicinity
	Air Quality	Project area
	Greenhouse Gas and Climate Change	County

Environmental Setting

Land use within the project area is mainly forested. There are some occurrences of agricultural, utility corridor, and rural residential land use.

The project footprint is in both Solway Township and the City of Hermantown in St. Louis County, Minnesota, west of Duluth and south of County Highway 56 and US Highway 2 (Appendix B, Maps 2a and 2b). The project area is roughly bounded to the north by Morris Thomas Road (County Road 56), and to the west by Sandberg Road (Township Road 5610). Town Road 889 is within the proposed route, entering on the north from Morris Thomas Road and traveling south to several former residences. The project area to the south and east is roughly bounded by the existing 230 kV transmission corridor.

There are no active or abandoned pipelines are in the project area, with the nearest being a single active natural gas pipeline less than a half mile north of the project area. No active or abandoned railways are in the project area, with the nearest being within a one-mile radius to the west (Duluth Winnipeg and Pacific Railroad) and north (Duluth Missabe and Iron Range Railroad). Built features common to the area include residences and buildings, paved and gravel roads, and transmission lines.

Multiple electric transmission line corridors bisect the forested project area, ultimately connecting to both Minnesota Power's and ATC's Arrowhead Substations (Appendix B, Map 1). The northwestern portion of the project area is developed and includes single family houses, hayfield, and horse pasture (Minnesota Power's Route Permit Application, Appendix I, Wetland and Other Waters Delineation Report, part 1). Land cover of the project area is further discussed in Chapter 4, Land Use and Zoning.

The project area is in the Laurentian Mixed Forest physiographic province. This province traverses northern Minnesota, Wisconsin, Michigan, southern Ontario, and the less mountainous portions of New England. Near the project area, the province is characterized by broad areas of conifer forest, mixed hardwood and conifer forests, and conifer bogs and swamps.[70]

The landscape ranges from rugged lake-dotted terrain with thin glacial deposits over bedrock, to hummocky or undulating plains with deep glacial drift, to large, flat, poorly drained peatlands. The project area has high relief (elevation ranges between approximately 1,270 and 1,480 feet above mean sea level), reflecting the rugged topography of the underlying bedrock.[71]

The project area is characterized by a series of hills, and multiple drainages running west to east leading water down to West Rocky Run, a designated trout stream. West Rocky Run is a tributary to the Midway River, eventually flowing to the St. Louis River and Lake Superior. On site, the stream is in a steep valley with a broad floodplain. Uplands within the project area are forested slopes, open pasture hillsides, upland hayfields, and maintained residential lawns. Forested slopes are the most common upland community, with bedrock and boulders protruding from the soil, and a natural canopy with a variety of tree covers.

Human Settlement

High voltage transmission lines have the potential to impact human settlement. Impacts might be short-term, such as noise during construction, or long-term, such as changes to the aesthetics in the project area.

Cultural Values

The ROI for cultural values is the project area. Impacts associated with rural character and sense of place are expected to be dependent on the individual. For nearby residents that place high value on rural character and a sense of place, impacts are anticipated to be moderate. These impacts will be localized, short- and long-term, but might diminish over time depending on the individual. For the ATC Alternative, impacts are expected to be minimal as that infrastructure is generally cited farther away from residents and view. Impacts to community unity are likely to occur regardless of whether the proposed project or the ATC Alternative is selected. Impacts are unavoidable.

[70] Minnesota Power Route Permit Application, Appendix P, June 1, 2023, eDockets No. 20236-196333-04.
[71] *Ibid*.

Cultural values can be described as shared community beliefs or attitudes that define what is collectively important to the group. These values provide a framework for both individual and communal thought and action. Infrastructure projects believed inconsistent with these values can deteriorate community character. Those found consistent with these values can strengthen it. Projects can invoke varying reactions and can, at times, weaken community unity.

Cultural values are also informed by the work and recreational pursuits of residents and by geographical features. The regional economy near the project area is 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.

Residents and visitors can participate in various recreational opportunities, including fishing, hunting, hiking, and snowmobiling, which are supported by a variety of natural resources that are important to the identity of the area, including trails, lakes, rivers, and state and national forests. The highly visible, industrial look and feel of utility projects can erode the rural feeling that is part of a residents' sense of place.

Potential Impacts

Construction and operation of the project for the proposed project and ATC Alternative are not anticipated to impact or alter the work life and leisure pursuits of residents or visitors in the project area, or affect land use in such a way as to impact the underlying culture or community unity of the area. At the same time, the development of the project may change the character of the area, at least where it is visible. The value residents place on the character of the landscape within which they live is subjective, meaning its relative value depends upon the perception and philosophical or psychological responses unique to individuals. Because of this, construction of the project might—for some residents—change their perception of the area's character thus potentially eroding their sense of place. This tension between infrastructure projects and rural character creates real tradeoffs.

Having been under private ownership without prior provision for public recreational or economic opportunities, the designated construction land is set to be transferred to Minnesota Power. Thus, no recreational or economic opportunities will be removed that previously existed and impact cultural values in the area. For the ATC Alternative, the Converter Station is farther away from residential properties and more likely to be obscured by existing wooded buffers. The ATC Alternative route width also lacks nearby residents to the south by the proposed transmission line; thus impacts are more likely to be minimal.

Impacts are anticipated to be minimal for the proposed project area generally, and moderate for nearby residents. Nearby residents may feel a rural sense of place where outdoor activities and pursuits are enjoyed, common to the culture of this area. Minnesota Power has stated that the finished appearance of the buildings will typically look like a metal-clad industrial building. New transmission buildings or features that may be visible from neighboring properties or roadways, most likely the Switchyard near Morris Thomas Road included in the proposed project, may affect the rural character of the surrounding area.

Mitigation

Impacts for the ATC Alternative are expected to be minimal, thus no mitigation is proposed. Impacts for the proposed project can be minimized by employing mitigation similar to those proposed for aesthetic impacts, such as:

- Coloring the Converter Station and Switchyard a more natural color that blends into the landscape;
- Placing structures the maximum feasible distance from roads and residents, or in a way that is shielded from view by terrain or existing vegetation;
- Maintaining the surrounding forested landscape to the extent possible; and,
- Pwlanting a border of trees, installing a slated privacy fence, or using an otherwise more decorative fence along Morris Thomas Road.

Environmental Justice

The ROI for environmental justice includes the census tracts intersected by the route widths of the proposed project and the ATC Alternative. A meaningfully greater low-income or minority population does not reside in these census tracts. This means that when compared to the combined population of St. Louis County, the percentage of people living in poverty or not self-identifying as white alone were either: 1) not greater than 50 percent, or 2) not 10 percentage points or more than the percentage of the same population in St. Louis County. Therefore, disproportionate and adverse impacts to these populations are not expected. Mitigation is not proposed.

Utility infrastructure can adversely impact low-income, minority or tribal populations. Environmental justice is the "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."[72] The "fair treatment" goal is not to shift risks among populations, but to identify potential disproportionately high and adverse effects, and identify alternatives that may mitigate these impacts.[73]

Minnesota Statute 216B.1691, subd. 1 (e) was recently updated to reflect the definition of an environmental justice area. The data does not define the project area as an environmental justice area based on the population residing in surrounding census tracts. This means that none of the census tracts contain:

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.

Potential Impacts

The ROI for this analysis includes the census tract (#27137011102) intersected by the project. This census tract serves as the most accurate representation of the geographical region where the project may potentially give rise to disproportionate adverse impacts. St. Louis County, which contains this census tract, is considered representative of the general population in the project area against which census tract poverty and demographic data can be compared.

[72] US EPA, Guidance for Incorporating Environmental Justice Concern in EPA's NEPA Compliance Analyses (pdf).
[73] *Ibid.*

Staff conducted a demographic assessment of the affected community to identify low-income and minority populations that might be present. US Census data was used to identify low-income and minority populations. Low-income and minority populations are determined to be present in an area when any of the four criteria outlined in Minnesota Statute 216B.1691, subd. 1 (e) are met.

Table 6 lists the rounded percentage of individuals living below the poverty level and household income. It also lists the percentage of those persons who did not self-identify as non-Hispanic white alone. Information about Minnesota and St. Louis County is provided for context.

Table 6: Environmental Justice Characteristics

Area	% Nonwhite	% income ≤200% of poverty level	% limited English proficiency	Indian Country
Minnesota	20	23	2	NA
St. Louis County	9	30	0	No
Solway Township	7	15	0	No
City of Hermantown	9	18	0	No
Census Tract 27137011102	8	17	0	No

Source: US Census Bureau 2017-2021 American Community Survey data[74]

The low-income and minority populations in the ROI census tract, represented by the percentage living in poverty and those not self-identifying as non-Hispanic white alone, were compared with St. Louis County to determine if any were greater than 50 percent or 10 percentage points or more. None of the percentages for the census tract exceed 50 percent or the St. Louis County percentage by 10 percentage points or more, which is the defined threshold of significance for potential environmental justice impacts from the project. The project is not located in Indian Country.

The U.S. Environmental Protection Agency's (EPA) Environmental Justice Screening Tool (EJ Screen)[75] was also used to evaluate the project area census tract to determine whether there may be disproportionate adverse human health or environmental effects on these populations. This tool suggests the population in the project area's exposure to environmental hazards is less than the state and national average exposure values across a range of variables relevant to the project (Appendix D).

MITIGATION

An environmental justice area or a meaningfully greater low-income or minority population does not reside in the project area. Therefore, the project will not have disproportionately high and adverse human health or environmental effects on low-income, minority, or tribal populations. Mitigation is not proposed.

Land Use and Zoning

The ROI for land use and zoning is the route width. The impact intensity level is anticipated to be minimal for both the proposed project and the ATC Alternative. Land use impacts are anticipated to

[74] EJScreen Technical Documentation, Version 2.2, retrieved from: https://www.epa.gov/system/files/documents/2023-06/ejscreen-tech-doc-version-2-2.pdf

[75] Retrieved from: https://www.epa.gov/ejscreen

be long-term and localized. Constructing the HVTL will change the underlying land use from currently forested and rural residential areas to a utility corridor. The Switchyard and Converter Station will permanently change the underlying land use from forested and rural residential areas to an industrial use. Changes in the underlying land use are unavoidable, but impacts can be minimized. Interference with city and county zoning or land use ordinances is not expected.

Land use is the characterization of land based on what can be built on it and how the land is used. Zoning is a regulatory tool used by local governments (cities, counties, and some townships) to guide specific land uses within specific geographic areas. Land use is linked with zoning regulations in St. Louis County. Land cover documents how much of a region is covered by forests, wetlands, impervious surfaces, agriculture, and other land and water types, including wetlands. Construction of transmission line facilities have the potential to impede or alter current and future land use and land cover.

A route permit from the Commission supersedes local zoning, building, and land use rules.[76] Though zoning and land use rules are superseded, the Commission's site permit decision must be guided, in part, by consideration of impacts to local zoning and land use in accordance with the legislative goal to "minimize human settlement and other land use conflicts."[77] Thus, the Commission can and does consider impacts to zoning and land use when considering route permit applications. The applicant is vested with the power of eminent domain, however, it will not be needed for this project since Minnesota Power owns all land within the proposed route width.

Current land use within the project area is mainly forested, agricultural, and rural residential with the existing HVDC Line corridor. The area includes existing transmission line infrastructure rights-of-way, and the Arrowhead Substation is adjacent to the eastern boundary of the project area. The majority of land cover is forested land, with some cropland and developed land, leaving a little grassland (Appendix B, Map 6).

The project area is within the boundary of 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 project area is zoned Rural/Suburban, S1.[78] The Solway Township portion of the project area is zoned Residential, RES-3.[79]

St. Louis County provides Land Use Districts to guide the purpose on the use of the zoning district, and states that the district shall not be used contrary to the purpose of the district or in conflict with state statutes, regulations or adopted plans.[80] The Utilities Facilities Use Class III category is not allowed on areas zoned RES-3, Class II is allowed with a permit, and Class I is allowed. Regardless of the category that the project falls under, Commission route permits supersede local land use laws. Thus, utility structures are allowed in all zone districts in St. Louis County. The same would apply to any City of Hermantown zoning regulations. The trout stream's zoning that may be in conflict with the project as it's considered a Natural Environment Shoreland Overlay Zone by the City of Hermantown (Appendix B,

[76] Minnesota Statutes 216E.10, subd. 1.
[77] Minnesota Statutes 216E.03, subd. 7.
[78] City of Hermantown Zoning Map, retrieved from: https://hermantownmn.com/wp-content/uploads/2020/01/Zoning2016_website_map.pdf
[79] St. Louis County Land Use Map (Zoning and Land Use layer), retrieved from: https://gis.stlouiscountymn.gov/landexplorer/
[80] St. Louis County Land Use District Chart, retrieved from: https://www.stlouiscountymn.gov/LinkClick.aspx?fileticket=IHWsu0ti1HE%3d&tabid=57&portalid=0&mid=1011

Map 7).[81] The proposed project or ATC Alternative could be subject to the shoreland zoning requirements if project infrastructure were within the shoreline zone in the City of Hermantown. A land alteration permit from the local jurisdiction may be necessary for any filling, grading, and/or excavating.

POTENTIAL IMPACTS

Impacts can occur to zoning ordinances, land uses, or land cover due to construction and operation of the project.

Zoning

The existence of a power line easement restricts certain activities on a property, which might interfere with the underlying zoning designation by restricting the underlying property owner's development. Easements are conditions in a property title and are independent of zoning. Minnesota Power owns all property within the route width for the proposed project and the ATC Alternative, and since utilities generally supersede local regulations, impacts to zoning designations or county ordinances are not expected to occur. Most commonly this type of interference with zoning ordinances/standards occurs in more densely populated urban areas.

Land Use and Cover

Constructing the HVTLs is not anticipated to wholly transform existing land use and cover. For example, planting agricultural crops or using the right-of-way for grazing land is generally not precluded. However, constructing the HVTLs will permanently change the right-of-way into a transmission corridor, so for areas that are currently forested, the underlying land use will permanently change. Anything that is currently rural residential or a developed area will be abandoned, meaning that Minnesota Power will seal wells, remove buildings on the property, and fill in any basements that may be present. The Converter Station and Switchyard will permanently change the underlying land use from forested and rural residential areas to an industrial use. Changes in the underlying land use and cover are unavoidable.

MITIGATION

Potential current and future land use impacts can be mitigated by selecting routes and alignments that are compatible, to the extent possible, with current and future land use and zoning. Maintaining and utilizing the existing right-of-way to a greater extent, such as with the ATC Alternative, mitigates more potential impacts. ATC anticipates that the centerline for the HVTL would be offset from the existing HVDC Line by approximately 110 feet, thus the HVTL would share approximately 25 feet of the existing HVDC Line ROW. The ATC Alternative also requires less HVTL and no Switchyard, thus has relatively less tree clearing that would affect forested land use.

Generally, 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 proposed. The Commission can and will consider the impacts to zoning and land use discussed in this EA when considering route permit applications.

Noise

The ROI for noise is the local vicinity (1,600 feet). Distinct noises are associated with construction and operation. Noise created by *construction* activities are anticipated to be moderate for both the

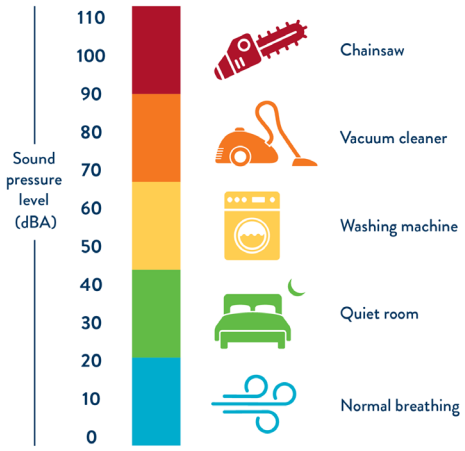
[81] City of Hermantown Public GIS Viewer, retrieved from: https://hermantownmn.maps.arcgis.com/apps/webappviewer/index.html?id=4cc07a64d5fb4a48a6d4b0cf696212e1

proposed project and the ATC Alternative. Potential impacts are anticipated to be intermittent, short-term, and localized. Impacts are unavoidable but can be minimized. Since *operational* noises are not expected to rise above background levels for any significant time period, potential impacts are expected to be minimal.

Noise can be defined as any undesired sound.[82] It is measured in units of decibels on a logarithmic scale. The A-weighted scale (dBA) is used to duplicate the sensitivity of the human ear.[83] A three dBA change in sound is barely detectable to average human hearing, whereas a five dBA change is clearly noticeable. A 10 dBA change is perceived as a sound doubling in loudness. Noise perception is dependent on a number of factors including wind speed, wind direction, humidity, and natural and built features between the noise source and the receptor. Figure 3 provides decibel levels for common indoor and outdoor activities.[84]

Because sounds levels are measured on a logarithmic scale, they are not directly additive. "A doubling of sound energy yields an increase of three decibels."[85] For example, if a sound level of 50 dBA is added to another sound level of 50 dBA, the total sound level is 53 dBA, not 100 dBA. This change in sound level (three dBA) would be barely detectible.

Figure 3: Comparative Noise Levels



All noises produced by the project must be within state noise standards (Minnesota Rule 7030.0050; Table 7). Noise standards in Minnesota are based on noise area classifications (NACs) that correspond to the location of the listener—referred to as a receptor. These classifications are not necessarily synonymous with zoning classifications. NACs are assigned to areas based on the type of land use activity occurring at that location. Noise standards are expressed as a range of permissible dBA over a one-hour period. L_{10} may be exceeded 10 percent of the time, or six minutes per hour, while L_{50} may be

[82] MPCA. *A Guide to Noise Control in Minnesota.* (2015), retrieved from: https://www.pca.state.mn.us/sites/default/files/p-gen6-01.pdf.

[83] *Ibid.*

[84] Federal Aviation Administration (February 9, 2018) *Fundamentals of Noise and Sound*, retrieved from: https://www.faa.gov/regulations_policies/policy_guidance/noise/basics/.

[85] MPCA. A Guide to Noise Control in Minnesota. (2015), retrieved from: https://www.pca.state.mn.us/sites/default/files/p-gen6-01.pdf.

exceeded 50 percent of the time, or 30 minutes per hour. Standards vary between daytime and nighttime hours. There is no limit to the maximum loudness of a noise.

Table 7: Noise Standards (dBA)

Noise Area Classification	Daytime (7:00 a.m. to 10:00 p.m.)		Nighttime (10:00 p.m. to 7:00 a.m.)	
	L_{10}	L_{50}	L_{10}	L_{50}
1	65	60	55	50
2	70	65	70	65
3	80	75	80	75

The state noise standards are public health standards. That is, they protect people from noise generated by all sources at a specific time and place. The total sum of noise at a specific time and location cannot exceed the standards. The MPCA evaluates whether a specific noise source is in violation by determining if the source causes or significantly contributes to a violation of the standards.

Community noise levels are usually closely related to the intensity of human activity. Noise levels are generally considered low when below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. In wilderness areas, ambient noise levels can be below 35 dBA. In small towns or wooded and lightly used residential areas, noise levels are more likely to be around 50 or 60 dBA. Daytime noise levels in rural areas with no significant noise sources might be in the 30 to 40 dBA range.[86] Noise levels increase with passing vehicle or rail traffic; high winds and storms; or use of farm equipment, chainsaws, all-terrain vehicles, boats, or snowmobiles.

POTENTIAL IMPACTS

Potential noise impacts from the project are associated with both construction and operation. The primary noise receptors within the local vicinity are residences and farmsteads. These receptors are assigned to the most stringent standards, NAC 1. Figure 4 shows the number of residences within the local vicinity. Noise receptors could also include individuals working outside in the project vicinity. Ambient noise levels in rural areas such as the one surrounding the project are estimated to be 45 dBA.[87]

Noise standard exceedances need not occur for a negative impact to occur, such as with the disruption caused by rhythmic pounding of foundations posts. For example, "interference with human speech begins at about 60 dBA."[88] 70 dBA interferes with telephone conversations, and 80 dBA interferes with normal conversation.

Construction

Distinct noise impacts during construction are anticipated to vary between minimal to significant depending on the activity, duration, and equipment being used. Construction noise impacts will be temporary, localized, limited to daytime hours, and intermittent. The noise from construction activities

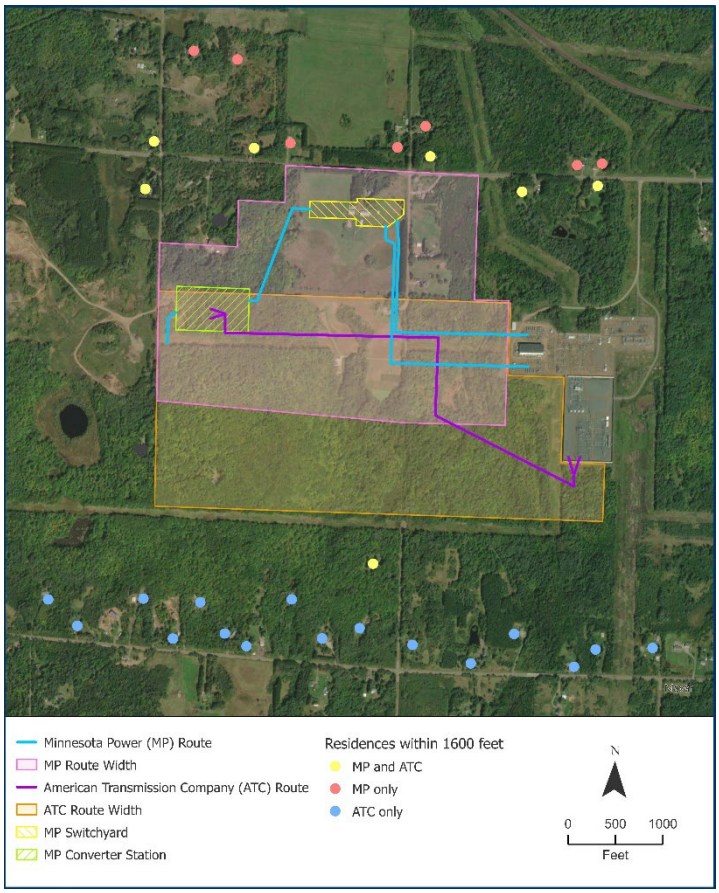
[86] Federal Highway Administration (June 1, 2018) Techniques for Reviewing Noise Analyses and Associated Noise Reports, Figure 1-1, retrieved from: https://www.fhwa.dot.gov/Environment/noise/resources/.

[87] ANSI/ASA S12.9-2013/Part 3.

[88] U.S. Bureau of Reclamation (June 2008) *Navajo Reservoir RMP/FEA, Appendix E Noise*, retrieved from: https://www.usbr.gov/uc/envdocs/ea/navajo/appdx-E.pdf.

would dissipate with distance and be audible at varying decibels, depending on the distance from the equipment to the receptor.

Figure 4: Residences in the Local Vicinity



Noise from heavy equipment and increased vehicle traffic will be intermittent and occur during daytime hours. Major noise producing project construction activities include clearing and grading, material delivery, and driving foundations. The majority of construction equipment that could be used on site, such as grading equipment and Bobcats™, are anticipated to generate noise between 72-85 dBA.[89] Heavy equipment generally runs at full power up to 50 percent of the time.[90] Point source sounds, like construction equipment, decrease six dBA for each doubling of distance;[91] therefore, 90 dBA at 50 feet is perceived as a 72 dBA at 400 feet and 60 dBA at 1,600 feet.

Switchyard

The nearest residence to any project equipment that will be under construction is within 500 feet of the proposed project's Switchyard to the north. Thus, noise impacts from most construction activities at this residence will not be within the daytime state noise standards if they are continuous for at least six minutes. Therefore, this construction noise has the potential to exceed state noise standards at select times intervals and locations. For example, the noisiest construction equipment tends to be bulldozers, drill rigs, and crane derricks at 82, 84, and 88 dBA respectively 50 feet away.[92] Using the most conservative value of 88 dBA reveals that construction at the Switchyard would exceed state L10 noise standards at a residence within less than 800 feet if continuous (88 dBA at 50 feet is perceived as a 70 dBA at 400 feet and 64 dBA at 800 feet).

Exceedances would be short-term, likely not continuous enough to violate state noise standards, and confined to daytime hours. Nighttime construction work may be required during outages, the accommodation of customer schedules, or other operational limitations that may cause construction to occur outside of daytime hours or on weekends. Minnesota Power will work with local governments if

[89] Federal Highway Administration Construction Noise Handbook, retrieved from: https://www.fhwa.dot.gov/environment/noise/construction_noise/handbook

[90] *Ibid.*

[91] MPCA. *A Guide to Noise Control in Minnesota.* (2015), retrieved from: https://www.pca.state.mn.us/sites/default/files/p-gen6-01.pdf.

[92] Federal Highway Administration. Construction Noise Handbook, Chapter 9: Construction Equipment Noise Levels and Ranges. Retrieved from: https://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

construction becomes necessary outside of these hours and will be required to maintain compliance with state noise standards.

Converter Station

Minnesota Power states that the 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 Converter Station) during operation. These areas are residential parcels or NAC 1. Initial engineering estimates determined operation of the Converter Station would comply with the most stringent standard, the 50 dBA nighttime limit. Minnesota Power stated at the in-person public meeting that they intend to do a noise study on that facility and to take the noise impacts into account during detailed design.[93]

Transmission Lines

During construction of the transmission lines, major noise producing activities would be associated with clearing and grading, material delivery, auguring foundation holes, setting structures, and stringing conductors. Crews and activity would be present at a particular location during daytime hours for a few days at a time but on multiple occasions throughout the period between initial right-of-way clearing and final restoration. Intermittent construction noise would occur and is dependent upon the activity. Construction noise associated with heavy equipment can range between 80 and 90 dBA at full power 50 feet from the source.[94]

Operation

Switchyard

The Switchyard will be quieter than the Converter Station. It will contain normal substation equipment such as breakers, switches, and single transformers. The Converter Station includes additional reactors, power electronics, transformer cooling, and valve cooling for the power electronics. Those additional noise sources will have a larger impact during operation of the project in comparison to the Switchyard, which will generate substantially less noise than other project equipment.

Converter Station

The main source of noise during operation will be the Converter Station. Noise contributions from the HVDC Converter Station are dependent on the layout of buildings and equipment within the fence. The most significant sources would be the converter transformers with integrated cooling fans, which produce a consistent humming sound. Transformer noise is nearly constant whenever the transformer is energized. Variations in transformer noise may occur due to the operation of cooling pumps and fans at higher loading levels.

Other outdoor electrical equipment such as the valve cooling system and smoothing reactors would also generate noise. Valve cooling system noise would vary with HVDC system operation, generally producing more noise at higher transfer levels where cooling requirements become more significant. Noise from other electrical equipment, including the transformers and smoothing reactors, would generally be constant whenever the equipment is energized. Noise from indoor equipment is not expected to propagate outside the building.

[93] Oral Public Comments 8.29.23 Public Meeting, eDockets No. 20239-198862-01, p. 30.

[94] Federal Highway Administration. Construction Noise Handbook, Chapter 9: Construction Equipment Noise Levels and Ranges. Retrieved from: https://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

The HVDC Converter Station will be designed to ensure that it does not exceed noise standards during operation at the nearest receptor locations (estimated to be approximately 1,500 feet from the HVDC Converter Station). If studies conducted during the design of the project indicate potential for standards to be exceeded, Minnesota Power will incorporate noise control measures in 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.

Transmission Lines

Operational noise levels produced by a transmission line are generally less than outdoor background levels and are therefore not usually perceptible. Audible transmission line noise is created by small electrical discharges at specific locations along the surface of the conductor that ionize surrounding air molecules. This phenomenon—common to all power lines—is known as corona and is often described as a "crackling" sound. In general, any imperfection on the surface of the conductor might be a source for corona. Examples include dust and dirt, or nicks and burrs in the equipment. Resulting noise levels are dependent upon voltage level (corona noise increases as voltage increases) and weather conditions. In foggy, damp, or rainy conditions, audible corona noise is common. In light rain, dense fog, snow or other relative moist conditions, corona noise might be higher than rural background levels. In heavy rain, corona noise increases even more, but because background noise increases too, corona noise is undetectable. During dry weather, corona noise is less perceptible.

The predicted L50 audible noise levels associated with the various structure configurations of the transmission lines are given in Table 8 for the edge of either the proposed project or ATC Alternative right-of-way. Audible noise from transmission lines is primarily related to the electric field, and electric fields are particularly dependent on the voltage of the transmission line.

Table 8: Calculated L50 Audible Noise for Transmission Lines[95]

Structure Type	Line Voltage Modeled*	Edge of right-of-way L50 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

* Calculated at the lines' maximum continuous operating voltage (defined as the nominal voltage plus 10 percent for the project).

\+ Values were calculated assuming minimum conductor-to-ground clearance (mid-span) and a height of one meter above ground.

MITIGATION

Section 5.3.5 of the DRP requires the permittee to limit construction and maintenance activities to daytime hours to the extent practicable. Minnesota Power will work with local governments if construction becomes necessary outside of these hours. Construction noise impacts can be reduced through sound control devices on vehicles and equipment, for example, mufflers; and running vehicles and equipment only when necessary.

[95] Route Permit Application, Table 7.2.3-3

Proper design and construction of the transmission line in accordance with industry standards will help ensure that noise impacts are minimized. During operation, permittees are required to comply with noise standards established under Minnesota Rule, part 7030.010 to 7030.0080. Other mitigation could incorporate screens or berms that muffle noise leaving the project property, or include a natural buffer that the applicant could dedicate to upholding at a certain distance agreeable to nearby residences. No additional mitigation is proposed.

Property Values

The ROI for property values is the route width. A property's value is influenced by a complex interaction of factors, such as the presence of a HVTL or substation. Reductions in property value could occur, but changes to a specific property's value are difficult to predict. If effects occur, they tend to be small, almost always less than 10 percent, and usually in the range of three to six percent. Because of this uncertainty, impacts are anticipated to be minimal, and dissipate rapidly with distance. Potential impacts to these unique resources can be mitigated.

Impacts to property values that result from power line construction have been studied for over half a century. These studies have focused primarily on residential, agricultural, and undeveloped properties as opposed to commercial or industrial properties. While the research demonstrates that property value impacts vary, the majority indicates that HVTLs have "no significant impact or a slight negative impact on residential properties."[96]

HVTL impacts on property values can be measured in three ways: sale price, marketing time, and sales volume.[97] These measures are influenced by a complex interaction of factors. Most of these factors are parcel specific, including: condition, size, improvements, acreage and neighborhood characteristics; the proximity to schools, parks and other amenities; and the presence of existing infrastructure, for example, highways, railways, or power lines. In addition to property-specific factors, local and national market trends, as well as interest rates can affect all three measures. Thus, impacts from HVTLs on property values depend upon "many factors, including market condition, location, and personal preference."[98] The presence of a HVTL becomes one of many interacting factors that could affect a specific property value.

Generally, HVTL impacts on property values are based on individual perceptions relating to "aesthetic concerns about the effect of overhead wires and supporting towers on views [and] concerns about the possible adverse health impacts associated with exposure to [EMFs]."[99] Property use and size also influence potential value-related impacts. Properties used exclusively for residential purposes "are more vulnerable to value impact than agricultural or recreational uses, where a broader set of property attributes become relevant for the purchaser."[100] Smaller properties are generally more vulnerable to value impacts "due to decreased flexibility in the siting of improvements," though, due to topography,

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[96] Pitts, Jennifer, and Jackson, Thomas (2007) *Power Lines and Property Values Revisited*, THE APPRAISAL JOURNAL 75(4):323-325, retrieved from: https://www.researchgate.net/publication/316674821_Power_Lines_and_Property_Values_Revisited.

[97] Kinnard, William and Dickey, Sue Ann (April 1995) A Primer on Proximity Impact Research: Residential Values Near High-Voltage Transmission Lines, Real Estate Issues 20(1):23-29.

[98] Pitts and Jackson (2007).

[99] Roddewig, Richard and Brigden, Charles (2014) *Power Lines and Property Prices*, REAL ESTATE ISSUES 39(2):15-33.

[100] Chalmers, James (2012) Transmission Line Impacts on Rural Property Values, retrieved from: https://eweb.irwaonline.org/eweb/upload/web_mayjune12_Transmission.pdf.

access, and related constraints, this can also apply to larger sized parcels.[101] Whether or not an HVTL would encumber future land use,[102] and the "existence of close substitutes unaffected by transmission lines" can increase the likelihood of value impact.[103]

Researchers have used survey-based techniques and statistical analyses to draw conclusions about the relationship between HVTLs and property values. In general, surveys provide useful insights into buyer behavior based on stated preferences or when market data is not available.[104] However, survey research presents inherent disadvantages; for example, respondents might not give realistic or truthful responses.[105] Additionally, conducting a survey regarding the relationship between HVTLs and property values in and of itself might trigger negative responses from respondents.[106]

The results of survey studies are generally consistent, and can be summarized as follows:

- A high proportion of the residents were aware of the HVTLs at the time of purchase.
- Between one-half and three-fourths of the respondents have negative feelings about the HVTLs.
- These negative feelings center on fear of negative effects to aesthetics, health, and property values.
- Of those who have negative feelings about HVTLs, the majority (67 percent to 80 percent) report that the purchase decision and the price they offered to pay were not affected by the HVTLs.[107]

Multiple regression statistical analysis techniques are generally accepted as the current professional and academic standard for evaluating potential property value impacts, as it reflects the actual behavior of property buyers and sellers in terms of recorded sales prices, while controlling for other factors such as home size.[108] This type of analysis allows researchers to identify "revealed preferences" or what people actually did, in contrast to survey research, which identifies what people say they would do.[109] This type of research requires large data sets; therefore, it is less subjective and more reliable than paired sales studies.[110] The results are often reported as an average change over a number of properties; however, the effect to individual properties can vary—increase or decrease—widely.[111]

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[101] Ibid.

[102] For example Chalmers, James and Voorvaart, Frank (2009) High-Voltage Transmission Lines: Proximity, Visibility, and Encumbrance Effects, The Appraisal Journal 77(3):227-245, retrieved from: http://www.atc-projects.com/wp-content/uploads/2012/11/Chalmers-Appraisal-Journal-Article-Q2-2009-HVTLs-Proximity-Visibility-Encumbrance-Effects.pdf.

[103] Chalmers (2012).

[104] See Jackson, Thomas and Pitts, Jennifer (2010) The Effects of Electric Transmission Lines on Property Values: A Literature Review, Journal of Real Estate Literature 18(2):239-259, retrieved from: http://www.real-analytics.com/Transmission%20Lines%20Lit%20Review.pdf; see also Kinnard and Dickey (1995).

[105] Electric Power Research Institute (November 2003) *Transmission Lines and Property Values: State of the Science*, retrieved from: http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000000001005546.

[106] *See* Electric Power Research Institute (November 2003), page 2-1 (stating "it is the nature of a questionnaire that by asking a question on a topic, the importance of that topic is highlighted").

[107] Chalmers and Voorvaart (2009), page 229-230.

[108] Kinnard and Dickey (April 1995), page 25; Chalmers and Voorvaart (2009), page 228.

[109] *See* Kinnard and Dickey (April 1995); *see also* Jackson and Pitts (2010).

[110] Chalmers and Voorvaart (2009) at page 228; Kinnard and Dickey (April 1995) at page 25 (a paired sales study involves an appraiser comparing the value of two similar properties, one of which is not impacted by an HVTL).

[111] Electric Power Research Institute (November 2003).

The results of these studies can be summarized, generally, as follows: [112]

- Over time, there is a consistent pattern with about half of the studies finding negative property value effects and half finding none.
- When effects have been found, they tend to be small; almost always less than 10 percent and usually in the range of 3 percent to 6 percent.
- Where effects are found, they decay rapidly as distance to the lines increases and usually disappear at about 200 feet to 300 feet.
- Two studies investigating the behavior of the effect over time find that, where there are effects, they tended to dissipate over time.

POTENTIAL IMPACTS

The ROI for property values is the route width. Impacts to property values could occur; however, specific changes to a property's value are difficult to predict. Impacts, if they occur, are expected to decay over time. Property value impacts fall off rapidly with distance; therefore, impacts are anticipated to be localized. On whole, impacts are anticipated to be minimal and dissipate quickly at distances greater than 400 feet from the HVTL. The nearest resident to any proposed project component or the ATC Alternative is approximately 500 feet, thus impacts are anticipated to be minimal. However, impacts to specific properties could vary widely. Smaller properties are generally more vulnerable to value impacts. Long-term impacts might or might not occur.

Note: Every landowner has a unique relationship and sense of value associated with their property. Thus, a landowner's assessment of potential impacts to their property's value is often a deeply personal comparison of the property "before" and "after" a proposed project is constructed. These judgments, however, do not necessarily influence the market value of a property. Rather, appraisers assess a property's value by looking at the property after a project is constructed. Moreover, potential market participants likely see the property independent of the changes brought about by a project; therefore, they do not take the "before" and "after" into account the same way a current landowner might. EERA acknowledges this section does not and cannot consider or address the fear and anxiety felt by landowners when facing the potential for negative impacts to their property's value.[113]

MITIGATION

Impacts to property values can be mitigated by reducing aesthetic impacts, perceived health risks, and encumbrances to future land use. Routing the HVTL away from residences might reduce aesthetic impacts and perceived health risks. Co-locating the HVTL with existing infrastructure might reduce aesthetic impacts and potential land use conflicts. No mitigation is proposed.

Recreation

The ROI for recreation is the local vicinity. Because few recreational resources exist in the project area, potential impacts to these resources are anticipated to be minimal and temporary.

[112] Chalmers and Voorvaart (2009).

[113] This paragraph is based, in part, on the following: Chalmers, James (October 30, 2019) *High Voltage Transmission Lines and Residential Property Values in New England PowerPoint Presentation*, retrieved from: https://www.nhmunicipal.org/sites/default/files/uploads/Annual_Conference/2019/Sessions/Wednesday/market_effects_of_utility_rows_presentation-1045am.pdf ; Department of Commerce (August 5, 2014) *Rights-of-way and Easements for Energy Facility Construction and Operation*, retrieved from: https://mn.gov/Commerce/energyfacilities/.

Operational impacts will be long-term and primarily associated with visual impacts caused by new built features introduced to the landscape. Given that direct long-term effects are predominantly related to aesthetics, the indirect long-term repercussions on recreation are anticipated to be subjective, meaning that responses will vary based on individual perspectives and experiences. Potential impacts can be minimized.

Multiple recreational opportunities exist in the local vicinity including bird watching, biking, fishing, camping, hunting, canoeing/kayaking, hiking, skiing, and snowmobiling. Activities in the local vicinity are associated with trails and rivers rather than designated outdoor recreation areas. There are three recreational areas within one mile of the proposed route.

The most notable resource is a perennial, designated trout stream to the east of the proposed routes and runs adjacent to the Arrowhead Substation. The stream is inaccessible to the public within the project area as it is surrounded by private land within the proposed route.

Except for a 40-acre parcel of miscellaneous forest land 0.25 miles west of the proposed route, there are no other DNR classified lands, such as State Forests, Parks, or Trails; Wildlife Management Areas; or Scientific and Natural Areas within the local vicinity of either the proposed project or the ATC Alternative. DNR Forestry acquires and manages parcels of Minnesota's forests and trees for both ecological and economic benefit, rather than DNR State Forests, which are managed for public recreation.[114] There are no federal parks, forests, refuges, or county parks within the local vicinity. Outside of the local vicinity is a snowmobile trail approximately one mile north-northeast of the proposed route in the City of Hermantown and the Midway River Aquatic Management Area approximately 0.8 miles to the east.

A collaboration between the City of Hermantown and the City of Proctor is planning multi-use trail spurs to connect the cities to the Munger State Trail, a 70-mile multi-use trail between Hinckley and Duluth approximately 4 miles southeast of the project. The planned spurs also indicate Minnesota Power rights-of-way in the project area as an option for future expansion.[115]

POTENTIAL IMPACTS

Power lines have the potential to impact recreational activities. Impacts might be negative if the line interferes with the resources that provide these activities, for example, changing the aesthetic of a recreational destination in a way that reduces visitor use. Alternatively, a power line might increase recreational opportunities, for example, right-of-way clearing might provide increased opportunities for wildlife viewing or hunting. Minnesota Power has variable span lengths of 200 to 1000 feet between structures intended for the project.

Impacts to recreational activities and other scenic views are anticipated to be similar for both the proposed project and the ATC Alternative. The only recreational area within the project area and local vicinity is West Rocky Run, a trout stream that is inaccessible to the public within the proposed route as Minnesota Power's and ATC's properties near their substations are adjacent to the stream. All proposed facilities would be constructed on privately owned lands and therefore no public recreation would be affected within. There are otherwise no Wildlife Management Areas, trout or muskie lakes, state trails,

[114] Minn. Stat. 89.001, subd. 4.

[115] Proctor Hermantown Munger Trail Spur Master Plan, December 2015, p. 12, retrieved from: https://hermantownmn.com/wp-content/uploads/2020/01/2016-01-21_Master_Plan_Document.pdf.

public water access, designated wildlife lakes, or state lands in the local vicinity. There are two state aquatic management areas over a mile away from the proposed route.

Noise impacts from construction are anticipated to be short-term and intermittent. Operational noise is negligible and will not affect recreationalists. Dust associated with construction might indirectly impact recreationalists or natural areas.

New built features will be introduced to the landscape, and construction equipment and vehicle traffic will affect aesthetics. No structures will be placed in or near publicly accessible recreation areas, thus, they will not be visible. Recreationalists using the area generally for hiking or fishing, for example, may see the infrastructure in certain places, however, given the forested nature of the area, visibility is limited with some distance from the project. Recreationalists most likely to be impacted are neighboring properties not owned by Minnesota Power that use the surrounding area for outdoor activities. Neither the proposed project nor the ATC Alternative would impact any planned use of the Minnesota Power rights-of-way for a multi-use trail.

If they are seen, impacts would be incremental as relatively high levels of electrical and transportation infrastructure exists near the project area. While visual impacts will occur, the HVTL, Substation, and Converter Station will not impede recreational activities. The ATC Alternative would generally be more hidden from the public and thus would have less recreational impacts.

Indirect impacts, such as sedimentation and increased temperatures, may affect the trout stream due to the proposed project or the ATC Alternative. The relevance and significance of these impacts are addressed more comprehensively in the Water Resources section of this EA.

MITIGATION

Impacts to recreation can be mitigated by selecting routes and alignments that avoid resources utilized for recreational purposes. Impacts can also be mitigated by reducing impacts to natural landscapes during construction. Maintaining more natural barriers around the project after construction would also mitigate noise. Various sections of the DRP indirectly address impacts to recreation, such as noise, aesthetics, soils, and others. No impacts to recreation are anticipated during construction or operation of the project; as such, no mitigation is proposed.

Transportation and Public Services

The ROI for transportation and public services and infrastructure is the project area. Potential impacts to roads and railroads, the electrical grid, and other utilities are anticipated to be short-term, intermittent, and localized during construction. Impacts to water (wells and septic systems) and pipelines are not expected to occur. Overall, construction-related impacts are expected to be minimal and are associated with short electrical outages and possible traffic delays. During operation, negligible traffic increases would occur for maintenance. Impacts are unavoidable but can be minimized.

Public services are services provided by a governmental or regulated private entity for public health, safety, and welfare. Large energy projects can impact public services, such as buried utilities or roads. These impacts are usually temporary, for example, road congestion associated with material deliveries. Impacts can be long-term if they change the area in a way that precludes or limits public services.

Water and Wastewater

Minnesota Power will own all of the land in the project study area once construction commences. Previous residences will be abandoned after acquisition, e.g. any wells will be sealed if present at these residences. Several of these private wells are currently in the project study area, all of which are domestic. Minnesota Unique Well Numbers for these are 743182, 513605, 786235, and 751462. Nearby domestic wells that are slightly outside the project study area that will not be owned by the applicant include well number 660860, south of the ATC Alternative route width. Minnesota Power states that they will continue to work with landowners to identify springs and wells near the proposed route. Since minimal water appropriation increase is associated with the project (Converter Station sanitary and fire suppression), other than any possible dewatering that may be required and can be permitted during construction, interference with wells is not expected.

If any septic systems are discovered at residences that Minnesota Power is abandoning, compliance with state rules will be required for managing those if they apply. The project area is generally serviced by private wells rather than city water supply or sanitary sewer.

Electric Utilities

Minnesota Power provides electrical service in the project area and distribution lines throughout. Planned outages along these distribution lines would be necessary to construct the HVTL. Minnesota Power states that building the Converter Station on an adjacent site to their Arrowhead Substation enables the existing HVDC Converter Stations to continue operating to the greatest extent practicable during construction of the project. Single pole outages will be required to upgrade the capacity of the Switchyard and interconnection points in the Arrowhead Substation for the two new 230 kV lines.

An outage that can last up to five days will also be required to cut into the existing HVDC line and reconnect it to the Converter Station. For the ATC Alternative, the centerline for the new HVTL would be offset from the existing HVDC's Line's ROW by 110 feet, which would allow for safe operation of the line during construction of the new ATC Alternative line. This line would require one crossing over the top of the existing HVDC Line and one crossing over the top of the existing 230 kV line that runs north-south, which would require the same temporary outage of up to five days.

Existing transmission and high voltage transmission infrastructure also exist (Appendix B, Map 1). These lines are not expected to be affected by the project (crossed, tapped, raised, etc.), except for the current HVDC line which will be taken out of service.

Pipelines

No active or abandoned pipelines are in the project area, the nearest being one active natural gas pipeline less than a half mile north of the project area. This pipeline is too far from project infrastructure to be impacted by factors such as transmission line currents causing pipeline corrosion.

Roads

State routing policy indicates a preference for consolidating HVTLs with existing infrastructure, including transportation right-of-ways. Minnesota Statute 216E.03, subdivision 7, directs the Commission to "make specific findings that it has considered locating a route for a [HVTL] 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."

The project does not cross any roads or occur within any nearby road right-of-ways. While roads are nearby the project, the Switchyard and interconnecting lines are the nearest infrastructure at approximately 300 feet from Morris Thomas Road.

Railroads

No active or abandoned railways are in the project area, the nearest being within a one-mile radius to the west (Duluth Winnipeg and Pacific Railroad) and north (Duluth Missabe and Iron Range Railroad).

Airports

The nearest airport to the project is private under the name of Lennartson in the City of Proctor, south of the project study area by about 1.3 miles. The nearest public airport is Duluth International, over five miles northeast.

To assure safety, both the Federal Aviation Administration (FAA) and MnDOT office of Aeronautics have established guidelines for locating structures near airports. The FAA has height restrictions for development near public airports and guidelines for placement of buildings and other structures near high frequency omnidirectional range navigation systems. MnDOT has zoning areas around public airports that restrict the area where buildings and other structures can be placed.

A FAA notice and approval is required for structures 200 feet above ground level as defined in the Code of Federal Regulations (CFR) Chapter 77.9. Minnesota Power must submit notice of construction beforehand to the FAA if applicable. The FAA would then screen project structures for proximity to airports. Minnesota Power states that detailed transmission line design has not been completed, however, all transmission line structures will be less than 199' tall.

Emergency Services

Power line construction and operation can potentially impact emergency services by interfering with the ability to communicate during an emergency or respond to an emergency. The Allied Radio Matrix for Emergency Response (ARMER) system is used across Minnesota.[116] Broadcast frequencies range from 851 MHz to 859 MHz; therefore, the ARMER system will not be impacted. Regardless of the selected route, project construction is not anticipated to affect emergency services because emergency response will be prioritized over construction activities to the greatest extent possible. Moreover, any temporary lane restrictions or slow-moving traffic that might affect emergency response services would be coordinated with local jurisdictions to ensure that safe alternative access is available for police, sheriff, fire, ambulance, and other rescue vehicles. Thus, impacts to emergency services are anticipated to be negligible, and will be mitigated.

Potential Impacts

Impacts to public services because of the project are anticipated to be minimal. Impacts that do occur are anticipated to be temporary. Delivery of project materials might cause minor traffic delays. Additionally, delays might be caused by construction worker traffic or slow-moving construction equipment.

[116] Minnesota Department of Public Safety, retrieved from: https://dps.mn.gov/divisions/ecn/programs/armer/Pages/default.aspx

Water and Wastewater

The project will require a sanitary septic system for restrooms, fire suppression, and potentially a kitchenette for the Converter Station. Equipment cooling will be closed loop. Running water could be used for minor cleaning of parts or vehicles. A new water supply well or water appropriation permit are not required (except if a temporary construction dewatering permit is required), thus impacts are not expected.

Roads

During construction workers and trucks delivering construction material and equipment will use the existing state, county, and township road system to access the project. Delivery of project materials might cause minor traffic delays. Slow-moving construction vehicles may also cause delays on smaller roads. However, these delays should be minimal for the relatively short construction delivery period.

Traffic during peak construction could be up to 250 trips per day for pickup trucks, cars, and/or other types of employee vehicles onsite during construction. Major components will likely be staggered in delivery times and dates so that on-site teams are not overwhelmed with a surge of trucks at one time. AADT along Morris Thomas Road is between 750 and 1,100. Since average daily traffic in the area is well below design capacity, this increased traffic may be perceptible to area residents, but the worst-case 33% increase in volume during peak construction is not expected to affect traffic function.

Minnesota Power and its contractors will work with St. Louis County under ordinance no. 13 should oversize/overweight load permits be required for the construction of the project. The oversize/overweight permit allows for truck, trailer, and load combinations that exceed the maximum dimensions and weight specified in state law to operate on county roads.

Minnesota Power will construct facilities within the limits of the project study area and no road closures are anticipated. Minnesota Power will closely coordinate construction activities with County, City, and Township staff if any closures are determined necessary. Except for minor field access or driveway changes that may occur (Appendix B, Map 3), no changes to existing roadways are anticipated. 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 will be obtained from the appropriate road authority. No impacts to roads are anticipated during operation; negligible traffic increases would occur for maintenance.

Railroads

No active railroads are near the project area, therefore there will be no impacts. Traffic backups may occur where Duluth Winnipeg and Pacific Railroad intersects Morris Thomas Road to the west, or on Midway Road that is intersected by Duluth Missabe and Iron Range Railroad to the northeast, but impacts would be minimal and temporary.

Electric Utilities

No long-term impacts to utilities will occur because of the project. Limited, temporary impacts to service will occur during interconnection of the project into the existing Arrowhead Substation, upgrading the capacity of the Switchyard, and to cut into the existing HVDC line and reconnect it to the Converter Station. These outages are anticipated to be up to five days and closely coordinated with utilities and landowners.

Air Safety

FAA regulation is not expected for the project. Minnesota Power states that detailed transmission line design has not been completed, however, all transmission line structures will be less than 199' tall. Thus, further FAA coordination is not required, and impact to airports are not anticipated.

MITIGATION

Water and Wastewater

A well construction permit from the Minnesota Department of Health (MDH) will be required if a well is installed for the Converter Station. A septic system permit is required from St. Louis County or the MPCA prior to installation of a septic system.

Utilities

Impacts from electrical outages can be minimized by informing customers of the outage well in advance. Additionally, necessary transmission outages must be coordinated through MISO. Minnesota Power owns existing electrical infrastructure that crosses the project area, thus coordination will already be maximized.

Section 5.3.3 of the DRP require the permittee to minimize disruptions to public utilities. The location of underground utilities can be identified using the Gopher State One Call system before and during construction to fully understand existing infrastructure. Underground utility locations will be marked prior to construction. Minnesota Power will coordinate with the utility to develop an approach to reroute or otherwise protect the utility if applicable.

Roads

Section 5.3.13 of the DRP requires permittees to inform road authorities of the routes that will be used during construction and acquire necessary permits and approvals for oversize and overweight loads. Permitted fencing and vegetative screening cannot interfere with road maintenance activities, and the least number of access roads shall be constructed.

The following practices can mitigate potential impacts:

- Pilot vehicles can accompany movement of heavy equipment (transformer).
- Deliveries can be timed to avoid traffic congestion and dangerous situations on the roadway.
- Traffic control barriers and warning devices can be used as necessary.
- Temporary guard structures should be used to support the conductor above vehicle traffic when stringing conductors over the roadway (or rail traffic when stringing conductors over a railway).

Railroads

No active or abandoned railways are in the project area, the nearest being within a one-mile radius to the west (Duluth Winnipeg and Pacific Railroad) and north (Duluth Missabe and Iron Range Railroad).

Air Safety

Because all transmission line structures will be less than 199' tall, impacts to airports are not anticipated, thus no mitigation is proposed.

Socioeconomics

The ROI for socioeconomics is St. Louis County. Economic factors related to construction and operation of the project are anticipated to be short-term and positive, but minimal, for both routing options. Positive impacts may come from increased expenditures at local businesses during construction, the potential for some materials to be purchased locally, and the use of local labor. Because potential impacts are positive, no mitigation is proposed.

Minnesota Power has applied for, and continues to pursue, both State and Federal funding for the project but at this time, neither funding sources have been secured.

The project is in Solway Township and the City of Hermantown in St. Louis County. Otherwise, the largest nearby City is Duluth about 10 miles to the East. St. Louis County overall has lower minority populations and median household incomes compared to the State – Solway Township, and the City of Hermantown have lower minority populations and higher median incomes than the State (Table 9).

St. Louis County is part of Economic Development Region 3 as defined by the Department of Employment and Economic Development.[117]

> Even though the region's population declined only slightly over the past decade, the labor force lost 4,344 workers from 2009-2019, a trend that accelerated in 2020 with the onset of the COVID-19 pandemic. The region dropped to 156,808 workers in 2021, the lowest number since 1995, before rebounding to over 161,000 in 2022. Prior to the pandemic, an increasingly tight labor market and a growing scarcity of workers was recognized as one of Northeast Minnesota's most significant barriers to future economic growth. After some pandemic-induced uncertainty, tight labor market conditions returned rapidly. In the face of these increasing constraints, it has become more evident than at any point in recent memory that a more diverse workforce in terms of age, gender, race, ethnicity, disability status, and immigration has been and will continue to be a vital source of the workers that employers need to succeed. As the White, native-born workforce continues to age, younger workers of different races or from different countries will comprise the fastest growing segments of the labor force.

Approximately 150 to 175 workers will be required for construction of the project in the Minnesota portion, 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 off-site support staff. For the ATC Alternative, four workers are expected for the existing ATC Arrowhead Substation and 4-6 for the transmission line. ATC did not include an estimate in the number of workers that would be required to construct the Converter Station, a necessary component of both the proposed project and the ATC Alternative.

Table 9: Population and Economic Profile

Location	Total Population	Percent Minority Population*	Median Household Income	Percent Low Income
Minnesota	5,706,494	23.7	$74,382	9.3
St Louis County	200,231	12.0	$64,959	13.8

[117] Retrieved from: https://mn.gov/deed/assets/091323_REGION%203_tcm1045-133251.pdf

City of Hermantown	10,221	10.6	$80,500	4.9
Solway Township	2,016	7.0	$85,625	2.6

*Minority population includes all persons who do not self-identify as white alone.
Source: U.S. Census Bureau 2017-2021 American Community Survey data

POTENTIAL IMPACTS

The project is not expected to disrupt local communities or businesses. Positive economic impacts include short-term increased expenditures, for example, food and fuel, at local businesses during construction which would generate local sales tax. The applicant indicates that labor will be procured from local employment resources and construction materials will be purchased from local vendors where practicable. These purchases could include fill, gravel, rock, concrete, rebar, fuel, and miscellaneous electrical equipment. Further, Minn. Stat. 216E.03, subd. 10 (c) requires recipients of route permits from the Commission, including the recipient's construction contractors and subcontractors, pay no less than the prevailing wage rate.

Long-term societal benefits of the project would 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) the HVDC system would intersect. Adverse impacts are not anticipated.

MITIGATION

Socioeconomic impacts are anticipated to be positive. Minn. Stat. 216E.03, subd. 10 (c) requires recipients of site permits from the Commission, including the recipient's construction contractors and subcontractors, pay no less than the prevailing wage rate. No additional mitigation is proposed.

Human Health and Safety

Construction and operation of a high voltage transmission line has the potential to impact human health and safety.

Electric and Magnetic Fields

The ROI for EMF is the proposed route width. Impacts to human health from possible exposure to EMFs are not anticipated. The HVTL will be constructed to maintain proper safety clearances. Project infrastructure that emits EMF will not be accessible to the public. EMFs associated with the project are below Commission permit requirements, and state and international guidelines. Potential impacts will be long-term and localized. These unavoidable impacts will be minimal and can be mitigated.

Electric and Magnetic Fields (EMFs) are invisible forces resulting from the presence of electricity. They occur naturally and are caused by weather or the geomagnetic field. They are also caused by all electrical devices wherever people use electricity. EMFs are characterized and distinguished by their frequency, that is, the rate at which the field changes direction each second. Electrical lines in the United States have a frequency of 60 cycles per second or 60 hertz, which is extremely low frequency EMF (ELF-EMF).

Voltage on a conductor creates an electric field that surrounds and extends from the wire. Using water moving through a pipe as an analogy, voltage is equivalent to the pressure of the water moving through

the pipe. The electric field strength is measured in kilovolts per meter (kV/m). The strength of an electric field decreases rapidly as it travels from the conductor and is easily shielded or weakened by most objects and materials.

Current moving through a conductor creates a magnetic field that surrounds and extends from the wire. Using the same analogy from above, current is equivalent to the amount of water moving through the pipe. The strength of a magnetic field is measured in milliGauss (mG). Like electric fields, the strength of a magnetic field decreases rapidly as the distance from the source increases; however, unlike electric fields, magnetic fields are not easily shielded or weakened.

Table 10 provides examples of electric and magnetic fields associated with common household items. "The strongest electric fields that are ordinarily encountered in the environment exist beneath high voltage transmission lines. In contrast, the strongest magnetic fields are normally found very close to motors and other electrical appliances, as well as in specialized equipment such as magnetic resonance scanners used for medical imaging."[118]

Table 10: Electric and Magnetic Field Strength of Common Household Objects[119]

Electric Field*		Magnetic Field**			
Appliance	kV/m	Appliance	mG		
	1 foot		1 inch	1 foot	3 feet
Stereo	0.18	Circular saw	2,100 to 10,000	9 to 210	0.2 to 10
Iron	0.12	Drill	4,000 to 8,000	22 to 31	0.8 to 2
Refrigerator	0.12	Microwave	750 to 2,000	40 to 80	3 to 8
Mixer	0.10	Blender	200 to 1,200	5.2 to 17	0.3 to 1.1
Toaster	0.08	Toaster	70 to 150	0.6 to 7	< 0.1 to 0.11
Hair Dryer	0.08	Hair dryer	60 to 200	< 0.1 to 1.5	< 0.1
Television	0.06	Television	25 to 500	0.4 to 20	< 0.1 to 1.5
Vacuum	0.05	Coffee maker	15 to 250	0.9 to 1.2	< 0.1

Source:
* German Federal Office for Radiation Safety
** Long Island Power Institute

HEALTH STUDIES

In the late-1970s, epidemiological studies indicated a weak association between childhood leukemia and ELF-EMF levels.[120] "Epidemiologists observe and compare groups of people who have had or have not had certain diseases and exposures to see if the risk of disease is different between the exposed and

[118] World Health Organization. *Radiation: Electromagnetic Fields, What are typical exposure levels at home and in the environment?* (2016). https://www.who.int/news-room/questions-and-answers/item/radiation-electromagnetic-fields

[119] *Ibid.*

[120] National Institute of Environmental Health Sciences. *EMF: Electric and Magnetic Fields Associated with the Use of Electric Power.* (2002). https://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf

unexposed groups, but does not control the exposure and cannot experimentally control all the factors that might affect the risk of disease."[121]

Ever since, researchers have examined possible links between ELF-EMF exposure and health effects through epidemiological, animal, clinical, and cellular studies. To date, "no mechanism by which ELF-EMFs or radiofrequency radiation could cause cancer has been identified. Unlike high-energy (ionizing) radiation, EMFs in the non-ionizing part of the electromagnetic spectrum cannot damage DNA or cells directly," that is, the ELF-EMF that is emitted from HVTLs does not have the energy to ionize molecules or to heat them.[122] Nevertheless, they are fields of energy and thus have the potential to produce effects.

"The few studies that have been conducted on adults show no evidence of a link between EMF exposure and adult cancers, such as leukemia, brain cancer, and breast cancer."[123] "Overall there is no evidence that exposure to ELF magnetic fields alone causes tumors. The evidence that ELF magnetic field exposure can enhance tumor development in combination with carcinogens is inadequate."[124]

"A number of scientific panels convened by national and international health agencies and the U.S. 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."[125]

The Minnesota State Interagency Working Group on EMF Issues, comprised of staff from state agencies, boards, and Commission, was tasked to study issues related to EMF. In 2002, the group published *A White Paper on Electric and Magnetic Field Policy and Mitigation Options*, and concluded the following:

> Some epidemiological results do show a weak but consistent association between childhood leukemia and increasing exposure to EMF…. However, epidemiological studies alone are considered insufficient for concluding that a cause and effect relationship exists, and the association must be supported by data from laboratory studies. Existing laboratory studies have not substantiated this relationship…, nor have scientists been able to understand the biological mechanism of how EMF could cause adverse effects. In addition, epidemiological studies of various other diseases, in both children and adults, have failed to show any consistent pattern of harm from EMF.

The Department of Health concludes that the current body of evidence is insufficient to establish a cause and effect relationship between EMF and adverse health effects. However, as with many other environmental health issues, the possibility of a health risk cannot be dismissed.[126]

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[121] *Ibid.*

[122] National Cancer Institute. *Magnetic Field Exposure and Cancer*. (2016). http://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/magnetic-fields-fact-sheet.

[123] National Institute of Environmental Health Sciences. *Electric and Magnetic Fields*, (2018). http://www.niehs.nih.gov/health/topics/agents/emf/index.cfm.

[124] World Health Organization. *Extremely Low Frequency Fields*. (2007).

[125] State of Minnesota, State Interagency Working Group on EMF Issues (2002) *A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options*, https://apps.commerce.state.mn.us/eera/web/project-file?legacyPath=/opt/documents/EMF%20White%20Paper%20-%20MN%20Workgroup%20Sep%202002.pdf: page 1.

[126] *Id*., page 36.

Regulations and Guidelines

Currently, there are no federal regulations regarding allowable ELF-EMF produced by power lines in the United States; however, state governments have developed state-specific regulations. For example, Florida limits electric fields to 2.0 kV/m and magnetic fields to 150 mG at the edge of the right-of-way for 161 kV transmission lines.[127] Additionally, international organizations have adopted standards for exposure to electric and magnetic fields (Table 11).

Table 11: International Electric and Magnetic Field Guidelines

Organization	Electric Field (kV/m)		Magnetic Field (mG)	
	Public	Occupational	Public	Occupational
Institute of Electrical and Electronics Engineers	5.0	20.0	9,040	27,100
International Commission on Non-Ionizing Radiation Protection	4.2	8.3	2,000	4,200
American Conference of Industrial Hygienists	—	25.0	—	10,000/ 1,000*
National Radiological Protection Board	4.2	—	830	4,200

* For persons with cardiac pacemakers or other medical electronic devices

The Commission limits the maximum electric field under high voltage transmission lines in Minnesota to 8.0 kV/m.[128] It has not adopted a standard for magnetic fields, and the State of Minnesota currently has no regulations pertaining to magnetic field exposure. The Commission has acknowledged that Florida, Massachusetts, and New York have established standards for magnetic field exposure.[129]

Potential Impacts

Potential impacts are anticipated to be negligible and are not expected to negatively affect human health. Impacts will be long-term and localized but can be minimized. The primary sources of EMF from the generating facility will include the transmission lines, transformers, and equipment in the Converter Station and Switchyard. Estimated electric and magnetic field strengths are shown in Table 12 and Table 13.

Table 12: Calculated Electric Fields

Structure type	Line Voltage	Electric Field (kV/m) Edge of ROW	Electric Field (kV/m) Maximum Overall	ROW Width (feet)
230 kV Single-Circuit H-Frame	253 kV	1.24	5.51	130

[127] Florida Department of State. *Rule 62-814.450 Electric and Magnetic Field Standards*. (2008). https://www.flrules.org/gateway/ruleNo.asp?id=62-814.450.

[128] *E.g.*, Department of Commerce (May 14, 2018) *Potential Human and Environmental Impacts of the Freeborn Wind Transmission Line Project,* retrieved from: https://mn.gov/eera/web/project-file?legacyPath=/opt/documents/34748/1%20Text%20Figures%20Tables.pdf, page 13.

[129] 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).

230 kV Single Circuit H-Frames (2x Parallel)	253 kV	1.28	5.56	230
230 kV Double-Circuit	253 kV	0.15	4.1	130
345 kV Single-Circuit Monopole	380 kV	0.55	6.26	150

Table 13: Projected Magnetic Fields

Structure Type	Line Current (amps)	Magnetic Field (mG) Edge of ROW	Magnetic Field (mG) Maximum Overall	ROW width (ft)
230 kV Single-Circuit H-Frame	1017 (peak loading)	51.22	251.91	130
230 kV Single Circuit H-Frames (2x Parallel)	1017 (peak loading)	58.71	238.94	230
230 kV Double-Circuit	1017 (peak loading)	12.63	154.54	130
345 kV Single-Circuit Monopole	1356 (peak loading)	62.84	167.06	150
230 kV Single-Circuit H-Frame	3000 (max. cont. rating)	148.62	730.97	130
230 kV Single Circuit H-Frames (2x Parallel)	3000 (max. cont. rating)	170.37	693.34	230
230 kV Double-Circuit	3000 (max. cont. rating)	50.94	448.45	130
345 kV Single-Circuit Monopole	3000 (max. cont. rating)	136.15	363.59	150

Electric field strengths decrease with distance. The intensity of the magnetic field associated with a transmission line is proportional to the amount of current flowing through the line's conductors, and rapidly decreases with the distance from the conductors. The nearest residence is within 250 feet of the project boundary and within 600 feet of the Switchyard. At this distance, electric and magnetic fields from the project dissipate to background levels.

For 345 kV transmission lines such as those proposed for the project, maximum electric field levels overall are 6.26 kV/m and dissipate to 0.55 kV/m at about 75 feet away from the lines, or the approximate edge of the right of way as shown in Table 12.[130] Even at electric field level maximums, these electric field levels are consistent with the Commission's electric field limit (less than 8.0 kV/m). Because electric fields are dependent on the voltage of the HVTL, maximum values were calculated as the lines' maximum continuous operating voltage assuming minimum conductor-to-ground clearance (that is, at mid-span) and a height of one meter above ground. Maximum continuous operating voltage is 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). Thus, potential health impacts from these electric field levels are anticipated to be negligible.

[130] National Institute of Environmental Health Sciences (NIEHS). 2002. EMF Electric and Magnetic Fields Associated with the Use of Electric Power, Questions and Answers, https://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf

This assessment is consistent with the findings of the National Institute of Environmental Health Sciences as well regarding the Converter Station and Switchyard:

> In general, the strongest EMF around the outside of a substation comes from the power lines entering and leaving the substation. The strength of the EMF from equipment within the substations, such as transformers, reactors, and capacitor banks, decreases rapidly with increasing distance. Beyond the substation fence or wall, the EMF produced by the substation equipment is typically indistinguishable from background levels.[131]

EMF for the Converter Station and Switchyard were not calculated; however, potential impacts are not anticipated because power lines entering and leaving substations generally have the strongest EMF. The maximum EMF for the project was discussed above. Values demonstrated for the project are below the standards identified in Table 11: International Electric and Magnetic Field Guidelines. Based on Table 13 for project EMF, the strongest would be the 345 kV line. The project is below the limit outside the Converter Station and Switchyard, and the Converter Station is on a grounded grid. Therefore, measuring additional electrical fields that are not already presented above is not warranted.

MITIGATION

No health impacts from EMF are anticipated; however, the Commission has adopted a prudent avoidance approach regarding high voltage transmission lines. If warranted, the Commission considers, and may require, mitigation strategies to minimize EMF exposure levels. Consistent with this approach, basic mitigation measures are prudent. EMF diminishes with distance from a conductor; therefore, EMF exposure levels can be minimized by routing power lines away from residences and other locations where citizens congregate to the extent practicable.

The HVTL will be constructed to maintain proper safety clearances, etc. The Converter Station and other project infrastructure will not be accessible to the public; thus people are not expected to get close enough to experience maximum calculated EMF levels. No additional mitigation is proposed.

Implantable Medical Devices

The ROI for implantable medical devices is the anticipated route width. Magnetic fields produced by HVTLs are not high enough to interfere with these devices; however, electric fields have a potential to interfere. Electric field strengths associated with the project are below the 5.0 kV/m interaction level for modern, bipolar pacemakers, but might interact with older, unipolar pacemakers. Electric fields are easily shielded. Potential impacts are expected to be minimal across routing options. Impacts to human health are not anticipated. Potential impacts, if they occur, would be short-term, intermittent, and localized and can be mitigated.

EMF could interfere with implantable electromechanical medical devices, such as cardiac pacemakers, implantable cardioverter defibrillators, neurostimulators, and insulin pumps. Most research on electromagnetic interference and medical devices relates to pacemakers. Manufacturers' recommended threshold for magnetic fields is 1,000 mG.[132] Laboratory tests indicate that interference from magnetic

[131] National Institute of Environmental Health Sciences (2002), page 37 of pdf.

[132] Public Service Commission of Wisconsin (July 2013) *Environmental Impacts of Transmission Lines*, retrieved from: https://psc.wi.gov/Documents/Brochures/Enviromental%20Impacts%20TL.pdf.

fields in pacemakers is not observed until 2,000 mG—a field strength much greater than that associated with transmission lines.[133] As a result, research has focused on electric field impacts.

Electric fields can interfere with a pacemaker's ability to sense normal electrical activity in the heart. In the unlikely event a pacemaker is impacted, the effect is typically a temporary asynchronous pacing (commonly referred to as reversion mode or fixed rate pacing). The pacemaker returns to its normal operation when the person moves away from the source of the interference.

Modern pacemaker technology has greatly reduced the EMF interference potential; however, the risk is not completely eliminated: "While the present-day units are better shielded against electromagnetic interference than their earlier counterparts, sensitivity to electric field exposure is inevitable."[134] Interference in unipolar pacemakers that results in asynchronous pacing may occur with electric fields ranging from 1.2 to 1.7 kV/m; however, other units are unaffected at 8.0 kV/m.[135] In general, electric interference must be at levels above 5.0 kV/m to interfere with modern, bipolar pacemaker behavior.[136] Some models appear unaffected at 20 kV/m.[137]

There are no sensitive receptors such as hospitals or nursing homes within the route width or the project area of either routing option. The route width would also be entirely within private property not accessible by the public. Therefore, once constructed, the regular presence of implantable medical devices within the right-of-way is not expected.

POTENTIAL IMPACTS

Negligible impacts would occur during construction. Construction equipment typically generates low levels of EMF, usually by the occasional use of electric devices. Potential electromagnetic interference to workers with implantable devices is expected to be known by the individual using the device—the public is not allowed within the work area. Any effects from electric devices during construction would be infrequent and are expected to be within same range of typical EMF levels described in Table 13.

For the project's 345 kV transmission lines, maximum EMF levels were calculated as 6.26 kV/m and dissipate to 0.55 kV/m about 75 feet away, or at the approximate edge of the right of way.[138] Even at EMF level maximums, these electric field levels are consistent with the Commission's electric field limit (less than 8.0 kV/m). Field strengths associated with the project are below the 5.0 kV/m interaction level at the edge of the right-of-way for modern, bipolar pacemakers, but might interact with older, unipolar pacemakers. Impacts to unipolar pacemakers could occur directly underneath the HVTL, but the public will not have access to the project area. Thus, it is reasonable to assume that people with pacemakers would not experience the maximum EMF levels that could be generated by the project.

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[133] Electric Power Research Institute (1997) *Susceptibility of Implanted Pacemakers and Defibrillators to Interference by Power-Frequency Electric and Magnetic Fields*, retrieved from: https://www.epri.com/research/products/TR-108893, page 8-1.

[134] *Ibid.*

[135] *Ibid*., page 7-9.

[136] Pinski, Sergio L. and Trohman, Richard G. (2002) *Interference in Implanted Cardiac Devices, Part 1*, JOURNAL OF PACING AND CLINICAL ELECTROPHYSIOLOGY (25)9:1,367-1,381, retrieved from: http://www.sarasota anesthesia.com/reading/literature/Interference%20AICD%20Review%20Part%201.pdf.

[137] Electric Power Research Institute (1997), page 8-2.

[138] National Institute of Environmental Health Sciences (NIEHS). 2002. EMF Electric and Magnetic Fields Associated with the Use of Electric Power, Questions and Answers, https://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf

MITIGATION

Impacts to implantable medical devices and persons using these devices might occur, but it is not expected. Patients are informed of potential problems associated with electromagnetic interference and their device. The device changes their behavior considerably. Transmission lines and substations are only one of many sources of electromagnetic interference. Affirmative and proven mitigation is established by simply moving away, where "Moving away from a source is a standard response to the effects of exposure…. Patients can shield themselves from [electromagnetic interference] with a car, a building, or the enclosed cab of a truck."[139] Additional mitigation is not proposed.

Public Health and Safety

The ROI for public health and safety is the route width. Like any construction project, there are risks that include potential injury from falls, equipment and vehicle use, electrical accidents, and the like. Public risks involve electrocution. This risk is lower for high voltage lines because the conductor is higher from the ground. Electrocution risks could also result from unauthorized entry into the project area. Potential impacts are anticipated to be minimal. Impacts would be short- and long-term and can be minimized.

During operation there are occupational risks similar to those associated with construction. Construction crews must comply with local, state, and federal regulations when installing the project. This includes standard construction-related health and safety practices such as safety orientation and training as well as routine safety meetings.

The most recent injuries and fatalities data available is from the North American Industry Classification System Code No. 237130 *Power and Communication Line and Related Structures Construction,* which shows that in 2019 there were 2,250 reported nonfatal occupational injuries and illnesses involving days away from work.[140] Of these, about four percent were considered traumatic. In 2019, 26 fatal injuries occurred to workers in this industry, most associated with transportation (roadway accident or being struck by a vehicle).[141] In all industries, 166 fatal injuries occurred from either direct or indirect electrocution—the data did not specify whether these fatalities were a result from an overhead power line.[142]

Emergency services in the project area are available such as local law enforcement, the fire department, and first responders. These services are generally within ten miles of the project area.

POTENTIAL IMPACTS

The presence of workers will depend on the anticipated schedule for construction and future operation, maintenance, and repair of the project. Worker safety issues are primarily associated with construction, and like any construction project, there are risks. The inflow of temporary construction personnel could increase demand for emergency and public health services. On the job injuries of construction workers

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[139] Public Service Commission of Wisconsin (July 2013) *Environmental Impacts of Transmission Lines*, retrieved from: https://efis.psc.mo.gov/mpsc/commoncomponents/viewdocument.asp?DocId=936061727.

[140] U.S. Bureau of Labor Statistics (2019) TABLE R1. Number of nonfatal occupational injuries and illnesses involving days away from work by industry and selected natures of injury or illness, private industry, retrieved from https://www.bls.gov/iif/oshwc/osh/case/cd_r1_2019.htm#iif_cd_r1p.f.2.

[141] U.S. Bureau of Labor Statistics (2019) *TABLE A-1. Fatal occupational injuries by industry and event or exposure, all United States, 2019*, retrieved from: https://www.bls.gov/iif/oshwc/cfoi/cftb0331.htm#cfoi_at_a1.f.4.

[142] U.S. Bureau of Labor Statistics (2019) *Graphics for Economic News Release: Fatal occupational injuries by event*, retrieved from: https://www.bls.gov/charts/census-of-fatal-occupational-injuries/fatal-occupational-injuries-by-event-drilldown.htm.

requiring assistance due to slips, trips or falls, equipment use, or electrocution can create a demand for emergency, public health, or safety services that would not exist if the project were not built. During operation and maintenance occupational risks like those associated with construction exist, but to a lesser degree. Potential impacts to emergency services are anticipated to be negligible – Minnesota Power does not expect required road closures during construction.

Construction might disturb existing environmental hazards on-site, for example, contaminated soils. A review of *What's in My Neighborhood*[143], maintained by MPCA, indicates that there are two hazardous waste generators in the project area. Other sites are not within an impactful distance, and the hazardous waste generators should not interact with the project.

Public risks with the project involve electrocution. Electrocution risks could result from unauthorized entry into the project area or infrastructure such as the Converter Station. However, "The most significant risk of injury from any power line is the danger of electrical contact between an object on the ground and an energized conductor."[144] When working near power lines, for example, using heavy equipment, an electrical contact can occur "even if direct physical contact is not made, because electricity can arc across an air gap."[145] This risk is higher in low-voltage lines, such as distribution lines, because the conductor is lower to the ground. This risk is lower for high voltage lines because the conductor is higher from the ground.

MITIGATION

The project will be designed and constructed in compliance with applicable electric codes. Electrical inspections will ensure proper installation of all components, and the project will undergo routine inspection. Electrical work will be completed by trained technicians. Fencing will deter public access, and signage will provide appropriate public warnings. The project will also be designed in compliance with local, state, and NESC requirements[146] regarding clearance to ground, crossing utilities, and buildings as well as strength of materials and right-of-way widths. Safeguards will be implemented for construction and operation of the project transmission lines, Converter Station, and Switchyard. Construction and/or contract crews will comply with local, state, and NESC standards regarding installation of facilities and standard construction practices.

Construction and operation will follow Minnesota Power's established safety procedures and industry safety procedures including clear signage during construction activities. The proposed HVTLs would be equipped with switching devices and the Converter Station 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 as well as protect other equipment and the extended power system from damaging currents and more extensive outages; however, any electrical facility that 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. The HVTL will also be constructed with one or two grounded shield wires placed along the top of the structures, above the conductors. This protects the transmission

[143] Retrieved from: https://mpca.maps.arcgis.com/apps/webappviewer/index.html?id=9d45793c75644e05bac197525f633f87

[144] Public Service Commission of Wisconsin (July 2013) *Environmental Impacts of Transmission Lines*, retrieved from: https://psc.wi.gov/Documents/Brochures/Enviromental%20Impacts%20TL.pdf, page 20.

[145] Ibid.

[146] Draft Route Permit, Section 5.5.1.

line from a lightning strike. "As a general precaution, no one should be on an object or in contact with an object that is taller than 15 to 17 feet while under a high-voltage electric line."[147]

The project would be required to comply with the Occupational Safety and Health Administration standards, which (1) provide regulations for safety in the workplace, (2) regulate construction safety, and (3) require a Hazard Communication Plan to identify and inventory all hazardous materials for which material safety data sheets would be maintained.

Stray Voltage

The ROI for stray voltage is the route width. Potential impacts to residences or farming operations from neutral-to-earth stray voltage are not anticipated. HVTLs do not produce this type of stray voltage because HVTLs do not directly connect to businesses, residences, or farms. Neutral-to-earth stray voltage is most associated with local distribution lines and electrical wiring within the affected building. Induced voltage is the result of an electric field from the HVTL extending to nearby conductive objects. Constructing the project to NESC standards and Commission route permit requirements mitigate this concern. Therefore, potential impacts from stray voltage are anticipated to be minimal for both routing options. Potential impacts can be mitigated.

In general terms, stray voltage is "voltage caused by an electric current in the earth, or in groundwater, resulting from the grounding of electrical equipment or an electrical distribution system."[148] Stray voltage encompasses two phenomena: neutral-to-earth voltage (NEV) and induced voltage.

Neutral-to-Earth Voltage

Neutral-to-earth voltage is a type of stray voltage that can occur where distribution lines enter structures. "Electrical systems—farm systems and utility distribution systems—are grounded to the earth to ensure safety and reliability…. Inevitably, some current flows through the earth at each point where the electrical system is grounded and a small voltage develops."[149] This extraneous voltage appears on metal surfaces in buildings, barns, and other structures.

NEV is typically experienced by livestock that contact one or more metal objects on a farm, for example, feeders, waterers, or stalls. Metal objects on a farm are grounded to earth through electrical connections. Livestock, by virtue of standing on the ground, are also grounded to earth. If an animal touches two points at different voltages (one at neutral voltage and the other near true ground),[150] a small current will flow through the livestock to the ground because the animal completes the electrical circuit.[151]

Despite metal objects and livestock both being grounded to the earth many factors affect the effectiveness of their respective ground, that is, a good or poor ground. In metal objects these include wire size and length, quality of connections, number and resistance of ground rods, and electrical

[147] Public Service Commission of Wisconsin (July 2013) Environmental Impacts of Transmission Lines, retrieved from: https://psc.wi.gov/Documents/Brochures/Enviromental%20Impacts%20TL.pdf, page 20.
[148] Edison Electric Institute (April 2005) *Glossary of Electric Industry Terms*, Washington, DC: Edison Electric Institute (2005).
[149] Wisconsin Public Service Corporation (2011) *Answers to Your Stray Voltage Questions: Backed by Research*, retrieved from: http://www.wisconsinpublicservice.com/business/pdf/farm_voltage.pdf, page 1.
[150] North Dakota State University Agricultural Engineering Department (1986) *Extension Publication #108: Stray Voltage*.
[151] Michigan Agricultural Electric Council (October 2008) *Stray Voltage: Questions and Answers*, retrieved from: http://maec.msu.edu/Stray%20Voltage%20Brochure%202008.pdf.

current being grounded.[152] Likewise, a number of factors also determine the extent to which livestock are grounded, for example, if the animal is standing on wet or dry ground.[153] Stray voltage results from this difference in the effectiveness of grounding and on the resulting electrical currents. It can exist at any farm, house, or business that uses electricity, independent of a nearby transmission line.

If NEV is prevalent in an agricultural operation it can affect livestock health. This concern has primarily been raised on dairy farms because of its potential to affect milk production and quality. NEV is by and large an issue associated with distribution lines and electrical service at a residence or on a farm. Transmission lines do not create NEV stray voltage as they do not directly connect to businesses, residences, or farms.

Induced Voltage

The electric field from a transmission line can extend to nearby conductive objects, for example, farm equipment, and induce a voltage upon them. This phenomenon is dependent on many factors, including the shape, size, orientation, capacitance, and location of the object. If these conductive objects are insulated or semi-insulated from the ground and a person touches them, a small current will pass through the person's body to the ground. This may be accompanied by a spark discharge and mild shock like what can occur when an individual walks across a carpet and touches a grounded object or another person.

The primary concern with induced voltage is not the voltage, but rather the current that flows through a person to the ground when touching the object. To ensure safety in the proximity of transmission lines, the NESC requires that any discharge be less than five milliamperes. In addition, the Commission's electric field limit of 8 kV/m is designed to prevent serious shock hazards due to induced voltage.[154] Proper grounding of metal objects under and adjacent to HVTLs is the best method of avoiding these shocks.

Transmission lines may cause additional current to flow on distribution lines where these lines parallel. When distribution lines are properly wired and grounded, these additional currents are not significant. However, if distribution lines are not properly wired and grounded, these additional currents could create induced voltage impacts.

POTENTIAL IMPACTS

The proposed HVTL does not interconnect to businesses or residences within either routing option and does not change local electrical service. ATC is a transmission only utility that plans, constructs, operates, and maintains transmission facilities within its footprint; under Wis. Stat. § 196.485(3m)(a)2.b. ATC cannot serve any retail electric customers. It is typical practice for the interconnecting transmission owner to own the tie-line facilities. As a result, impacts to residences or farming operations from NEV are not anticipated.

The project might induce a voltage on insulated metal objects within the final right-of-way; however, the Commission requires that transmission lines be constructed and operated to meet NESC standards as well as the Commission's own electric field limit of 8 kV/m reducing these impacts.[155] Additionally,

[152] North Dakota State University Agricultural Engineering Department (1986).

[153] *Ibid.*

[154] Draft Route Permit, Section 5.4.2.

[155] Draft Route Permit, Section 5.4.2.

right-of-ways for either routing option will not be on public property or accessible to the public. As a result, impacts due to induced voltage are not anticipated to occur.

MITIGATION

The DRP requires the project meet electrical performance standards. Thus, no additional mitigation is proposed.

Any person with questions about a new or existing metal structures can contact the applicant for further information about proper grounding requirements. If other problems exist, the applicant may be willing to discuss the situation with technical staff and potentially perform an on-site investigation to identify possible solutions.

Land-based Economies

Transmission lines can impact land-based economies by precluding or limiting land use for other purposes.

Mining

The ROI for mining is the route width. There are no existing mines in the project area. Impacts to underground mineral resources near the route width are expected to be minimal. The construction of electrical utility facilities would likely interfere with any future geophysical surveys because the surveying technology cannot accurately assess what is underground when HVTLs are above the survey location. Project infrastructure will not be cited above this resource or other identified aggregate sources.

Mineral resources are resources that have a concentration or occurrence of natural, solid, inorganic, or fossilized organic material in such form, quantity, grade, and quality that it has reasonable prospects for commercial extraction. The *Aggregate Source Information System*[156] maintained by MnDOT revealed no aggregate resources in either the proposed project or ATC Alternative route widths, one aggregate pit within the project study area (Source No. 69368), and two within the project area (Appendix B, Map 8). DNR submitted comments about these aggregate resources during scoping.[157] Although no mining operations currently exist at this location, the DNR asked that the EA discuss how future mining exploration and/or development would be addressed.

The applicant's proposed route, along with new buildings and electrical infrastructure, are sited in an area where the land has metallic mineral potential. The DNR recommended that the applicant collect geophysical data before project development. Minnesota Power stated in their reply comments[158] that the property is not state or federal land, and such survey would increase project costs. The DNR has underground mineral rights but no surface mineral rights. Since the DNR does not have surface ownership in the project area, they cannot require geophysical survey of the below-ground minerals on private lands.[159]

[156] Department of Transportation (January 24, 2018) *Aggregate Sources: Viewing with Google Earth™*, retrieved from: https://www.dot.state.mn.us/materials/asis_GE.html.
[157] Scoping Comments of the Minnesota DNR, September 22, 2023, eDockets No. 20239-199095-01.
[158] Scoping Comments of Minnesota Power, September 29, 2023, eDockets No. 20239-199286-01.
[159] Personal communication between DNR and EERA staff, February 8, 2024.

The DNR indicated that terms in a future lease would include requirements that preserve access to minerals in case of future exploration and/or development. In addition to metallic mineral potential, there may also be aggregate potential on the proposed parcel. If mineral or aggregate development were to occur within the project area, any infrastructure would need to be moved/removed at the expense of the applicant.

POTENTIAL IMPACTS

Existing mines could be negatively impacted by high voltage transmission lines if sited on or routed through land used for mineral production/extraction by interfering with access to minerals or the ability to remove them.

Impacts to lands with metallic mineral potential in the project area are anticipated to be minimal. The only resource identified within the project study area is outside both the proposed route and the ATC Alternative. The construction of electrical utility facilities would likely interfere with any future geophysical surveys because the surveying technology cannot accurately assess what is underground when HVTLs are above the survey location. Project infrastructure will not be cited above this resource or other identified aggregate sources.

MITIGATION

Impacts to gravel pits will be avoided if the project is constructed within the proposed project's route or the ATC Alternative route. This prudent routing and placement of structures do not necessitate mitigation, such as through structure design that allows for extraction while maintaining safe operation of the line.

Archeological and Historic Resources

The ROI for archaeological and historic resources is the project area. One identified site is within the project study area and the ATC Alternative route width. The proposed project has designed a 150-meter buffer around the site and the ATC Alternative will avoid this feature by complying with the 100-meter buffer. SHPO has concurred that no known or suspected historical places or archeological properties in the area will be affected by the project. Since impacts to archeological and historic resources are not anticipated, mitigation is not proposed.

Archeological resources are locations where objects or other evidence of archaeological interest exist, and can include aboriginal mounds and earthworks, ancient burial grounds, prehistoric ruins, or historical remains.[160] Sites not included in state agency datasets may include locations known to Minnesota Indian Tribes to have cultural importance. Coordination with THPOs prevents impacts from the project to known traditional cultural properties. Historic resources are sites, buildings, structures or other antiquities of state or national significance.[161]

Potential Impacts

Transmission lines and substations can potentially impact archeological and historic resources. Project construction can disrupt or remove or damge archeological resources. The long-term presence of a transmission line or substation near historic resources has the potential to impair or decrease their value.

[160] *See* Minn. Stat. 138.31, subd. 14.
[161] *See* Minn. Stat. 138.51.

The applicant gathered information on known archaeological and historic resources in August 2022 from SHPO and the Minnesota Office of the State Archaeologist (OSA). The investigation included a desktop review that queried the within one mile of the project study area.

On November 17, 2022, the applicant met with and asked for comments of the Fond du Lac Band of Lake Superior Chippewa THPO. They indicated that a potential, unconfirmed trail may be present in the very southwest of the project study area, but outside of the proposed project and ATC Alternative route width which is wholly within the applicant's study area (Appendix E).

The Upper Sioux Community THPO also responded to EERA's notification of application receipt for the project on June 22, 2023, indicating that while the Dakota lived, prayed, hunted, gathered, battled, and buried their relatives in the project area, no adverse effect to any known Tribal Cultural Properties was found (Appendix F).

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.

The applicant hired a third-party to conduct a *Phase I Reconnaissance Survey* for the project in August of 2022. This review covers the parcels that were accessible within the project study area at the time because survey permission was granted by landowners. This survey acknowledged that additional survey would be needed to cover the remainder of the project area and was included with the route permit application.[162] Minnesota Power submitted an updated survey to the record with SHPO concurrence from December 2023 that included the entire project study area (Appendix G). SHPO reviewed the information pursuant to the responsibilities under the Minnesota Historic Sites Act (Minn. Stat. 138.665-666) and the Minnesota Field Archaeology Act (Minn. Stat. 138.40).

SHPO confirmed Minnesota Power's assertion that one archaeological site, site **21SL1274**, was identified during the 2022 field investigations and that this site has not been evaluated for eligibility of listing in the National Register of Historic Places (NRHP). SHPO concurred that no additional archaeological resources were identified in the updated survey. SHPO further requested avoidance of site **21SL1274** during all construction activity and recommended a 100-meter buffer to ensure it would not be impacted. The proposed project has designed a 150-meter buffer around the site and the ATC Alternative will avoid this feature by complying with the 100-meter buffer. As such, impacts to this resource is not anticipated.

Mitigation

Prudent routing can avoid impacts to archaeological and historic resources. This is the preferred mitigation. Section 5.3.14 of the DRP addresses archeological resources. If previously unidentified archaeological sites are found during construction, the applicant would be required to stop construction and contact SHPO to determine how best to proceed.[163] Ground disturbing activity would stop and local law enforcement would be notified should human remains be discovered.[164]

[162] Minnesota Power Route Permit Application, Appendix J, eDockets No. 20236-196333-10.
[163] Draft Route Permit, Section 5.3.14.
[164] Ibid.

As noted by SHPO, future surveys should include a subsurface investigation component due to the potential for shallowly buried archaeological sites in forest settings that are not easily identified on the surface.

SHPO concluded that based on information available to them at the time of review, there are no properties listed in the NRHP and no known or suspected archaeological properties in the area that will be affected by the project. Because the project review encompassed the entire study area, which the ATC Alternative is entirely within, the same conclusion applies.

Natural Resources

Electric infrastructure such as transmission lines impact the natural environment. Impacts are dependent upon many factors, such as how the project is designed, constructed, and maintained. Other factors such as the environmental setting influence potential impacts.

Air Quality

The ROI for air quality is the project area. Distinct impacts to air quality during construction such as fugitive dust and exhaust would be intermittent, localized, short-term, and minimal. Impacts are associated with fugitive dust and exhaust and can be mitigated. Long-term impacts to air quality will also be minimal and are associated with the creation of ozone and nitrous oxide emissions along the HVTL. These localized emissions will be below state and federal standards. Impacts are unavoidable and do not affect a unique resource.

Air quality is a measure of how pollution-free the ambient air is and how healthy it is for humans, other animals, and plants. Emissions of air pollutants will occur during construction and operation of new infrastructure for the project. Overall air quality in Minnesota has improved over the last 20 years, but current levels of air pollution are alleged to still contribute to health impacts.[165] Air quality in the project area is relatively better than more populated areas of the state such as the Twin Cities metro region. According to MPCA models, air pollution in the project area's census tract is in the lowest 20% of all air scores in Minnesota.[166]

"Regulation and voluntary actions have reduced air pollution over time. Most reductions have come from permitted facilities and electrical generation. Daily fine particle concentrations have increased in recent years due to wildfire smoke. To achieve further improvements in air quality, transportation and neighborhood air sources will need to reduce their emissions. Minnesota meets all current federal standards, but… air pollution levels remain elevated in many areas of concern for environmental justice compared to state averages." (Figure 5).[167]

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 (O3), particulate matter (PM10/PM2.5), sulfur dioxide (SO2), nitrogen dioxide (NO2), and carbon monoxide

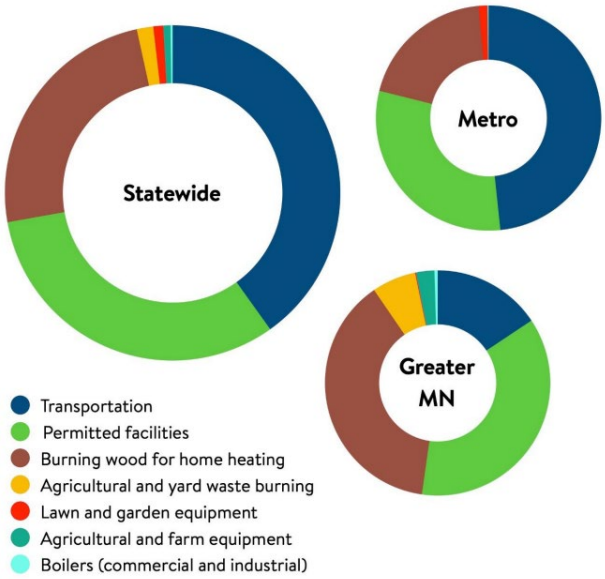
[165] The State of Minnesota's Air Quality, January 2023 Report to the Legislature, retrieved from: https://www.pca.state.mn.us/sites/default/files/lraq-1sy23.pdf.

[166] Pollution Control Agency (n.d.) *MNrisks: Pollutant Priorities*, retrieved from: https://www.pca.state.mn.us/air/mnrisks-pollutant-priorities (Where a health benchmark is a concentration level in the air that is unlikely to result in health effects after a lifetime of exposure; a concentration to benchmark ratio less than one is below the health benchmark. The ratio in the land control area is 0.09, respectively, compared to 3.4 in portions of Duluth.)

[167] Ibid.

(CO). The AQI is used to categorize the air quality of a region as one of five levels: good, moderate, unhealthy for sensitive groups, unhealthy, or very unhealthy. The nearest air quality monitor to the project is in Fond du Lac, Minnesota. Air quality in the area has been considered "good" between 329 and 351 days of the year from 2017-2021. During the same time period, the number of days classified as moderate was between 3 and 32. Air quality was considered unhealthy for sensitive groups for four days in 2021 only, with no days classified as unhealthy or very unhealthy throughout 2017-2021.[168]

Figure 5: Air Pollution Sources by Type



POTENTIAL IMPACTS

Construction

Minimal intermittent air emissions are expected during construction of the project. Air emissions associated with construction are highly dependent upon weather conditions and the specific activity occurring. For example, traveling to a construction site on a dry gravel road will result in more fugitive dust than traveling the same road when wet.

All projects that involve movement of soil, or exposure of erodible surfaces, generate some type of fugitive dust emissions.[169] Construction activities will generate fugitive dust from travel on unpaved roads, grading, foundation excavation, and setting structures. Some of these activities such as clearing vegetation may create exposed areas susceptible to wind erosion. Most of the fugitive dust emissions associated with the project are expected to be along gravel roads during worker and material transport.

[168] MPCA. *Annual AQI Days by Reporting Region*, retrieved from:https://public.tableau.com/app/profile/mpca.data.services/viz/MinnesotaAirQualityIndex_0/AQIExternal

[169] U.S. Environmental Protection Agency (January 1995) *Compilation of Air Pollutant Emissions Factors: Western Surface Coal Mining*, retrieved from: https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors at section 11.9

Fugitive dust is a particulate air pollutant. "The impact of a fugitive dust source on air pollution depends on the quantity and drift potential of the dust particles injected into the atmosphere. In addition to large dust particles that settle out near the source (often creating a local nuisance problem), considerable amounts of fine particles also are emitted and dispersed over much greater distances from the source."[170]

Motorized equipment will emit exhaust. This includes construction equipment and vehicles travelling to and from the project. Exhaust emissions, primarily from diesel equipment, would vary according to the phase of construction. Any adverse impacts are anticipated to be localized, minimal, and temporary.

Both the proposed project and the ATC Alternative would generally use paved roads such as Morris Thomas Road to access construction areas. If the existing road to the Arrowhead Substation is to be used, that road is unpaved. The ATC Alternative would see increased use of this road more than the proposed project to access their construction area. Solway Road is paved and may also be used during construction of the ATC Alternative. Sandberg Road is unpaved and is more likely to see increased use during construction of the proposed project to access their construction area – however, the ATC Alternative may equally utilize this option to build the Converter Station as an access road is proposed there (Appendix B, Map 3). To construct the Switchyard, the proposed project is likely to use the unpaved Solway Road, which is also near the ATC Alternative alignment.

Access roads to be built for the project may be temporarily or permanently made of dirt or gravel. The number of access roads encompasses about the same amount of area between the proposed project and the ATC Alternative. Without mitigation, travel on dirt or gravel access roads would generate greater amounts of fugitive dust than paved roads, the former more so than the latter, increasing negative impacts to air quality.

Operation

During operation, power lines produce ozone and nitrous oxide through the corona effect—the ionization of air molecules surrounding the conductor. Ozone production from a conductor is proportional to temperature and sunlight and inversely proportional to humidity. Nitrogen oxides can react to form ground-level ozone. Ozone is one of the most impactful pollutants in Minnesota and can contribute to health issues even as the State continues to meet all current federal standards. Ozone and nitrous oxide are reactive compounds that contribute to smog and can have adverse impacts on human respiratory systems.[171] Accordingly, these compounds are regulated and have permissible concentration limits. The State of Minnesota has an ozone standard of 0.07 parts per million (ppm) through an 8-hour averaging time[172] which conforms to the federal ozone standard.[173]

Nitrous oxide is regulated indirectly through the state and federal standards for nitrogen dioxide (NO_2). Nitrogen oxides are a criteria pollutant under the Clean Air Act, and the standards for them are set by using NO_2 as the indicator of the larger group of nitrogen oxides[174]. Ozone and nitrous oxide emissions are anticipated to be well below these limits. Impacts are unavoidable and do not affect a unique resource. Air emissions associated with maintenance of the HVTL are, like construction emissions,

[170] U.S. Environmental Protection Agency (January 1995) *Compilation of Air Pollutant Emissions Factors: Miscellaneous Sources*, retrieved from: https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors at section 13.2.

[171] https://www.epa.gov/criteria-air-pollutants

[172] Minn. R. 7009.0800, https://www.revisor.mn.gov/rules/?id=7009.0080.

[173] The Clean Air Act, 40 CFR part 50, https://www.epa.gov/criteria-air-pollutants/naaqs-table

[174] https://www.epa.gov/no2-pollution/setting-and-reviewing-standards-control-no2-pollution

dependent upon weather conditions and the specific activity occurring. Air quality impacts would be slightly less for the ATC Alternative as less infrastructure would be constructed and operated. The ATC Alternative would further have a decreased impact if ATC commits to the same mitigation as Minnesota Power, which is referenced below.

MITIGATION

Exhaust emissions can be minimized by keeping vehicles and equipment in good working order, not running equipment unless necessary, and minimizing the number of driving trips. Additionally, utilizing existing power sources, for example, grid supplied-power, or cleaner fuel generators and vehicles rather than diesel-powered generators and vehicles, wherever practical could reduce emissions.

Watering exposed surfaces, utilizing chemical stabilization, covering disturbed areas, covering open-bodied haul trucks, and reducing speed limits on-site are all standard construction practices. The applicant indicates that they've committed to using dust mitigation and control measures that do not contain chloride.[175] The Vegetation Management Plan (VMP) identifies construction best management practices related to soils and vegetation that will help mitigate fugitive dust emissions.

Several sections of the DRP indirectly mitigate impacts to air quality, including sections related to soils, vegetation removal, restoration, and pollution and hazardous wastes. Direct impacts to soils can cause indirect impacts to air quality through erosion. Section 5.3.7 Soil Erosion and Sediment Control of the DRP requires permittees to "implement reasonable measures to minimize erosion." This includes protecting exposed soils by promptly planting and seeding, using erosion control blankets, protecting soil stockpiles, and controlling vehicle tracking. The applicant has also committed to utilizing wildlife friendly erosion control measures during construction, which includes no plastic mesh netting.[176]

Greenhouse Gases

The project will help to shift energy production in Minnesota and the upper Midwest toward carbon-free sources, thus will be beneficial over time. Total GHG emissions for project construction are estimated to be approximately 9,019 tons of carbon dioxide (CO2). Operational impacts from the formation of nitrous oxide and release of sulfur hexafluoride are minimal. Potential impacts due to both construction and operational GHG emissions are anticipated to be minimal, unavoidable, and can be minimized.

Greenhouse gases (GHG) are gaseous emissions that trap heat in the atmosphere and contribute to climate change. These emissions occur from natural processes and human activities. The most common GHGs emitted from human activities include carbon dioxide, methane, and nitrous oxide.

POTENTIAL IMPACTS

Deforestation is a source of carbon dioxide to the atmosphere, as trees and forest land act as a carbon sink, absorbing carbon dioxide from the atmosphere and storing it. Removing forests releases most of the stored carbon stock, either through burning or decay. In addition, deforestation eliminates future carbon dioxide capture. Some vegetation recovery will be a part of the project after construction, but a one for one replacement plan has not been committed to, resulting in a net loss.

[175] Scoping Comments of Minnesota Power, September 29, 2023, eDockets No. 20239-199286-01, page 14.
[176] *Ibid.*

As shown in Table 14, some clearing of forested land would be required for both the ATC Alternative (~34.72 acres) and the proposed project (~34.25 acres). The ATC Alternative is anticipated to need less land overall because it shares 25 feet of width along the existing right-of-way that is already cleared for the HVDC Line, which would ultimately be removed following construction. ATC estimates for forested land impacts are disseminated by existing ROW, new ROW, and the Converter Station which would be required regardless of which project is chosen. Forested National Land Cover Database cover types are indicated with green text.

Table 14: Acres of Forested Land Impacted[177]

Land Cover Type	Proposed Project Total Impacts *(all construction extents)*[178]	ATC Alternative (existing to be shared ROW)	ATC Alternative impacts (new ROW)	Converter Station impacts *(construction extent)*[179]	ATC Alternative Total Impacts *(excludes existing ROW, includes Converter Station)*
developed, open space	0.45 acres	NA	NA	0.22 acres	0.22 acres
developed, low intensity	0.88 acres	NA	NA	0.39 acres	0.39 acres
developed, medium intensity	0.22 acres	NA	NA	NA	NA
Herbaceous	1.78 acres	0.055 acres	0.06 acres	1.33 acres	1.39 acres
Hay/pasture	12.63 acres	0.35 acres	2.15 acres	NA	2.15 acres
Shrub/Scrub	0.88 acres	0.07 acres	1.25 acres	NA	1.25 acres
Woody Wetlands	3.72 acres	0.05 acres	1.06 acres	2.67 acres	3.73 acres
Deciduous Forest	27.38 acres	1.64 acres	10.63 acres	18.99 acres	29.62 acres
Evergreen Forest	0.86 acres	NA	NA	NA	NA
Mixed Forest	2.29 acres	NA	1.37 acres	NA	1.37 acres
Total area	**51.09 acres**	**2.16 acres**	**16.52 acres**	**23.59 acres**	**40.12 acres**
Total Forested Land	**34.25 acres**	**1.69 acres**	**13.06 acres**	**21.65 acres**	**34.72 acres**

[177] Based on the U.S. Geological Survey National Land Cover Database rather than GAP Landcover.

[178] Includes shapefiles provided by the applicant in personal communication to EERA of access roads, 345 kV construction extents, 230 kV construction extents, Converter Station construction extents (which includes the 250 kV line), and Switchyard construction extents. These extents are based on the original proposal of parallel 230 kV lines.

[179] Includes shapefiles provided by the applicant in personal communication to EERA of Converter Station construction extents.

Construction activities will result in short-term increases in GHG emissions because of the combustion of fossil fuels in construction equipment and vehicles. Sulfur hexafluoride (SF6), a potent GHG, will be used at the Converter Station and Switchyard. SF6 is a common gas used in high voltage circuit breakers to extinguish arcs formed when the circuit breaker opens. Small releases will occur as part of regular breaker operation and maintenance. SF6 will be sealed during regular circumstances with no active emissions. The ATC Alternative would not construct a Switchyard, so SF6 impacts would be less.

Total GHG emissions for the proposed project's construction are estimated to be approximately 9,019 tons of carbon dioxide (CO_2) and 121 tons for the ATC Alternative as shown in Appendix H. GHG construction estimates provided by ATC do not include impacts from their project as a whole because emissions from building the required upgraded Converter Station were not included. The upgraded Converter Station must be considered as an environmental impact for both the proposed project and the ATC Alternative. Thus, the impact of GHG emissions for ATC Alternative is higher, but still less than the proposed project. This is the best information EERA can obtain at the time of writing this EA.

Total emissions for the state of Minnesota in 2020 were approximately 137 million tons.[180] Transportation remains one of the highest contributors to the total at about 35 million tons.[181] GHG emissions for project construction are anticipated to be an insignificant amount relative to the state's overall annual transportation emissions. Potential impacts due to construction GHG emissions are anticipated to be minimal.

Once operational, the project will generate considerably less GHG emissions than construction. Operational emissions include processes such as lighting, monitoring equipment, utilized electricity, and maintenance/employee vehicle usage. Over the project's life, the amount of electricity generated by renewable sources due to the upgraded HVDC line are expected to largely outweigh the amount of electricity it consumes. Potential impacts due to operational GHG emissions are anticipated to be minimal.

MITIGATION

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, Minnesota Rule 4410.4300, Subpart 15, Part B, establishes a mandatory category requiring preparation of an EAW for stationary source facilities generating 100,000 tons of GHGs per year. The purpose of an EAW is to assess whether a proposed project has the potential to result in significant environmental effects, which aids in determining whether an Environmental Impact Statement is needed. Regarding GHG emissions, state regulations establish 100,000 tons per year as the threshold to prepare an EAW 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.

Lastly, minimizing SF6 emissions through operational BMPs can reduce GHG. The applicant both monitors SF6 equipment leaks for reporting to the Environmental Protection Agency and to prioritize maintenance and replacement of any leaking equipment.

[180] Minnesota Pollution Control Agency, Greenhouse gas emissions data, retrieved from: https://public.tableau.com/app/profile/mpca.data.services/viz/GHGemissioninventory/GHGsummarystory.
[181] *Ibid.*

Climate Change

Construction emissions will have a short- term negligible increase in greenhouse gases that contribute to climate change. The project's design incorporates elements that minimize impacts from the increase in extreme weather events such as increased flooding, storms, and heat wave events that are expected to accompany a warming climate. Impacts are expected to be minimal as the project is expected to beneficially impact climate change.

Climate change refers to any significant change in measures of climate lasting for an extended period. Greenhouse gases emissions occur from natural processes and human activities which trap heat in the atmosphere and contribute to climate change. The most common GHGs emitted from human activities include carbon dioxide, methane, and nitrous oxide.

In 2020, the electricity sector was the second largest source of Minnesota GHG emissions at 15.8 million tons of 137 million tons, or 11.5%.[182] GHG from electricity generation have decreased by about 60% in Minnesota since 2005 due to a shift in generation to lower- and non-emitting sources and an increase in end-use energy efficiency.[183]

Potential Impacts

A warming climate might cause increased flooding, storm, and heat wave events. These events, especially an increased number and intensity of storms, could increase risks to transmission lines and substations. More extreme storms also mean more frequent heavy rainfall events, which could lead to increased soil erosion. Heat wave events could change demands on the electrical transmission and generation systems, especially as more indoor space is equipped with cooling systems. Because this is a reliability project, it will improve the electrical transmission system making it more resilient and reducing potential for peak overloads during heat wave events.

Using the DNR Climate Trends website[184] to retrieve data from 1895-2023 for the St. Louis River watershed (as representative geographic unit of the project area) showed a mean precipitation of 27.35 inches annually. This model estimated a 0.23-inch increase in precipitation per decade. Therefore, the annual rainfall is estimated to increase by 0.69 inches over the 30 year life of the project.

From the same climate data set and geographic unit, the annual mean temperature from 1895-2023 was determined to be 37.08 °F with an annual mean temperature increase of 0.29 °F per decade. Thus, the mean annual temperature is expected to increase by 0.87°F over the 30 year life of the project.

Construction activities will result in short-term increases in GHG emissions from the combustion of fossil fuels in construction equipment and vehicles, as detailed and analyzed in the GHG Emission section of this EA.

Tree and vegetation loss from construction eliminates related climate resilience benefits, leading to more intense runoff during storms or flooding (thus increasing erosion and reducing water retention), increased heat extremes, and potential reductions in air quality. Removal of or impacts to wetlands due

[182] Minnesota Pollution Control Agency, Greenhouse gas emissions data, retrieved from: https://public.tableau.com/app/profile/mpca.data.services/viz/GHGemissioninventory/GHGsummarystory

[183] Ibid.

[184] Retrieved from: https://arcgis.dnr.state.mn.us/ewr/climatetrends/

to construction eliminates the ability for the land to retain and absorb stormwater, leading to more intense stormwater runoff and nutrient loading.

Trout Stream (West Rocky Run)

West Rocky Run is a designated trout stream that supports wild brook trout. Increased stream temperatures are one of the greatest threats to cold water trout streams. Maintaining sufficient canopy and vegetative shading is especially important to protect cold water trout streams given that there are already multiple utility crossings of West Rocky Run to the north and south of the proposed project. For example, West Rocky Run is crossed by three utility lines near Morris Thomas Road, which is less than one-half mile north of Minnesota Power's existing Arrowhead Substation. Additional loss of shade to this trout stream is a long-term impact with potential to affect many miles of trout water downstream.

Both routing options propose to clear one additional right-of-way in a part of the trout stream that is already impaired and experiencing warming from previous right-of-way clearing that will remain. Both routes would increase the amount of stream corridor maintained in a "cleared" state, resulting in a large area with no large shade trees within the riparian corridor.

Although the ATC Alternative uses much of the existing 250 kV right-of-way, it also requires new trout stream crossings, which are within a previously undisturbed forested area. Although no structures are planned to be placed within waterbodies, the clearance requirements for the right-of-way to span West Rocky Run will cause the removal of tree cover that provides shade, which could potentially increase the temperature of the water, and negatively affect trout, a cold-water fish. If trees are removed, it would take some time for trees and other vegetation to grow in again and re-shade the stream. As the HVDC Line will be decommissioned/removed for both routing options, re-shading of this area will also take some time but may provide future minimization of warming impacts. This impact could be further exacerbated from the future effects of climate change.

MITIGATION

Increased chance of severe weather and heat wave events from a warming climate require adequate planning and preparation. Maintenance and repair plans should anticipate future changes to climate. For example, more robust permanent construction stormwater management might be needed at the substation to address the possibility of more frequent extreme storm events.

The applicant states that the project location is outside of the 100-year floodplain and on upland areas which minimizes susceptibility. While 500-year floods are also expected to be more common due to climate change, the project's upland location minimizes susceptibility. Slopes of variable grades are present throughout the proposed route. Project transmission towers and buildings will be designed to withstand extreme weather events, including high winds.

Mitigation to reduce emissions during construction is discussed in the GHG Emissions section of this EA. Vegetation clearing that will be a part of the project is ultimately expected to be partially offset by the vegetation management required after construction. This vegetation is unlikely to store as much GHG as the forested areas otherwise would have, but nonetheless will increase the carbon storage capacity of the land.

Heavy rainfall events could lead to increased soil erosion. The Converter Station will require grading and leveling for construction access and activities and therefore will have localized impacts on topography and drainage patterns. Ground disturbance will be minimized where practical, and disturbed ground will

be restabilized after construction. 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 and drainage patterns of the area.

There are several wetlands in the area, which serve to alleviate flooding for a heavy rainfall or flooding events. The project does not include a stormwater permit or control, so additional stormwater form increased impervious surface to account for the expected increase in precipitation will not be available, increasing runoff before discharging offsite. This impact would be larger for the ATC Alternative. Efforts will assist in managing impacts from increased storm intensity and frequency but may not fully mitigate the anticipated effects from climate change.

Trout Stream (West Rocky Run)

The CSW Permit requires the permittee to design the permanent stormwater treatment system so the discharge from the project minimizes any increase in the temperature of trout streams resulting from the one and two year 24-hour precipitation events. Several other CSW Permit requirements as discussed in the Soils and Topography section of this EA also address special requirements during construction of the project to prevent impacts to the trout stream.

As provided by Minnesota Rules 6135.1100, subpart 4, item B: Crossings on or under the beds of streams designated by the commissioner as trout waters shall be avoided unless there is no feasible alternative. When unavoidable, maximum efforts shall be taken to minimize damage to trout habitat.

Groundwater

The ROI for groundwater is the route width. Potential impacts to domestic water supplies are not expected, because all documented wells within the route width will be owned by Minnesota Power and sealed for the project. There are no wellhead protection or drinking water supply management areas in the route width. Subsurface activity would likely penetrate shallow water tables; however, subsurface disturbance is expected to be above well-depth used for potable water. Potential impacts for both routing options are anticipated to be minimal. Impacts will be short, localized, and can be mitigated in part.

The project is within the Central Groundwater Province, which is "characterized by buried sand aquifers and relatively extensive surficial sand plains, part of a thick layer of sediment deposited by glaciers overlying the bedrock," because of this "thick glacial sediment, sand and gravel aquifers are common, and the deeper fractured crystalline bedrock has poor aquifer properties and limited use as an aquifer."[185] Springs and other karst features are not present in the project area. The water table is relatively deep within the route width as it ranges from zero feet to over 50 feet depending on the location.[186] Depth to groundwater is shallower in the mapped hydric soils and areas delineated as wetland, and deeper in the non-hydric soil units.

Pollution Sensitivity of Near-Surface Materials is generally "very low" throughout the route width and ranges up to "moderate".[187] The sensitivity to pollution of near-surface materials is an estimate of the

[185] Department of Natural Resources, *Minnesota groundwater provinces 2021*, Retrieved from: https://www.dnr.state.mn.us/waters/groundwater_section/mapping/provinces.html.

[186] Department of Natural Resources Geospatial Data, retrieved from: https://mnatlas.org/resources/?id=k_0279.

[187] Department of Natural Resources Geospatial Data, retrieved from: https://mnatlas.org/resources/?id=k_0148.

time it takes for water to travel through the unsaturated zone to reach the water table, which for the purposes of the model was assumed to be 10 feet below the land surface.[188] This means that the project area is generally expected to have "very low" groundwater pollution sensitivity where contaminants from the land surface would not reach groundwater for months to a year.[189] Low sensitivity does not guarantee protection. Leakage from an unsealed well for example, may bypass the natural protection, allowing contamination to directly enter an aquifer. These models do not provide the detail necessary for regulation or other activities but are useful for region-wide assessments.

The MDH maintains the Minnesota Well Index (MWI), which provides basic information (e.g., location, depth, geology, construction, and static water level) for wells and borings drilled in Minnesota.[190] The MWI identifies four domestic wells within the proposed route, all of which will be owned and abandoned (sealed) by the applicant in compliance with MDH regulations. Thus, private wells in the route width will not be impacted. Additionally, there are no wellhead protection or drinking water supply management areas in the route width.

Minnesota Power will not need to connect to city water for the project but will need to install a domestic sized well for sanitary facilities at the Converter Station and/or Switchyard. This type of well is not expected to appropriate more water than a typical residence and would need to comply with applicable MDH permitting regulations. Thus, water appropriation for the project is not expected to affect wells in the area outside of the route width, and in fact the area should have an overall decrease.

POTENTIAL IMPACTS

Potential impacts to groundwater can occur directly or indirectly. Direct impacts are generally associated with construction, for example, construction may require "drilling to depths that can penetrate shallow water tables or open access channels to deeper aquifers."[191] Localized impacts, should they occur, would be intermittent, but have the potential to occur over the long-term. Indirect impacts could occur through spills or leaks of petroleum fluids or other contaminants that could ultimately contaminate groundwater. Impacts can be mitigated.

Transmission pole foundations that will be imbedded into the ground may be up to 60 feet deep for either routing option and range down to 25 feet. All foundation materials will be non-hazardous, preventing leaching into groundwater. Structures might come into direct contact with groundwater because portions of the project area have a depth to groundwater that is less than 60 feet. Prior to construction, geotechnical investigations will be completed to help identify shallow depth to groundwater resource areas, which may require special foundation designs and ultimately is expected to minimize impacts.

Because of the shallow depth to groundwater in some areas of the project, dewatering may be required during construction. If dewatering exceeds 10,000 gallons of water per day, a DNR water appropriation

[188] Adams, R. (June 2016) Pollution Sensitivity of Near-Surface Materials, retrieved from: https://www.leg.state.mn.us/docs/2017/other/170839.pdf, page 3.

[189] DNR, Methods to Estimate Near-Surface Pollution Sensitivity, retrieved from: https://files.dnr.state.mn.us/waters/groundwater_section/mapping/gw/gw03_ps-ns.pdf.

[190] MDH (n.d.) *Minnesota Well Index* https://www.health.state.mn.us/communities/environment/water/mwi/index.html .

[191] Maryland Department of Natural Resources, *Impacts of Power Generation and Transmission: Water Resources*, retrieved from: http://pprp.info/ceir17/HTML/Chapter4-2-2.html.

permit will be required.[192] Project structures as proposed are generally a suitable distance from areas of sloping which are near large drainage features. Although subsurface activity might disturb shallow groundwater resources, the disturbance area would be above well-depth used for potable water.

Impacts to surface waters can lead to indirect impacts to groundwater. For example, construction activities can directly or indirectly lead to increased turbidity of surface waters through sedimentation. These contaminated surface waters might then flow to groundwater. Contamination is not limited to sediment, any surface water pollutant, such as oil, can reach groundwater. Surface water impacts are anticipated to be moderate (see Surface Water section of this EA).

Minnesota Power has largely avoided wetlands in their project design (see Figures in Wetlands section of this EA); however, they are still nearby within their route width. The ATC Alternative would have less impact due to grading, changed drainage patterns, and increased impervious surface to water, soils, and wetland's ability to handle runoff because only the Converter Station would likely contribute. The proposed project and the ATC Alternative would reduce the land's ability to filter runoff from increased impervious surfaces. However, the impact is minimal as the small amount of increased impervious surface is not expected to change drainage patterns much.

MITIGATION

Indirect impacts to groundwater can be mitigated by avoiding or minimizing impacts to surface waters. Direct impacts to groundwater, such as from construction dewatering, should be directed away from wetlands and done in a manner to prevent erosion, that is, using an appropriately sized dewatering containment system that is carefully monitored.

Because the project will disturb more than one acre, the applicant must obtain a CSW Permit from the MPCA. The CSW Permit will identify BMPs for erosion prevention and sediment control. As part of the CSW Permit, the applicant will also develop a Stormwater Pollution Prevention Plan (SWPPP) that describes construction activity, temporary and permanent erosion and sediment controls, BMPs, permanent stormwater management that will be implemented during construction and through the life of the project. Implementation of the protocols outlined in the SWPPP will minimize the potential for soil erosion and detail stormwater management methods during construction and operation of the facility. Section 5.3.7 of DRP require permittees to obtain an MPCA CSW Permit and implement the BMPs within for erosion prevention and sediment control.

Any new wells require notification to MDH and would be constructed by a well borer licensed by MDH. If an unknown well is discovered, the applicant will coordinate with the landowner and follow MDH regulations such as capping and abandoning the well in place.

Grading for the project is designed to maintain existing drainage patterns to the extent feasible, minimizing water quality concerns due to the low percentage of disconnected impervious surfaces. Grading is discussed in more detail in the Soils and Topography section of this EA. As a result, sheet flow runoff is more likely to filter through vegetation into the soil prior to discharging to nearby wetlands or surface waters.

[192] DNR, Water Use Permits, retrieved from: https://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/permits.html

Soils and Topography

The ROI for soils is the anticipated route width. Common soil impacts include rutting, compaction, and erosion during construction. Potential impacts will be short-term, localized, and minimal. Construction may have erosion impacts where steep side slopes are excavated to provide a flat construction surface. Approximately 13 acres of soil may have permanent impacts from the proposed construction of the Converter Station and Switchyard – 5 acres of those contain steep slopes of greater than 8%, or 11% of the total construction acres. Impacts can be mitigated in part.

Overall, soils are essential natural resources that support various aspects of human life, the environment, and the economy. Understanding their properties, functions, and management is important to determine potential project environmental impacts. Soil is a mix of living and non-living material. Soil health is defined as "the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans."[193] Healthy soil provides a multitude of benefits: clean air and water, bountiful crops and forests, productive grazing lands, diverse wildlife, and beautiful landscapes. Soil performs five essential functions:

- Regulating water
- Sustaining plant and animal life
- Filtering and buffering potential pollutants
- Nutrient cycling
- Providing physical stability and support

Soils in the project area are predominantly derived from the rocky, red tills of the Superior glacial lobe. These soils mainly consist of Aldenlake complex or sandy loam as shown in Table 15. 43% of the survey area has steep slopes of 8 percent or more, which increases potential for erosion impacts. 100% of the project study area is classified as the Dusler-Duluth (s3677) soil association.

Table 15: Soil Types in the Survey Area[194]

Symbol	Description	Hydric	Acres
F145F	Ahmeek-Aldenlake complex, 18 to 45 percent slopes	No	22.89
F144D	Aldenlake-Ahmeek complex, 8 to 18 percent slopes	No	89.69
F121B	Aldenlake sandy loam, 2 to 8 percent slopes	No	51.29
1020A	Bowstring and Fluvaquents, loamy, 0 to 2 percent slopes, frequently flooded	Yes	25.07
F142A	Canosia loam, 0 to 2 percent slopes	Yes	13.97
F135A	Hermantown-Canosia-Giese, depressional, complex, 0 to 3 percent slopes	No	1.79
F136A	Hermantown silt loam, 1 to 3 percent slopes	No	0.22
F137B	Normanna-Canosia-Hermantown complex, 0 to 8 percent slopes	No	41.27
GP Pits	gravel-Udipsamments complex	Unranked	15.86
F117D	Rollins sandy loam, 8 to 18 percent slopes	No	7.22

[193] NRCS, retrieved from: https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soils/soil-health

[194] The Survey Area was defined by the most recent Wetland Delineation conducted for the project, eDockets No. 20242-203661-01 through -18. The Survey Area does not include the entire Project Study Area but does include all the soils within the proposed project's route width and the ATC Alternative's likely alignment.

F151A	Tacoosh mucky peat, dense substratum, 0 to 1 percent slopes	Yes	5.53
F154A	Urban land-Hermantown-Canosia complex, 0 to 3 percent slopes	<Null>	1.66
Total			**276.46**

Table 16: Soil Types within ATC's Proposed Alignment

Symbol	Description	Acres
1020A	Bowstring and Fluvaquents, loamy, 0 to 2 percent slopes, frequently flooded	0.9
F121B	Aldenlake sandy loam, 2 to 8 percent slopes	2.4
F137B	Normanna-Canosia-Hermantown complex, 0 to 8 percent slopes	2.9
F142A	Canosia loam, 0 to 2 percent slopes	1.9
F144D	Aldenlake-Ahmeek complex, 8 to 18 percent slopes	8.5
F145F	Ahmeek-Aldenlake complex, 18 to 45 percent slopes	2.0
Total		**18.7**

Potential Impacts

Soil compaction and rutting will occur from movement of construction vehicles along the right-of-way and near the substation. Installing structures requires removing and handling soils, which, along with vegetation clearing and grading, will expose soils to wind and water erosion. Topsoil could be lost to improper handling or erosion at the Converter Station or Switchyard. Groundcover protecting soils will be left undisturbed whenever practical. Should high rainfall events occur during construction or prior to establishment of permanent vegetation, significant sedimentation might occur.

Steep slopes of 12 percent or more and erosion prone soils should be described and shown on the site plan or on a separate grading plan.[195] Construction may have significant impacts where side slopes may be excavated to provide a flat construction surface. Minnesota Power has stated in their draft VMP that excavating in steeply sloped areas will be avoided to the extent practicable.[196] Approximately 44 acres of the 176-acre proposed route will be impacted by construction activities. Approximately 13 acres of soil may have permanent impacts from the proposed construction of the Converter Station and Switchyard – 5 acres of those contain slopes of greater than 8 percent (Map 9). Those potentially erosion prone soils comprise about 11 percent of the total acres to be impacted from construction.

Steep slopes 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 for both routing options. 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 for the Converter Station. Minnesota Power is still in the preliminary design phase and can provide more detailed design information in the future. Future project designs and grading plans should identify steep areas so that impacts can be minimized. Minnesota Power stated in their draft VMP that routine maintenance would clear steep slopes and slopes leading to water bodies by hand, leaving adequate herbaceous or low shrub cover to avoid erosion.[197]

[195] EQB Guidelines Preparing Environmental Assessment Worksheets, 2013.
[196] Minnesota Power draft Vegetation Management Plan, eDockets No. 20242-203665-11.
[197] *Ibid.*

Minimal impacts to topography, such as the creation of abrupt elevation changes or modifications to natural drainage patterns, may occur due to those 5 acres of potentially steep slopes with erosion prone soils for the Converter Station and Switchyard. The Converter Station will be one continuous graded pad with a maximum grade of 2 percent slope within the fenced area to accommodate runoff. All designs will follow current American Society of Civil Engineers standards and any other applicable rules or regulations. Minnesota Power added a 50-foot buffer on all sides of the building to accommodate an elevation change on the west side. This buffer is around the graded pad and provided for any required civil work that may come out of future designs specifications, however, will be greater than a two percent slope. Minnesota Power also committed to using rip rap or a similar material to stabilize slopes to ensure the existing drainage pattern remains after construction, minimizing impacts from topography and impacts to soil/erosion that could indirectly impact other resources such as the trout stream.

MITIGATION

Some site features such as highly erodible soils, steep slopes, and sensitive receiving waters will require special attention to avoid adverse environmental effects. The MPCA has identified increased Best Management Practices (BMPs) that are required to be used in areas discharging to and within one mile of designated Special or Impaired Waters. These are applicable to both routing options as multiple drainages on the property run west to east leading water down to West Rocky Run. The BMPs will be included as Appendix A of the Construction Stormwater General Permit as applicable. There are Special or Impaired Waters in and near the proposed route, all designated trout streams or tributaries.[198] Additional regulations during construction and regulated in the CSW permit are as follows:

- Projects discharging to trout streams must incorporate additional BMPs found in items 23.9, 23.10, 23.11 and 23.12 of the CSW permit if the project has a discharge point within 1 mile of and flows to the trout stream.
- Permittees must immediately initiate stabilization of exposed soil areas and complete the stabilization within seven (7) calendar days after the construction activity in that portion of the site temporarily or permanently ceases.
- Permittees must provide a temporary sediment basin for common drainage locations that serve an area with five or more acres disturbed at one time.
- Permittees must include an undisturbed buffer zone of not less than 100 linear feet from a special water (not including tributaries) and must maintain this buffer zone at all times, both during construction and as a permanent feature post construction, except where a water crossing or other encroachment is necessary to complete the project. Permittees must fully document the circumstance and reasons the buffer encroachment is necessary in the SWPPP and include restoration activities. Permittees must minimize all potential water quality, scenic and other environmental impacts of these exceptions by the use of additional or redundant BMPs and must document this in the SWPPP for the project.

The use BMPs and standard construction practices can protect topsoil and minimize the potential for soil erosion. These practices include temporary and permanent topsoil stabilization measures in accordance with the project's CSW Permit; restoring disturbed areas to pre-construction conditions to the extent practicable; minimizing erosion by implementing environmental control measures, such as,

[198] MPCA Construction Stormwater Special Waters Search, retrieved form: https://mpca.maps.arcgis.com/apps/webappviewer/index.html?id=e03ef170fa3e41f6be92f9fafec100cc.

temporary and permanent seeding, mulching, filter strips, erosion blankets, and sod stabilization. Several sections of the DRP address soil-related impacts such as those outlined above. Common mitigation methods employed to minimize soil erosion include:

- Promptly seeding to establish temporary or permanent vegetative cover on exposed soil.
- Using mulch to form a temporary and protective cover on exposed soils. Mulch can help retain moisture in the soil to promote vegetative growth, reduce evaporation, insulate the soil, and reduce erosion. A common mulch material used is certified weed free hay or straw.
- Erecting or using sediment control fences that are intended to slow water flow, filter runoff, and promote the settling of sediment out of runoff via ponding behind the sediment fence.
- Using erosion control blankets and turf reinforcement mats that are typically single or multiple layer sheets made of natural and/or synthetic materials that provide structural stability to bare surfaces and slopes.
- Separating topsoil and subsoil and covering stockpiled soils.
- Returning locations where grading or temporary access is required to their original contours and elevation to the greatest extent possible.
- Permanent stormwater controls will control runoff at the substation.

Additional mitigations may include using only new timber matts, equipment washing in and out of wetland areas, and seasonal construction restrictions to protect trout. Additionally, winter construction can reduce potential impacts such as rutting and compaction because soils are frozen. Minnesota Power stated in their draft VMP that to the extent the project schedule allows, vegetation clearing will be conducted on firm or frozen ground to minimize rutting and soil erosion.[199] If schedules or weather do not allow for work on firm ground, wood or plastic mats or corduroy roads will be used as necessary to prevent erosion. Winter construction makes handling topsoil more difficult. Mitigation associated with grading during frozen ground conditions include applying heating mats to warm the soil or using soil rippers to break frozen soil particles into more manageable sizes before grading.

Surface Water

The ROI for surface water is the local vicinity. Direct impacts to an impaired, designated trout stream cannot be avoided by the project. Potential impacts to surface waters are anticipated to be moderate for both routing options which will clear one additional right-of-way in a part of the trout stream that is already impaired and experiencing warming from previous right-of-way clearing that will remain. This impact could be further exacerbated from the future effects of climate change. Potential impacts can be mitigated.

Both routing options would utilize the Converter Station, which is the project's greatest potential for indirect impacts to surface waters due to grading steep slopes and increased impervious surface that may alter existing drainage patterns to the trout stream.

The surface topography in the project area is characterized by a series of hills with multiple drainages running west to east leading water down to West Rocky Run, a designated trout stream (eDockets No. 20242-203661-01 through -18).[200] In the project area, the main surface water feature is West Rocky Run

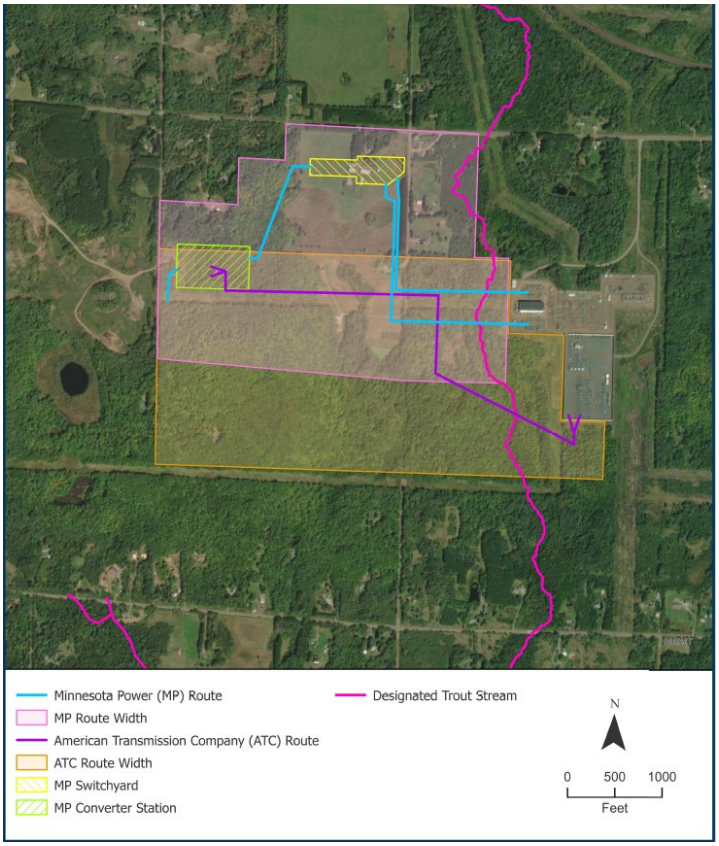
[199] Minnesota Power draft Vegetation Management Plan, eDockets No. 20242-203665-11.
[200] Minn. R. 6264.0050 subp. 4, NN. (110)

(AUID: 04010201-625) which is a tributary to the Midway River, which flows to the St. Louis River and Lake Superior. Other surface water in the project area includes a small ephemeral stream channel connecting a shallow marsh and an open pond, the pond located approximately 75 feet east of West Rocky Run and 300 feet west of Arrowhead Substation.

Certain waters in Minnesota are classified as public waters under Minnesota Statute 103G.005. Public waters include wetlands, water basins, and watercourses of significant recreational or natural resource value in Minnesota. A public waters designation means that DNR has regulatory jurisdiction over the water.[201] Minnesota Power also hired a third-party contractor to delineate wetlands and other watercourses (eDockets No. 20242-203661-01 through -18). Utilities are required to obtain a license to cross state lands and waters. All transmission routes cross West Rocky Run, none cross the pond. Wetlands are discussed in the next section of this EA.

Minnesota water quality standards protect lakes, rivers, streams, and wetlands by defining how much of a pollutant (bacteria, nutrients, turbidity, mercury, etc.) can be in the water before it is no longer drinkable, swimmable, fishable, or useable in other, designated ways. An impaired water fails to meet one or more water quality standards. West Rocky Run is classified by the MPCA as an impaired waterbody due to concentrations of *E. coli* exceeding water quality standards.[202] A Total Maximum Daily Load plan has been approved by the EPA for this impairment.[203]

Figure 6: Trout Stream Crossings



The project is within the St. Louis River Area of Concern (AOC) and is one of the AOCs across the Great Lakes created under the 1987 Great Lakes Water Quality Agreement. An AOC is a location that has experienced environmental degradation.[204] Draining to 3,634 square miles of watershed and encompassing a 1,020 square-mile area, the St. Louis River is the second largest U.S.-based AOC. It crosses state boundaries, including both the states of Minnesota and Wisconsin.

Potential Impacts

Potential impacts to surface water related to the project include soil disturbance from construction, stormwater runoff, dewatering of foundation borings, and transmission lines crossing West Rocky

[201] Public waters are defined in Minnesota Statute 103G.005, subdivision 15.

[202] Minnesota Pollution Control Agency Impaired Waters: draft 2024, retrieved from: https://mpca.maps.arcgis.com/apps/webappviewer/index.html?id=fcfc5a12d2fd4b16bc95bb535d09ae82.

[203] *Ibid.*

[204] Great Lakes Water Quality Agreement, *Annex 1 of the 2012 Protocol*, retrieved from: https://www.epa.gov/glwqa.

Run, an impaired and designated trout stream, for both the proposed project and the ATC Alternative. Construction equipment use, repair, and maintenance involves fluids that may leak or spill with the potential to reach surface water. If equipment crosses a watercourse or inadvertently enters a waterbody, direct impacts, for example, bottom disturbance or petroleum-based products washing into the water would occur.

Stormwater runoff from construction areas can cause direct impacts to surface waters by discharging sediment into the waterbody and damaging riparian vegetation along the shore. Soils will be disturbed by clearing trees and vegetation, access road construction, and site grading for project components. More site grading will be conducted for the proposed project whereas the construction of access roads is closer to West Rocky Run for the ATC Alternative (Appendix B, Map 3).

If dewatering is necessary, water removed could contain sediments or pollutants that might be introduced into surface waters. The applicant does not anticipate that dewatering will be necessary as plans are to use a bucket auger or bucket pile instead. Water leaking from this equipment can nevertheless cause similar impacts to surface waters. If dewatering exceeds 10,000 gallons a day, a DNR Water Appropriations Permit will be required. The CSW permit will regulate water discharge regardless, especially in the case of West Rocky Run, and those permit requirements were discussed thoroughly under the Soils section of this EA.

Transmission

Direct impacts to West Rocky Run cannot be avoided by the project, primarily derived from tree clearing for the new transmission line right-of-way (Figure 6). Potential impacts to surface waters are anticipated to be moderate for both routing options which will clear one additional right-of-way in a part of the trout stream that is already impaired and experiencing warming from previous right-of-way clearing that will remain.[205]

Although there are no plans to locate structures within waterbodies, the clearance requirements for the right-of-way to span West Rocky Run will require tree cover removal presently providing shade, which could potentially increase the temperature of the water, and negatively affect trout, a cold-water fish. If trees are removed, it would take some time for trees and other vegetation to grow in again and re-shade the stream. This impact could be further exacerbated from the future effects of climate change. As the HVDC Line will be decommissioned/removed for both routing options, re-shading of this area will also take some time but may provide future minimization of warming impacts.

Construction activities near surface waters could cause riparian vegetation disturbance and surface erosion. These activities can speed water flow and expose previously undisturbed soils, increasing erosion and the potential for sediment to reach surface waters. Disturbed soils will generally be limited to the area immediately adjacent to structure locations; however, areas outside these locations might also be disturbed, for example, moving construction equipment within the ROW.

Presently, in the project area, there are two crossings of West Rocky Run by transmission lines. These and the proposed crossings of the trout stream are summarized in Table 17. Both the proposed project and the ATC Alternative would be crossing near existing ROW that is cleared – however, the ROW for

[205] **Note:** *Minnesota Power later offered in its testimony to route one double-circuited monopole 230 kV line instead of two parallel H-frame lines.*
Minnesota Power, Direct Testimony and Schedules Daniel McCourtney, February 14, 2024, eDockets No. 20242-203446-09.

the proposed project will regrow over time, whereas the ROW will remain cleared near the ATC Alternative's new crossing, which could exacerbate warming impacts.

Table 17: Existing and Proposed Crossings of West Rocky Run in the Project Study Area

Crossing	Existing Width	Proposed Project	ATC Alternative
Existing Facilities			
Existing 250 kV HVDC Line	One crossing (120-foot-wide ROW)	To be removed, eventual revegetation of the ROW	To be removed, eventual revegetation of the ROW
Existing 230 kV	130 ft (one crossing)	No change 130 ft (one crossing)	No change 130 ft (one crossing)
Proposed Facilities			
New double-circuit 345 kV	NA	Does not cross trout stream	150 ft (One crossing)
New double-circuit 230 kV	NA	130 ft (one crossing)	Not proposed
Total length of stream affected	250 feet of cleared ROW existing	• 130 feet of new ROW • 260 feet of cleared ROW total *(380 feet total until revegetation of HVDC Line ROW)*	• 150 feet of new ROW • 280 feet of cleared ROW total *(400 feet total until revegetation of HVDC Line ROW)*

Converter Station and Switchyard

Additional impacts could occur from sanitation systems associated with the new Converter Station and Switchyard that are utilizing a septic tank. If the tank were to experience a failure or be subject to flooding, especially extreme flooding cause by climate change, a release could increase *E. coli* impairments in West Rocky Run.

MITIGATION

Construction projects that disturb one or more acres of land require a general CSW Permit from the MPCA. This permit is issued to construction site owners and their operators to prevent stormwater pollution entering surface water during and after construction. The CSW Permit requires use of best management practices; development of a SWPPP; and adequate stormwater treatment capacity once the project is complete. Projects must be designed so that stormwater discharged after construction does not violate state water quality standards. Specifically, projects with net increases of one acre or more to impervious surface must be designed to treat water volumes of one inch multiplied by the net increase in impervious surface.**Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.**

Standard construction management practices, including, but not limited to containment of excavated soils, protection of exposed soils, stabilization of restored soils, and controlling fugitive dust would minimize the potential for eroded soils to reach surface waters. Other mitigation measures include using BMPs to reduce the potential for erosion and sedimentation. Commission route permits require that soil excavated from riparian areas not be placed back into the riparian area. Temporary bridges can be used to span watercourses, if necessary, to avoid driving vehicles in a stream bed. Construction and maintenance during frozen ground conditions would minimize impacts to surface waters.

Use of the wire/border zone vegetation clearing method could help to stabilize the ROW by allowing certain low growing woody vegetation and trees to persist along the outside edges of the ROW. This allows for different types and heights of vegetation based on whether the vegetation is directly underneath the conductor (wire zone) or elsewhere in the right-of-way (border zone). This type of vegetation management could be required in the DRP as a special condition near West Rocky Run.

> **Wire Zone** Area directly underneath the conductors, including potential conductor sway. Vegetation in this zone consists of low-growing forbs and grasses.
>
> **Border Zone** Area that begins at the outside edge of the wire zone and extends to the edge of the right-of-way. This zone may contain additional low-growing woody plants and trees.

The wire/border zone method appears consistent with the City of Hermantown Shoreland Ordinance (555.07[206]). The ordinance restricts the removal of natural vegetation to prevent erosion into public waters, to conserve nutrients in the soil and to preserve shoreland aesthetics except when sufficient vegetation cover will remain to screen structures from the water and when natural vegetation is restored to the extent feasible. While staff acknowledges this is clearly not feasible at all locations within the right-of-way, it might be feasible within the border zone.

Minnesota Power stated in their draft VMP that a minimum 50-foot natural vegetative buffer will be maintained on both banks of the stream crossing to maintain habitat and bank stability.[207] Additionally, ROW clearing within no less than 30 feet of non-DNR jurisdictional streams or wetlands will be conducted to protect all non-invasive vegetation. Lastly, brush species will be left across a majority of the ROW, except brush in the wire zone will be removed to facilitate ROW access. Low growing woody vegetation could be allowed where it is consistent with engineering design and safe operation of the line.

ATC would be required to submit a draft VMP for approval prior to construction to ensure similar measures would be implemented. ATC has also stated that they do not anticipate the need for any in-water work within West Rocky Run and, where practicable, will leave a 75-foot buffer of low-growing vegetation adjacent to the waterway (tall growing trees will be removed).[208] Rootstock of woody vegetation would remain in place to minimize ground disturbance.

As provided by Minnesota Rules 6135.1100, subpart 4, item B: Crossings on or under the beds of streams designated by the commissioner as trout waters shall be avoided unless there is no feasible alternative. When unavoidable, maximum efforts shall be taken to minimize damage to trout habitat.

Wildlife and Habitat

The ROI for wildlife and habitat is the route width, whereas the ROI for avian species is the local vicinity. Wildlife using the route width are expected to be displaced during construction due to increased human activity. Most wildlife would return to the area after construction. Distinct impacts to terrestrial species, avian species, and habitat will occur.

[206] Zoning, Chapter 5 Land Use Regulations, retrieved from: https://hermantownmn.com/wp-content/uploads/2020/01/ZONING_CHAPTER_5_LAND_USE_REGULATIONS_2015-12-29.pdf

[207] Minnesota Power draft Vegetation Management Plan, eDockets No. 20242-203665-11.

[208] Personal email communication with EERA staff, December 15, 2023.

Potential impacts to avian species include those described above. Additionally, birds—especially large bodied birds—are susceptible to electrocution from, and collision with, HVTLs during operation. Potential impacts to avian species are expected to be minimal but might impact unique resources. These short- and long-term, localized impacts can be minimized.

Impacts to terrestrial species will be intermittent, temporary, and localized during construction. While direct significant impacts might occur to individuals, population level impacts are not anticipated. These short-term, localized impacts can be minimized. Minimal operational impacts are expected from intermittent but long-term maintenance of the right-of-way.

Impacts to habitat are primarily associated with creating new transmission line corridors. These long-term impacts are unavoidable. Overall, potential impacts to wildlife and habitat are expected to be minimal for both the proposed project and the ATC Alternative.

Construction and operation of the proposed project or the ATC Alternative may cause short-term and long-term impacts to wildlife and habitat. Impacts on wildlife are assessed by evaluating the vegetation cover/habitat in the project area, and the proximity of the project to wildlife habitat.

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. After extensive logging, white and red pine forests were replaced by quaking aspen and paper birch.[209] Vegetation communities in the project area currently include agricultural land, deciduous forest, and residential lawns. The project area is not in or within an area identified as part of the DNR's Wildlife Action Network.[210] There are no DNR Wildlife Management Areas, Scientific and Natural Areas, native plant communities or prairies, Reinvest in Minnesota Reserve areas, wetland banking easements, Migratory Waterfowl Feeding and Resting Areas, or National Audubon Society Important Bird Areas within the local vicinity of either routing option.

Most wildlife using the local vicinity are common species associated with disturbed habitats and are accustomed to human activities occurring in the area, for example, agriculture, roads, and rural homesteads. The applicant identified wildlife that could be present within the project study area that include common species such as:

- Woodcock
- Ruffed grouse
- Wild turkey
- White-tailed deer
- Black bear
- Beaver
- Muskrat
- River otter
- Grey wolf
- Rabbit
- Squirrel

[209] Retrieved from: https://www.dnr.state.mn.us/ecs/212Lb/index.html

[210] The WAN identifies significant aquatic and terrestrial biological areas across the state with the intent of aiding conservation efforts to address large-scale threats, including climate change, invasive species, habitat loss, and others.

- Red and gray fox
- Raccoon
- Migratory waterfowl (geese, ducks, trumpeter swans, herons)
- Raptors, such as bald eagles
- Various birds (meadowlarks, sparrows, thrushes, woodpeckers, shore birds)

In addition, the USFWS identifies Birds of Conservation Concern of migratory birds that are a conservation priority to the USFWS but are not listed as having status protected by law. The project area is in the Boreal Hardwood Transition bird conservation region, and the following species were identified as having potential to be present in the project area:[211]

- Black-billed Cuckoo
- Bobolink
- Canada Warbler
- Evening Grosbeak
- Golden-winged Warbler
- Olive-sided Flycatcher
- Wood Thrush

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. No Important Bird Areas are near the project area, although several are in St. Louis County.

POTENTIAL IMPACTS

During construction of the project, vegetation currently present in the area would be removed to accommodate the new electrical facilities and stage associated materials and equipment. Vegetation clearing for new and extended right-of-way will widen existing corridors, ranging from 110 additional feet (where the ATC Alternative widens the existing HVDC Line ROW) to 260 additional feet (for the proposed project's 230 kV parallel corridor) in impacts. Estimated acreage of vegetation removed is summarized in Table 18.

Table 18: Vegetation Removed Between Projects[212]

Project Name	Forested Area Cleared for Construction	Non-forested Area Cleared for Construction	Total Forested/Non-forested Area Cleared
Proposed Project	34.25 acres	16.84 acres	51.09 acres
ATC Alternative	34.72 acres	5.4 acres	40.12 acres

During operations, the ~34.25 acres to be cleared during construction (see Table 14) would be restored where permanent infrastructure isn't present consistent with a VMP to be prepared by Minnesota Power. The composition and structure of vegetation—and, as a result, wildlife habitat—will be altered in these areas. Habitat loss has a consistent negative affect on biodiversity and can adversely impact species richness, population growth rates, reductions in habitat specialist species, and breeding success,

[211] Minnesota Power Route Permit Application, Appendix J, eDockets No. 20236-196333-10.

[212] Based on Table 14 of this EA.

among other measures.[213] Potential impacts to wildlife would be associated with fencing, lighting, or noise from the project.

During construction, wildlife in the project area may be displaced due to equipment noise, increased human activity, and other disturbance of habitat. The distance animals are displaced depends on the species and the tolerance level of each animal. Most wildlife would likely return to the area after construction; however, others might be permanently displaced. Because other suitable habitat is available in and near the project area, potential temporary impacts to wildlife are not expected to cause permanent changes to local populations. Although streams will be spanned, and no structures will be placed directly in the trout stream, the increased vegetation clearing for new right-of-way will directly impact cold water fish and/or their habitat along this stretch.

Plastic erosion control netting is frequently used for erosion control during construction and landscape projects and can negatively impact wildlife populations. Wildlife entanglement and death from plastic netting and other plastic materials has been documented in birds, fish, mammals, and reptiles.[214] Minnesota Power has committed to using wildlife friendly erosion control for the project, which is included as a suggested special permit condition for the DRP.[215]

Habitat fragmentation is "usually defined as a landscape-scale process involving both habitat loss and the breaking apart of habitat."[216] This definition, however, does not isolate the impact of fragmentation independent of habitat loss. The potential impact from habitat fragmentation—when controlled for habitat loss—is "generally much weaker than the effects of habitat loss," and is "at least as likely to be positive as negative."[217] Negative impacts associated with habitat fragmentation include 1) an increased number of smaller habitat patches interspersed among larger areas of non-suitable habitat, and 2) increased "edge for a given amount of habitat."[218]

"An 'edge' is the boundary, or interface, between two biological communities or between different landscape elements."[219] Edge effects may alter habitats that are important to interior forest dwellers through microclimate changes to these areas. Additionally, increased predation, competition, and parasitism from plants and animals intruding on interior forest environments can become more prevalent, as well as interior forest species increasingly moving through and along edges, that is, habitat transition areas.[220,221] In locations where the proposed transmission line will parallel existing right-of-way, edge effects will be limited to one side of the right-of-way. As a result, edge effects are expected to intensify in locations where new right-of-way will be created and lessen where existing right-of-way is expanded, but this is also expected to be relative to the level of expansion.

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[213] Fahrig, Lenore (2003).

[214] DNR. *Wildlife-friendly Erosion Control*. (2013).http://files.dnr.state.mn.us/eco/nongame/wildlife-friendly-erosion-control.pdf.

[215] Scoping Comments of Minnesota Power, September 29, 2023, eDockets No. 20239-199286-01, page 14.

[216] Fahrig, Lenore (2003) Effects of Habitat Fragmentation on Biodiversity, ANNUAL REVIEW OF ECOLOGY AND SYSTEMATICS 2003(34):487-515, retrieved from: http://www.montana.edu/hansenlab/documents/bio515_13/farhig%202003.pdf, page 487.

[217] *Ibid.,* page 502.

[218] *Ibid.,* page 505.

[219] British Columbia Ministry of Forests Research Program (June 1998) Biodiversity and Interior Habitats: The Need to Minimize Edge Effects, retrieved from: https://www.for.gov.bc.ca/hfd/pubs/Docs/En/En21.pdf.

[220] *Ibid.*

[221] Fahrig, Lenore (2003), page 505.

Should winter construction occur, reptiles, such as snakes, move underground below the frost line and become inactive or hibernate over winter months.[222] Turtles and amphibians generally hibernate under pond bottoms, but will also hibernate on land underneath the frost line. "Insects may winter above or below ground as eggs, larvae, pupae, or adults, depending on the species" in areas like grass thatch, leaf litter, bunch grasses, tunnels in wood, etc.[223] Impacts to overwintering reptiles, amphibians, and insects (pollinators) might occur during transmission structure placement, that is, individuals might be inadvertently killed, should placement occur at their place of hibernation.

Avian Species

Potential impacts to avian species include electrocution from, and collision with, HVTLs during operation. Electrocution risk is greater with large-bodied birds and is most prevalent when the power line structure is the tallest feature on the landscape, such as on a bluff or prairie. The most critical component of avian electrocution is the "physical separation between energized and/or grounded structures, conductors, hardware, or equipment that can be bridged by birds to complete a circuit. Generally, electrocution can occur on structures with the following:

- Phase conductors separated by less than the wrist-to-wrist or head-to-toe distance of a bird;
- Distance between grounded hardware (for example, grounded wires, metal braces) and any energized phase conductor that is less than wrist-to-wrist or head-to-foot distance of a bird."[224]

Independent of the risk of electrocution, birds might be injured or killed by colliding with transmission line structures and conductors. The risk of collision is influenced by several factors including habitat, flyways, foraging areas, and bird size. Waterfowl, especially larger waterfowl such as swans and geese, are more likely to collide with transmission lines. The frequency of collisions increases when a transmission line is placed between agricultural fields that serve as feeding areas and wetlands or open water, which serve as resting areas. In these areas, it is likely that waterfowl and other birds would be traveling between different habitats, increasing the likelihood of collision.

The incidence of birds colliding with transmission lines is also influenced by the number of horizontal planes in which the conductors are strung. Stringing the conductors in a single horizontal plane presents less of a barrier to birds crossing the transmission line right-of-way. A single horizontal plane, however, generally requires a wider structure (H-frame structure). Conversely, stringing the conductor wires in two or more planes creates a greater barrier to birds attempting to fly, not only across the lines, but over and potentially between them (monopole structure). The proposed project and the ATC Alternative both propose to use both H-frame (all 230 kV lines) and monopole structures (all 345 kV lines). However, Minnesota Power later offered to route one double-circuited monopole 230 kV line instead of two parallel H-frame lines.[225] See Appendix I for technical drawings of these structures, and Appendix B, Maps 1 and 4 for 230 kV and 345 kV alignments for the proposed project and the ATC Alternative,

[222] Minnesota Department of Natural Resources (2010) Snakes and Lizards of Minnesota, retrieved from: http://files.dnr.state.mn.us/natural_resources/animals/reptiles_amphibians/snake_lizard_mn.pdf.

[223] Department of Natural Resources (December 2014) DNR Pollinator Best Management Practices, retrieved from: https://files.dnr.state.mn.us/natural_resources/npc/2014_draft_pollinator_bmp_guidelines.pdf.

[224] Avian Power Line Interaction Committee, Edison Electric Institute, and California Energy Commission (2006) Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006, retrieved from: https://www.nrc.gov/docs/ML1224/ML12243A391.pdf, page 55.

[225] Minnesota Power, Direct Testimony and Schedules Daniel McCourtney, February 14, 2024, eDockets No. 20242-203446-09.

respectively. Impacts are expected to be the greatest along the two parallel 230 kV single circuit H-frame corridors for the proposed project.

MITIGATION

Minnesota Power will prepare a VMP for the project prior to construction in consultation with State Agencies. The plan will include proposed seed mixes, short-term monitoring, maintenance, and measures to mitigate the introduction of invasive species and noxious weeds to the project area.

Additionally, the DRP (Section 5.3.16) require that permittees "incorporate adequate spacing of conductors and grounding devices in accordance with Avian Power Line Interaction Committee standards to eliminate the risk of electrocution to raptors with larger wingspans that may simultaneously come in contact with a conductor and grounding devices."

Potential impacts to wildlife can be avoided by routing power lines away from quality habitat or migratory corridors. Impacts can be minimized by spanning habitats and minimizing the number of structures to the extent practicable. Impacts to avian species can be mitigated by winter construction—nesting activities would not be occurring and most species would have migrated out of the local vicinity. For example, Minnesota Power has committed to schedule the project's tree clearing activities to occur during the northern goshawk's inactive season.[226] The northern goshawk is discussed in more detail in the next section of this EA, Rare and Unique Resources.

Bird diverters are placed on top of the shield wire and could reduce impacts because of the natural tendency for birds to avoid obstacles in flight by increasing altitude. Minnesota Power states that because the water features in the area are too small or narrow, and habitat conditions would not concentrate waterfowl in the area, bird flight diverters are not being considered on the HVTLs at this time. ATC stated that where the new double-circuit line crosses the existing 230 kV line, there will be visual marker balls. They also suggest that ATC's proposed transmission line design will meet Avian Power Line Interaction Committee Avian Protection Guidelines including spacing guidelines to avoid electrocutions. Lastly, ATC reports that there are no indicators that the proposed route would be at high risk for avian collisions, therefore, bird flight diverters are not planned but could be added at a later date if problems are identified.

Rare and Unique Resources

The ROI for rare and unique resources is the local vicinity. One state listed species of special concern, the Northern Goshawk, has the potential to occur in the project area based on the Natural Heritage Information System. Minnesota Power has committed to schedule the project's tree clearing activities to occur during the northern goshawk's inactive season, thus, the potential to adversely affect nesting species such as the Northern Goshawk and bats within the project area is minimal for both routing options. These long-term, localized impacts would affect a unique resource. Potential impacts can be mitigated and avoided in part.

Rare and unique resources include assemblages of species or habitat that are designated for special care and conservation by state and federal agencies because loss of habitat and small or shrinking population is cause for concern. Rare and unique resources at the federal level are typically evaluated and protected by the USFWS or USACE. The plants and wildlife protected by the USFWS are discussed in this section, and certain wetland types that may be considered rare and unique by DNR that are protected

[226] Scoping Comments of Minnesota Power, September 29, 2023, eDockets No. 20239-199286-01, page 14.

by the USACE are discussed in the Surface Water section. Applicants can access information about plants and wildlife protected by federal law through the Information for Planning and Consultation (IPaC) tool developed and maintained by the USFWS.

At the state level, the evaluation and protection of Minnesota's rare and unique resources are overseen by the DNR Division of Ecological and Water Resources through the identification and evaluation of native plant communities, rare plants, wildlife, and unique wetlands such as calcareous fens. Information about rare and unique resources protected by the state can be found through (1) a review of Sites of Biodiversity Significance (SBS) maps maintained by the Minnesota Biological Survey (MBS); and (2) requesting information from the Natural Heritage Information System (NHIS). Although these reviews do not represent a comprehensive survey, they provide information on the potential presence of rare and unique species and habitats. The NHIS is continually updated as new information becomes available and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. There are no lands within the project area reserved for the protection of natural resources (e.g., National Wildlife Reserves, State Wildlife Management Areas, State Scientific and Natural Areas, State Significant Ecological Areas, State SBS sites, etc.).

Minnesota Power submitted a request to the USFWS IPaC website, as well as the DNR's NHIS for documented occurrences of federally listed species, state-listed species, and designated critical habitat.[227] The information returned from both agencies is summarized in Table 19 below. As follow up to its USFWS determination, Minnesota Power stated that the project will require an individual wetland permit and will be subject to Interagency Consultation under Section 7 of the Endangered Species Act (Section 7 Consultation) through the USACE process. This process is done between a federal agency providing permitting or funding for a project (federal nexus). Prior to plan and profile review[228], Minnesota Power will provide documentation of the determination reached through the Section 7 Consultation to share what was agreed upon between USFWS and the USACE, such as tree clearing restrictions, proposed surveys, etc. These requirements are also addressed in Section 5.3.8 of the DRP. While specific language around plan and profile construction specifications are not outlined in entirety in the permit conditions, they must identify necessary impact avoidance and minimization measures for wetlands as well as threatened and endangered species. Those avoidance and minimization measures should be the result of consultation with the USFWS and USACE.

Table 19: Potentially Occurring Rare and Unique Resources[229]

Species/Resource	Protection Classification	Potential for Project to Affect Resource
Northern Long-eared Bat (Myotis septentrionalis)	Federal endangered, State Species of Special Concern	See discussion below
Whooping crane (Grus americana)	Federal non-essential experimental population	No; protected only in National Wildlife Refuges or National Parks

[227] Minnesota Power Route Permit Application, Appendix P, June 1, 2023, eDockets No. 20236-196333-04.

[228] DRP Section 9.1.

[229] Information sources are from the April 17, 2023 IPaC report, November 11, 2022 DNR Natural Heritage Review, and data on DNR Sites of Biodiversity Significance.

Bald and Golden Eagle (Haliaeetus leucocephalus, Aquila chrysaetos)	Bald and Golden Eagle Protection Act	See discussion below
Canada Lynx (Lynx canadensis)	Federal threatened	See discussion below
Gray Wolf (Canis lupus)	Federal threatened	See discussion below
Piping Plover (Charadrius melodus)	Federal endangered	See discussion below
Tricolored Bat (Perimyotis subflavus)	Federal proposed endangered	See discussion below
Monarch Butterfly (Danaus plexippus)	Federal candidate	See discussion below
Northern Goshawk (Accipiter gentilis)	State species of special concern	See discussion below
Sites of Biodiversity Significance	Varies, depending on resources present	No; does not occur in project area

Northern Goshawk

There is one state listed species of special concern, the Northern Goshawk, with the potential to occur in the area because they have been observed nesting within the project boundary.[230] Because suitable habitat remains in the area, undocumented nests may be present within the project impact area. It is the largest of the three accipiters (forest hawks adapted to fast flight) found in Minnesota and year-round in the Laurentian Mixed Forest Province of the state. They prefer contiguous areas of mature and older forest for nesting and foraging.[231] The Northern Goshawk's diet consists of a variety of moderately sized mammals and birds; red squirrels, snowshoe hares, eastern chipmunks, ruffed grouse, and American crows being the most common prey species. Impacts to the northern goshawk can be minimized by removing trees outside of the nesting season (approximately February through August)[232], and properly managing food and trash during construction as not to attract the northern goshawk's prey to the area.

Regarding the federally protected species, Minnesota Power will require a federal permit from the US Army Corps of Engineers to disturb wetlands during construction of the project. This permit process includes a consultation between the USACE and the USFWS regarding the potential for protected species to occur in the area being disturbed, and the USFWS will determine the actions to be implemented to protect those species. The federally protected species are discussed below, with a general discussion of typical protective measures; however, Minnesota Power will be subject to the mitigation measures resulting from the wetlands permitting process.

Northern Long-eared Bat and Tricolored Bat

The range of the northern long-eared bat stretches across much of the eastern and Midwestern United States. Even if there are no bat records listed in the Natural Heritage Information System, all seven of Minnesota's bats can be found throughout Minnesota. Tree removal can negatively impact bats by destroying roosting habitat, especially during the pup rearing season when females are forming maternity roosting colonies and the pups cannot yet fly.[233] During summer, the bats roost singly or in

[230] Scoping Comments of the Minnesota DNR, September 22, 2023, eDockets No. 20239-199095-01.

[231] Retrieved from: https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=ABNKC12060

[232] Minnesota DNR Rare Species Guide, 2018, retrieved from: https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=ABNKC12060#:~:text=Within%20Minnesota%2C%20Northern%20Goshawks%20are,mi.).

[233] Minnesota Power Route Permit Application, Appendix P, June 1, 2023, eDockets No. 20236-196333-04.

colonies under bark, in cavities, in crevices of both live and dead trees; or in cooler places such as caves and mines. In winter, northern long eared bats use caves and mines as hibernacula.[234] Typical protective measures for northern long-eared bat are to conduct tree removal outside of the bat's active season, which is May through September.

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 overwinters in caves and mines where available; or in roadside culverts, tree cavities, and abandoned water wells. During the active season, the species may be found roosting among leaf clusters (live and dead) on living or recently dead deciduous hardwood trees.[235] Typical protective measures for tri colored bat is to conduct tree removal outside of the bat's active season, which is April through October.

Bald and Golden Eagle

Bald eagles live near rivers, lakes, and marshes where they can find fish. Their habitat includes estuaries, large lakes, reservoirs, rivers, and some seacoasts. In winter, the birds congregate near open water in tall trees for spotting prey and night roosts for sheltering. Bald eagles usually choose the tops of large trees to build nests.[236]

The range of golden eagles is widespread, and can be found from the tundra, through grasslands, forested habitat and woodland-brushlands, and south to arid deserts. They are aerial predators and eat small to mid-sized reptiles, birds, and mammals up to the size of mule deer fawns and coyote pups. Golden eagles build nests on cliffs or in the largest trees of forested stands that often afford an unobstructed view of the surrounding habitat.[237] Golden eagles typically don't nest in Minnesota.

Typical protective measures for bald and golden eagles are to avoid tree clearing during nesting season, December to August.

Canada Lynx

Canada lynx are most likely to occur in Minnesota after populations of snowshoe hare decline significantly in Canada, which is a cyclical occurrence. Lynx are primarily found in boreal forests; in Minnesota, this habitat is dominated by spruce, fir, and pine. Lynx may also use transitional zones where boreal forest gives way to northern hardwood forest where hardwood species, including birch, aspen, and willow are interspersed among conifers.[238] The Canada lynx could be present in the region, if snowshoe hare populations decline in Canada and local forested habitat is intact.

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. 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

[234] https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=AMACC01150
[235] https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=AMACC03020
[236] https://www.fws.gov/media/bald-eagle-fact-sheet
[237] https://www.fws.gov/sites/default/files/documents/golden-eagle-fact-sheet.pdf
[238] https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=AMAJH03010

low rates of human-caused mortality, wolves can survive in proximity to human-dominated environments. The gray wolf was removed from Minnesota species of special concern status in 2013[239], and is being considered for delisting at the federal level[240].

Piping Plover

The Great Lakes Population of Piping Plovers is migratory, and nests along sandy gravel shorelines of large lakes and rivers in the upper Midwest, including the shores of Lake Superior near Duluth. The species can also be found in sand and gravel mine sandpits, lake shore housing developments, and reservoir shorelines. There has not been successful nesting of piping plovers in Minnesota in over 25 years.[241]

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 for both laying eggs and as a food source for caterpillars.[242] Potential impacts to monarch butterflies could be reduced by minimizing the removal of flowering plants.

POTENTIAL IMPACTS

Power lines can impact rare and unique resources during construction and operation. Adverse impacts include the taking or displacement of individual plants or animals, invasive species introduction, habitat loss, reduced community size, and, for avian species, collision with conductors or electrocution. Impacts to rare and unique resources are not necessarily adverse. In some limited cases, power line right-of-ways can be managed to provide habitat. For example, nesting platforms can be built on top of transmission structures for use by rare avian species.

The determination of impact hinges on tree clearing for the project. Minnesota Power states that tree clearing will occur based on consultation with USFWS. Thus, the potential to adversely affect nesting species such as the Northern Goshawk and bats within the project area is minimal.

Northern Goshawk

Rare and unique features were identified in the project area. The EA does not map federal- or state-listed species found in the NHIS database, because DNR requires that public display of NHIS data mask the identity or location of rare features due to the vulnerability of some species to exploitation. Moreover, the NHIS database masks the occurrence of rare species by randomly incorporating their location into a larger polygon. Nonetheless, the DNR has stated that the northern goshawk has been observed nesting within the project boundary, which would apply to both the proposed project and the ATC Alternative.[243]

[239] https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=AMAJA01030#
[240] https://www.fws.gov/species-publication-action/removing-gray-wolfcanis-lupus-list-endangered-and-threatened-wildlife
[241] https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=ABNNB03070#
[242] https://www.fws.gov/species/monarch-danaus-plexippus
[243] Scoping Comments of the Minnesota DNR, September 22, 2023, eDockets No. 20239-199095-01.

Northern Long-eared Bat and Tricolored Bat

Under the USFWS Final 4(d) Rule for the Northern long-eared bat, purposeful take of the species is prohibited with limited exception. Incidental take from tree removal is also prohibited if it occurs within one-quarter mile of a known hibernacula; or cuts or destroys known occupied maternity roost trees, or any other trees within a 150-foot radius from a known maternity tree during the pup season (June 1 and July 31). These prohibitions focus on protecting the bat's sensitive life stages (that is, hibernation and raising young) in areas affected by white nose-syndrome.[244] No hibernacula or maternity roosts trees are identified in the NHIS database within the project area.

MITIGATION

Impacts to rare and unique resources can be avoided by selecting routes, alignments, and structure placements away from these resources and their habitats to the extent practicable. If these resources cannot be avoided, impacts can be minimized by routing alignments or placing structures away from rare and unique resources; spanning these resources; or using seasonal construction practices within the selected route. Upon determining a final route, biological surveys may be required as a permit condition should resource agencies deem it necessary.

The following mitigation measures, some of which are outlined in Minnesota Power's draft VMP, can help to avoid or minimize impacts to rare and unique resources:

- Minimize tree felling and shrub removal.
- For water dependent species, limit in-water work and disturbance to the greatest extent possible.
- Implement water and soil conservation practices to protect topsoil and adjacent water resources. Minimize soil erosion by containing excavated material, protecting exposed soil, and stabilizing restored soil.[245]
- Re-vegetate disturbed areas with certified weed-free, native species that provide value to local wildlife species where applicable.[246]

Development of a VMP, in consultation with resources agencies known as the Vegetation Management Plan Working Group, is a common special condition used by the Commission when issuing route permits.

Northern Goshawk

As follow up to its USFWS determination, Minnesota Power stated that the project will require an individual wetland permit and will be subject to Section 7 Consultation through the USACE process. Prior to plan and profile review[247], Minnesota Power will provide documentation of the determination reached through the Section 7 Consultation to share what was agreed upon between USFWS and the USACE, such as tree clearing restrictions, proposed surveys, etc. This review must be complete before construction can be initiated. These requirements are also addressed in Section 5.3.8 of the DRP. While specific language around plan and profile construction specifications are not outlined in entirety in the

[244] U.S. Fish and Wildlife Service (January 14, 2016) *Endangered and Threatened Wildlife and Plants; 4(d) Rule for the Northern Long-Eared Bat*, FEDERAL REGISTER 81(9), retrieved from: https://www.fws.gov/midwest/endangered/mammals/nleb/pdf/FRnlebFinal4dRule14Jan2016.pdf.

[245] Minnesota Power draft Vegetation Management Plan, section 5.3. eDockets No. 20242-203665-11.

[246] Minnesota Power draft Vegetation Management Plan, page 8. eDockets No. 20242-203665-11.

[247] DRP Section 9.1.

permit conditions, they must identify necessary impact avoidance and minimization measures for wetlands as well as threatened and endangered species. Those avoidance and minimization measures should be the result of consultation with the USFWS and USACE.

Minnesota Power has committed to schedule the project's tree clearing activities to occur during the northern goshawk's inactive season[248] which should avoid direct impacts to the birds or their eggs due to tree clearing.

Northern Long-eared Bat and Tricolored Bat

Any tree removal should avoid the active season (April 1-September 30)[249] for the Northern long-eared bat. Ensuring construction and operation are consistent with USFWS guidance would minimize impacts to this species. It should be noted that the Tricolored Bat could be considered for federal listing as a threatened or endangered species under the Endangered Species Act by the time construction commences. Minnesota Power has committed to schedule the project's tree clearing activities to occur during the northern goshawk's inactive season[250] (approximately beginning of September to the end of February)[251], which will overlap with avoiding impacts to the Northern Long-eared Bat. The proposed project and the ATC alternative must comply with USFWS conservation measures:[252]

1. The project must not disturb or disrupt hibernating Northern Long-eared Bat in a known hibernaculum during hibernation.
2. The project must not alter the entrance or interior environment of a known hibernaculum at any time of year.
3. The project must not remove any trees within 0.25 miles of a known Northern Long-eared Bat hibernaculum at any time of the year. The 0.25-mile tree clearing buffer serves multiple purposes including protecting hibernating bats from disturbance, protecting the hibernaculum's microclimate roosting habitat around the hibernacula, and providing some roosting and foraging protection during spring staging and fall swarming.
4. The project must not cut or destroy known occupied maternity roost trees, or any other trees within a 150-foot radius from the maternity roost tree, from June 1 – July 31.

Unavoidable Impacts

Resource impacts are unavoidable when an impact cannot be avoided even with mitigation strategies.

Transmission lines are infrastructure projects that have unavoidable adverse human and environmental impacts. These potential impacts and the possible ways to mitigate against them were discussed above. However, even with mitigation strategies, certain impacts cannot be avoided.

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[248] Scoping Comments of Minnesota Power, September 29, 2023, eDockets No. 20239-199286-01, page 14.

[249] USFWS Interim Consultation Framework for the Northern Long-Eared Bat, Appendix A, March 6, 2023, retrieved from: https://www.fws.gov/sites/default/files/documents/App%20A%20Standing%20Analysis%20Interim%20Consultation%20Framework_6Mar23.pdf.

[250] Scoping Comments of Minnesota Power, September 29, 2023, eDockets No. 20239-199286-01, page 14.

[251] Minnesota DNR Rare Species Guide, 2018, retrieved from: https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=ABNKC12060#:~:text=Within%20Minnesota%2C%20Northern%20Goshawks%20are,mi.).

[252] USFWS Interim Consultation Framework for the Northern Long-Eared Bat, Appendix A, March 6, 2023, retrieved from: https://www.fws.gov/sites/default/files/documents/App%20A%20Standing%20Analysis%20Interim%20Consultation%20Framework_6Mar23.pdf.

Unavoidable adverse impacts associated with construction of the proposed project include:

- Possible traffic delays and fugitive dust on roadways.
- Visual and noise disturbances.
- Soil compaction and erosion.
- Vegetative clearing; removal or changes to wetland type and function.
- Disturbance and temporary displacement of wildlife, as well as direct impacts to wildlife inadvertently struck or crushed during structure placement or other activities.
- Minor amounts of habitat loss.
- Converting the underlying land use to an industrial use.
- GHG emissions.

Unavoidable adverse impacts associated with the operation of the proposed project include:

- Visual impact of structures, conductors, Converter Station, and Switchyard.
- Change in landscape character and any subsequent impact to cultural values.
- Loss of land use for other purposes, such as the removal of prime farmland, where structures are placed.
- Injury or death of avian species that collide with, or are electrocuted by, conductors.
- Interference with AM radio signals.
- Potential decrease to property values.
- Continued maintenance of tall-growing vegetation.
- GHG emissions.
- Increased EMF on the landscape (potential impacts from EMF are minimal and are not expected to impact human health.)

Irretrievable or Irreversible Impacts

Resource commitments are irreversible when it is impossible or very difficult to redirect that resource to a different future use; an irretrievable commitment of resources means the resource is not recoverable for later use by future generations.

Irreversible impacts include the land required to construct the transmission line. While it is possible that the structures, conductors, and buildings could be removed and the right-of-way restored to previous conditions, this is unlikely to happen in the reasonably foreseeable future (~50 years). The loss of wetlands is considered irreversible, because replacing these wetlands would take a significant amount of time. Certain land uses within the right-of-way will no longer be able to occur, especially at the Converter Station and Switchyard.

An irretrievable commitment of resources means the resource is not recoverable for later use by future generations. These impacts are primarily related to project construction, including the use of water, aggregate, hydrocarbons, steel, concrete, wood, and other consumable resources. The commitment of labor and fiscal resources is also considered irretrievable.

Resource Topics Receiving Abbreviated Analysis

Resource topics that will have negligible impacts from the project and that do not impact the Commission's route permit decision receive less study and analysis.

Many environmental factors and associated impacts from a project are analyzed during the environmental review process. However, if impacts are negligible and will not impact the permit decision, those resource impacts receive less study and analysis. The following resource topics meet this threshold, which is based on information provided by the applicant, field visits, scoping comments, environmental analysis, and staff experience with similar projects.

Agriculture

There are no known agricultural areas or prime farmland near the project area. Most of the project is considered deciduous forest by the U.S. and Minnesota Departments of Agriculture.[253] Project infrastructure thus will not interfere with current farming or grazing operations. As all land for the project will be owned by Minnesota Power, the project is also not expected to interfere with future agricultural operations.

Issues such as herbicide or pesticide drift from maintaining right-of-ways are also not expected to interfere as the application is limited in extent, largely to be surrounded by vegetation, and the nearest farms to the project boundary are less than half an acre. Developing specific construction, restoration, and operation plans with any organic producers that may be affected and, to the extent agreeable, their neighbors, can reduce potential for inadvertent application or chemical drift. *DriftWatch* "is a voluntary communication tool that enables crop producers, beekeepers, and pesticide applicators to work together to protect specialty crops and apiaries through use of mapping programs."[254] No farms within the project area are registered with this program.

The Natural Resources Conservation Service (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. 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 project includes approximately 14 acres of land classified as farmland of statewide importance. The ATC Alternative includes approximately 5.3 acres of farmland of statewide importance.

Areas within both routing options were formerly used for agriculture, primarily hay production, but have been out of production for several years and are currently lying fallow. The amount of acres of farmland utilized by the project between the proposed and ATC Alternative routes amount to a negligible difference. These localized impacts will be small and affect farmland of statewide importance — a unique resource that is common in the project area. Impacts can be mitigated.

Displacement

To the extent possible, the project will be constructed on land owned by Minnesota Power. In that case, the project will not use traditional transmission line easements for right-of-way. No residence or business is expected to be removed for either the proposed project of the ATC Alternative to facilitate construction and operation. Minnesota Power has acquired all parcels within the proposed route as of January 30, 2024. The proposed route also covers the route width for the ATC Alternative.

[253] US and Minnesota Departments of Agriculture, 2022 National Agricultural Statistics Survey.
[254] DriftWatch (n.d.) *Welcome to DriftWatch*, retrieved from: https://mn.driftwatch.org/.

Electronic Interference

The project area is served by several AM and FM radio stations, and digital television channels. 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. Additionally, 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. There are no cellular, AM, FM, Microwave, TV, or other broadcast transmission towers within one mile of the project area according to publicly available Federal Communications Commission sources. The nearest is over 1 mile northwest from the project boundary off Munger Shaw Road.

Electronic interference associated with electrical infrastructure is related to a phenomenon known as corona. Impacts are not expected, because anticipated electric fields are below levels expected to produce significant levels of corona. Section 5.4.3 of the DRP requires permittees to take whatever action is feasible to restore or provide equivalent reception should interference occur to "radio or television, satellite, wireless internet, GPS-based agriculture navigation systems or other communication devices" as a result of the project. Additional mitigation is not proposed.

Floodplain

The project is within an upland area outside of Federal Emergency Management Agency (FEMA) mapped 100-year floodplains. Therefore, impacts to mapped floodplains will not occur. The project does span a trout stream within a designated Natural Environment Shoreland Overlay Zone that is discussed in more detail in the Land Use and Zoning section of this EA. Minnesota Power stated in their draft VMP that a minimum 50-foot natural vegetative buffer will be maintained on both banks of the stream crossing to maintain habitat and bank stability, alleviating impacts associated with the stream's floodplain.[255] Thus, transmission structures are not anticipated to impact flood heights or course.

Forestry

While much of the project study area is considered Deciduous Forest, active forestry operations, including commercial timber harvest, woodlots, or other forestry resources do not occur within the project area. Because Minnesota Power will own all property for construction of the project, current personal timber harvest or future commercial forestry operations are precluded. Impacts to forestry operations will not occur.

Geology

The project study area has thin glacial drift over the entire subsection and large areas of exposed bedrock near the surface. There are no mapped karst features in the land control area and the project is outside of areas prone to surface karst development. Construction of the project will not alter geology because construction methods will not cause significant bedrock and geologic structure modification. Impacts to geology are not expected to occur.

[255] Minnesota Power draft Vegetation Management Plan, eDockets No. 20242-203665-11.

Tourism

Electrical infrastructure can impact tourism if they affect visitor experiences at tourism sites, primarily through aesthetic or noise impacts, or degrade natural or human-made resources that provide tourist-type activities. There are no tourist activities or areas near or within the project area, and all land will be privately owned by Minnesota Power. Further, the project will have no impact on tourism elsewhere in the County.

Various sections of the DRP indirectly address impacts to recreation, such as noise, aesthetics, soils, etc. and as a result indirectly mitigate impacts to tourism. No mitigation is proposed.

Cumulative Potential Effects

Cumulative potential effects result from the incremental effects of a project in addition to other projects in the environmentally relevant area. Consideration of cumulative potential effects is intended to aid decision-makers so that they do not make decisions about a specific project in a vacuum. Effects that may be minimal in the context of a single project may accumulate and become significant when all projects are considered.

Minnesota Rule 4410.0200, subpart 11a, defines "cumulative potential effects," in part, as the "effect on the environment that results from the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects ... regardless of what person undertakes the other projects or what jurisdictions have authority over the project."

The "environmentally relevant area" includes locations where the potential effects of the project coincide with the potential effects of other projects to impact the elements studied in this EA. Generally, this area includes the ROI for the different resource elements.

Cumulative effects are discussed here for projects that are foreseeable in the next five years in the project area. It is assumed that the construction-related impacts of these projects are short-term, for example, construction impacts will cause local disturbances, such as increased noise levels, and traffic delays/and reroutes. Thus, the discussion here is focused on the potential long-term impacts of these projects.

EERA staff analyzed what projects are "reasonably likely to occur."[256] To staff's knowledge, there are no planned, privately sponsored projects in the project area. This is based on information from the applicant, such as responses they received from other State, County, Township, and local agencies as stated in the application, as well as a review of other public projects within the County or from MnDoT. Additionally, no relevant projects were found on the Environmental Quality Board's interactive project database.[257] Information was checked for the South St. Louis Soil and Water Conservation District, St. Louis County Planning, and the City of Hermantown Planning, the last of which showed an expansion of the Munger State Trail which is discussed in more detail in the Recreation section of this EA.

Current and reasonably foreseeable future projects in the area include:

[256] Minn. R. 4410.0200, subp. 11a.

[257] Environmental Quality Board Environmental Review Projects Database, retrieved from: https://webapp.pca.state.mn.us/eqb-search/search

- Highway 2 resurfacing through Midway Township[258]
    - Construction timeframe: May-August 2026
- Replacing aging box culverts along Highway 2 at West Rocky Run Creek, Midway River and Kingsbury Creek[259]
    - Construction timeframe: 2025
- Haines Road and Piedmont Avenue construction[260]
    - Construction timeframe: June 5th - September 1st, 2024

Regarding the construction and operation of the project for the purposes of this cumulative potential effects analysis, the assumption that the Converter Station and Switchyard will not be decommissioned and removed at the end of the project's useful life was used. The following subsection analyzes the cumulative potential effects of the project and the reasonably foreseeable future projects where potential effects coincide.

Analysis Background

The ROI for cumulative potential effects varies across elements and is consistent with the ROI identified in Chapter 4: Potential Impacts and Mitigation in this document. Cumulative potential effects—where they coincide—increase or decrease the breadth of the impact to the resources and elements studied in this section. This may or may not change the impact intensity level assigned to the resource or element.

Cumulative potential effects are impacts to the environment that results from "the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects actually planned or for which a basis of expectation has been laid, regardless of what person undertakes the other projects or what jurisdictions have authority over the projects."[261]

Cumulative effects are discussed here for projects that are foreseeable in the next five years in the project area. It is assumed that the construction-related impacts of these projects are short-term, for example, construction impacts will cause local disturbances, such as increased noise levels, and traffic delays/and reroutes. Thus, the discussion here is focused on the potential long-term impacts of these projects.

Where cumulative effects are anticipated, a written description is provided. Where cumulative potential effects are not anticipated no further analysis is provided. For the purposes of this EA, actions that have occurred in the past and their associated impacts are considered part of the existing environmental and were analyzed in this section.

Human Settlement

Cumulative potential effects on human settlements during construction are anticipated to be minimal. Future projects will result in long-term aesthetic impacts. Most will occur in developed areas, for

[258] Minnesota Department of Transportation, Minnesota state highway projects, February 16, 2024, retrieved from: https://www.dot.state.mn.us/roadwork/index.html#gsc.tab=0

[259] *Ibid*.

[260] St. Louis County Public Works, Projects, Plans, and Studies, retrieved from: https://slc-mn-public-works-slcgis.hub.arcgis.com/pages/projects

[261] Minn. R. 4410.0200, subp. 11a

example, in cities and along existing roads and highways. These impacts are anticipated to be both positive, for example, Highway 2 resurfacing, and negative, such as with the proposed project. Increased recreational opportunities will occur from the Munger State Trail system expansion project supported within the applicant's existing ROW. These projects are also expected to benefit local economies. The proposed project might negatively affect property values, and cause additional impacts to aesthetics and rural character.

Public Health and Safety

Cumulative potential effects to public health and safety are expected to be positive. Several of the projects considered here are road and highway related. They are undertaken to maintain and improve local roads to ensure their safe operation and the public's health and safety. The proposed project would make the electrical grid more reliable and is expected to add to background EMF levels. However, impacts are anticipated to be negligible.

Construction activities along with maintenance of electrical equipment have inherent risks. These risks are minimal to trained personal. Potential impacts can be mitigated through worker training, safety equipment, etc. The overall impact intensity level is anticipated to remain minimal.

Land-based Economies

Cumulative potential effects on land-based economies are anticipated to be minimal. Most projects are in cities or along existing roadways. Increased traffic might cause minor traffic delays along local roads, which could impact emergency response vehicles. Minor electrical outages, up to five days, are associated with construction of the Converter Station. Potential impacts can be mitigated. The overall impact intensity level is anticipated to remain minimal.

Archaeological and Historical Resources

Because only one archaeological resource has been identified in the project study area, and both routing options would avoid it with a 100 meter buffer, impacts are not expected. Cumulative potential effects from reasonably foreseeable future projects are also not expected as the projects will not be occurring within the project study area. The overall impact intensity level is expected to remain minimal.

Natural Resources

Cumulative potential effects on the natural environment are anticipated to be minimal. Most projects are in well-developed areas in cities or along roadways. Impacts are limited along roadways by using existing infrastructure right-of-way. Wildlife might be inadvertently harmed or killed during construction. Long term impacts include a greater risk of bird electrocution or collision due to increased electrical equipment on the landscape. Potential impacts can be mitigated. The overall impact intensity level is expected to remain minimal.

Soils within the footprint of the Converter Station and some construction projects such as Haines Road and Piedmont Avenue will be permanently compacted, and may experience rutting from movement of construction vehicles. The overall impact intensity level is expected to remain minimal.

Air quality impacts associated with construction vehicles for the proposed project and reasonably foreseeable future projects will occur over the short term (emissions and fugitive dust). HVTLs will produce ozone and nitrous oxide through the corona effect. Impacts would be long term, permanent, and negligible. The overall impact intensity level is expected to remain minimal.

RARE AND UNIQUE RESOURCES

Cumulative potential effects on rare and unique natural resources are anticipated to be minimal. Certain projects might impact rare and unique resources during construction and operation, however, others, like the Munger State Trail system expansion, might benefit rare and unique resources.

Chapter 5: Potential Impacts and Mitigation that Vary Between Routing Options

This chapter details potential human and environmental impacts and mitigative measures anticipated to be route specific, that is, different between the proposed project and the ATC Alternative. Chapter 4 defined how potential impacts and mitigative measures are described in this EA and described the environmental setting. **Unless otherwise noted, the source of information for this chapter is the combined certificate of need and route permit application.**

Human Settlement

High voltage transmission lines have the potential to impact human settlement. Impacts might be short-term, such as noise during construction, or long-term, such as changes to the aesthetics in the project area.

Aesthetics

The ROI for aesthetics is the local vicinity. Aesthetic impacts reflect the human subject's reaction to a landscape change, though may also affect a population where the visual landscape defines a visual identity. This means that potential impacts are unique to an individual or group, with reactions that can vary widely. Potential impacts might dissipate over time depending on the individual. Impacts will be short- and long-term, and localized. Potential impacts are unavoidable but can be mitigated in part.

Visual impacts are expected to be minimal for those with low viewer sensitivity, such as people traveling to and from work. For those with high viewer sensitivity, for example, neighboring landowners or recreationalists, visual impacts are anticipated to be moderate to significant. On whole, impacts are anticipated to be moderate for both the proposed project and the ATC Alternative, however, slightly more so for the proposed project as it includes the Switchyard in addition to the Converter Station. The Switchyard and subsequent vegetation clearing would be near Morris Thomas Road, an area with nearby residents. The ATC Alternative infrastructure and subsequent clearing is farther away from residents.

Aesthetics refers to the visual quality of an area as perceived by the viewer and forms the impression a viewer has of an area. Aesthetics are unique to the human subject or population, meaning their relative value, held individually or communally, depends upon several factors that may include perception, and the strength of values, history, and memory, held either individually or communally resulting in potentially varied and unique responses. Impacts to aesthetic changes are expected to be equally diverse, depending upon individual perception of impact, degree of aesthetic change, strength of commitment to the unimpacted aesthetic, and acceptance of the proposed project. This means that how an individual values aesthetics and reacts to their change, especially perceived impacts to a viewshed, can vary greatly.

A viewshed includes both the natural and built landscape with features visible from a specific location. Natural landscapes can include wetlands, surface waters, distinctive landforms, and vegetation patterns. Homes, businesses, roads, bridges, cell towers, and power lines are examples of built features. Generally, an intact and harmonious viewshed is considered by many to be more aesthetically pleasing.

Viewsheds might be important regardless of whether they are considered beautiful by the observer, for example, a scattered stone foundation of a historical resource.

Viewer sensitivity is understood as an individual's interest or concern for the quality of a viewshed and varies depending upon the activity viewers are engaged in, their values and expectations related to the viewshed, and their level of concern for potential changes to the viewshed. High viewer sensitivity is generally associated with individuals engaged in recreational activities; traveling to scenic sites for pleasure and to or from recreational, protected, natural, cultural, or historic areas; or experiencing viewsheds from resorts, road-side pull-outs, or residences. Residents have a higher sensitivity to potential aesthetic impacts than temporary observers. Low viewer sensitivity is generally associated with individuals commuting, working, or passing through an area.

Viewer exposure refers to variables associated with observing a viewshed, and can include the number of viewers, frequency and duration of views, and view location. Viewer exposure would typically be highest for views experienced by high numbers of people, frequently, and for long periods. These variables, as well as other factors such as viewing angle or time of day, all affect the aesthetic impact.

POTENTIAL IMPACTS

The project will introduce 40 acres of new terminal facilities and HVTLs to connect those facilities to each other and the existing electrical grid on the landscape. These features will create aesthetic impacts. Right-of-way clearing and building construction will have the most visual impacts in areas close to roads and residents. To the extent these impacts can be quantified depends on the presence of several on-the-ground factors linked to the concepts of viewer quality, sensitivity, and exposure. These factors include:

- Views valued by the public at large, for example, scenic overlooks or scenic byways;
- Locations where relatively more people are present, for example, schools, churches, and residences; or
- Locations where people recreate or otherwise enjoy leisure activities.

Presently, the project area is characterized by low density, rural residential land use with houses and other nonresidential structures on large, wooded lots. Property acquired by Minnesota Power within the route width that have homesteads will be abandoned after acquisition in the project area. This means that Minnesota Power will seal the wells, remove the homes and other buildings on the property, and fill in any basements that may be present.

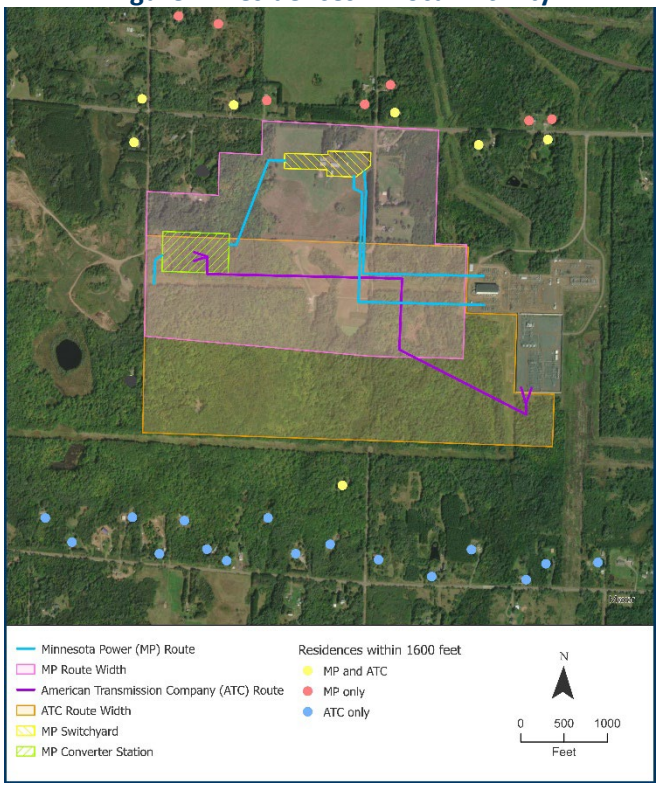
Screening, the use of terrain and vegetation to obstruct the visibility of recently built infrastructure or lighting, helps to limit clear views of these developments. These features are also important when determining and abating potential aesthetic impacts. Minnesota Power has not proposed screening for the project, but individual landowners may consider it on their own property. In their application, Minnesota Power stated they will limit project-related aesthetic impacts by maintaining existing trees when practical to serve as a physical visual barrier to the new project facilities. The applicant believes their proposed siting has avoided impacts as much as possible and has stated that buildings are not proposed in areas that are already cleared because of wetlands and constructability issues with topography.

There are no scenic overlooks or scenic byways near the project. The closest scenic byway is the Skyline Parkway, over five miles east of the project near Duluth, Minnesota. Impacts to this scenic byway are

not expected to occur, however, there is potential for recreationalists engaged in a scenic drive to be in the local vicinity of the project.

There are no schools, hospitals, nursing or boarding homes, childcare centers, or churches within the local vicinity of any route segment. The number of residences not owned (or with signed purchase agreements) by Minnesota Power within the local vicinity of the proposed project is 14 and of the ATC Alternative is 23 as shown in Figure 7 below. Because this count is by distance, overlap exists in these estimates as shown by the yellow circles in Figure 7. Minnesota Power may continue to purchase nearby properties, which would change these counts since the release of this EA.

Figure 7: Residences in Local Vicinity



Impacts to recreational activities and other scenic views are anticipated to be similar for both the proposed project and the ATC Alternative. The only recreational area within the project area and local vicinity is West Rocky Run, a trout stream that is inaccessible to the public within the proposed route as Minnesota Power's and ATC's properties near their substations are adjacent to the stream. All proposed facilities would be constructed on privately owned lands and therefore no public recreation would be affected within. There are otherwise no Wildlife Management Areas, trout or muskie lakes, state trails, public water access, designated wildlife lakes, or state lands in the local vicinity. There are two state aquatic management areas over a mile away from the proposed route. Because the area is heavily forested, it is unlikely that recreationalists over a mile from the project will be able to view it once constructed.

In addition to residents and recreational users, travelers along nearby roads may also experience visual impacts from the project. Annual average daily traffic counts (AADT) indicate that traffic levels are highest on State Highway 2 with 5,600 AADT. The project will not be visible from State Highway 2, thus, the most potential for visual impacts will be along Morris Thomas Road with between 750 and 1,100 AADT.

This assessment is consistent with visual sensitivity classifications prepared for the area in 1990. For instance, the highest viewer sensitivity in the local vicinity is rated as "moderate" along the Morris Thomas and Sandberg Roads. These classifications were developed as part of an effort led by the Minnesota Resort Association and the Minnesota Forest Industries to create positive dialogue between their industries.[262] As part of this effort, visual quality guidelines were developed for the more forested counties in the state, which included St. Louis County. The DNR maintains that moderately sensitive areas include, "Examples of these routes and areas may include public highways and local roads,

[262] Department of Natural Resources (n.d.) *Visual Sensitivity Classifications*, retrieved from: https://www.dnr.state.mn.us/forestry/visual_sensitivity/index.html

recreational lakes and rivers, and designated recreational trails that provide moderate to high scenic quality but less significant public use."[263] Visual sensitivity classifications should be taken into consideration when designing and constructing the project to develop appropriate visual quality guidelines.

Converter Station and Switchyard

With the proposed project, a new Converter Station and Switchyard will be constructed; however, under the ATC Alternative, the Switchyard would not be constructed. The Switchyard is the most likely feature to impact nearby residents and travelers as it is proposed to be within 300 feet of Morris Thomas Road. While the Switchyard will also be within 1,500 of the existing Arrowhead Substation and other existing transmission line infrastructure, Arrowhead Substation is well screened by the forested landscape. Thus, the Switchyard will introduce new industrial structures that are visible on the otherwise rural forested space. The Converter Station and Switchyards will be fenced, graveled, and accessible via a total of three access roads, and parking lots (Figure 8). The ATC Alternative includes two access roads southeast of their existing Arrowhead Substation, which together are roughly the same length as the proposed project's access roads (Appendix B, Map 3). These structures will also feature lighting, potentially introducing new visual impacts, especially to residents off Morris Thomas Road.

Figure 8: Example of the Proposed HVDC Terminal

Transmission Lines

New transmission lines will create new visual impacts that may be visible from adjacent roads or nearby residents. A portion of the new transmission line construction is proposed to be adjacent to existing transmission lines. While new transmission lines and cleared right-of-ways will introduce new impacts,

[263] *Ibid.*

the proposed route is already near an existing substation and several transmission lines (Appendix B, Map 1). Impacts are not minimal, however, the proposed project and ATC Alternative will be constructed on wooded property parcels separated from the existing substation by a wooded area. The proposed transmission lines will be designed such that vegetation clearing will use the typical right-of-way widths per voltage class (Table 20) with a maximum of 150 feet wide. Additional maintained width beyond these values may be required as needed based on design requirements.

Table 20: Structure Design Summary[264]

Line Type	Structure Type	Right-of-Way Width (feet)	Structure Height (feet)	Foundation Diameter (feet)	Span Between Structures (feet)
230 kV	Tubular Steel Pole[265]	130	60-180	4-12	200-1000
345 kV	Tubular Steel Pole	150	60-180	4-12	200-1000
±250 kV HVDC	Tubular Steel Pole	120	60-180	4-12	200-1000

Note: *The values in the table above are typical values expected for the majority of structures based on similar facilities. Actual values may vary. All line types would be made of weathering steel with concrete pier foundations.*

Generally, the ATC Alternative is expected to have less aesthetic impact than the proposed project because the Switchyard would not be constructed near the most frequently used road and cluster of residences on developed land (Appendix B, Map 5), less new right-of-way would need to be established, and less residents are nearby South of the project area. ATC anticipates that nine structures would be required, including four tangent structures and five dead-end structures. Typical structure heights would range from 115 to 180 feet and use a double circuit configuration. Typical spans would be between 700 and 850 feet in length.

Mitigation

Routing the new transmission lines with existing infrastructure right-of-ways can mitigate potential impacts because the new built feature would be an incremental increase consistent with previous human modification. The proposed project uses no existing right-of-way, creating new impacts, while the ATC Alternative uses existing right-of-way from the HVDC Line as it heads east (Appendix B, Maps 1 and 4). ATC anticipates that the centerline for the HVTL would be offset from the existing HVDC Line by approximately 110 feet, thus the HVTL would share approximately 25 feet of the existing HVDC Line ROW. The HVDC Line ROW would otherwise revegetate over time, resulting in 25 feet of width (2.16 acres total along ATC's proposed ROW) of less impact than the proposed project.

Impacts can also be mitigated by limiting vegetation clearing to only what is necessary for the safe construction and operation of the HVTL. Commission route permits require permittees to minimize vegetation removal when constructing an HVTL.[266] Adverse impacts can be further mitigated by ensuring that damage to natural landscapes during construction is minimized, and, to the extent that it does not

[264] Route Permit Application, Table 2.1.2-1

[265] Minnesota Power later offered in its testimony (eDockets No. 20242-203446-09) to route one double-circuited monopole 230 kV line instead of two parallel H-frame lines.

[266] Draft Route Permit, Section 5.3.10.

interfere with safe operation of the transmission line, planting lower growing woody vegetation in a transition area near the edge of the right-of-way in wooded areas.

Impacts from the Converter Station and Switchyard can be minimized by choosing a site where the facility is consistent with the existing landscape, or not immediately adjacent to homes and shielded from view by terrain or existing vegetation. This could incorporate a natural buffer that the applicant could dedicate to upholding at a certain distance agreeable to nearby residences. Techniques could include vegetation screening, berms, or fencing should the existing landscape lack appropriate screening. Choosing to utilize existing access points instead of building new ones off Morris Thomas Road would further mitigate impacts. Minnesota Power has committed to installing shielded or downward facing lighting at their facilities to minimize impacts to wildlife, the night sky, and nearby residents.[267] Minnesota Power also stated in their application that they will place emphasis on preserving the natural landscape whenever practical and implement construction and operation practices to prevent any unnecessary disturbance of the natural surroundings in the vicinity of the work.

Other potential mitigation measures may include selecting color coatings for the Converter Station and Switchyard buildings that blend into the landscape, such as brown or green; utilizing a slated privacy fence or other decorative fence; placing structures the maximum feasible distance from roads and residents; maintaining the surrounding forested landscape to the extent possible; or planting a border of trees along Morris Thomas Road that may include a commitment to uphold the natural buffer for the duration of the project.

Natural Resources

Electric infrastructure such as transmission lines impact the natural environment. Impacts are dependent upon many factors, such as how the project is designed, constructed, and maintained. Other factors such as the environmental setting influence potential impacts.

Wetlands

The ROI for wetlands is the route width. Wetlands will be spanned to the greatest extent possible for both routing options. Where one structure is proposed for placement in a wetland for the ATC Alternative, vegetation is expected to regenerate around the structure within a matter of years. Permanent wetland impacts from construction as a result of the proposed project is expected to be 7.04 acres and 6.6 acres for the ATC Alternative. Tall growing vegetation will also be cleared in some places to facilitate the safe operation of the transmission line. Overall, potential impacts to wetlands are anticipated to be slightly greater for the ATC Alternative than the proposed project. Impacts are anticipated to be short-term, minimal, and localized, especially when compared to total wetland acres in St. Louis County. Impacts will affect a unique, but common resource. Impacts can be mitigated or minimized; however, the conversion of wetlands to a different type and function is unavoidable.

Wetlands are areas with hydric (wetland) soils, hydrophilic (water-loving) vegetation, and wetland hydrology (inundated or saturated during much of the growing season). Wetland types include marshes, swamps, bogs, and fens. Wetlands vary widely due to differences in soils, topography, climate,

[267] Scoping Comments of Minnesota Power, September 29, 2023, eDockets No. 20239-199286-01, page 14.

hydrology, water chemistry, vegetation, season, and other factors.[268] Minnesota has 12.2 million acres of wetlands, the second most in the lower 48 states.[269]

Wetlands are important to the health of waterways and communities that are downstream. Wetlands can be one source of hydrology in downstream watercourses and water bodies, detain floodwaters, recharge groundwater supplies, remove pollution, serve as a "natural filter" by trapping and absorbing sedimentation, and provide fish and wildlife habitat. Forty-three percent of threatened or endangered species in the U.S. live in or depend on wetlands.[270]

Wetland health also has economic impact because of their key role in fishing, hunting, agriculture, and recreation. These large infrastructure projects could temporarily or permanently impact wetlands if these features cannot be avoided through project design. During construction, temporary disturbance of soils and vegetative cover could cause sediment to reach wetlands which could affect wetland functionality.

Certain wetlands are federally protected under Section 404 of the Clean Water Act. "Section 404 requires a permit before dredged or fill material may be discharged into waters of the United States," including wetlands.[271] This permit is administered by USACE. The USACE consults with the USFWS as part of the permitting process to determine if protected species would be adversely affected by the permitted activity. Additionally, Section 401 of the Clean Water Act requires any applicant for a federal license or permit to conduct an activity that may result in a discharge of a pollutant into waters of the United States to obtain a certification from the State in which the discharge originates that the discharge complies the applicable water quality standards.[272] In Minnesota, the MPCA administers Section 401 on non-tribal lands and issues a Water Quality Certification that becomes a condition of the federal permit.

In Minnesota, wetlands are also protected under the WCA, which is administered by the BWSR. St. Louis County oversees local implementation of the WCA in the project area. The WCA requires that any person "proposing to impact a wetland to first, attempt to avoid the impact; second, attempt to minimize the impact; and finally, replace any impacted area with another wetland of at least equal function and value."[273] There are no wetland banking easements within or near the project area.

Potential Impacts

Wetlands consist of organic soils comprised of layers of decomposed plant material that formed very slowly; as a result, disturbed wetlands are not easily repaired.[274] However, crossing a wetland does not necessarily mean it will be impacted; in some cases it can be spanned.

[268] USEPA. 2022. *What is a Wetland* https://www.epa.gov/wetlands/what-wetland

[269] Minnesota Wetland Inventory: User Guide and Summary Statistics (state.mn.us)

[270] Retrieved from: https://www.dnr.state.mn.us/wetlands/index.html

[271] Environmental Protection Agency (June 17, 2020) *Section 404 of the Clean Water Act: Section 404 Permit Program*, retrieved from: https://www.epa.gov/cwa-404/section-404-permit-program.

[272] Minnesota Pollution Control Agency (n.d.) *Clean Water Act Section 401 Water Quality Certifications*, retrieved from: https://www.pca.state.mn.us/water/clean-water-act-section-401-water-quality-certifications.

[273] Minn. R. 8420.0100, subp. 2.

[274] Public Service Commission of Wisconsin (July 2013).

A Wetlands and Waterbody Delineation Report was prepared by a third party in October 2023 (eDockets No. 20242-203661-01 through -18) that covers 276 acres of the project study area, which excluded the southwest corner. Field surveys were conducted August 22-24, 2022, September 22-23, 2022, and July 31-August 2, 2023. The survey identified 29 discrete wetlands totaling 55.92 acres within the survey area as summarized in Table 21. The results are shown high-level in Figure 9.

The proposed location for the Switchyard would entirely cover one 0.04-acre fresh (wet) meadow PEM wetland and might occupy small portions (<0.5-acre total) of two wetlands (mostly shrub-carr PSS, some fresh (wet) meadow PEM) on the eastern boundary. The proposed location for the Converter Station, which would be required for both the proposed project and the ATC Alternative, would cover half or more of one 4.8-acre alder thicket PSS wetland.

Figure 9: Delineated Wetlands in Project Study Area

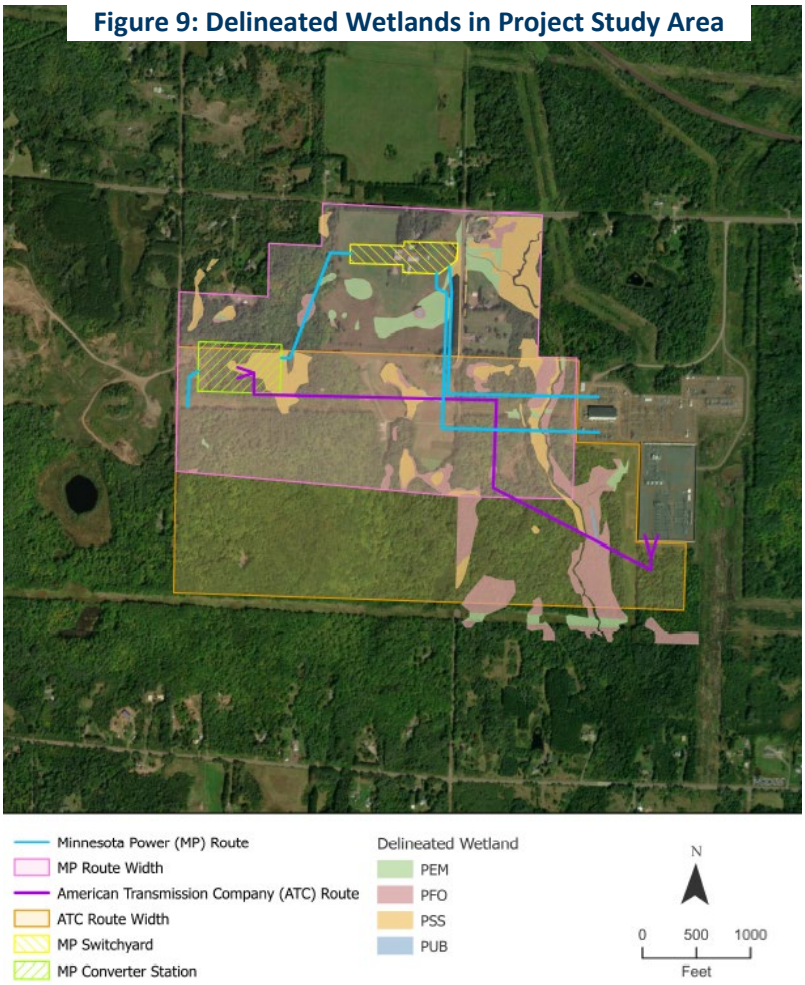


Table 21: Delineated Wetland in Survey Area

Eggers and Reed Classification	Circular 39 Classification	Cowardin Classification	Acreage
Fresh (Wet) Meadow	Type 2 – Inland Fresh Marsh	PEM	6.58
Sedge Meadow	Type 2 – Inland Fresh Marsh	PEM	2.95
Shallow Marsh	Type 3 – Inland Shallow Fresh Marsh	PEM	0.13
Shallow Open Water	Type 5 – Inland Open Fresh Water	PAB	0.27
Alder Thicket	Type 6 – Shrub Swamp	PSS	19.41
Shrub-Carr	Type 6 – Shrub Swamp	PSS	2.22
Coniferous Swamp	Type 7 – Wooded Swamp	PFO	2.31
Hardwood Swamp	Type 7 – Wooded Swamp	PFO	22.05
Total			55.92

Permanent Impacts

Construction equipment access can cause rutting, compaction, erosion, and sedimentation. Rutting and compaction can change water flow, whereas erosion and sedimentation can increase water turbidity levels. Impacts that influence the hydrology of the wetland—even small changes—might significantly impair the function of the wetland. Fuel or hazardous substances could spill over the wetland, which could lead to contamination.

Transmission lines and their new right-of-ways would mostly span wetlands and not require wetland vegetation clearing for both routing options. When a wetland cannot be avoided, construction must occur within the wetland under permit by the USACE, which may include mitigation ratios as a condition. Minnesota Power has stated that structures will be sited outside of wetlands. For the ATC Alternative, one structure is expected to be placed in wetlands resulting in 70 square feet of permanent fill.

Permanent impacts would involve structure placement or other project related fill material being placed within a wetland for the life of the project. Minnesota Power estimates their current design would permanently impact 7.04 acres, whereas ATC estimates 70 square feet (however, based on the amount of wetland to be covered by the Converter Station in addition to permanently converted wetland, both of which weren't included in ATC's estimate, this number is more likely 6.6 acres). The upgraded Converter Station and permanently converted wetland must be included in environmental impact estimates for both routing options. Thus, the wetland impact for the ATC Alternative and the proposed project are similar.

A summary of permanent fill, permanent conversion, and temporary impacts to wetlands for both routing options is presented in Table 22 and Figures 10 and 11 below. These estimates include data for the Converter Station for both options, construction extents, and are based on Minnesota Power's most recent wetland delineation and alignment change since the scoping decision as shown in Figure 10.[275]

Table 22: Project Wetland Impacts

Impact Type	Proposed Project	ATC Alternative
TOTAL Fill (Permanent Impact) *Includes building footprints*	**2.48 acres**	**2.40 acres**
TOTAL Conversion (Permanent Impact)	**4.56 acres**	**4.20 acres**
Conversion: ROW with wetland clearing	*2.06 acres*	*2.30 acres*
Conversion: building construction extents	*2.5 acres*	*1.9 acres*
TOTAL Temporary Impact	**1.04 acres**	**0.24 acres**
Temporary: construction in ROW	*0.9 acres*	*0.24 acres*
Temporary: building construction extents	*0.14 acres*	*NA*

[275] Minnesota Power, Direct Testimony and Schedules Daniel McCourtney, February 14, 2024, eDockets No. 20242-203446-09.

Figure 10: Delineated Wetland Covered by Proposed Project

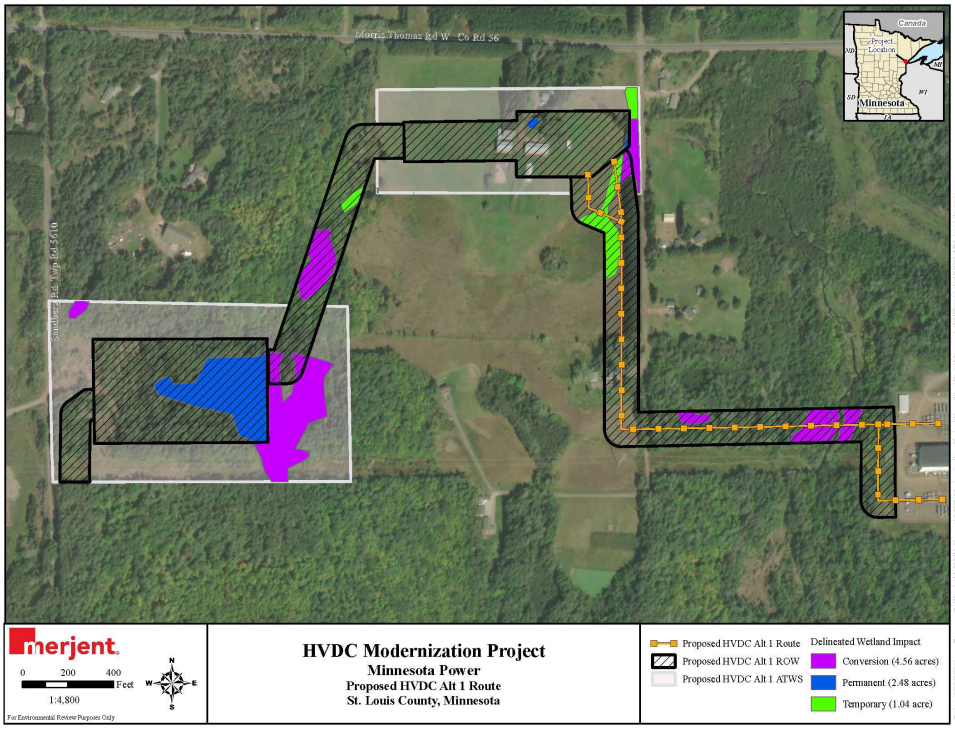
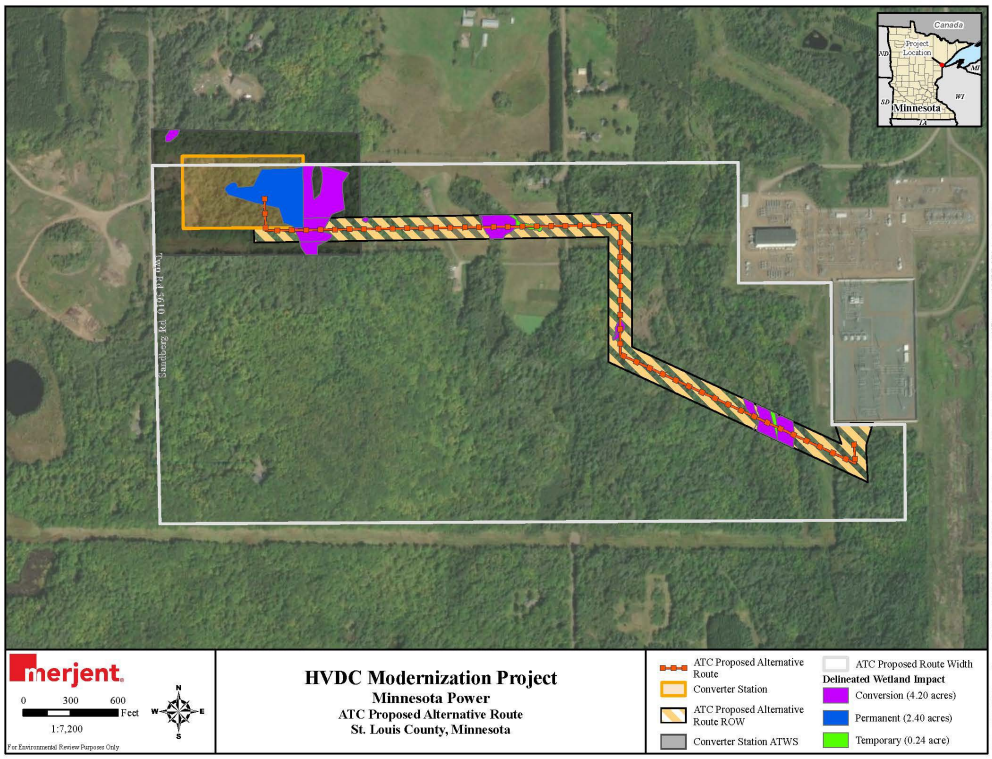


Figure 11: Delineated Wetland Covered by the ATC Alternative



Conversion Impacts (permanent)

Wetland conversion is distinct from permanent wetland fill. Whereas permanent wetland fill eliminates the wetland, conversion is a process where the wetland changes from one wetland type to another. The wetland itself is not eliminated, however, it is still considered a permanent impact because it changes functionality of the wetland. Safe operation of the HVTLs would necessitate removal of woody vegetation. In areas where forested/shrub wetlands exist this would result in wetland conversion, that is, tree or shrub clearing will change the function of a forested/shrub wetland to a different wetland type within the right-of-way. Ongoing maintenance makes this conversion permanent. Consequently, the type and magnitude of wetland function would change, for example, wildlife habitat, flood flow attenuation, and sediment stabilization and retention.

The ATC Alternative is estimated to convert 4.2 acres of forested wetland, whereas the proposed project is estimated to convert 4.56 acres. This was determined by taking construction extents into account, as can be seen on Figures 10 and 11. During construction, spoil could fall back into the wetland if appropriate precautions are not taken. Commission route permits require that all spoil be removed from the wetland.

Temporary Impacts

Temporary impacts are associated with access to wetlands with construction equipment. While use of construction mats during construction in wetlands reduce soil compaction, it has potential to disturb or kill the underlying vegetation based on the amount of time these mats are in use. Vegetation would be expected to regenerate relatively quickly; however, disturbed areas would be more susceptible to invasive plant species, which, if established, could lead to long-term adverse impacts to wetland function. Commission route permits require use of construction mats when winter construction is not possible.[276] The USACE may have additional permit requirements such as access to wetland and riparian areas be the shortest route possible to minimize travel through the wetland.

Should dewatering be necessary to install the transmission structures, it would temporarily lower groundwater to allow for excavation. Reduced groundwater can reduce standing water, decrease soil moisture, affect ground surface stability, and impact vegetation. Water discharge could lead to contamination and sedimentation within nearby wetlands.

Impacts to wetlands can also occur if disturbed soils are eroded by rain or snowmelt and transported into a wetland. The indirect filling of wetlands by up slope construction erosion and run-off could result in temporary or permanent impacts to the receiving wetland, depending on the timing of clean-up and restoration of the affected area. Erosion and sediment controls utilized during ground disturbing activity are maintained until soil is fully stabilized.

Temporary impacts based on the proposed project's updated design due to construction could amount to 1.04 acres.[277] These impacts would include temporary fill via construction matting placement along access routes, structure work areas, and wire pull sites. The ATC Alternative reported temporary impact amounts for access routes and workspace of 0.05 acres of forested wetland, however, Figure 11 shows estimated values closer to 0.24 acres.

[276] Draft Route Permit, Section 5.3.8.

[277] **Note:** *Minnesota Power later offered in its testimony to route one double-circuited monopole 230 kV line instead of two parallel H-frame lines.*
Minnesota Power, Direct Testimony and Schedules Daniel McCourtney, February 14, 2024, eDockets No. 20242-203446-09.

MITIGATION

Potential impacts to wetlands can be avoided by selecting routes, alignments, and structure placements outside of wetlands. When a wetland crossing is unavoidable, spanning wetlands to the greatest extent possible is the preferred mitigation. If wetlands cannot be avoided, impacts can be minimized by a variety of strategies: use of construction mats and silt tubes; conducting construction and maintenance activities during winter months when the ground is frozen; spreading spoils from structure placement outside the wetland or disposing spoil off right-of-way; assembling structures on upland areas prior to installation; and transporting crews and equipment, to the greatest extent possible, over improved roads and via access routes which minimize travel over wetlands. If impacts to hydrologic features are unavoidable, the applicant could work with the jurisdictional agencies to determine the best ways to minimize the impacts and create appropriate mitigation measures.

Based on the results of delineation and wetlands identified, mitigation would be required in accordance with the Clean Water Act, DNR Public Waters and Wetlands Work Permit, and WCA requirements. Mitigation developed on the route and final ROW would include wetland replacement as necessary for long-term impacts and location-specific wetland avoidance measures. Minnesota Power believes that the project will qualify for the Utility Exemption from preparing a Wetland Replacement Plan under WCA.

For both routing options, promptly restoring areas after construction where ground disturbance occurs and revegetating with noxious/invasive species free seed will be expected conditions in the VMP. Minnesota Power stated in its draft VMP that heavy equipment passage through wetlands will be limited to only when necessary to complete the O&M activity.[278] Other than typical CSW Permit conditions, the applicant committed to the following in the route permit application:

- 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.
- Transmission lines and their new right-of-ways would mostly span wetlands and not require wetland vegetation clearing.
- Structures will be sited outside of wetlands.

Other than typical CSW Permit conditions, ATC has committed to the following to minimize impacts to wetlands:

- Transmission lines and their new right-of-ways would mostly span wetlands and not require wetland vegetation clearing. Wetland boundaries will be factored into final engineering to avoid impacts to the extent practical.
- Developing access routes to minimize crossing wetlands, where possible.

Commission route permits require permittees to avoid and minimize wetland impacts. This includes requiring winter construction to the extent possible and requiring that soil excavated from wetland areas not be placed back into the wetland.[279] Standard conditions in Section 5.3.9 of the DRP directs the applicant to:

[278] Minnesota Power draft Vegetation Management Plan, eDockets No. 20242-203665-11.

[279] Draft Route Permit, Section 5.3.8.

- Avoid impacts to wetlands to the extent possible;
- Construct in wetland areas during frozen ground conditions where practicable; when construction during winter is not possible, to utilize wooden or composite mats to protect wetland vegetation; and
- Contain soil excavated from the wetlands and riparian areas.

Vegetation

The ROI for vegetation is the route width. Potential impacts, such as clearing, compacting, or otherwise disturbing vegetation, are expected to be moderate for both routing options. Tree clearing impacts to construct the proposed project and the ATC Alternative are similar at 34.25 acres and 34.72 acres, respectively. Invasive species might establish. Potential impacts will be both short- and long-term. Impacts are localized, but unavoidable. Potential impacts can be minimized.

Prior to colonization, white and red pine dominated most forest communities on end moraines and till plains. Jack pine barrens and jack pine woodlands were found on well-drained sites on outwash plains. Black spruce, tamarack, white cedar, and black ash were prominent tree species in poorly to very poorly drained soils. Pre-settlement vegetation in this area included primarily pine, fir, and aspenbirch forest, along with conifer bogs and swamps. Today's landscape is still dominated by forest.

The current landscape is rural open space and forested areas. The project area is relatively more developed to the south, and rural to the north. Land cover types within proposed route are approximately 64% forest and shrubs, 21% rural developed land, 14% cropland, and 1% grassland.[280]

MDA administers the *Minnesota Noxious Weed Law*. Noxious weeds are defined as an annual, biennial, or perennial plants designated to be injurious to the environment, public health, public roads, crops, livestock, or other property. The purpose of the law is to protect residents of Minnesota from the injurious effects of these weeds.[281] MDA lists four categories of noxious weeds with differing levels of eradication, control, reporting, transport, sales, and propagation requirements. There are 14 weeds on the eradicate list, nine on the control list, and 15 restricted weeds.[282] None of the weeds on these lists are to be transported, propagated, or sold in the state.

There are no DNR-designated wild rice lakes around the project area, the nearest being Twin Lakes about five miles to the west. Due to this distance, the project is not expected to affect water flow, turbidity, water quality and water level fluctuations to this resource.

Potential Impacts

Construction activities will cause both short- and long-term impacts to vegetation. Short-term impacts will result from grading and other physical disturbances. Site preparation and structure installation might remove, disturb, or compact vegetation. Establishing and using access roads and staging and stringing areas will concentrate surface disturbance and equipment use causing short-term impacts to vegetation. Construction of the Converter Station will permanently remove approximately 21.65 acres of vegetation (see Table 14).

[280] U.S. Geological Survey Gap Analysis land cover types, Table 7.6.3-1 of the Route Permit Application.

[281] Minnesota Department of Agriculture, *Noxious Weed List*, updated January 2023, retrieved from: https://www.mda.state.mn.us/plants-insects/minnesota-noxious-weed-list.

[282] *Ibid.*

Based on 2021 NLCD spatial data, tall growing vegetation estimates (including all forested cover types and woody wetlands) are ~34.25 acres for the proposed project and ~34.72 acres for the ATC Alternative (see Table 14). The NLCD is based on 30-meter resolution meaning cover types are grouped into 30 by 30-meter blocks. This scale provides an accurate depiction of land cover types at the landscape scale. However, smaller cover types may be classified the same as larger, surrounding cover types. Therefore, when reviewing projects at a localized scale, the NLCD may not accurately depict all parcels. This often manifests in the overestimation of developed cover types near roads.

Construction activities could introduce noxious weeds and invasive species, especially 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. Noxious weeds have potential to dominate and displace native plants and plant communities, permanently altering ecosystem functions.

Long-term impacts include removal of woody vegetation within the right-of-way, which will result in conversion to low-stature vegetation (shrubs and grasses) throughout its length. Approximately 34.25 acres of forested land will be cleared as a result of the proposed project construction. Minnesota Power would routinely clear woody vegetation from the right-of-way to ensure it does not interfere with the safe operation of the HVTL. Removal of woody vegetation will widen existing corridors through wooded areas or remove wooded areas from the landscape. Habitat fragmentation is discussed in more detail in the Wildlife and Habitats section of this EA. Conversion of wooded landscapes to open landscapes could indirectly affect native vegetation by increasing potential for spread of invasive and non-native species.

Maintenance and emergency repair activities could result in direct impacts to vegetation from removal, disturbance, or compaction caused by these activities. Maintenance and emergency repair is expected to be infrequent throughout the life of the project, and potential impacts to vegetation would be short-term and more localized than construction-related impacts.

MITIGATION

Impacts to vegetation, especially trees, can be avoided or minimized by selecting a route that avoids important vegetation resources. Collocating with existing infrastructure right-of-way, for example, roadways or transmission lines, might limit tree removal. The ATC Alternative follows the existing HVDC Line right-of-way for most of its west to east routing and would share 25 feet of existing width. Plant communities can be spanned. Additionally, new plantings within the right-of-way of compatible cover types, or planting of tall-growing trees in areas outside the right-of-way can mitigate impacts. Use of the wire/border zone method of vegetation clearing and management can reduce impacts to tall growing species at the edge of the right-of-way. Major restoration efforts for the community could include replacing trees one for one within the same local municipality and monitoring all restoration efforts for multiple growing seasons.

Mitigation measures to reduce the spread of invasive and non-native plant species during construction include the regular and frequent cleaning and inspection of construction equipment and vehicles; minimizing ground disturbance to the greatest degree practicable; rapid revegetation of disturbed areas with native or appropriately certified weed-free seed mixes and using weed-free straw and hay for erosion control; conducting field surveys of the right-of-way prior to construction to identify areas containing noxious weed (weed surveys during construction would identify infestations of the right-of-

way and staging areas); and eradicating new infestations as soon as practicable in conjunction with landowner input.

Mitigation and restoration measures for vegetation on landowner property are standard Commission route permit conditions, however, all of the land within the proposed route will be owned by the applicant. No further mitigation is recommended.

Chapter 6: Routing Factors

The Minnesota Legislature has directed the Commission to select HVTL routes that minimize adverse human and environmental impacts while ensuring continuing electric power system reliability and integrity.[283] An HVTL route must be compatible with environmental preservation and the efficient use of resources while also ensuring electric energy needs are met and fulfilled in an orderly and timely fashion.[284]

Minnesota Statute 216E.03, subdivision 7(b) identifies 12 considerations that the Commission must take into account when designating a route for a HVTL. These considerations are further clarified and expanded by Minnesota Rule 7850.4100, which identifies 14 factors the Commission must consider when making a permit decision.

- **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.

This analysis applies the routing factors to the project. The analysis that follows applies the information and data available in the route permit application and this EA to the factors the Commission must consider when making a route permit decision. Some factors are described in just a few words. Other factors are more descriptive and include a list of elements that, when grouped, make up the factor. Finally, certain factors are relatively succinct, but the scoping process identified elements to be analyzed in this EA. For example, the public health and safety factor includes an EMF element.

[283] Minn. Stat. 216E.02, subd. 1.

[284] *Ibid*.

Factor I (use of existing large electric power generating plant sites) does not apply to HVTLs. It is assumed that all routing options maximize energy efficiencies and accommodate expansion of transmission capacity (**Factor G**), and all routing options are electrically reliable (**Factor K**). **Factor M** (unavoidable impacts) and **Factor N** (irreversible and irretrievable resource commitments) are discussed at the end of Chapter 4 in this EA. **Factor H** (use of existing rights-of-way) and **Factor J** (use of existing infrastructure rights-of-way) apply solely to high voltage transmission lines. **Factor G** (application of design options) and **Factor L** (costs dependent on design) apply to the ATC Alternative, which is a design under consideration in addition to the proposed project.

Other factors are ranked as follows:

●	• Route alternative is consistent with the routing factor OR • Impacts are anticipated to be negligible to minimal and able to be mitigated or consistent with factor.
○	• Route alternative is consistent with routing factor but less so than the other options OR • Impacts are anticipated to be minimal but the potential for impacts is greater than the other options or require special permit conditions OR • Impacts are anticipated to be moderate
⊘	• Route alternative is not consistent with routing factor or consistent only in part OR • Impacts might be moderate but the potential for impacts is greater than the other options or require special permit conditions OR • Impacts are anticipated to be significant

Graphics above are used to illustrate distinct impacts associated with construction and operation. A discussion highlighting differences in the types of impacts follows.

Analysis

This analysis applies the routing factors to the proposed project and discusses the relative merits of the ATC Alternative.

Should the Commission issue a route permit for the project, it must select the either the proposed project or the ATC Alternative. Graphics (described above) are used to illustrate the application of the routing factors outlined in Minnesota Rule 7850.4100 to the proposed project. These same graphics are used to explain the distinct impacts associated with ATC Alternative. A discussion highlighting differences follows.

Table 23: Application of Routing Factors/Relative Merits of Routing Options

Element	Application of Routing Factor	Relative Merits of Routing Factor
	Proposed Project	ATC Alternative
Factor A: Human Settlement		
Aesthetics	○	●

Element	Application of Routing Factor	Relative Merits of Routing Factor
	Proposed Project	ATC Alternative
Displacement	●	●
Cultural Values	○	●
Electric Interference	●	●
Environmental Justice	●	●
Floodplains	●	●
Land Use and Zoning	●	●
Noise	●	●
Property Values *	●	●
Recreation	●	●
Socioeconomics	●	●
Factor A: Public Services		
Airports	●	●
Roads and Highways	●	●
Utilities	●	●
Factor B: Public Safety		
EMF	●	●
Emergency Services	●	●
Induced Voltage	●	●
Medical Devices	●	●
Public Safety	●	●
Stray Voltage	●	●
Worker Safety	●	●
Factor C: Land Based Economies		
Agriculture	●	●
Forestry	●	●
Mining	●	●
Tourism	●	●
Factor D: Archaeological and Historic Resources		
Archeological	●	●

Element	Application of Routing Factor	Relative Merits of Routing Factor
	Proposed Project	**ATC Alternative**
Historic	●	●
Factor E: Natural Resources		
Air Quality	●	●
Climate Change	●	●
Geology	●	●
Groundwater	●	●
Soils	●	●
Surface Water	○	○
Topography	●	●
Vegetation	○	○
Wetlands	●	●
Wildlife and Habitat	●	●
Factor F: Rare and Unique Resources		
—	●	●
Factor H: Paralleling Existing ROW		
—	●	●
Factor J: Use of Existing Infrastructure		
—	●	●
Factor L: Cost		
	$55 million[285]	**$51 to 85 million**
Minnesota Statute 216E.03, Subdivision 7(12): Existing HVTL route and Highway ROW		
—	●	●

Discussion

The following summarizes potential impacts to factor elements that are anticipated to be moderate to significant, as well as routing factors that are less consistent, consistent in part, or not consistent.

[285] These costs are intentionally underestimated for comparison purposes to the ATC Alternative. See more detailed explanations of cost and breakdowns in the following Discussion of Costs and Table 24.

Table 24: Summary of Differing Impacts Between Routing Options

Element	Application of Routing Factor	Relative Merits of Routing Factor
	Proposed Project	**ATC Alternative**
Aesthetics	○ The proposed project includes the Switchyard in addition to the Converter Station. The Switchyard and subsequent clearing would be near Morris Thomas Road, an area with nearby residents.	● On whole, impacts are anticipated to be moderate for both options. However, the ATC Alternative infrastructure and subsequent clearing is farther away from residents.
Cultural Values	○ For nearby residents that place high value on rural character and a sense of place, impacts are anticipated to be moderate.	● For the ATC Alternative, impacts are expected to be minimal as all infrastructure is generally sited farther away from residents and view.
Cost	**$55 million** Minnesota interconnection facilities only. Does not include upgrades required in North Dakota and the full converter cost.[286]	**$51 to 85 million** Minnesota interconnection facilities only. Does not include upgrades required in North Dakota and the full converter cost.[287]

Aesthetics

All routing options will impact residences, but the proposed project will have more aesthetic impacts than the ATC Alternative because it includes construction of the Switchyard near Morris Thomas Road. Other project infrastructure for both options is less concerning as they will be partially screened from view by what existing vegetation will remain on the landscape in this heavily wooded area.

Costs

Because the ATC Alternative does not require the Switchyard, its cost could be lower overall, but could also depend on whether another transformer is needed. Minnesota Power stated that the cost provided only for the Minnesota interconnection facilities is the most direct cost comparison for the proposed project and the ATC Alternative, rather than just the converter cost (although it is required for both options).[288] The proposed project is expected to cost $55 million for the Minnesota interconnection facilities while the ATC Alternative could range from $51 to $85 million based on whether a phase shifting transformer is included.[289]

[286] Route Permit Application, Table 2.2.1-1.
[287] Minnesota Power, Christian Winters Direct Schedule 2, February 14, 2024, eDockets No. 20242-203446-07.
[288] Personal communication with Minnesota Power, Daniel McCourtney, February 28, 2023.
[289] Minnesota Power, Christian Winters Direct Schedule 2, February 14, 2024, eDockets No. 20242-203446-07.

Noise
Distinct noises are associated with the different phases of project construction. These impacts will be temporary and intermittent and range from negligible to significant depending on the construction equipment used and the receptor's location.

Surface Waters
Direct impacts to an impaired, designated trout stream cannot be avoided by the project. Potential impacts to surface waters are anticipated to be moderate for both routing options which will clear one additional right-of-way in a part of the trout stream that is already impaired and experiencing warming from previous right-of-way clearing that will remain. This impact could be further exacerbated from the future effects of climate change.

Both routing options would utilize the Converter Station, which is the project's greatest potential for indirect impacts to surface waters due to grading steep slopes and increased impervious surface that may alter existing drainage patterns to the trout stream.

Soils
Impacts to soils will occur during construction of the project, some of which such as topsoil compaction is expected to be permanent through operation. Potential impacts will be short-term, localized, and minimal. Construction may have erosion impacts where steep side slopes are excavated to provide a flat construction surface. Approximately 13 acres of soil may have permanent impacts from the proposed construction of the Converter Station and Switchyard – 5 acres of those contain steep slopes of greater than 8%, or 11% of the total construction acres. Impacts can be mitigated in part.

Vegetation
Potential impacts, such as clearing, compacting, or otherwise disturbing vegetation, are expected to be moderate for both routing options. Tree clearing impacts to construct the proposed project and the ATC Alternative are similar at 34.25 acres and 34.72 acres, respectively. Invasive species might establish. Potential impacts will be both short- and long-term. Impacts are localized, but unavoidable. Potential impacts can be minimized.

Wetlands
The potential for permanent impacts to delineated wetlands is slightly higher for the proposed project at 7.04 acres, whereas the ATC Alternative is expected to be approximately 6.6 acres. Permanent and temporary wetland impacts are similar between both options.

Paralleling *(including Minnesota Statute 216E.03)*
The ATC Alternative will parallel existing right-of-way for the west to east extent of its length, sharing 25 feet of ROW with the existing HVDC Line. The proposed project does not parallel existing right-of-way, however, it should be noted that transmission lines are proposed to be cumulatively less than three miles in length. Neither option follows state or county highway ROW.

Use of existing infrastructure *(including Minnesota Statute 216E.03)*
The ATC Alternative would use more existing infrastructure than the proposed project because it would omit the Switchyard and connect to its existing Arrowhead Substation instead. The proposed project would utilize Minnesota Power's existing Arrowhead Substation. Both options require new transmission

lines and the decommissioning of the existing substation and HVDC Line. Neither option follows state or county highway ROW.

Recommendations

The following summarizes mitigation measures recommended by staff that are not part of the sample permit issued for the project. In addition to the measures summarized below, the Commission could require a third-party monitor, reporting directly to EERA staff, to monitor construction and restoration of the project in compliance with the conditions of the Commission route permit issued for the project. The costs for such a monitor could be borne by the applicants.

Aesthetics

The Commission could require downward illumination (shielded lighting) at all locations where lighting is required to mitigate impacts to wildlife, the night sky, and nearby residents, which would also reduce cumulative impacts with existing lighting at the Arrowhead substations. Minnesota Power has already committed to install shielded or downward facing lighting in their scoping comments.[290] Example permit language could be:

> *Facility Lighting*
> *To reduce harm to birds, insects, and other animals, the Permittee shall utilize downlit and shielded lighting at the site entrances and inverters. Lighting utilized shall minimize blue hue. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce or Commission staff.*

The Commission could require a vegetated or fenced buffer that blends into the natural landscape in between the approximately 300 feet from Morris Thomas Road to the Switchyard.

Noise

The Commission could require construction timing restrictions, that is, limiting the duration of certain construction activities, to mitigate impacts to state noise standards.

Surface Water

Use of the wire/border zone vegetation clearing method could help to stabilize soils by allowing certain low growing woody vegetation and trees to persist along the outside edges of the ROW.

Vegetation

The Commission could require continued coordination with state agencies in developing a VMP to mitigate impacts to vegetation.

Wildlife

The Commission could require the applicant to using dust mitigation and control measures that do not contain chloride, which the applicant has already committed to in its scoping comments. Example permit language could be:

> *To protect plants and wildlife from chloride products that do not break down in the environment, the Permittee is prohibited from using dust control products containing calcium chloride or*

[290] Scoping Comments of Minnesota Power, September 29, 2023, eDockets No. 20239-199286-01, page 14.

magnesium chloride during construction and operation. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce or Commission staff.

Additionally, The Commission could require the applicant to utilize wildlife friendly erosion control measures during construction and operation that would not contain plastic mesh netting. The applicant has already committed to this in their scoping comments.[291]

Archeological and Historic Resources

The Commission could incorporate SHPO's recommendation to require a 100-meter buffer zone around the identified archeological resource within the project study area. Both the applicant and ATC have committed to this measure in the record.

Rare and Unique Resources

The Commission could require the project's tree clearing activities to occur during the northern goshawk's inactive season (approximately beginning of September to the end of February)[292], which should avoid direct impacts to the birds or their eggs due to tree clearing. The applicant has already committed to this mitigation in their scoping comments.[293] This timeframe would also overlap with avoiding impacts to any Northern Long-eared Bats that may also occur in the project area. Ensuring construction and operation are consistent with USFWS guidance would minimize impacts to both species.

Due to a northern goshawk nest that has been documented within the area by the NHIS, it would be appropriate for the Commission to require raptor nest surveys. The permit should have a special condition requiring survey protocol development and results reporting to the DNR.

Soils and Topography/Surface Water

Due to the occurrence of steep slopes in the area and increased impervious surfaces for the project, high erosion impacts are a possibility, which could also alter drainage patterns and ultimately increase impacts the trout stream such as causing impairments due to total suspended solids. The Commission could require the applicant to use rip rap or a similar material to stabilize steep slopes after construction to ensure the existing drainage pattern remains. This tactic would be most effective with a well vegetated buffer between the stream and graded areas because the buffer could slow and filter any remaining water that is flowing towards the stream.[294] A vegetated buffer would allow for a more variable habitat and vegetation growth than riprap.[295]

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[291] *Ibid.*

[292] Minnesota DNR Rare Species Guide, 2018, retrieved from: https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=ABNKC12060#:~:text=Within%20Minnesota%2C%20Northern%20Goshawks%20are,mi.).

[293] Scoping Comments of Minnesota Power, September 29, 2023, eDockets No. 20239-199286-01, page 14.

[294] Personal email communication with the DNR Acting Fisheries Supervisor, February 29, 2024.

[295] *Ibid.*

Chapter 7: Alternatives to the Proposed Project

The Minnesota Power HVDC Modernization project is one possible solution to maintain the current load, gain additional access to renewable resources, and reach the state's goal of 100 percent carbon-free energy by 2040. This chapter evaluates alternatives to the project that may also address this problem. As described in Chapter 2, the Minnesota Public Utilities Commission (Commission) must determine whether the proposed project is needed or if another project would be more appropriate for Minnesota. For example, a project of a different type or size, or a project that connects different endpoints (substations). The alternatives discussed here include the following:

- No-build alternative
- Demand side management
- Purchased power
- Transmission line of a different size, including higher and lower voltages
  - DC alternatives
  - AC alternatives
- Upgrading of existing facilities, including conductors and double-circuiting existing lines
- Generation rather than transmission
- Use of renewable energy sources

These alternatives are commonly referred to as system alternatives. This chapter discusses whether these system alternatives are feasible (whether they can be engineered, designed, and constructed) and available (whether the alternative is readily obtainable and at the appropriate scale) and, if so, whether they can meet the need for the project. Additionally, this chapter discusses the potential human and environmental impacts of the alternatives, particularly in comparison to the project.

Need for the Project

Minnesota Power indicated that the project is needed to modernize aging HVDC assets, which will continue to position the transmission grid for clean energy transition and improve the reliability of the transmission system. The HVDC Line has been operating for 45 years. Minnesota Power purchased the line in 2010 with the Commission's approval. Due to increased HVDC outages and equipment failure, the orderly replacement of the HVDC terminal equipment is prudent to ensure continuous efficient delivery and expansion of Minnesota Power's renewable energy resources into the future. In addition to the existing HVDC terminal replacement, the new HVDC technology would be designed to provide key reliability attributes including voltage regulation, frequency response, blackstart capability, and bidirectional power transfer capability.

No-Build Alternative

Under the no-build alternative, the applicant's proposed project would not be constructed and all other electrical transmission facilities in the project area would remain as is. This could occur if the Commission determines that the need for is not clearly established; no CN would be issued, and the project would not be constructed. This alternative is both feasible and available but would not meet the need for the project.

Minnesota Power has concluded that the project must be constructed as proposed because modernizing the HVDC Converter Stations will greatly reduce the likelihood of an extended outage due to component

failures. The equipment has been reliable for most of its history but forced outages due to failures have increased since approximately 2009 and appear to be accelerating over the last five years. The worst historical case reduced the annual availability of the system by 16 percent (equivalent to about 1,400 hours) due to a failure in one of the HVDC Converter Stations. At some point, outages will become unavoidable due to component failures or imminent concerns about safety and reliability. At that time, there will be even greater risk of a high-impact unplanned outage affecting customers.

The no-build alternative would have no direct human or environmental impacts. It would, however, adversely affect the local transmission system and reduce electrical reliability. In addition, it would impede greater use of Minnesota Power's connection to wind energy resources in North Dakota and the benefits associated with this use. While there are solar and wind resources in other parts of the state that could replace the project, the land on which to site these resources is finite. Finally, if the project is not constructed, and electricity consumption increases in the Upper Midwest, the cleaner wind energy that would have been provided by the project might be replaced by a carbon-emitting, non-renewable energy source, for example, coal or natural gas, which would lead to further global climate change. If the project is not built, it would reduce the available options to meet, or as easily meet, the state's renewable energy goals.

Purchased Power

Under a purchased power alternative, power would be purchased from existing generation sources, rather than generated by constructing a new electric generating plant. This alternative is more relevant to a site permit application for a large electric power generating plant than a route permit for a transmission line project. Minnesota Power states that purchased power is also not a system alternative since it would not address the transmission system and reliability issues that are being addressed by project through the replacement of aging infrastructure.

The HVDC Modernization project will facilitate delivery of 550 MW of owned and purchased wind energy from North Dakota. This additional electrical energy, once purchased, would need to be transmitted – through existing lines and substations or through new facilities – to the project area. Purchasing an equivalent amount of wind energy is not a viable alternative because it would still require new or upgraded transmission and delivery to Minnesota Power's customers. In fact, the purchased power alternative is the status quo. Relatively low-cost electricity from wind generation in North Dakota is unable to reach consumers due to congestion on the transmission grid, thus other electrical power is being purchased to meet consumer demand.

Not constructing the project would also significantly increase customer costs without a transmission path to deliver existing resources or cause significant congestion on the transmission system that would raise costs for Minnesota Power customers. Even if lower-cost or an alternative source of generation was available, it would likely require new transmission to bring the power to consumers.

A purchased power alternative may be feasible and available, but it would not meet the need for the project. Purchasing power would not improve the reliability of the existing HVDC transmission system, nor would it make the system less susceptible to outages. The human and environmental impacts of purchased power would vary, depending on how the power was produced and how it was transmitted to the project area. The generators producing the purchased power are assumed to already be in operation, independent and regardless of any power purchased in an attempt to meet the need

for the project. Attempting to meet the need for the project with purchased power would adversely affect the local transmission system, reduce electrical reliability, and prevent expanded use of wind energy resources in North Dakota.

Demand Side Management

Demand side management is the industry term for a suite of measures designed to reduce and manage demand for electrical energy, particularly peak loads. Minnesota Power considered demand side management and conservation as alternatives to the project and determined that it is feasible and available but would not meet the need for the project. In this context, demand side management and conservation are assumed to encompass all forms of peak shaving programs, such as interruptible loads and dual fuel programs, as well as more general energy conservation programs, such as energy-efficiency rebates.

In Minnesota Power's most recently approved Integrated Resource Plan, the Commission determined that Minnesota Power has approximately 200 MW of demand side management (DSM) within its customer portfolio, primarily from industrial load customers. This level or an increased level of DSM on Minnesota Power's system would not be a replacement for the 500 MW of wind energy transmission delivery on Minnesota Power's HVDC line. Additional power purchase agreements, regardless of source, would require additional transmission needs for Minnesota Power's customers and would not replace the proposed HVDC Modernization project, which would prevent Minnesota Power's wind generation from being delivered to its customers.

Demand side management would have few direct human or environmental impacts. However, attempting to meet the need for the project with demand side management would adversely affect the local transmission system and reduce electrical reliability. In addition, it would prevent greater use of Minnesota Power's wind energy in North Dakota.

Transmission Line of a Different Size

Under this alternative, the need for the project would be met by a transmission line of a different size, i.e., a line with a voltage other than 345 kV and 230 kV. 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. Transmission Lines carry electricity over long distances, from the generating facility to areas of demand. The electricity in transmission lines is transported at voltages of over 200 kV to maximize efficiency. Voltages of 230 kV to 500 kV are typical. Currently in Minnesota, the high-voltage system is generally comprised of 230 kV and 345 kV systems. Structures are generally steel lattice towers, wooden H-Frames, or single-pole steel.

In general, transmission lines with voltages other than 345 kV and 230 kV are feasible and available and could meet the need for the project, at least in part. Based on analysis by MISO (Tranche 1 of the MISO Long Range Transmission Plan) and the applicants, alternatives with alternative voltages do not meet the need as well as the proposed project and would return a long-term alternative that is not cost effective.

Minnesota Power states that as the use and significance of the existing HVDC system evolves over the life of the project, 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. 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 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 Minnesota Power states is not necessary at this time to support the near-term capacity needs on the HVDC system. Thus, all human and environmental impacts for a transmission line with a different voltage would significantly increase compared to those for the proposed project.

Alternative Voltages (AC) and Reactive Resources

High voltage direct current (HVDC) lines are typically proposed for transmitting large amounts of electricity over long distances because line losses are significantly less over long distances on a HVDC line than an AC line. 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 Substation. 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 demonstrated by Tranche 1 of the MISO Long Range Transmission Plan, 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. Minnesota Power believes the Square Butte HVDC Line (HVDC Line) 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 project, 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 Converter Station itself, there would be a significant sunk cost at the time the transition from 230 kV to 345 kV is made. Therefore, Minnesota Power does not consider alternative AC transmission voltages are not a cost-effective long-term alternative for the project.

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. Minnesota Power concludes 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. 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 much greater human and environmental impacts compared to the project. In addition to the human and environmental impacts, there is higher risk for permitting, engineering, procurement, and construction of an AC alternative project, potentially leading to even higher costs and longer implementation timelines.

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, the new sites have been 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, scale, and human and environmental impacts of the project. Minnesota Power concludes there are no feasible alternative endpoints for the project outside the immediate vicinity of the existing HVDC Converter Stations. The ATC Alternative analyzed throughout this EA offers an alternative endpoint for their existing Arrowhead Substation directly south of Minnesota Power's.

Upgrading of Existing Facilities

The project involves upgrading existing facilities as discussed throughout this chapter.

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 applicant stated it would consider implementing double circuit-capable structures for these short new AC interconnection facilities where appropriate given the potential future use of the facilities. Minnesota Power has offered double-circuiting the proposed interconnecting line into their Arrowhead Substation in the record in place of the current project proposal. The ATC Alternative would utilize double circuit capable structures for the entire length of the new lines. Double-circuiting would meet the need for the project and have less overall human and environmental impacts.

Alternative Number, Size, And Type of Conductor

The specific conductors for the proposed AC 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 utilize bundled configurations (e.g., two sub-conductors per phase). The conductor for the short segment of the new ±250 kV line is anticipated to be 2839 ACSR to match the existing HVDC Line conductor. Minnesota Power states that 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 to meet the need of the project. Human and environmental impacts are thus expected to be similar regardless of final conductor number, size, or type.

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.

To be a viable alternative to the project, a generation or non-wire alternative (or combination of alternatives) must address the primary needs for the project to modernize aging HVDC assets to position the grid for clean energy transition and improve reliability, and ensure continuous efficient delivery and expansion of Minnesota Power's renewable energy resources into the future

Minnesota Power states there is no alternative generation or non-wire solution that can feasibly replace the function of the HVDC Converter Stations in facilitating the bulk long distance transfer of renewable energy across the grid.

Renewable Generation

The project involves enabling transfer of available renewable wind energy from North Dakota to the Arrowhead Substation. The replacement of aging infrastructure through the HVDC Modernization project would 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.

Renewable generation needs to be available when called upon in the amount required to mitigate the risk of a voltage collapse. Wind energy output is unpredictable, sometimes decreasing during the evening hours of the day. The project is designed to adequately address reliability concerns and avoid outages (hence 500 MW) while enabling a renewable energy supply that depends on natural events such as wind speed. Minnesota Power believes the HVDC Line 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. An alternative to the project as proposed would increase risk and cost for Minnesota Power's existing and planned renewable generation facilities, decrease progress in meeting renewable energy goals, and cause significant costs for AC network upgrades to mitigate reliability impacts.

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