NORTH STAR SOLAR PV LLC

Joint Application to the
Minnesota Public Utilities Commission
For a Site Permit and Route Permit

NORTH STAR SOLAR ELECTRIC POWER GENERATING PLANT AND NORTH STAR 115kV HIGH VOLTAGE TRANSMISSION LINE

Alternative Permitting Process
MPUC Docket No. GS-15-33

FEBRUARY 11, 2015

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1.0 INTRODUCTION

North Star Solar PV LLC ("North Star" or "Applicant"), respectfully submits this joint application to the Minnesota Public Utilities Commission ("Commission") for Site and Route Permits pursuant to the Minnesota Power Plant Siting Act (Minnesota Statutes Chapter 216E) and Minnesota Administrative Rules Chapter 7850.

North Star proposes to construct a photovoltaic ("PV") solar energy generating facility and associated systems totaling 100 megawatts ("MW") alternating current ("AC") nameplate capacity ("North Star Solar Project" or "Solar Project"). The North Star Solar Project will utilize a linear axis tracker system and be placed in service by the end of 2016. The Solar Project is described in more detail throughout this Application.

The Solar Project falls within the definition of a Large Electric Power Generating Plant (LEPGP) in the Power Plant Siting Act, and thus, requires a Site Permit from the Commission prior to construction. Minnesota Administrative Rules Chapter 7850 provide for three different procedures for obtaining a site permit: full review, alternative review, and local review. Pursuant to 2014 Session Laws, Chapter 254, North Star seeks approval of its application under the alternative review process provided for under Minnesota Statute 216E.04 and Minnesota Administrative Rules 7850.2800-7850.3900.

The Site Permit is the only site approval needed for construction of the Solar Project (Minnesota Statutes 216E.10, subd. 1.).

As a joint application to the Site Permit, the Applicant also requests a Route Permit to construct an approximately one-mile long, 115 kilovolt (115 kV) high voltage transmission line between the proposed 34.5/115 kV Solar Project substation and the existing Chisago Substation ("NS HVTL Project"). The Applicant seeks approval of its Route Permit application under the alternative review process. The NS HVTL Project qualifies for the alternative review process because it meets the requirements of Minnesota Rule 7850.2800, subp.1C, which allows for permitting under the alternative process if the HVTL project is capable of operating between 100 and 200 kilovolts.

Throughout this document the term "Projects" refers to both the North Star Solar Project (Solar Project) and the North Star 115 kV High Voltage Transmission Line (NS HVTL). Reference to the "Project areas" indicates all land within the Solar Project boundary and land within the NS HVTL Project proposed Route Corridor.

1.1 Purpose and Need

The Solar Project was proposed to Northern States Power Company d/b/a Xcel Energy ("Xcel Energy") in response to Xcel Energy's 2014 Solar Resource Solicitation ("Solar RFP") on June 20, 2014. The Solar RFP is established in Docket No. E002/M-14-162. According to the

Midwest Independent System Operator ("MISO") non-wind variable generation capacity calculation, the Solar Project will provide approximately 68 MW of accredited capacity and supply Xcel Energy with approximately 204,000 megawatt hours (MWh) annually of reliable, deliverable on-peak energy. The NS HVTL Project will facilitate the interconnection of the Solar Project at the Xcel Energy Chisago Substation at the 115kV bus – a point of significant transmission infrastructure with strong electrical ties to the Xcel Energy load in the Minneapolis/St. Paul metropolitan area. The robust interconnection will provide sufficient outlet to accommodate all of the solar generation. The North Star Solar Project and NS HVTL Project will provide cost-effective solar energy and help Xcel Energy meet its obligations under the Minnesota Solar Energy Standard (Minn. Stat. § 216B.1691, subd. 2(f).

1.2 Applicant Information

1.2.1 Permittee and Contact Information

The permittee for the Site Permit and Route Permit will be:

North Star Solar PV LLC
3 Radnor Corporate Center
Suite 300
100 Matsonford Road
Radnor, PA 19087

The contact persons regarding this Application are:

Chase Whitney Originator Community Energy Renewables, LLC 1120 Pearl Street, Suite 200 Boulder, CO 80302 chase.whitney@communityenergyinc.com 303-444-1412	Eric Swanson Winthrop & Weinstine, P.A. Capella Tower Suite 3500 225 S. 6th Street Minneapolis, MN 55402 eswanson@winthrop.com 612-604-6511

1.2.2 Ownership at Time of Filing

North Star Solar PV LLC ("North Star") is a Delaware Limited Liability Company authorized to do business in Minnesota. North Star is a wholly-owned subsidiary of Community Energy Renewables, LLC ("Community Energy").

Community Energy develops, markets and builds renewable energy projects throughout the United States. Community Energy has been pioneering renewable energy development and marketing for 15 years. Since its inception in 1999, Community Energy has led the

development, financing and construction of more than 800 MW of renewable energy facilities. Through innovative utility off-take agreements, renewable energy credit marketing programs, new financing structures, development expertise, and public policy support, Community Energy developed and built some of the first wind generation facilities in Pennsylvania, New Jersey, New Hampshire, Illinois and Missouri. Community Energy's track record is evidenced by 713 MW of operational wind capacity and a growing portfolio of solar capacity - now in excess of 300 MW.

Community Energy entered the solar market in 2009 and has started construction or built approximately 100 MW of solar photovoltaic facilities in Pennsylvania, New Jersey, Massachusetts, Indiana, North Carolina and Colorado. More recently, Community Energy successfully developed and secured long-term off-take agreements for a 120 MW solar project in Colorado called Comanche Solar and a 100 MW solar project with Georgia Power called Butler Solar. Comanche Solar is an example of a large scale solar being deemed cost-effective based on wholesale capacity and energy prices.

North Star, in association with its parent, Community Energy, will direct project development, permitting, interconnection and initial phases of construction.

1.2.3 Proposed Ownership after Commercial Operation

Community Energy and North Star will arrange the construction and term financing for the Solar Project and NS HVTL Project prior to the start of construction. Community Energy and North Star reserve the right to sell or assign the Projects to another qualified entity at any time before, during or after the Projects are constructed. Any sale or assignment will likely require approval by the Minnesota Public Utilities Commission. Any future buyer or assignee will be required to meet all Site and Route Permit conditions and Power Purchase Agreement ("PPA") obligations.

1.3 Project Schedule

The proposed in-service date for the North Star Solar Project and the NS HVTL Project is November 1, 2016.

In order to meet the above in-service date, the following schedule is anticipated for the various phases of development.

Land Acquisition

North Star is responsible for all land acquisition necessary for the North Star Solar Project and the NS HVTL Project. The necessary leases, easements and/or purchase agreements will be secured prior to the start of construction.

Permitting

North Star is responsible for obtaining all permits necessary for construction and operation of the North Star Solar Project and the NS HVTL Project. The Applicant is working with regulatory staff and anticipates permits to be issued on or before December 31, 2015.

Equipment Acquisition

North Star is in the process of soliciting bids from contractors for solar and transmission line engineering, procurement and construction services ("EPC") for the Projects. Final EPC contractor selection will be made contingent on the North Star Solar Project PPA being approved by the Minnesota Public Utilities Commission in association with Docket No. E002/M-14-162. Solar Project components could start arriving on site in the fourth quarter of 2015.

Construction

North Star will oversee the primary contractors performing construction of the North Star Solar Project and NS HVTL Project. These construction activities will include road building, solar array assembly, electrical, transmission, and communications installation work. Construction of both Projects will take approximately 10 to 12 months to complete. North Star anticipates beginning construction soon after being granted a Site Permit and Route Permit by the MPUC and fulfilling the Permits' pre-construction requirements.

Sections 1.3 and 3.2 of this Application provide additional information on the construction timeline and process.

1.4 Required Project Permits

1.4.1 Certificate of Need

Solar Project

Pursuant to Minn. Stat. §§ 216B.243, subd. 9, no separate Certificate of Need is required for the Solar Project as it was selected in Docket No. E002/M-14-162.

The Certificate of Need statute provides as follows:

Renewable energy standard facilities. This section does not apply to a wind energy conversion system or a solar electric generating facility that is intended to be used to meet the obligations of section 216B.1691; provided that, after notice and comment, the Commission determines that the facility is a reasonable and prudent approach to meeting a utility's obligations under that section.

NS HVTL Project

The NS HVTL Project is exempt from Certificate of Need (CN) requirements because it does not meet the voltage and length requirements of a "large energy facility" under Minn. Stat. § 216B.2421. The NS HVTL Project is a 115kV transmission line, that is less than ten miles in length and does not cross a state border, therefore, a CN is not required for the NS HVTL Project (§ 216B.2421 subd.2(3)).

1.4.2 Route Permit

Minnesota Statues § 216E.03, subd. 2, provides that no person may construct a high-voltage transmission line ("HVTL") without a route permit from the Commission. A HVTL is defined as a transmission line of 100 kV or more and greater than 1,500 feet in length. The proposed 115kV NS HVTL Project meets the definition of a HVTL, and therefore a route permit is required prior to construction.

According to Minnesota Statues § 216E.04, subd. 2 the NS HVTL Project qualifies for the alternate permitting process because it is between 100 and 200kV. This abbreviated process requires an Environmental Assessment (rather than an Environmental Impact Statement) and does not require the identification of an alternate route.

1.4.3 Other Permits

North Star will obtain all permits and licenses that are required following issuance of the Site and Route Permits. The permits or approvals that North Star has identified as potentially being required for the construction and operation of the North Star Solar Project and the NS HVTL Project are shown in **Table 1**. Copies of agency correspondence are included in Appendix A, Agency Correspondence.

TABLE 1: Permits and Approvals

Table 1. Permits and Approvals	
Regulatory Authority	**Permit or Approval**
Federal Approvals	
U.S. Army Corps of Engineers (USACE)	Wetland Delineation Approvals
	Jurisdictional Determination
	Federal Clean Water Act Section 404 and Section 10 of the Rivers and Harbors Act Permit(s)
U.S. Fish and Wildlife Service	Review for Threatened and Endangered Species – informal coordination
Environmental Protection Agency (Region 5) (EPA) in coordination with the Minnesota Pollution Control Agency (MPCA)	Spill Prevention Control and Countermeasure (SPCC) Plan
Lead Federal Agency	Federal Section 106 National Historic Preservation Act Review – will occur if Project triggers a federal nexus such as USACE individual permit
U.S. Department of Agriculture	Form AD-1006 Farmland Conversion Impact Rating – will occur if Project triggers a federal nexus such as USACE individual permit
U.S. Department of Agriculture	Conservation / Grassland / Wetland Easement and Reserve Program releases and consents
	Farm Services Agency Mortgage Subordination & Associated Environmental Review
Federal Energy Regulatory Commission	Exempt Wholesale Generator Self Cert. (EWG)
	Market-Based Rate Authorization
	Waiver of Open Access Transmission Tariff (OATT), Open Access Same-Time Information System (OASIS), and Standards of Conduct requirements applicable to transmission providers with respect to Seller's ownership of generator interconnection facilities
Federal Aviation Administration	Form 7460-1 Notice of Proposed Construction or Alteration (Determination of No Hazard)
State of Minnesota Approvals	
Board of Water and Soil Resources	Wetland Conservation Act Approval
Minnesota Pollution Control Agency	Section 401 Water Quality Certification
	National Pollutant Discharge Elimination System Permit (NPDES) – MPCA General Stormwater Permit for Construction Activity. The Project is subject to a SWPPP submittal and 30 Day review process due to more than 50 acres of disturbance and within 1 mile of impaired receiving waters.
	Very Small Quantity Generator (VSQG) License – Hazardous Waste Collection Program
	Aboveground Storage Tank (AST) Notification Form

Table 1. Permits and Approvals	
Regulatory Authority	**Permit or Approval**
Federal Approvals	
Minnesota Department of Health	Environmental Bore Hole (EBH)
	Water Supply Well Notification
	Plumbing Plan Review
Minnesota Department of Natural Resources	License to Cross Public Land and Water and/or Public Waters Work Permit
Minnesota Department of Transportation (MnDOT)	Utility Permits on Trunk Highway Right-of- way
	Overweight Permit for State Highways – for transport of transformers, inverters
	Access Driveway Permits for MnDOT Roads
Minnesota Department of Labor and Industry	Building Plan Review and Permits
Minnesota Public Utilities Commission	Site Permit for Power Plant Site
	Exemption from Certificate of Need for Power Plant
Minnesota State Historic Preservation Office (SHPO)	Cultural and Historic Resources Review and Review of State and National Register of Historic Sites and Archeological Survey

Local Approvals

Pursuant to Minnesota Statutes 216E.10, subd. 1, the Site and Route Permits are the only approvals North Star must obtain to construct the Solar Project and the NS HVTL Project, and they will supersede and preempt all zoning, building, or land use rules, regulations, or ordinances put in place by regional, county, local and special purpose governments.

North Star has consulted with local officials from the very beginning of development and will strive to incorporate the feedback and reasonable recommendations of local stakeholders into the final design of the Projects.

2.0 PROJECT DESCRIPTION

2.1 Overall Project Description

The Solar Project is comprised of approximately 1,112 acres of agricultural land located within the political boundaries of the city of North Branch, and Lent and Sunrise Townships in Chisago County, Minnesota. North Star has secured site control for 1,112 acres of agricultural land that will host the Solar Project. The final Solar Project design is expected to occupy approximately 800 acres of land. Site control for the Solar Project resides adjacent to the Xcel Energy Chisago Substation. This will allow the Solar Project to interconnect to the Chisago Substation via the NS HVTL Project by creating a new transmission line easement parallel to the existing transmission line corridor serving the Chisago Substation. The final interconnection from the

Solar Project substation to the Xcel Energy Chisago Substation point of interconnect will be accomplished via the proposed 115kV NS HVTL Project, the majority of which will be located within the Xcel Energy property boundary.

North Star has filed a Large Generator Interconnection Agreement (LGIA) application with the Midwest Independent System Operator (MISO) that is identified as queue number J385. North Star will enter the J385interconnect request into the MISO Definitive Planning Phase study process on Wednesday, February 4, 2015. North Star expects to finalize an Interconnection Agreement with Xcel Energy and MISO in the third Quarter of 2015. The preliminary Feasibility results for J385 indicated that zero contingencies will arise from the addition of 100 MW of solar generation at the 115kV bus of the Chisago Substation. This further substantiates the strength of the Solar Project's interconnection solution and its ability to reliably serve Xcel Energy load. Using the MISO capacity accreditation methods for non-wind variable generation, North Star has estimated the Solar Project's accredited capacity to be approximately 68%.

North Star has designed a highly efficient 100 MW-AC solar photovoltaic system utilizing single axis trackers. The arrays will face due south and will have a range of tilt up to +/- 60 degrees east and west. The proposed arrays will create a ground cover ratio of approximately 0.33 using a tracker and module layout designed for maximized energy production. The ground cover ratio means that 1/3 of the Solar Project footprint, when viewed from above, will be occupied by solar modules. Energy losses and wiring requirements are minimized with strategically placed inverters and an optimized electrical collection system.

Final equipment selection has not yet been made. For the North Star Project, North Star has modeled the Sun Edison "Sylvantis" F335 Solar Module mounted on single axis trackers with the Advanced Energy 1000NX inverter. The F335 is a high efficiency mono-crystalline 72-cell module that delivers a low cost per watt and an extended lifetime from one of the leading companies in the solar industry.

The Solar Project's primary components include PV modules mounted on a linear axis tracking system, solar inverters, and a project substation. The racking system foundations will utilize driven piers or posts and are generally not anticipated to require concrete, although some concrete foundations may be necessary depending on location and specific soil conditions. The balance of plant components include electrical cables, conduit, switchgear, step up transformers, supervisory control and data acquisition (SCADA) system, and metering equipment. The solar facility will be fenced for security and seeded in a beneficial seed mix to enhance soil water retention and reduce stormwater runoff and erosion. North Star will work collaboratively with the Minnesota Department of Natural Resources to maximize the opportunity to establish and manage the vegetation at the Project to the benefit of pollinators and other wildlife.

At approximately 1.0 mile long, the 115kV NS HVTL Project will provide the physical interconnection between the North Star Solar Project substation and the 115kV bus at the Xcel Energy Chisago Substation. The NS HVTL Project will be constructed within an approximately 75-foot right of way located parallel to the existing transmission corridors located north and east

of the Chisago Substation. The NS HVTL Project will include approximately 25 wood or steel direct embedded posts approximately 70 feet in height. The post structures are anticipated to consist of a standard horizontal braced-post design. Typical spans will be approximately 300 to 340 feet in length.

North Star believes that the selected project location in Chisago County is feasible for solar development based upon the proximity to existing electric transmission infrastructure, minimal impact to natural resources, available non-prime farm land, sufficient solar resource and consistency with existing uses and local zoning.

2.2 Facility and HVTL Route Description

2.2.1 Location

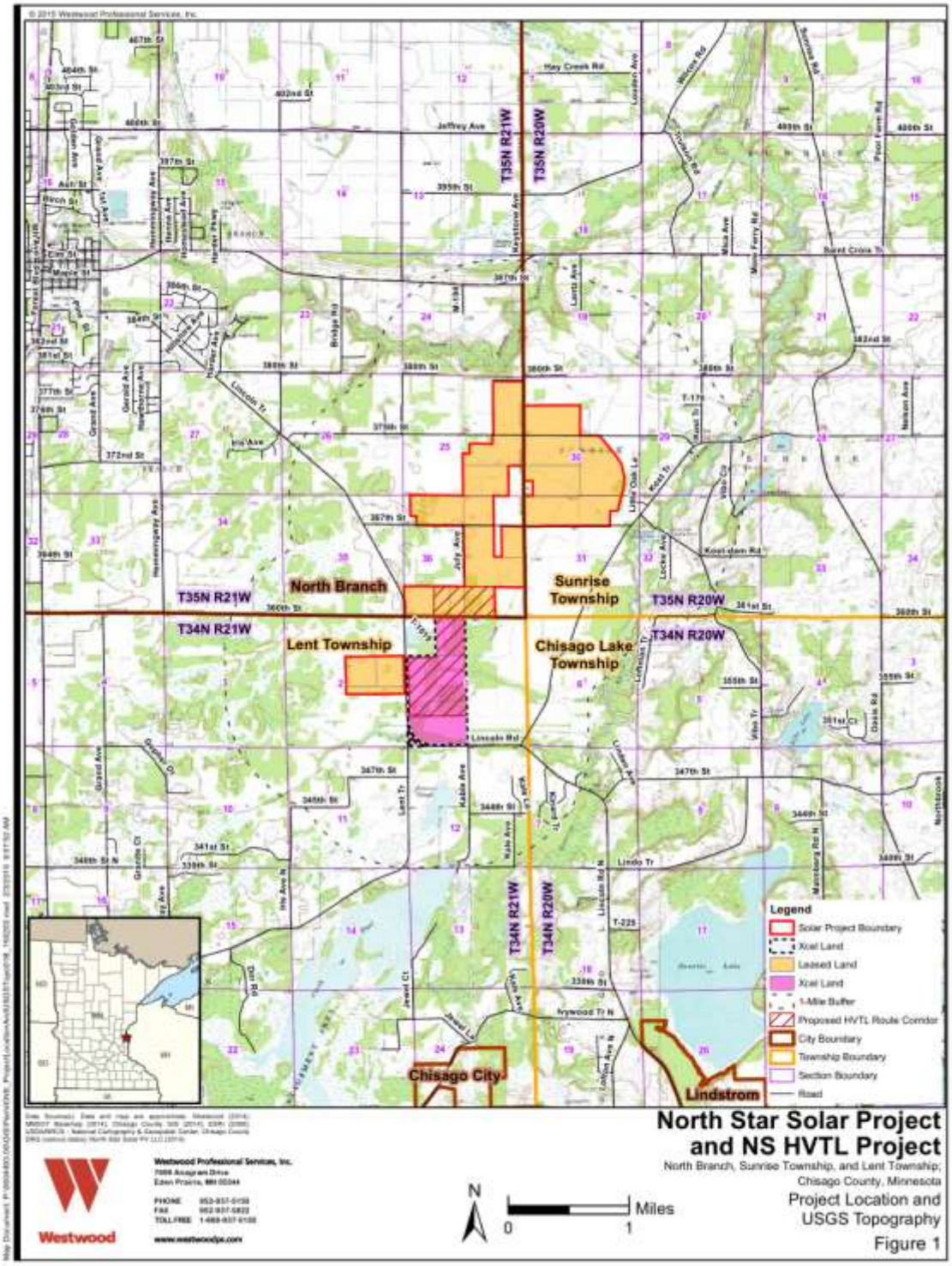
North Star is proposing to build a solar electric generating facility and 115kV HVTL located in the political boundaries of city of North Branch and Lent and Sunrise Townships in Chisago County, Minnesota. **Table 2** summarizes the Section, Township and Range of areas included within the respective political boundaries. **Figure 1** depicts the location of the proposed Solar Project, the Xcel Energy property boundary, and the Route Corridor for the proposed NS HVTL Project.

TABLE 2: Project Location

Table 2. Project Location	
Political Boundary	**Section, Township, Range**
City of North Branch	Sections 25 and 36, Township 35N, Range 21W
Sunrise Township	Sections 30 and 31, Township 35N, Range 20W
Lent Township	Sections 1 (Xcel Property) and 2, Township 34N, Range 21W

The participating landowners are provided in **Appendix B,** Table of Landowners, per Minnesota Rules 7850.1900, subp. 1(Figure 1).

Figure 1: Project Location and USGS Topography

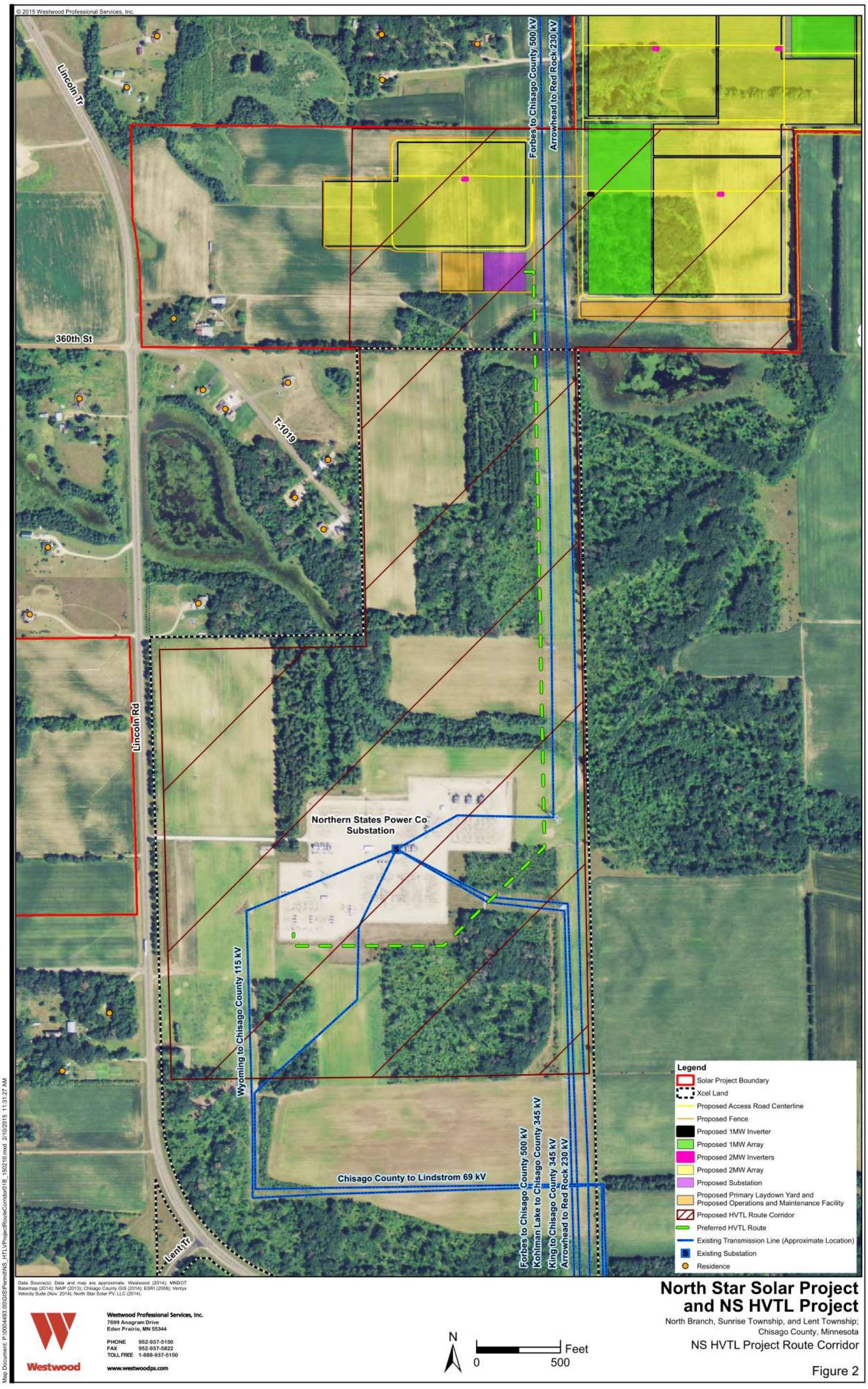


2.2.2 HVTL Route Description

The preferred alignment for the 115 kV NS HVTL Project would extend south from the proposed Solar Project substation and proceed south approximately 0.75 miles to the Xcel Energy Chisago Substation parallel to existing 500 kV and 230 kV transmission lines. Depending on the final easement agreements with Xcel Energy, the NS HVTL Project will be routed around to the southwest corner of the Chisago Substation where the 115kV bus is located.

The Applicant requests a variable route width of between 0.25 and 0.50 miles within which the right-of-way necessary to construct and operate the NS HVTL Project will be located. **Figure 2** depicts the location and extent of the NS HVTL Project Route Corridor and preferred alignment. The final easement width for the NS HVTL Project will be approximately 75 feet wide. The northern portion of the Route Corridor is located on private land under agreements with North Star and the southern portion of the Route Corridor is located on land owned by Xcel Energy.

Figure 2: NS HVTL Project Route Corridor



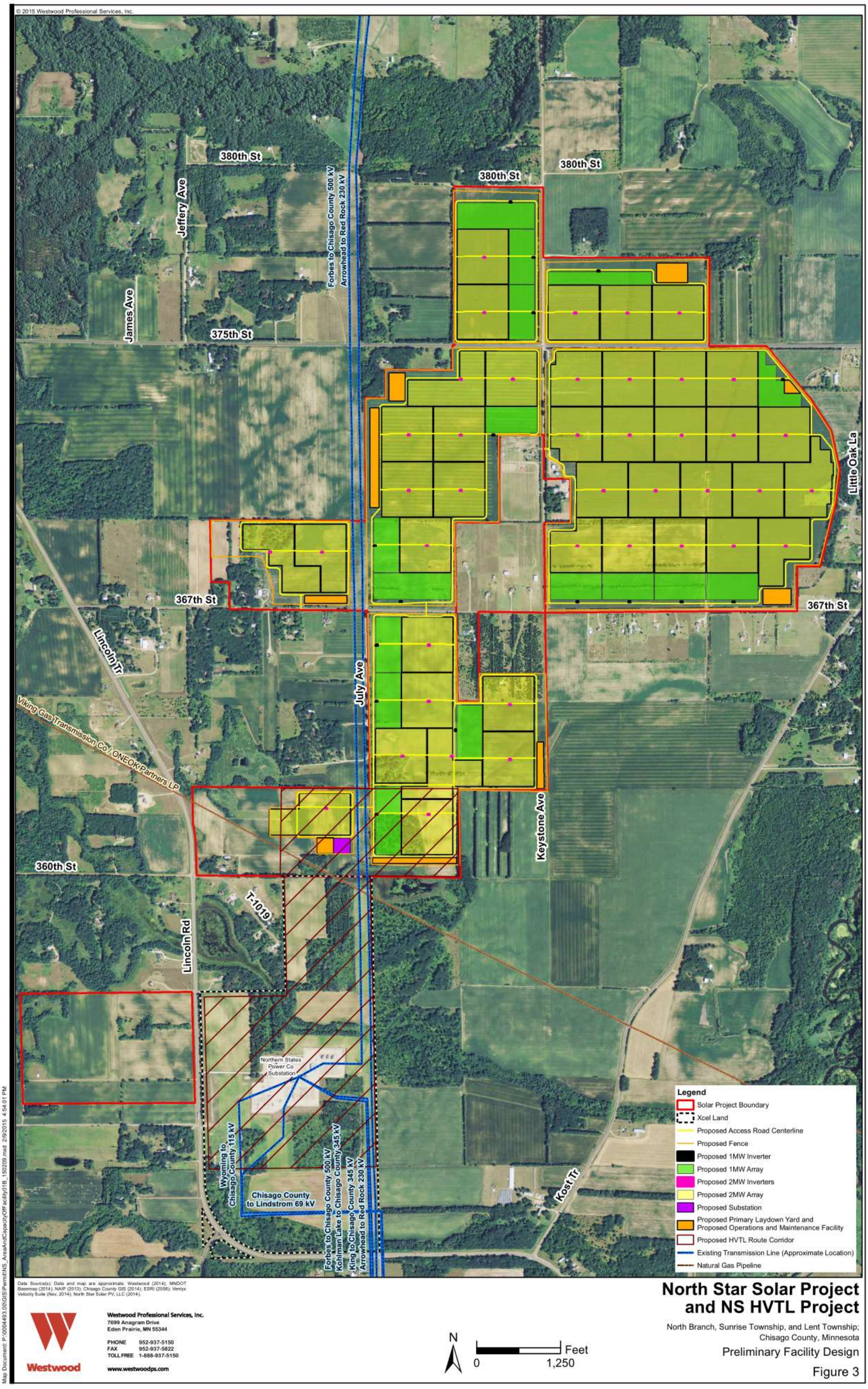
The proposed "Route Corridor" is parallel to two existing transmission easements for a 500kV and 230kV HVTL which are the Northern States Power Forbes to Chisago Substation 500 kV and the Great River -Arrowhead to Red Rock 230 kV. Both existing transmission lines traverse north to south through the western portion of the Solar Project boundary and east of the Xcel Energy Chisago Substation. Other major utilities in the area include a Viking Gas Transmission pipeline that extends through the southern part of the Solar Project boundary.

Ongoing title examinations will identify any additional easements of record that are applicable to the NS HVTL Project. The Applicant will coordinate with Gopher State One Call, Great River Energy, Northern States Power Co., and Viking Gas Transmission Company to avoid any conflicts with buried lines, rights-of-way, and existing easements.

2.2.3 Size and Capacity

North Star has approximately 1,112 acres of private land under control. North Star estimates that 800 acres is necessary to accommodate the final design of the 100 MW-AC Solar Project. Using MISO capacity accreditation methods for non-wind variable generation, the Solar Project is expected to have an accredited capacity of approximately 68%. **Figure 3** depicts the preliminary layout and associated infrastructure of the Solar Project. Additional information on the proposed Facility design and layout can be found in Section 3.1.

Figure 3:Preliminary Facility Design



2.2.4 Prohibited and Exclusion Sites

Minnesota Rules 7850.4400 subp. 1 prohibits power generating plants from being sited in several prohibited areas, including: national parks; national historic sites and landmarks; national historic districts; national wildlife refuges; national monuments; national wild, scenic and recreational riverways; state wild, scenic, and recreational rivers and its land use districts; state parks; nature conservancy preserves; state scientific and natural areas (SNAs); and state and national wilderness areas. The North Star Solar Project and NS HVTL Project are not located within any prohibited areas.

Additionally, Minnesota Rules 7850.4400 subp. 3 require that Applicants avoid siting power generating plants in several exclusion areas unless there is no feasible and prudent alternative. These exclusion areas include: state registered historic sites; state historic districts; state wildlife management areas (WMAs); county parks; metropolitan parks; designated state and federal recreational trails; designated trout streams; and state water trails. The Projects are not located within any exclusion areas.

Subject to certain exceptions, Minnesota Rules 7850.4400, subp. 4 prohibits large energy power generating plants from being sited on more than 0.5 acre of prime farmland per MW of net generating capacity unless there is no feasible and prudent alternative. There is no prime farmland within the Project areas; therefore, the Projects are in compliance with 7850.4000, subp. 4. Project specifics are discussed in section 4.3.1.

2.3 Alternatives Considered but Rejected

Alternatives are not required under alternative permitting process pursuant to 2014 Minnesota Statutes 216E.04 subd.3. No alternatives were considered for the Projects.

2.4 Cost Analysis

Total EPC costs for constructing the Solar Project are estimated to be approximately 180 million dollars. Operating costs for the Solar Project are estimated to be approximately 12 million dollars on an annual basis, including labor, materials, and property taxes. As substantiated in comments submitted by the Minnesota Department of Commerce to Docket No. E002/M-14-162 on December 8, 2014[1], the costs associated with the North Star Solar Project are competitively derived and reasonable. In fact, the Solar Project is associated with significant savings to Minnesota rate payers when valued on a Present Value of Societal Costs basis.

[1] PUBLIC Comments of the Minnesota Department of Commerce, Division of Energy Resources – Docket No. E002/M-14-162 at p. 4 & 5

Total EPC costs for constructing the NS HVTL Project are estimated at approximately five hundred thousand dollars. The primary costs for operation and maintenance of a HVTL line is ongoing maintenance costs, particularly for vegetation removal, and scheduled equipment inspections. Operating and maintenance costs for the first few years of the NS HVTL Project will be nominal because the line will be new and minimal vegetation management should be required.

2.5 Future Expansion

Although the North Star Solar Project and the NS HVTL Project could be expanded in the future, North Star is not currently planning any expansions. If expansion becomes an option in the future, it would necessitate additional PPA's from utilities and site approval by the Minnesota PUC.

3.0 Engineering and Operational Design

3.1 Design

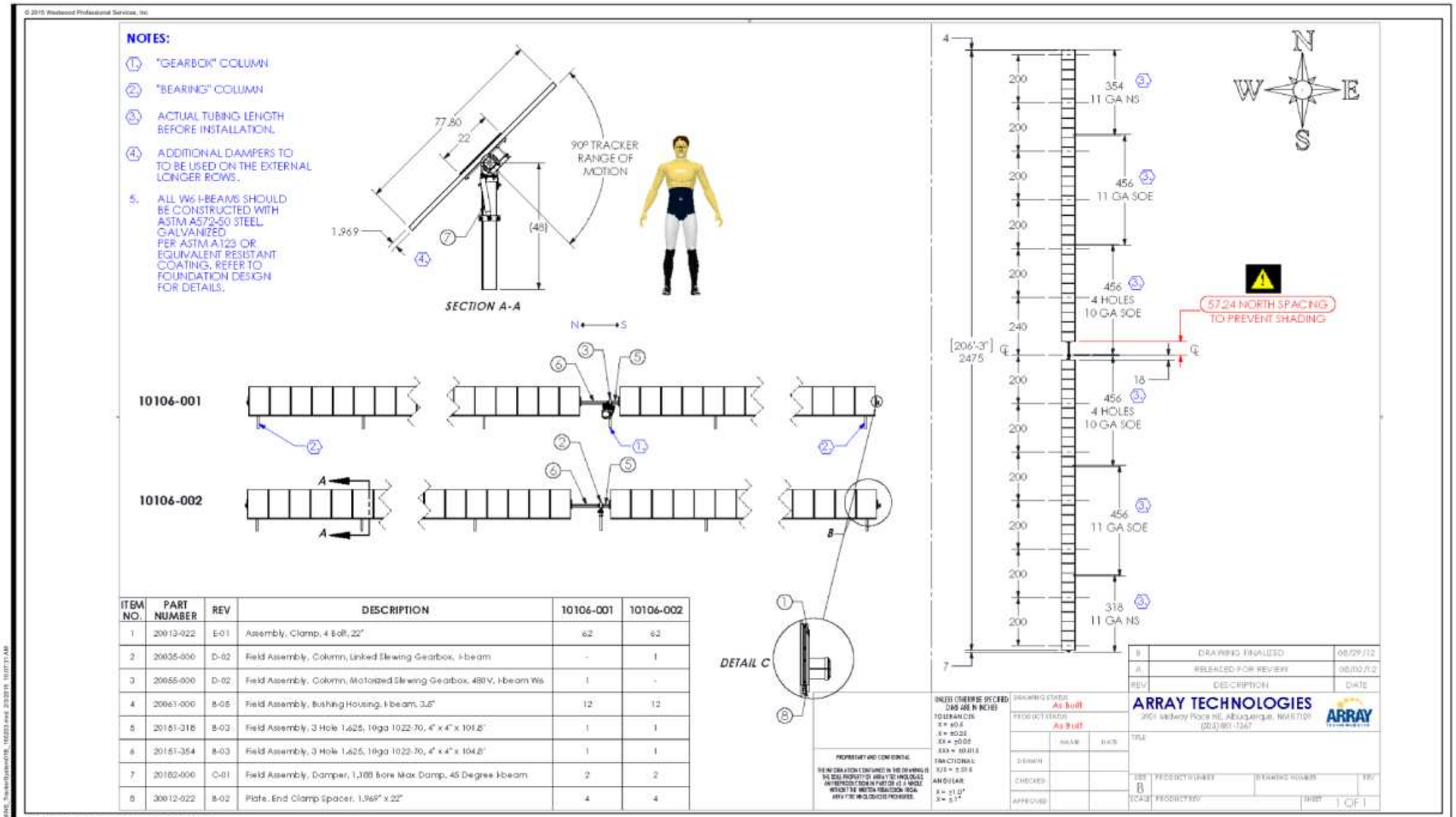
As previously stated, the Solar Project's primary components include PV modules mounted on a linear axis tracking system, centralized inverters, and a Project substation. For descriptive purposes, an individual tracker row is used as a basic unit of the Solar Project. A tracker row is typically made up of 60 PV modules mounted on a flat beam oriented north-south, with a break in the middle where the gear box is located. A typical tracker row is approximately 200 feet long and 6.5 feet wide. The tracker rows, which tilt east-west to follow the sun throughout the day, are connected together in groups of approximately 20 and, depending on the manufacturer, served by a single motor. The 20 tracker rows are aligned east to west parallel to each other, and this grouping typically makes up a "tracker block". Typically, four tracker blocks will make up an "array" which is 1 MW-AC in size and has a centralized inverter. For the North Star Solar Project, a combination of 1MW-AC and 2MW-AC arrays (comprised of eight tracker blocks) will be used in combination to make up the 100MW-AC solar facility. In some cases arrays will be made up of different sized blocks, (i.e. a different number of tracker rows comprising a tracker block) in order to accommodate site constraints. The racking system consists of all the components involved in fastening the modules to the tracker rows, plus the tracker beams, gearboxes, motors, and pier foundations.

To the extent practical, the racking system foundations will be a driven pier and will not require concrete, although some concrete foundations may be required depending upon site specific soil conditions. The balance of plant components includes electrical cables and accessories, conduit, switchgears, step up transformers, SCADA systems, and metering equipment. The Solar Project will include an operations and maintenance (O&M) facility, temporary laydown yards/staging areas, and internal access roads. The Solar Project will include a perimeter fence and will be gated at access points. The Project will be re-vegetated with a low-growing seed mixes (e.g. short grasses or low-growing forbs, low-growing wetland seed mixes (where appropriate) or some other low-growing perennial cover). North Star is working collaboratively with the

Minnesota Department of Natural Resources to maximize the opportunity to manage the vegetation at the Solar Project to the benefit of pollinators and other wildlife. In addition to providing clean, renewable energy, North Star is excited by the opportunity to make the solar facility even more ecologically beneficial.

Figure 3 depicts the preliminary Solar Project design. **Figure 4** shows a typical solar tracker row design.

Figure 4: Typical Tracker Row



Data Source(s): Data and map are approximate. Westwood (2014); Array Technologies (2014).

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North Star Solar Project

North Branch, Sunrise Township, and Lent Township; Chisago County, Minnesota

Typical Tracker Row

Figure 4

3.1.1 Photovoltaic Arrays and Solar Field

The solar array at the Solar Project will consist of the following equipment:

- 1 and 2 MW-AC Solar arrays: Typically comprised of 80 (or 160) tracker rows of PV modules approximately 4 to 6 feet above grade, variance will depend on the final design.
- A racking system.
- Solar inverter skids: A centrally located skid typically supports the inverter and transformer for an array. If an enclosure is used over this equipment it will be approximately 45 feet long by 12 feet wide by 10 feet tall.
- Security fence: Chain-link fence around the perimeter, approximately 8 feet tall, with security wire. North Star is working collaboratively with the Minnesota Department of Natural Resources to explore different fencing designs and materials that can both provide effective site security and minimal impacts to wildlife.
- Weather station: One or more meteorological stations up to approximately 15 feet tall.

The Solar Project will include PV modules mounted on a single-axis tracking system, which will entail the installation of tracker rows on a rack that tracks the sun. When the sun is directly overhead, the PV modules will be at a zero degree angle (level to the ground) and four to six feet off the ground. The tracker rows will follow the sun from approximately 60 degrees east to 60 degrees west through the course of the day. At 60 degrees (tilted to the highest position), the edge of the modules will be about eight to ten feet off the ground. The design will involve no spinning machinery, no thermal cycle, and no water use (except for infrequent panel washing; refer to the Operations and Maintenance discussion in Section 3.3).

The Solar Project will require approximately 500,000 PV modules grouped into a combination of 1 and 2 MW-AC to make up the 100MW-AC solar facility.

3.1.2 Project Substation

The Solar Project substation is proposed for the SE ¼ of the SW ¼ of S. 36, T35N, R21W, which is in the southern part of the Solar Project boundary. The Solar Project substation is estimated to occupy approximately 2 acres of land that will be fenced. The Solar Project substation will include a parking area and will be accessible at all times using the Solar Project access roads. The Solar Project substation will consist of supporting structures for high voltage electrical structures, breakers, transformers, lightning protection, and control equipment according to the specifications of the future Interconnection Agreement with MISO and Xcel Energy. The Solar Project substation location will be graded and the ground surface dressed with crushed rock, and secondary containment areas for the transformer will be installed as necessary. The fenced area of the Solar Project substation will be approximately 125’ x 225’ in size and be surrounded by a minimum 20-foot buffer. Underground 34.5 kV collector lines from the North Star Solar Project will deliver energy to the Solar Project substation. The collector system voltage will then be stepped up from 34.5 kV to 115kV and transmitted to the Xcel

Energy Chisago Substation via the NS HVTL Project. North Star will provide additional detail for the substation that will optimize land use while meeting future Interconnection Agreement commitments.

3.1.3 Balance of Plant Equipment

The arrays will be mounted on metal racks that will be installed on a series of driven piers that will be driven into the soil, or in some cases, installed on a concrete foundation. Each array will contain either an internal access drive or drive linkage and electrical utilities to support the array. Each array will include one or multiple inverters, depending on the size of the array and inverter availability. Inverters will be installed on an inverter skid which is also supported by driven piers. Depending on the type of inverter selected and its ability to weather the elements, the inverter skid may or may not be enclosed.

Inverters convert the direct current ("DC") output of the modules to AC, which is required for delivery to the electrical grid. The modules deliver DC power to the inverters through cabling that will typically be located in an underground trench (approximately two to three feet deep and one to two feet wide). The depth to cables may be deeper for installation under existing utilities or other features requiring avoidance. Each inverter pad will also include one or more transformers to which the inverters will feed electricity. After the inverter has converted the electricity from DC to AC, the electricity is stepped-up via a transformer from low-voltage to medium or intermediate voltage (up to 34.5 kV). The final number of inverters for the Solar Project will depend on the inverter size, inverter and module availability, as well as the final array configuration.

The electricity from all of the inverters and step-up transformers will be collected via underground cables at intermediate voltage to the Solar Project substation. The Solar Project substation will transform the electric voltage from the intermediate level of 34.5kV to the interconnection voltage of 115kV. The electricity will be taken from the Solar Project substation into the grid via the overhead high voltage transmission line contemplated by the NS HVTL Project. North Star anticipates that the line will be built from the Solar Project substation to the Point of Interconnect ("POI") with Xcel Energy at the Chisago Substation. North Star will work collaboratively with Xcel Energy to utilize the existing transmission easement and corridor to site the NS HVTL Project.

3.1.4 Operations and Maintenance Area

The O&M area at the facility may consist of the following components:

- O&M Facility: An O&M facility will be constructed on the site and will provide for both the North Star Solar Project and NS HVTL Project operations and maintenance needs. The final location of the O&M facility has yet to be determined, but it will likely be located near the Solar Project substation to provide easy access to both the Solar Project

and the NS HVTL Project. Construction of the O&M facility will require a building permit from Chisago County and the local responsible government unit (RGU). The buildings typically used for this purpose are 3,000 to 5,000 square feet and house the equipment to operate and maintain the solar facility. The O&M area also includes space for parking and receiving/loading requirements.

- Lighting: During construction, temporary service poles will be approximately 18 feet tall. During operations, lighting will be located near the O&M area, security gates and perimeter areas as necessary for safety and security. If practicable, lighting will be motion-activated and down lit to minimize impacts and effects.

3.1.5 Access Roads/Transportation System

Gravel roads, typically 12 to 20 feet wide, will be constructed within the Solar Project boundary. Roads will be located between some arrays and around the Solar Project perimeter to provide access to the solar equipment and accommodate ongoing maintenance of the Solar Project components. Roads will also provide access for emergency vehicles. Because the final array configuration will not be determined until final design and prior to construction, the locations of these roads shown in Figure 3 are preliminary. North Star will incorporate the input from local landowners and road authorities in the final design considerations.

No upgrades or other changes to existing transportation systems will be necessary during construction or operations of the Projects, with the possible exception of minor field access or driveway changes which may be needed depending on final design. All new access road construction will be occurring within the Solar Project and NS HVTL Route Corridor boundary. North Star will obtain all relevant permits from road authorities relating to access to the Project through public roads, as well as installation of temporary facilities that may be proposed to occupy portions of public road rights of way during the construction process. North Star will also obtain all relevant permits and/or authorizations from road authorities relating to any electric cables and/or feeder lines that may be placed in or across a public road right of way.

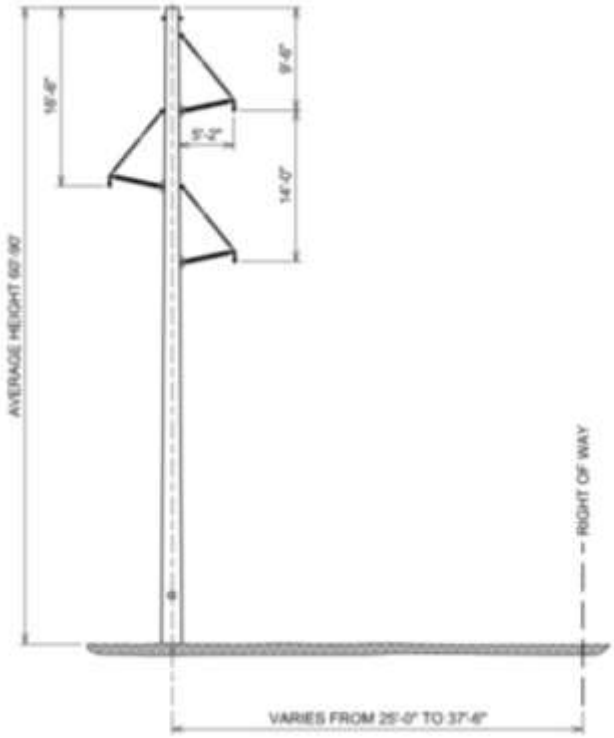
3.1.6 Transmission System

A primary advantage of the North Star Solar Project is its single, strong transmission interconnection solution. The Solar Project will connect directly to the 115kV bus at the Chisago Substation. North Star will construct a 115 kV HVTL from the Solar Project substation near the southern Solar Project boundary to the Chisago Substation. The Applicant will utilize, as much as feasible, the existing Xcel Energy transmission easement and corridor for the NS HVTL Project connecting to the Chisago Substation.

The electricity from all of the inverters and step-up transformers will be collected at the Solar Project substation. The substation will transform the electric voltage from the intermediate level of 34.5kV to the interconnection voltage of 115kV. The electricity will be taken from the Solar

Project substation into the grid via an overhead HVTL described as the NS HVTL Project. The NS HVTL Project will be constructed within an approximately 75-foot right of way located parallel to existing transmission corridors. The line will include approximately 25 wood and/or steel, direct-embedded, braced-post structures approximately 70 feet in height. Typical spans between posts will be 300 to 340 feet. The potential pole design is shown in **Figure 5**.

Figure 5: Typical Pole Structure



The proposed conductor for the NS HVTL Project is a 795 kcmil (thousand circular mils[2]) "Drake" Aluminum Conductor Composite Reinforced ("ACCR"). Geotechnical investigations and final design requirements may warrant the use of special structures to accommodate specific engineering circumstances or to accommodate or avoid sensitive areas and easements. The proposed transmission line will be designed to meet or surpass all relevant local and state codes,

[2] A circular mil is the cross-sectional area of the conductor equal to a circle with a diameter equal to one mil (one-thousandth of an inch)

North American Electric Reliability Corporation ("NERC") standards, and the National Electric Safety Code ("NESC"). Appropriate standards will be met for construction and installation, and all applicable safety procedures will be followed during construction and operation of the transmission line.

TABLE 3: Structural Design for the NS HVTL Project

Table 3. Structural Design for the NS HVTL Project	
Project Component	**Single Circuit 115 kV HVTL**
Typical Structure Type	Braced Post Structure-wood and/or steel monopole
ROW Required (ft)	Approximately 75 feet wide on private land (adjacent to existing transmission ROW)
Conductor	795 kcmil "Drake" ACCR
Foundation	Direct embedded (guying as necessary)
Span Length	300-340 feet
Height (above ground)	Approximately 70
Line Voltage	115 kV

3.1.7 Pipeline System

Minnesota Rules 7850.1900, subp. 1(J) is not applicable to the Solar Project or the NS HVTL Project because no pipelines will be accessed or built as part of the proposal.

3.2 Construction and Restoration

Construction will begin after the necessary permits are received and the electrical interconnection process is finalized. Project construction will begin with workforce mobilization and the initial site preparation work including grading, vegetation removal, and any necessary tree removal. Preliminary engineering analysis indicates that approximately 170 acres of the total Project area (within the proposed fence line) will require grading. A majority of the grading consists of small cut/fill areas approximately 10' by 10' in size. These small cut/fill areas are to reshape slopes to allow for solar modules to be installed within a range 4 to 7-foot off of the ground when at their 0 degree position (horizontal to the ground). The balance of the grading is north of 367th Street to smooth out hills and valleys to allow for a more consistent surface for construction and installation of the solar arrays. A total of 40,000 cubic yards of cut and fill is estimated for the Solar Project overall. Some grading will be required for the Solar Project substation and O&M facility foundations but access roads will be constructed at grade when possible.

In this first phase of construction, general site improvements will be made such as access improvements and preparation of the staging/laydown areas. Temporary staging/laydown areas

will be approximately 2 to 4 acres and located at various locations within the Solar Project boundary. The staging/laydown areas will be used for storage of construction materials and shipped equipment containers, receiving construction deliveries, and temporary parking for Solar Project and NS HVTL Project-related vehicles. Temporary construction offices will also be located onsite during construction.

The solar energy system (solar arrays and collection and distribution systems) will be installed next along with access roads within the arrays. The Solar Project will be constructed in blocks, and multiple blocks will be constructed simultaneously.

The construction of the Solar Project Substation will begin while the final blocks of arrays are being installed. Grading for the substation foundation and future access roads will have already been completed. The grounding grid and underground conduit will be installed in conjunction with the foundations for the transformer, control housing, and high voltage structures. The substation equipment will then be delivered to the site and installed on the prepared foundations. Secondary containment areas for the transformer will be constructed as necessary and finish grading will occur around the substation. The last construction activities associated with the Solar Project substation include stringing the electrical wires, installing the perimeter fence, and placing course, clear crushed rock throughout the interior of the fenced area and three feet outside the fence.

Construction of the NS HVTL Project will take approximately four weeks to complete and will occur around May or June of 2016, about half way through the overall construction timeline. The Applicant will work with an experienced contractor to construct and maintain the HVTL using industry best practices of right-of-way clearing, staging, erecting transmission line structures and stringing transmission lines. Prior to construction, surveyors will stake the construction corridor and pole locations of the approved HVTL alignment. Vegetation will be cleared from the approved right-of-way and according to NESC standards. The Applicant will work to minimize the amount and effect of vegetation clearing activities. A significant amount of clearing and grading is not anticipated for the NS HVTL Project because most of the preferred alignment will likely fall within existing transmission corridors and agricultural fields. Transmission structures will be delivered to the site and stored in laydown areas until they are installed. When it is time to install the structures, the poles will be moved to the staked location utilizing existing access roads for the Solar Project and transmission corridor. Transmission poles are to be direct-embedded and back filled with crushed rock and soil. Spoil from the holes will be removed from the site as necessary or placed according to previous arrangements with the landowner. Spoil will not be placed in any wetlands or other water resources or native or restored habitats. Concrete pole foundations and guy wires will only be used when necessary to address site specific soil conditions and accommodate any turns in the line. Transmission line structures are usually designed to be installed at existing grades and typically areas with less than a ten percent slope are not altered prior to pole installation. Areas with steeper slopes will be graded and/or filled to provide a suitable pad during construction.

The North Star Solar Project and the NS HVTL Project will be constructed in approximately 10 months. Electrical testing and equipment inspections will be conducted prior to Commercial Operations of the 100-MW Solar Project. As portions of the Solar Project near completion, temporary staging and laydown areas will be vacated and disturbed areas will be reseeded and re-vegetated consistent with the Solar Project revegetation and restoration plan. Once installation is complete, the primary staging area will be reduced in size and the O&M facility and associated permanent infrastructure (storage, lighting, etc.) will be constructed. All temporary restroom facilities will be removed.

Onsite construction personnel will consist of laborers, craftspeople, supervisory personnel, construction management personnel, civil and construction trades, as well as administrative and support staff. Typical onsite construction staff levels will depend on the number of concurrent tasks being performed and the phasing of the Projects. Collectively, the North Star Solar Project and the NS HVTL Project will create approximately 200-300 direct construction jobs and construction-related jobs. Additionally, during construction, other non-construction jobs such as engineering and surveying will be needed. North Star used the National Renewable Energy Laboratory's (NREL) Jobs and Economic Development Impacts (JEDI) PV tool to calculate direct and indirect jobs associated with the design, construction, and installation of the Projects. According to the JEDI model, the Projects are estimated to create a total of 1,600 direct and indirect jobs and facilitate approximately $200 million dollars in economic output during the construction and installation phases.

North Star estimates that there will be between 25 and 35 trucks used daily for equipment delivery during construction. Light duty trucks will also be used on a daily basis for transportation of construction workers to and from the site. Typical construction equipment such as scrapers, bulldozers, dump trucks, watering trucks, motor graders, vibratory compactors, and backhoes will be used during construction. Specialty construction equipment that may be used during construction will include:

- Skid steer loader;
- Vibratory pile driver;
- Medium duty crane;
- All-terrain forklift;
- Concrete truck and boom truck;
- High reach bucket truck; and
- Truck-mounted auger or drill rig.

Table 4 provides data on how North Star will schedule the construction process for the Projects.

TABLE 4: Construction Timeline for the Projects

Table 4 Construction Timeline for the Projects	
Date	**Construction Milestone**
01/01/16	Site and Route Permit Approval.
~02/01/16	Construction begins. • Grading and vegetation clearing where necessary, • Preparation of roadways, staging/laydown yards, • Installation of job site trailers, temporary restroom facilities • Installation of foundation piles and racking • Access road construction
05/30/16	Foundations for inverters, transformers, substation, and O&M building.
05/30/16	Installation of transformers and inverters begin
05/30/16	Ongoing restoration/revegetation activities as necessary.
06/01/16	HVTL construction begins
06/30/16	Solar Project substation construction begins
08/01/16	Substantially complete interconnection facilities
08/01/16	Start-up testing of the Solar Project commences.
08/01/16	Renewable Energy Credit Accreditation
11/01/16	Commercial Operation Milestone

After construction, temporarily disturbed areas will be restored. The Site will be graded to natural contours where possible, soil will be loosened as necessary and seeded. Once construction is complete, the permanent access roads will be repaired and dressed as necessary to ensure their long-term function. Erosion control methods during and after construction will depend on the contours of the land, as well as requirements of relevant permits. North Star anticipates that the post-construction clean-up and site restoration activities will last approximately two to four weeks. North Star will work collaboratively with the Minnesota Department of Natural Resources to maximize the opportunity to establish and manage vegetation at the Solar Project to the benefit of pollinators and other wildlife. In addition to providing clean, renewable energy, North Star looks forward to the opportunity to improve the ecological value of the underlying land during the expected service life of the Solar Project.

3.2.1 Operation and Maintenance

The expected service life of the proposed solar facility is 25 to 30 years, and North Star estimates that the North Star Solar Project will result in up to 12 full-time equivalent (FTE) permanent positions to operate and maintain the facility. A maintenance plan will be created for the North Star Solar Project and the NS HVTL Project to ensure the ongoing performance of the solar

facility, including a scheduled check of all Facility components and a predictive maintenance approach for the devices subjected to derating/degradation. Derating/degradation refers to the known process of components losing some efficiency or otherwise degrading over the expected useful life. Like all technology and physical components, a certain amount of this is unavoidable, but North Star will plan for and maintain the Projects to ensure the maximum performance over the expected life of the components. Once construction is complete, O&M staff will be present on a daily basis, with potentially more personnel on site at intervals associated with the maintenance schedule in Section 3.2.5. The main scheduled activities are described in more detail in Sections 3.2.1 through 3.2.5.

All maintenance activities will be performed by qualified personnel and will be performed during the day to the extent that they do not disrupt energy production. Activities that have the potential for substantial noise generation will be performed during the day to minimize impacts in areas where residents are present. It may be desirable to perform certain maintenance functions after sunset to minimize loss of power production. The operation of the North Star Solar Project and the NS HVTL Project is partitioned to a certain extent to minimize the effect of unscheduled maintenance on overall energy production of the Solar Project. As an example, if a module needs repair, that particular section of the array can be disconnected from the array by opening the combiner box circuit. The module can then be replaced and the combiner box circuit closed. Because of the way the Facility is designed, a temporary shutdown such as this would result in only a minimal loss of production capability during that time. Additionally, the power production circuits are separated from the tracking circuits. This allows the PV modules to operate during an unscheduled outage of the tracker system.

The O&M facility will provide for the storage of spare parts and tools. The Solar Project will have the capability to be remotely operated through a real-time SCADA control system for most operational functions. All the monitored data will be managed by North Star or contracted out to a qualified subcontractor. Onsite operations will be performed from time to time as required for certain resets and troubleshooting activities.

3.2.2 Equipment Inspection

Inspection of the main equipment will occur at regular intervals, including:

- PV modules: visual check of the modules, tracking system and surrounding grounds to verify the integrity of the modules and tracking structure, the presence of animals and nests, etc.

- Inverters, transformer and electrical panels: visual check of the devices including the connection equipment and the grounding network. Check for presence of water and dust;

- Electrical check: measurement of the insulation level and dispersion. Check of the main switches and safety devices (fuses);

- Noise: check of abnormal sounds;

- Cabling and wiring: visual check of electrical lines (where visible) and connection box to verify its status;

- HVTL: routine visual inspection of the transmission line, structures and components;

- Solar Project substation: frequent visual inspections and scheduled inspections, tests, and maintenance.

3.2.3 Performance Monitoring

Performance monitoring of the Solar Project will consist of a real-time and continuous assimilation of the data acquired by the onsite meteorological station, energy meter and SCADA system. Operators will be notified immediately of any abnormalities allowing for timely corrective action.

3.2.4 Facility Maintenance

Housekeeping of the North Star Solar Project and the NS HVTL Project will include access road maintenance, vegetation maintenance including mowing and noxious weed control, fence and gate inspection, lighting system checks, and PV module washing (if required; minimal to no washing is anticipated to be needed at the Solar Project).

3.2.5 Frequency

Table 5 provides more information on the anticipated frequency of the operations and maintenance tasks associated with the Solar Project. The table represents the anticipated preliminary frequency of these tasks; the actual frequency of inspection may vary based on project demands and experience with performance of certain components and Solar Project features.

TABLE 5: Solar Project Maintenance Frequency

Table 5 Solar Project Maintenance Frequency	
Photovoltaic Field	
PV modules visual check	*Every two months*
Wirings and junction boxes visual check	*Quarterly*
PV strings measurement of the insulation	*Quarterly*
PV strings and string boxes faults	*Weekly (1)*
PV module washing	*No regular washing planned, (only as conditions warrant)*
Grass cutting *(if necessary at site)*	*Once in Spring, once in Summer*
Electric Boards	
Case visual check	*Twice Yearly*
Fuses check	*Twice Yearly*
Surge arresters check	*Twice Yearly*
Torque check	*Twice Yearly*
DC voltage and current check	*Twice Yearly*
Grounding check	*Twice Yearly*
Case visual inspection	*Every two months*
Air intake and filters inspections	*Every two months*
Inverter	
Conversion stop for lack of voltage	*Twice Yearly*
AC voltage and current check	*Twice Yearly*
Conversion efficiency inspection	*Twice Yearly*
Datalogger memory download	*Twice Yearly*
Fuses check	*Twice Yearly*
Grounding check	*Twice Yearly*
Torque check	*Twice Yearly*
Support Structures	
Visual Check	*Twice Yearly*
PV modules torque check on random sample	*Twice Yearly*

HTVL Maintenance

Transmission lines are designed to last for decades and typically only require moderate maintenance. The estimated service life of the NS HVTL Project is 40 years; however, the HTVL may not be completely retired and instead could potentially be integrated into the transmission system over time. The principle operating and maintenance cost for an HVTL is vegetation management and the cost of inspections. Visual inspections are typically performed quarterly to ensure the line is fully functional and clear of vegetation. Pole by pole inspections are typically done annually. Actual maintenance costs will be dependent landscape setting, necessary vegetation management, structure type, and storm damage.

3.3 Decommissioning and Repowering

At the end of commercial operations, North Star will be responsible for removing all of the solar arrays, HVTL, and associated facilities. At the end of the Site and Route Permit terms, North Star reserves the right to extend operations of the North Star Solar Project and the NS HVTL Project by applying for an extension of the permits, if necessary, and continuing operation. Should North Star decide to continue operation, a decision would be made as to whether the Projects would continue with the existing equipment or to upgrade the facilities with newer technologies.

Decommissioning of the Solar Project and the NS HVTL Project at the end of their useful life, approximately 25 to 30 years, would include removing the solar arrays, inverters, transformers, above-ground portions of the electrical collection system, fencing, lighting, substation, HVTL and the O&M facility. Standard decommissioning practices will be utilized, including dismantling and repurposing, salvaging/recycling, or disposing of the solar energy improvements, and restoration. A detailed decommissioning plan will be developed and approved by the Commission before construction of the North Star Solar Project and the NS HVTL Project commences.

North Star expects to implement the following decommissioning plan:

Timeline

Decommissioning is estimated to take approximately 6 months to complete and the decommissioning crew will ensure that all equipment is recycled or disposed of properly.

Financial Resource Plan

North Star will be responsible for all costs to decommission the North Star Solar Project and the NS HVTL Project and associated facilities. Because of the uncertainty in predicting future decommissioning costs and salvage values, North Star will review and update the original decommissioning plan approved by the Commission at a point approximately half way through the life of the Solar Project, or at the 12^{th} or 15^{th} year. At that time North Star will either enter into a surety bond agreement and create an escrow account or create a reserve fund for decommissioning purposes. North Star will abide by the applicable permit condition(s) and ensure the Projects are decommissioned in accordance with the Site and Route Permits. In addition to any MN PUC permit conditions, North Star has included an obligation to decommission the Solar Project and NS HVTL Project components in the applicable real estate agreements.

Removal and Disposal of Project Components

The removal and disposal details of the Solar and NS HVTL Project components are found below.

Modules: Modules will be inspected for physical damage, tested for functionality, and removed from racking. Functioning modules will be packed and stored for reuse. Non-functioning

modules will be sent to the manufacturer or a third party for recycling or other appropriate disposal method.

Racking, Poles, and Fencing: Racking, poles, and fencing will be dismantled/removed and will be sent to a metal recycling facility. Holes will be backfilled.

Wire: Aboveground wire will be sent to a facility for proper disposal and/or recycling. Belowground wire will be cut back to a depth of two to three feet and abandoned in place.

Conduit: Aboveground conduit will be disassembled onsite and sent to a recycling facility.

Junction boxes, combiner boxes, external disconnect boxes, etc.: The boxes will be sent to an electronics recycler.

Inverter: Inverters will be sent to the manufacturer or an electronics recycler as applicable and functioning parts will be reused.

Concrete pad(s): Material from concrete pads will be removed and sent to a concrete recycler.

Computers, monitors, hard drives, and other components: Computer components will be sent to an electronics recycler and functioning parts will be reused.

NS HVTL Project: Conductor is removed first, then any anchors or guy wires used are removed. Materials from the anchors or guys more than four feet in the ground will be abandoned in place. Poles are removed next and holes are subsequently back-filled. Topsoil material will be replaced as appropriate for ongoing land use. HVTL conductor, anchors, guy wires, and pole structures will be recycled and disposed of as indicated above for the applicable material.

Restoration/Reclamation of Facility

After all equipment is removed, the Project Area will be restored to a condition reasonably similar to its pre-construction state. Holes will be filled, concrete pads, and all other equipment will be removed and disposed of as described above. Unless requested by the landowner, permanent access roads constructed for the Projects will be removed. North Star reserves the right to extend operations at the termination of the Site and Route Permit term. Any extended operations will require an approved extension of the Site and Route Permit by the PUC.

4.0 ENVIRONMENTAL INFORMATION

4.1 Environmental Setting

The North Star Solar Project and NS HVTL Project are located within the political boundaries of the city of North Branch and Lent and Sunrise Townships in Chisago County, Minnesota. The

Xcel Energy land adjacent to the Solar Project boundary is within Lent Township. The Solar Project is located on approximately 1,112 acres of land, north of and adjacent to the Xcel Energy Chisago Substation. According to the National Resources Conservation Service (NRCS) Land Resource Region (LRR) and Major Land Resource Area (MLRA) (USDA 2006), this area is in the Wisconsin and Minnesota Thin Loess and Till Southern Part of the Northern Lake States Forest and Forage Region. This MLRA is in the southern part of the conifer-hardwood forest and is characterized by ground moraines, outwash plains, valley trains, glacial lakes, and sandstone hills. The area is generally flat, agricultural land with some wooded and wetland sections. The Sunrise River runs within a mile to the east of the eastern portion of the Projects; in addition, an unnamed creek runs within a mile of the western periphery, and an unnamed, intermittent creek runs between the planned Solar Project and the Chisago Substation.

4.2 Human Settlement

4.2.1 Public Health and Safety

The Solar Project Area and NS HVTL Project Route Corridor have a low population density with limited potential to affect the public safety. The Projects will be designed in compliance with company, local, state, and NESC standards regarding installation of facilities and standard construction practices. Information will be gathered to coordinate with all local emergency services including law enforcement, fire departments, ambulance services and 911. Established company and industry safety procedures will be followed during and after installation of the Solar Project and NS HVTL Project. This will include clear signage during all construction activities. The Solar Project will be fenced for security and to limit access by the public.

Electric and Magnetic Fields

Electro Magnetic Fields (EMF) are invisible lines of electrical and magnetic force that surround an electrical device and occur where an electric conductor exists with an electrical current flowing through it. The electrical field extends from the energized conductors to other nearby objects. These effects decrease rapidly as the distance from the conductor increases. Examples of such conditions include high-voltage transmission lines, distribution (feeder) lines, substation transformers, house wiring, and electrical appliances. EMF's also occur in nature, in the form of the earth's direct current magnetic field and in electric and magnetic fields generated during lightning storms.

A system of 34.5kV electrical collection lines will be installed two to three feet below ground as part of the Solar Project While a certain amount of EMF will be generated from this system, it should not substantially increase public exposure to EMF. Inverters and transformers will be setback from residences to the extent possible. Based on the preliminary plan, the closest residence to a Solar Project inverter is approximately 400 feet. By siting these facilities in this manner, EMF related to the Solar Project will be maintained at background levels. Risks associated with EMF are further minimized because all of the collection lines will be underground.

The NS HVTL Project is a 115 kV overhead HVTL approximately one mile in length that will physically interconnect the Solar Project to the Xcel Energy Chisago Substation. While the NS HVTL Project is likely to generate more EMF than from the Solar Project collection system, overall it should not substantially increase public exposure to EMF. The NS HVTL will also be set back from residences to the extent possible. Based on the location of the preferred route, the closest residence to the NS HVTL is approximately 1,100 feet. The maximum electric field associated with the NS HVTL Project, measured at one meter above ground, is calculated to be 0.739 kV/m (115 kV single circuit). As depicted in **Table 6,** the EMF levels associated with the NS HVTL Project decrease significantly with increased distance from the source.

TABLE 6. Calculated Electric Fields for Proposed Transmission Line Designs

Table 6. Calculated Electric Fields (KV/M) for Proposed 115 KV Transmission Line Designs (One meter above ground)										
Structure Type	**Maximum Operating Voltage (kV)**	**Distance to Proposed Centerline**								
		-300'	**-200'**	**-100'**	**-50'**	**0'**	**50'**	**100'**	**200'**	**300'**
Braced Post 115kV Steel or Wood Pole Single Circuit	121	0.006	0.013	0.056	0.200	0.739	0.188	0.058	0.015	0.007

The magnetic field (MF) around the proposed transmission line was also calculated for the NS HVTL Project and is shown in **Table 7.** The peak magnetic field values are calculated at a point directly under the transmission line and where the conductor is closest to the ground. The same method is used to calculate the magnetic field at the edge of the right-of-way and beyond. The magnetic field profile data show that magnetic field levels decrease rapidly as the distance from the centerline increases. The magnetic field produced by the transmission line is dependent on the current flowing on its conductors. Actual current flow on the line will vary, so magnetic fields will be less than peak levels during most hours of the year.

TABLE 7. Calculated Magnetic Flux Density for Proposed Transmission Design

Table 7. Calculated Magnetic Flux Density (Milligauss) for Proposed 115 kV Transmission Line Design (one meter above ground)										
Structure Type	Maximum Operating Voltage (kV)	Distance to Proposed Centerline								
		-300'	-200'	-100'	-50'	0'	50'	100'	200'	300'
Braced Post 115kV Steel or Wood Pole Single Circuit	115	0.56	1.24	4.48	13.20	42.47	14.71	4.80	1.29	0.58

Considerable research has been conducted throughout the past three decades to determine whether exposure to power-frequency (60 hertz) magnetic fields (MF) causes biological responses and health effects. Epidemiological and toxicological studies have shown no statistically significant association or weak associations between MF exposure and health risks. Public health professionals have also investigated the possible impact of exposure to EMF upon human health for the past several decades. While the general consensus is that electric fields pose no risk to humans, the question of whether exposure to magnetic fields can cause biological responses or health effects continues to be debated.

In 1999, the National Institute of Environmental Health Sciences ("NIEHS") issued its final report on "Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields" in response to the Energy Policy Act of 1992 (Olden, 1999). The NIEHS concluded that the scientific evidence linking MF exposures with health risks is weak and that this finding does not warrant aggressive regulatory concern. However, because of the weak scientific evidence that supports some association between MFs and health effects and the common exposure to electricity in the United States, passive regulatory action, such as providing public education on reducing exposures, is warranted.

In 2007, the World Health Organization ("WHO") concluded a review of the health implications of electromagnetic fields. In this report, the WHO stated:

> Uncertainties in the hazard assessment [of epidemiological studies] include the role that control selection bias and exposure misclassification might have on the observed relationship between magnetic fields and childhood leukemia. In addition, virtually all of the laboratory evidence and the mechanistic evidence fail to support a relationship between low-level (extremely low frequency (ELF)) magnetic fields and changes in biological function or disease status. Thus, on balance, the evidence is not strong enough to be considered causal, but sufficiently strong to remain a concern. (*Environmental*

Health Criteria Volume N°238 on Extremely Low Frequency Fields at p. 12, WHO (2007)).

Also, regarding disease outcomes, aside from childhood leukemia, the WHO stated that:

> A number of other diseases have been investigated for possible association with ELF magnetic field exposure. These include cancers in children and adults, depression, suicide, reproductive dysfunction, developmental disorders, immunological modifications and neurological disease. The scientific evidence supporting a linkage between ELF magnetic fields and any of these diseases is much weaker than for childhood leukemia and in some cases (for example, for cardiovascular disease or breast cancer) the evidence is sufficient to give confidence that magnetic fields do not cause the disease. (Id. at p.12.)

Furthermore, in their "Summary and Recommendations for Further Study" WHO emphasized that:

> The limit values in [ELF-MF] exposure guidelines [should not] be reduced to some arbitrary level in the name of precaution. Such practice undermines the scientific foundation on which the limits are based and is likely to be an expensive and not necessarily effective way of providing protection. (Id. at p. 12).

Although WHO recognized epidemiological studies indicate an association on the range of three to four mG, WHO did not recommend these levels as an exposure limit but instead provided: "The best source of guidance for both exposure levels and the principles of scientific review are international guidelines." Id. at pp. 12-13. The international guidelines referred to by WHO are the International Commission on Non-Ionizing Radiation Protection ("ICNIRP") and the Institute of Electrical and Electronic Engineers ("IEEE") exposure limit guidelines to protect against acute effects. Id. at p. 12. The ICNIRP-1998 continuous general public exposure guideline is 833 mG and the IEEE continuous general public exposure guideline in 9,040 mG. In addition, WHO determined that "the evidence for a causal relationship [between ELF-MF and childhood leukemia] is limited, therefore exposure limits based on epidemiological evidence is not recommended, but some precautionary measures are warranted." Id. at 355-56.

WHO concluded that:

> given both the weakness of the evidence for a link between exposure to ELF magnetic fields and childhood leukemia, and the limited impact on public health if there is a link, the benefits of exposure reduction on health are unclear. Thus, the costs of precautionary measures should be very low. Provided that the health, social and economic benefits of electric power are not compromised, implementing very low-cost precautionary procedures to reduce exposure is reasonable and warranted. (Id. at p. 13).

Wisconsin, Minnesota and California have all conducted literature reviews or research to examine this issue. In 2002, Minnesota formed an Interagency Working Group ("Working Group") to evaluate the body of research and develop policy recommendations to protect the public health from any potential problems resulting from HVTL (High Voltage Transmission Lines) EMF effects. The Working Group consisted of staff from various state agencies and published its findings in a White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options in September 2002, (Minnesota State Interagency Working Group, 2002). The report summarized the findings of the Working Group as follows:

> Research on the health effects of EMF has been carried out since the 1970s. Epidemiological studies have mixed results – some have shown no statistically significant association between exposure to EMF and health effects, some have shown a weak association. More recently, laboratory studies have failed to show such an association, or to establish a biological mechanism for how magnetic fields may cause cancer. A number of scientific panels convened by national and international health agencies and the United States Congress have reviewed the research carried out to date. Most researchers 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. (Id. at p. 1.)

The Public Service Commission of Wisconsin ("PSCW") has periodically reviewed the science on MFs since 1989 and has held hearings to consider the topic of MF and human health effects. The most recent hearings on MF were held in July 1998. Recently, January 2008, the PSC published a fact sheet regarding MFs. In this fact sheet the PSC noted that:

> Many scientists believe the potential for health risks for exposure to EMF is very small. This is supported, in part, by weak epidemiological evidence and the lack of a plausible biological mechanism that explains how exposure to EMF could cause disease. The magnetic fields produced by electricity are weak and do not have enough energy to break chemical bonds or to cause mutations in DNA. Without a mechanism, scientists have no idea what kind of exposure, if any, might be harmful. In addition, whole animal studies investigating long-term exposure to power frequency EMF have shown no connection between exposure and cancer of any kind. (EMF-Electric & Magnetic Fields, PSC (January 2008)).

The MPUC, based on the Working Group and World Health Organization findings, has repeatedly found that "there is insufficient evidence to demonstrate a causal relationship between EMF exposure and any adverse human health effects." In the Matter of the Application of Xcel Energy for a Route Permit for the Lake Yankton to Marshall Transmission Line Project in Lyon County, Docket No. E-002/TL-07-1407, Findings of Fact, Conclusions of Law and Order Issuing a Route Permit to Xcel Energy for the Lake Yankton to Marshall Transmission Project at p. 7-8 (Aug. 29, 2008); See also, In the Matter of the Application for a HVTL Route Permit for the Tower Transmission Line Project, Docket No. ET-2, E015/TL-06-1624, Findings of Fact, Conclusions of Law and Order Issuing a Route Permit to Minnesota Power and Great River

Energy for the Tower Transmission Line Project and Associated Facilities at p. 23 (Aug. 1, 2007)("Currently, there is insufficient evidence to demonstrate a causal relationship between EMF exposure and any adverse human health effects.").

The MPUC again confirmed its conclusion regarding health effects and MFs in the Brookings County – Hampton 345 kV Route Permit proceeding ("Brookings Project"). In the Brookings Project Route Permit proceeding, Applicants Great River Energy and Xcel Energy and one of the intervening parties provided expert evidence on the potential impacts of electric and magnetic fields on human health. The administrative law judge (ALJ) in that proceeding evaluated written submissions and a day-and-half of testimony from these two expert witnesses. The ALJ concluded: "there is no demonstrated impact on human health and safety that is not adequately addressed by the existing State standards for [EF or MF] exposure." In the Matter of the Route Permit Application by Great River Energy and Xcel Energy for a 345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota, Docket No. ET-2/TL-08-1474, ALJ Findings of Fact, Conclusions and Recommendation at Finding 216 (April 22, 2010 and amended April 30, 2010). The MPUC adopted this finding on July 15, 2010. In the Matter of the Route Permit Application by Great River Energy and Xcel Energy for a 345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota, Docket No. ET-2/TL-08-1474, Order Granting Route Permit (September 14, 2010).

Mitigative Measures

All Project facilities will be designed, constructed, and operated in compliance with company, local, state, and NESC standards and guidelines. This will include appropriate signage and fencing of the solar facility. Risks associated with EMF as a result of the Solar Project are anticipated to be negligible. By burying electrical collection lines in accordance with state setback standards, EMF will be reduced to background levels and no additional mitigative measures are proposed.

The NS HVTL Project will also be designed, constructed, and operated in compliance with company, local, state, and NESC standards and guidelines. The proposed transmission line will be equipped with protective devices to safeguard the public from the transmission line if an accident occurs, such as a structure or conductor falling to the ground. As no residences are located in the Route Corridor, possible exposure to EMF from the NS HVTL will be negligible and no additional mitigative measures are proposed.

4.2.2 Displacement

No displacement of residential homes or businesses is anticipated as a result of the Projects. **Appendix C-1**, Infrastructure and Human Settlement**,** depicts distances to homes within one half mile of the North Star Solar Project and NS HVTL Route Corridor boundaries (per preliminary design).

The buildings located within the Solar Project boundary include one residence and several agricultural support buildings. No displacement impact is anticipated to the one residence within the Solar Project boundary as it is located outside of the proposed perimeter fencing of the Solar Project. No impacts to other structures are currently planned. Structures are shown in Appendix C-1, and also discussed in Section 2.2.4, Prohibited and Exclusion Sites.

No displacement of residential homes or businesses is anticipated as a result of the NS HVTL Project. **Appendix C-1,** Infrastructure and Human Settlement**,** depicts distances to homes within one half mile of the Route Corridor (per preliminary design). No buildings are located within the route corridor or within ½ mile of the proposed corridor.

Mitigative Measures

No impacts to residential homes or businesses are anticipated from either the Solar Project or the NS HVTL Project; therefore, no mitigative measures are proposed.

4.2.3 Noise

Noise is defined as unwanted sound. It may be made up of a variety of sounds of different intensities, across the entire frequency spectrum. Noise is measured in units of decibels (dB) on a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more "weight." The A-weighted scale (dB(A)) is used to reflect the selective sensitivity of human hearing. This scale puts more weight on the range of frequencies that the average human ear perceives, and less weight on those that we do not hear as well, such as very high and very low frequencies.

Common sound sources within an agricultural and/or rural environment include, but are not limited to, sound from farm equipment such as tractors and combines, sound generated from traffic on roadways, sounds from birds, and wind rustling through the vegetation. Typically, the ambient acoustic environment of a rural or agriculturally-oriented community has equivalent continuous sound levels (Leq, which is an energy- based time-averaged noise level) ranging from 30 dB(A) to 60 dB(A).

The background noise in the vicinity of the Project facilities is typically a result of farming equipment/operations, wind, and vehicles. A comparison of typical noise-generating sources is outlined in **Table 8**.

TABLE 8: Decibel Levels of Common Noise Sources

Table 8.
Decibel Levels of Common Noise Sources

Sound Pressure (dBA)	Noise Source
140	Jet Engine (at 25 meters)
130	Jet Aircraft (at 100 meters)
120	Rock and Roll Concert
110	Pneumatic Chipper
100	Jointer/Planer
90	Chainsaw
80	Heavy Truck Traffic
70	Business Office
60	Conversational Speech
50	Library
40	Bedroom
30	Secluded Woods
20	Whisper

SOURCE: "A Guide to Noise Control in Minnesota" Minnesota Pollution Control Agency (2008).

The Minnesota Pollution Control Agency (MPCA) has the authority to adopt noise standards pursuant to Minnesota Statute Section 116.07, subd. 2. The adopted standards are set forth in Minnesota Rule Chapter 7030. The MPCA standards require A-weighted noise measurements. Different standards are specified for daytime (7:00 AM to 10:00 PM) and nighttime (10:00 PM to 7:00 AM) hours. The noise standards specify the maximum allowable noise volumes that may not be exceeded for more than 10 percent of any hour (L10) and 50 percent of any hour (L50). Household units, including farmhouses, are included in Land Use Classification 1. **Table 9** shows the MPCA State noise standards.

TABLE 9: State Noise Standards – Hourly A-Weighted Decibels

Table 9. State Noise Standards				
	Daytime		Nighttime	
Land Use Classification	L10	L50	L10	L50

Residential	NAC-1	65	60	55	50
Commercial	NAC-2	70	65	70	65
Industrial	NAC-3	80	75	80	75

During construction, noise will be emitted by the construction vehicles and equipment, including pile drivers for installation of piers. The amount of noise will vary based on what type of construction is occurring at the North Star Solar Project and the NS HVTL Project on a given day. These noise impacts will be temporary.

The main source of noise from the Solar Project during operation will be from the inverters, and to a lesser extent from the transformers and rotation of the tracking system. Additionally, foul weather (rain, fog, snow and hoar frost) can lead to discharges on HVTLs that result in a broadband crackling noise or a low humming tone at twice the frequency of the transmission frequency. All electrical equipment will be designed to National Electrical Manufacturer Association (NEMA) Standards. North Star plans to use AE 1000NX, or equivalent, inverters. These inverters produce 65 dBA at their source. According to preliminary design (Appendix C-1, Infrastructure and Human Settlement), the only occupied home located within the Solar Project boundary is located approximately 250 feet west of planned equipment, and no inverter, transformer, or transmission line would be closer than 20 feet from a property line. Because the inverters are centrally located within the solar arrays, the noise levels from the Solar Project equipment are not expected to be discernible from background noise levels at homes in the vicinity. Additionally, other high HVTLs exist within the planned transmission Route Corridor; so it is not expected that noise from the proposed NS HVTL Project or the Solar Project would significantly alter existing noise conditions.

North Star will confirm during final design that MPCA noise limits will be met at sensitive receptors.

Mitigative Measures

During construction, North Star plans to limit construction to daylight hours. No noise impacts during operation are anticipated; therefore, no additional mitigation measures are proposed.

4.2.4 Radio and Television Interference

There are four FM radio towers and two microwave towers are located within one mile of the Project Boundary. Corona from transmission line conductors can generate electromagnetic "noise" at the same frequencies that radio and television signals are transmitted. This noise can cause interference with the reception of these signals depending on the frequency and strength of the radio and television signal. Tightening loose hardware on the transmission line usually resolves the problem.

If radio interference from transmission line corona does occur, satisfactory reception from AM radio stations previously providing good reception can be restored by appropriate modification of (or addition to) the receiving antenna system. AM radio frequency interference typically occurs immediately under a transmission line and dissipates rapidly within the right-of-way to either side.

FM radio receivers usually do not pick up interference from transmission lines because:

- Corona-generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (88-108 Megahertz); and
- The excellent interference rejection properties inherent in FM radio systems make them virtually immune to amplitude type disturbances.

A two-way mobile radio located immediately adjacent to and/or behind a large metallic structure (such as a steel tower) may experience interference because of signal-blocking effects. Movement of either mobile unit so that the metallic structure is not immediately between the two units should restore communications. This would generally require a movement of less than 50 feet by the mobile unit adjacent to a metallic tower.

Television interference is rare but may occur when a large transmission structure is aligned between the receiver and a weak distant signal, creating a shadow effect. Loose and/or damaged hardware may also cause television interference. If television or radio interference is caused by or from the operation of the proposed facilities in those areas where good reception is presently obtained, North Star will inspect and repair any loose or damaged hardware in the transmission line, or take other necessary action to restore reception to the present level, including the appropriate modification of receiving antenna systems if deemed necessary.

Mitigative Measures

If radio or television interference occurs due to the North Star Solar Project or the NS HVTL Project, the Applicants will work with the affected landowner/business to restore reception to pre-Project quality.

4.2.5 Aesthetics

The North Star Solar Project will be constructed on a portion of the 1,112 acre site. The Solar Project area, which is predominantly agricultural land, will be developed into a solar facility consisting of arrays of solar PV modules and approximately one mile of high voltage transmission line on approximately 70-foot-high transmission poles. This land use will create a new view shed on the landscape. The solar arrays will be made of low profile modules approximately four to six feet above grade. Perimeter fencing will potentially consist of chain-link fence topped with security wire; however, additional options will be explored that have a

different aesthetic while still meeting safety and construction requirements of the Solar Project. The photo in **Figure 6** shows a typical solar farm.

Figure 6: Typical Solar Farm (Photograph)

Photo courtesy of Array Technologies, Inc.

Glint and glare from the modules are reduced by using dark colors to absorb rather than reflect light. During manufacturing, modules are coated to reduce light reflection. Typically solar modules only reflect 2 percent of light.

The North Star Solar Project will be visible from public roads and adjacent parcels, but will be fairly unobtrusive and not visible from long distances due to its low profile. Additionally, because other HVTL lines exist within the proposed transmission Route Corridor; it is not expected that the addition of the proposed NS HVTL Project will affect existing visual conditions along this corridor. Most of the adjacent parcels are agricultural land, but mixed with wood lots, open space, and large-lot residential development. The visual effect will depend largely on the perceptions of the observers across these various landscapes.

Mitigative Measures

It is expected that there will be minimal visual impacts from the North Star Solar Project and the NS HVTL Project. Locations where visual impacts may potentially be the greatest are adjacent to residences and along public roads. The Applicant will work with adjacent landowners to identify concerns and, if concerns are raised, work to achieve a mutually beneficial resolution. Such measures may include strategic plantings to obscure perimeter fencing and components of the Solar Project. Along public roads, the Applicant will work to preserve existing mature tree lines to screen perimeter fencing and Solar Project components where practical and appropriate.

4.2.6 Socioeconomics

The North Star Solar Project and the NS HVTL Project are expected to produce beneficial socioeconomic effects to the area. The North Star Solar Project is expected to generate more than $300,000 of property tax annually. It is also expected to support 250-300 jobs during the construction and installation phases, and up to a dozen permanent jobs during the operations phase. Temporary construction jobs within Chisago County will generate indirect economic benefits as employees spend their income on local goods and services and pay local sales tax. According to the Jobs and Economic Development Impact Model provided by the National Renewable Energy Laboratory, the Solar Project could create as much as 1,600 direct and indirect jobs and facilitate approximately $200 million of economic output during the construction and installation phases. As an operating facility, North Star Solar will annually generate $2.5 million in economic output by supporting approximately 25 indirect jobs and distributing nearly $1.5 million in direct earnings.

Adverse impact to socioeconomics will be limited to the temporary loss of the agricultural production on the land currently farmed. However, these temporary losses are negated by the payments to the landowners from the Project.

Mitigative Measures

No measures to mitigate socioeconomic impacts are needed because the North Star Solar Project and the NS HVTL Project are forecasted to achieve a positive benefit. Owners of land where the Solar Project will be constructed have entered into lease or purchase contracts with North Star and will be compensated for the use of the land based upon these agreements.

4.2.7 Cultural Values

Cultural values include those perceived community beliefs or attitudes in a given area, which provide a framework for community unity. According to the U.S. Census Bureau (2013), the population of Chisago County derives from a diverse ethnic heritage; however, a majority of the reported ethnic backgrounds are of European origin. In Chisago County, German heritage is the most prevalent, comprising 29% of the total population. This is followed by "unclassified" and Swedish with each representing about 12% of the population. The region immediately surrounding the Project has cultural values tied to the area's strong German and Swedish heritage, and the agricultural economy. Cultural representation in community events appears to be tied to geographic features (such as nearby lakes), seasonal events, national holidays, and municipal events as well as ethnic heritage. Examples of regional cultural events include the annual winter festivals of Winterfest in North Branch and the Celebration of the Lakes near

Lindstrom, Ki Shi Saga Days in Chisago City, and Karl Oskar Days in Lindstrom which celebrates the Swedish heritage of the region. Construction of the proposed Solar Project and the NS HVTL Project are not expected to conflict with the cultural values of the area.

Mitigative Measures

No impacts to cultural values are anticipated; therefore, no mitigative measures are proposed.

4.2.8 Recreation

Recreational opportunities in Chisago County primarily include fishing, boating, hunting, camping, hiking, bicycling, cross-country skiing, snowmobiling and golfing. Information from the Minnesota Department of Natural Resources (DNR) and Chisago County was reviewed to identify recreational resources within and near the North Star Solar Project and NS HVTL Project areas. Only one recreational resource, a snowmobile trail, was found within the Solar Project area. The North Branch Sno Drifters Trail, as it is named where it crosses the Solar Project area, is located on a combination of private land and within public road rights-of-way. Within the Solar Project, the Sno Drifters Trail is located within the public right-of way along 367th Street for approximately 0.90 miles, then turns south in the Keystone Avenue right-of-way for approximately 0.25 miles. The trail does not cross any private land within the Solar Project boundary.

There are no other designated public (federal, state, or local) recreational lands within the Project boundaries other than the snowmobile trail. Also, no lakes with public access are located in the Solar Project boundary or the NS HVTL Route Corridor. Within one mile of the Project boundaries are three county parks and two Wildlife Management Areas (WMA). **Appendix C-2**, Natural Resources – Managed and Recreation Areas, shows the recreation areas within one mile of the Projects.

Within one mile of the Solar Project boundary and the NS HVTL Route Corridor are portions of the Janet Johnson WMA and the Carlos Avery WMA. WMAs are part of Minnesota's outdoor recreation system and represent a large portion of the Minnesota DNR's wildlife management efforts in the state. The areas were established to protect certain lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses (MnDNR 2011).

Within one mile of the Project boundaries are three county parks including: Checkerboard County Park, Kost Dam County Park and Chisago County Park.

According to the Minnesota Department of Natural Resources Recreational Compass, there are no state forests, national forests, or national wildlife refuges within close proximity to the Project boundaries. Additionally, there are no state-owned Off-Highway Vehicle (OHV) trails and no DNR Scientific & Natural Areas identified within a mile of the Project boundaries (DNR 2014).

Mitigative Measures

The North Star Solar Project and the NS HVTL do not expect to encroach onto public lands; therefore, mitigation measures are not needed. Because the North Branch Sno Drifters Trail is entirely within public rights-of-way where it crosses the Solar Project area, no impacts to the trail are anticipated beyond minimal visual impacts for the approximately 1.25 miles that it travels through the Solar Project area. Perimeter fencing for the Solar Project will not impact the trail as it will be located within parcel boundaries and outside of the public rights-of-way. For these reasons, no mitigative measures are proposed.

4.2.9 Public Services and Infrastructure

Utilities and Infrastructure

Chisago County provides electricity and police services to the F area where the North Star Solar Project and the NS HVTL Project are proposed. The Amelund Fire and Rescue Department provides fire protection services to the Project areas. The Projects are located in an area where private wells and septic systems are used at rural residences. Review of the Minnesota Department of Health (MDH) County Well Index identified only three wells within the Solar Project boundary, two are indicated as irrigation wells and no use was identified for the third well.

Electrical distribution lines are located along roadways within the Solar Project area and two high voltage transmission lines (500 kV and 230 kV) cross the Projects north to south along July Avenue. Limited, temporary impacts may occur during interconnection of the Solar Project Substation via the NS HVTL Project to the Chisago Substation, but these outages will be of short duration. A natural gas pipeline crosses the southern part of the Solar Project area near the north property boundary of the Xcel Energy land. Encroachment agreements will be executed and utility locations will be marked prior to construction to avoid impacts from construction and operation activities.

Four FM radio towers and two microwave towers are located within one mile of the Solar Project boundary and the NS HVTL Project Route Corridor.

A preliminary title research survey was conducted to identify utility easements and other siting concerns; the results of this study can be found in **Appendix D,** Preliminary Title Research Results. This location information will be incorporated into the final design to avoid and minimize impacts to the existing utilities.

Roadway

Access to the Projects will be via existing township, county or state roads. With the limited possible exception of minor field access or driveway changes which may be needed depending on final design, no changes to existing roadways will occur. North Star will secure all necessary local permits for road access and other ancillary aspects of the Projects. During the construction phase, temporary impacts are anticipated on some public roads within the vicinity of Projects, primarily through additional traffic and the potential for slow-moving construction vehicles.

Construction traffic will use the existing county and state roadway system to access the Projects and deliver construction materials and personnel. The estimated maximum construction workforce is expected to generate approximately 40 additional vehicle trips per day associated with materials delivery, with some additional light truck trips delivering workers to the Projects during construction. The Federal Functional Classification (FFC) system groups roadways into classes according to their function and the type of service they provide. For purposes of comparison, the functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day, or Annual Average Daily Traffic (AADT). Since many of the area roadways have AADTs that are well below capacity, this increased traffic may be perceptible to area residents, but the slight increase in volume is not expected to affect traffic function. Slow-moving construction vehicles may also cause delays on smaller roads, similar to the impact of farm equipment during planting or harvest. However these delays should be minimal for the relatively short construction delivery period.

After construction is complete, traffic impacts during the operations phase of the Projects will be minimal. A small maintenance crew driving through the area in pickup trucks on a regular basis will monitor and maintain the Project as needed, but traffic function will not be impacted as a result.

Other Transportation Infrastructure

There are no railroads that cross the Solar Project or NS HVTL Route Corridor, so rail traffic will not be affected. According to the Federal Aviation Administration (FAA), there are two FAA-registered airports located within three nautical miles of the Solar Project and the NS HVTL Project: Al's Due North Airport, located west of the Solar Project, and the Bowers Airport, located west, south-west of the Solar Project.

North Star has used the FAA's Notice Criteria screening tool to determine if further aeronautical study or FAA filing is needed. The screening tool indicated that worst-case height and elevation scenarios (900 feet elevation, 100' structure) at the portion of the Project areas closest to these airports do not exceed Notice Criteria. As a result, no 7460-1 forms need to be filed for the North Star Solar Project or NS HVTL Project (transmission line poles are anticipated to be 70' in height). Results from this screening tool can be found in **Appendix A-3**.

A preliminary glare analysis was conducted using the Sandia National Laboratories' Solar Glare Hazard Analysis Tool ("SGHAT") in compliance with glare hazard analyses near airports (78 FR 63276) (**Appendix A-4,** Sandia National Laboratories' Solar Glare Hazard Analysis). The results indicate that the Solar Project will create, at various times throughout the year, a low potential for temporary after-image glare at the southern airport, and no potential for glare at the northern airport. According to the FAA, low potential for temporary after-image is acceptable for pilots.

Mitigative Measures

North Star will follow appropriate procedures to shut down private water wells located within the Solar Project boundary. These wells will likely be abandoned in place. North Star will work with affected landowners to install new wells outside of the Solar Project as needed. Final design will minimize and avoid impacts to underground utilities; if conflicts are unavoidable, North Star will coordinate with the utility to develop an approach to reroute or otherwise protect the utility. Underground utilities will be marked prior to construction start.

In general, the profile of the solar arrays will be within FAA height limits, and as noted in Section 4.2.5, the solar panels are designed to absorb rather than reflect light, therefore minimizing risk from glare. The results of the SGHAT glare analysis indicated a low potential for after-image from the Solar Project. No additional mitigation is anticipated to be necessary or proposed.

4.2.10 Land Use and Zoning

North Star is coordinating with local and county officials regarding the North Star Solar Project and the NS HVTL Project; however, it should be noted that per Minnesota Statutes 216E.10, subdivision 1, the Site Permit and Route Permit are the only site approvals required for construction of the Projects. A Site Permit and Route Permit supersedes and preempts all zoning, building, or land use rules, regulations, or ordinances put in place by regional, county, local and special purpose governments, although the review by the Commission will take local land use into consideration.

Zoning information found on the Chisago County interactive GIS tool shows that the Solar Project and the NS HVTL Route Corridor property is currently zoned approximately 51% agricultural, and 49% rural residential (**Appendix C-3**, Zoning**)**. Portions of the Solar Project within the jurisdictional boundary of the city of North Branch are zoned Rural Residential and Agricultural. Portions of the Projects within Lent Township are zoned Rural Residential and parts within Sunrise Township are zoned Agricultural. The Chisago County Zoning Map also indicates the Sunrise River Overlay District outside of the Project areas but within one mile of the Solar Project and NS HVTL Route Corridor boundaries. The Chisago County and city of North Branch Zoning Ordinances provide for the development of Solar Energy Farms. Both Ordinances explicitly surrender oversight of solar facilities greater than 50 MW in capacity to the Minnesota PUC and the Site Permit process.

Components of the Solar Project and the NS HVTL Project may be located in areas where there is a planned extension of water, sewer, or other services. Construction of the Projects would not preclude the future orderly extension of these services across property under North Star's control as these extensions would likely be accomplished by utilizing existing public rights-of-way which will not be impacted by the Projects.

The Solar Project will change the land use from agricultural and rural residential to industrial (solar power plant) in the parcels where the Solar Project is built. The NS HVTL Project will not result in in a conversion of land use and agricultural activities can continue. After the useful life of the Solar Project, the current agricultural land use could be restored by removing the solar facility. While there is very little land in the Solar Project boundary and Route Corridor that is currently used as residential, land use may also be restored to residential use after the useful life of the Solar Project. The Solar Project and the NS HVTL Project are not anticipated to preclude current or planned land use on any of the adjacent parcels; and upon decommissioning and removal of the Solar Project and the NS HVTL Project, the affected parcels may be returned to the existing agricultural use or transitioned to other planned land uses.

Mitigative Measures

All of the parcels where the proposed Solar Project is located are currently in agricultural land use, except for one residence outside of the solar Project perimeter fence, minimizing the impacts to commercial or residential development. Reversion to the existing rural residential and agricultural land use can occur after the Solar Project is decommissioned. Because no permanent land use impacts are anticipated, no additional mitigative measures are proposed.

4.3 Land-Based Economies

4.3.1 Agriculture

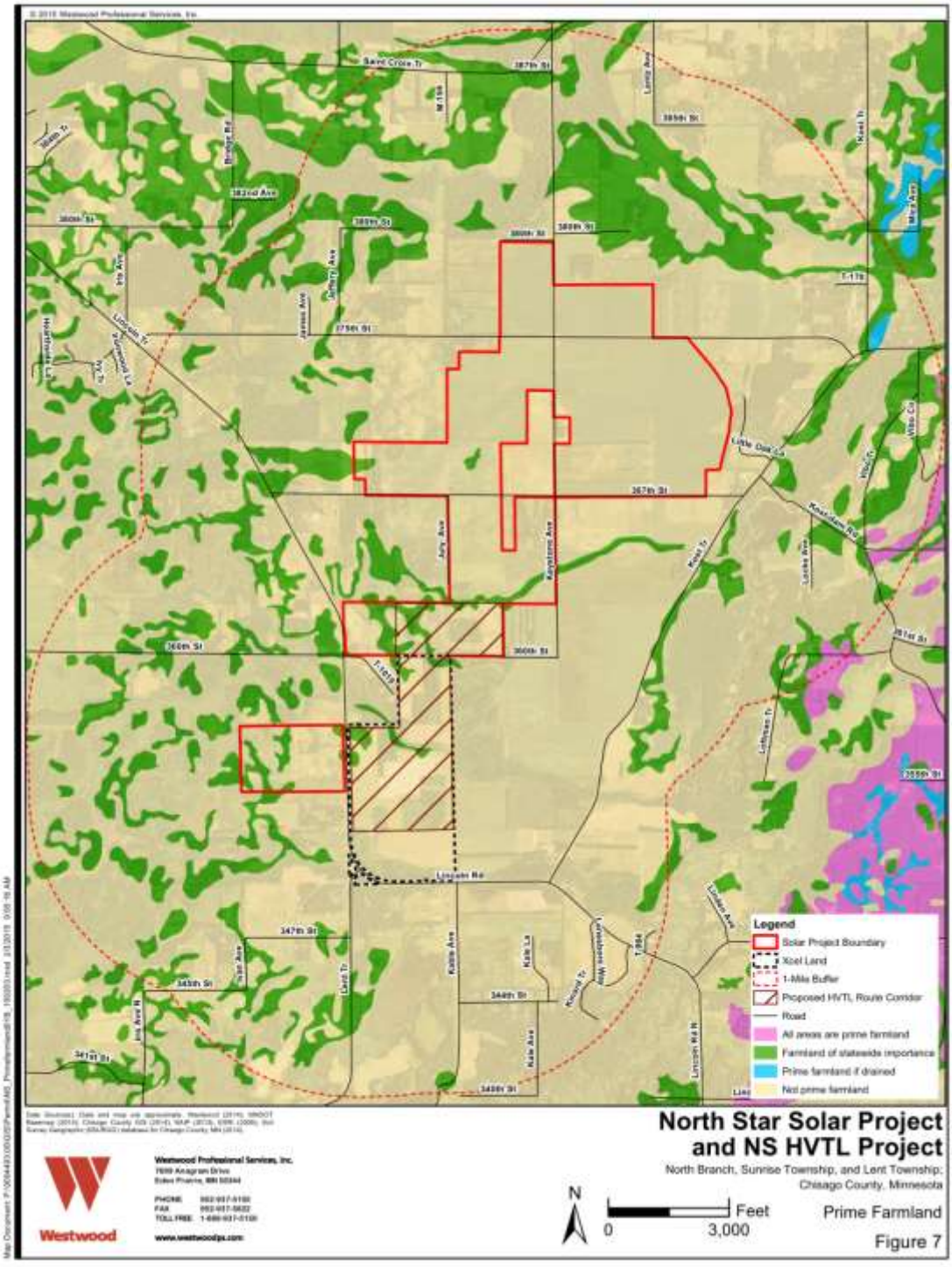
Agricultural use encompasses approximately 90 percent of the land within the Project areas, including the proposed NS HVTL Project Route Corridor. A breakdown includes row crop production as the major use with 87 percent. Corn and soybean production are the major crops grown. The remaining land is primarily used for forage production and pasture land which account for the remaining 3 percent according to USDA Cropland Data (2013) and the National Land Cover Database (NLCD) data. Chisago County has 113,744 acres of farmland. The Solar Project will temporarily remove less than one percent of the total farmland in the county from production (Census of Agriculture, 2013).

There are no prime farmland soils within the Solar Project boundary or NS HVTL Project Route Corridor as shown in **Figure 7**, Prime Farmland. This Figure also shows the 63 acres, or approximately 6 percent of the Solar Project area with soils designated as farmland of statewide

importance. Grading activities associated with the Solar Project with the most potential to affect topsoil conditions is likely to be the spot grading for the solar arrays, and construction of access roads, O&M facilities, and the Solar Project Substation. In general, because the Solar Project will result in a temporary land use without significant grading, minimal loss of these soils or opportunity for future agricultural production is expected when the Solar Projects is decommissioned. According to participating landowners, there are no existing agricultural drain tile systems within the Solar Project area.

The NS HVTL is not expected to result in a significant loss of farmland soils or agricultural activities because the NS HVTL Project will not result in a temporary land conversion and agricultural activities can continue.

Figure 7: Prime Farmland



Mitigative Measures

Payments will be made by North Star to the owners of the land directly used for the Projects. These payments will replace the revenue which would have been generated if agricultural production were continued by the landowners.

Measures to mitigate top soil removal include limiting removal to areas designated for spot grading and construction of roads and structures. Soil impacts from the transmission line installation are expected to be minimal and may include augured soil pole bases with no footings for the majority of the proposed line. Concrete footings for individual "turning poles" may be installed when turning the line through an angle. Impacts to soils will be further mitigated by incorporating erosion control measures during and following construction. Installation activities will implement erosion and sediment control best management practices (BMPs) outlined in the Stormwater Pollution Protection Plan (SWPPP) that will be specifically prepared for the Projects. The SWPPP will also include a discussion on top soil and compaction management. During the operating life of the Solar Project, erosion control will be further accomplished by establishment of a perennial vegetative cover under the solar arrays and installation of gravel roads with culverts (as necessary) to redirect concentrated surface water. These actions will preserve the soils in place and will likely result in less soil erosion than is typical with row crop agricultural activities.

4.3.2 Forestry

The North Star solar Project and the NS HVTL Project are located mainly on agricultural land. While some minimal impacts to wooded areas are planned, North Star is aware of no forested areas within the vicinity of the Projects where trees are harvested for economic purposes. The primary tree cover within the Project areas is associated with shelterbelts, homesteads, and waterways. No economically significant forestry resources will be affected by the Projects.

Mitigative Measures

No impacts to forestry resources are anticipated; therefore, no mitigative measures are proposed.

4.3.3 Tourism

Tourism in the region draws people to participate in activities such as festivals, fairs, markets, celebrations and outdoor recreation like fishing, boating, camping, bicycling, cross-country skiing, wineries and golfing. Most tourism activities will be the same as recreational activities. The St. Croix River as well as the several lakes in Chisago County offer ample destinations and outdoor recreational opportunities. As described in Section 4.2.7, the North Branch Sno Drifters snowmobile trail crosses the Solar Project area. Aside from a change to the viewscape along an approximately 1.25-mile segment of the trail, the Project will not impact this tourism activity.

Mitigative Measures

Because all Solar Project and NS HVTL Project facilities will be located on private lands, there will be no direct impacts to existing recreational facilities and tourism activities that typically generate revenue for the local community. Because no negative impacts to tourism and community benefits are anticipated aside from those noted above, no mitigative measures are proposed.

4.3.4 Mining

According to the Minnesota Department of Transportation (MNDOT) County Pit Maps, there are no mines located within the Solar Project boundary or the NS HVTL Project Route Corridor areas. Four inactive gravel mines are located within one mile of the Project boundaries; three are located north of the Solar Project boundary and the other is located near the intersection of Lincoln Avenue North and 347th Street, southeast of the Xcel property boundary. Because all of the noted mines are located outside of the Project boundaries, construction and operation of the Solar Project and NS HVTL Project are not expected to affect the current or future use of these mining areas.

If new mining operations are opened on adjacent parcels, dust from those operations could settle on the panels, potentially affecting the output. However, mining operations would be anticipated to follow appropriate dust control measures, minimizing this potential. Panel washing frequency could also be adjusted.

Mitigative Measures

No impacts to mining operations are anticipated; therefore, no mitigative measures are proposed.

4.4 Archaeological and Historical Resources

In September 2014, a review of records was conducted at the Minnesota State Historic Preservation Office (SHPO) and the Office of the State Archaeologist (OSA) for the Solar Project area and the NS HVTL Route Corridor and within a one-mile buffer surrounding these boundaries. No cultural resource surveys had been previously conducted in the location of the Solar Project or the NS HVTL Route Corridor and no previously recorded archaeological sites were recorded within one-mile of these boundaries.

The background literature search indicated eleven historic structures are documented within one mile of the Solar Project boundary. These include six farmsteads or houses, two bridges, one dam, one church, and one railroad bed. None of these resources are located within the Solar Project boundary.

The background research also indicated that seven historic structures are documented within one mile of the NS HVTL Route Corridor. These include six farmsteads or houses, and a railroad bed. These seven resources are all included in the eleven found within one-mile of the Solar Project boundary. One of these resources, the railroad bed, is located on the Xcel property within the NS HVTL Route Corridor. The railroad bed (SHPO Inventory Number CH-LEN-009) was previously recommended as not eligible for the National Register of Historic Places (NRHP) by ARCH3 in 2007.

In October 2014, a Phase I archaeological survey of the Solar Project and NS HVTL Route Corridor was completed. Three historic archaeological sites were identified during the survey, all within the Solar Project boundary. The archaeological sites are all historic farmsteads and were given site designations of NS-HIS1 (21CH0133), NS-HIS2 (21CH0134), and NS-HIS5 (21CH0135) (Appendix C-4, Cultural Resources). The proposed construction activities for the Solar Project may have the potential to impact the sites. In the event that an impact to these sites is proposed, North Star will determine the nature of the impact and consult with the SHPO prior to construction. No historic archaeological sites were identified within the NS HVTL Route Corridor.

Mitigative Measures

North Star will attempt to avoid impacts by the Solar Project on identified archeological and historic resources to the extent possible. If impacts to an identified archaeological resource are anticipated, the integrity and significance of such resources will be addressed in terms of the site's potential eligibility to the NRHP. Also, an assessment of the Solar Project's potential impacts upon the resource will be undertaken. If such resources are found to be eligible for the NRHP, adverse effects to the resource will be avoided by adjustment of the Solar Project layout when possible. If avoidance is not possible, appropriate mitigative measures will be developed in consultation with Minnesota SHPO, the State Archaeologist, and consulting American Indian communities. While avoidance would be a preferred action, mitigation for Solar Project-related impacts on NRHP-eligible archaeological and historic resources may include additional documentation through data recovery.

No impacts are anticipated to identified archeological and historic resources by the NS HVTL Project; therefore, no mitigative measures are proposed. Potential impacts to identified archeological and historic resources within the Solar Project boundary will be mitigated as noted above.

Should previously unknown archaeological resources or human remains be inadvertently encountered during the North Star Solar Project or NS HVTL Project construction and/or operation, the discoveries will be reported to the SHPO. With regard to a discovery of human remains, procedures would be followed to ensure that the appropriate authorities would become involved quickly and in accordance with local and state guidelines.

4.5 Natural Environment

4.5.1 Air

Minnesota's air quality is generally good and Minnesota has a good record of complying with federal air quality standards. Minnesota air quality has been improving for most pollutants. Much of this decline in pollution is attributed to lowered emissions from major facility or "point sources" from enforcement of the Clean Air Act and subsequent amendments. In recent years, because of an increased understanding of the health effects of certain pollutants, air quality standards have become stricter and acceptable thresholds for some pollutants have been lowered including the daily fine particle standard, the ozone standard, and lead standards. However, according to the MPCA Air Quality in Minnesota: 2013 Report to the Legislature, the majority of air pollutants of most concern today come from smaller, widespread sources that are not regulated in the way power plants and factories are and include things such as cars, trucks, construction equipment and residential wood and garbage burning.

Currently all areas of Minnesota are attainment areas except for an area in Dakota County. The Project Area presently meets federal air quality standards.

Minor temporary effects on air quality are anticipated during construction of the proposed Solar Project and the NS HVTL Project as a result of exhaust emissions from construction equipment and other vehicles, and from fugitive dust that becomes airborne during dry periods of construction activity.

The magnitude of air emissions during construction is influenced by weather conditions and the type of construction activity. Exhaust emissions, primarily from diesel equipment, will vary with the phase of construction. Adverse effects on the surrounding environment are expected to be negligible because of the short and intermittent nature of the emission and dust-producing construction phases.

Mitigative Measures

BMPs will be used during construction and operation of the Project to minimize dust emissions. Practices may include sprinkling haul and access roads and other exposed dust producing areas, containment of excavated material, protection of exposed soil, soil stabilization, and treating stockpiles to control fugitive dust. A SWPPP will be developed prior to construction that will include BMPs to minimize the potential for fugitive dust.

4.5.2 Geology, Soils and Groundwater

Soils, underlying bedrock formations and other geologic features were identified during desktop evaluations using applicable GIS layers, e.g., NRCS. Susceptible geologic features, including

sinkholes, shallow limestone formations, unconfined/shallow aquifers, or karst conditions are not present in the vicinity of the Facility.

The soils at the Solar Project and the NS HVTL Project locations are typically fine and loamy fine sands suited for the existing agricultural production (**Appendix C-5,** NRCS Soils). Most of the site is on level to nearly-level topography, which is consistent with the current agricultural production. Small areas of hydric soils are present at facility locations where wetlands are present. There are no known springs or seeps at the site.

Among wells in the MDH database within one mile of the Projects, average depth to groundwater ranges from 15 to 40 feet. According to the MDH information, no Wellhead Protection Areas are located within the Project boundary. Review of the MDH County Well Index identified only three wells within the Solar Project boundary, two are irrigation wells and a third with no identified use (**Appendix C-1**, Infrastructure and Human Settlement).
Impacts to groundwater from the construction or operation of the Projects are not anticipated. The direct-embedded piers will be installed to a depth of approximately 5 to 12 feet below the soil surface and foundations for the O&M facilities, transmission poles and substation are not anticipated to extend beyond that depth. The Solar Project and NS HVTL Project disturbances are generally anticipated to be limited to the ground surface and upper soil column. It is anticipated that there will be minimal contact with the surficial water table, and no contact with deeper groundwater or aquifers. Wells identified within the Solar Project boundary will likely be capped and abandoned in place according to applicable regulation. The Projects will not impact Wellhead Protection Areas as there are none identified within the Solar Project boundary or NS HVTL Project Route Corridor.

Impacts to soils will occur during both the construction and operational stages of the Projects.
Grading impacts will primarily be associated with the construction of foundations for the O&M facilities, substation, and access roads, and spot grading for the solar arrays and inverter skids. Impacts to soils will also occur associated with transmission pole installation for the NS HVTL Project. Because the Projects are located on relatively level existing agricultural fields, minimal grading will be necessary for the Projects overall. In addition, some soil compaction may result from the installation of the direct-embedded piers for the solar arrays and inverter skids. Soil replacement and/or amendments may be necessary in limited areas of the Projects, especially in hydric soil units near wetlands, or other areas with soil limitations.

During operation of the Solar Project, ongoing soil compaction could occur from the use of access roads. This impact is expected to be negligible and confined to the road bed. Overall, the Solar Project is expected to reduce the potential for erosion because permanent vegetation will be established over the Solar Project area that is occupied by solar arrays, in contrast to the amount of exposed soils typical of row crop agricultural production. Potential erosion will be further minimized by dressing access roads with gravel and installing culverts under access roads where necessary to redirect concentrated runoff. For the Projects overall, construction activities will

employ engineered erosion and sediment control best management practices (BMPs) implemented as part of the SWPPP specifically prepared for the Projects.

Mitigative Measures

North Star will acquire an NPDES permit from the MPCA and implement the associated SWPPP prepared for the Solar Project and the NS HVTL Project to minimize erosion and sediment transport. Soil compaction associated with access roads, pole installation, and from the installation of direct embedded piers may be mitigated by regrading and tilling these areas during the decommissioning process.

A Phase I Environmental Site Assessment (ESA) was conducted for the Project areas to identify any Recognized Environmental Conditions (RECs) associated with the site. This assessment revealed no RECs in connection with the site.

4.5.3 Rivers, Streams and Lakes

Appendix C-6, Water Resources**,** depicts surface water features in the Solar Project boundary and NS HVTL Route Corridor, and within one mile of these boundaries. Two unnamed MNDNR Public Watercourses are indicated within the adjacent Xcel Energy property; one consists of an intermittent stream, and the second, at the southern edge of the Xcel property, is a perennial stream. These two features are also indicated as Flowlines in the National Hydrography Dataset (NHD). Both of these streams are likely tributaries to the Sunrise River, located east of the Projects. The National Wetlands Inventory also depicts several wetlands in the southern portion of the site. Wetlands within the Solar Project and Xcel Energy property boundaries were delineated in the field in September 2014 and are further discussed in Section 4.5.4. FEMA floodplain mapping for the site indicates it is in FEMA Mapped Panel 27025C0260D, dated April 17, 2012, and is mapped as Zone D "Other Areas," or areas in which flood hazards are undetermined, but possible. No other rivers, streams or lakes are located within the Solar Project and NS HVTL Project boundaries.

Other surface water resources within a mile of the Projects include the Sunrise River which runs within a mile to the north and east of the Projects and five MNDNR Public Water Wetlands located to the west, south, and east of the Projects.

Mitigative Measures

The North Star Solar Project and the NS HVTL Project will be designed in a manner to avoid and minimize impacts to wetlands and water resources to the extent practicable. The preferred NS HVTL alignment will likely cross one delineated wetland and one unnamed MNDNR

protected watercourse located north of the Xcel Energy Substation. Direct impacts to these water resources can be minimized or avoided by placement of pole structures outside of the wetland and watercourse boundaries and spanning the distance for crossings over wetland and watercourse features to the extent practicable. Potential impacts to water resources and applicable mitigative measures are discussed in further detail in Section 4.5.4, Wetlands, below.

4.5.4 Wetlands

Wetlands were delineated by Westwood Professional Services (Westwood) during the week of September 15, 2014, using a level two routine determination method set forth in the USACE 87 Manual and the North central and Northeast Regional supplement. A total of 15 wetlands were delineated which are summarized in **Table 10.**

TABLE 10: Delineated Wetlands

Table 10. Delineated Wetlands			
Wetland ID	**Delineated Wetland Type**	**Wetland Size ac/sf (within Project Area)**	**Dominant Wetland Vegetation**
WB-01	PEMA/B, Type 2, Fresh Wet Meadow	0.72 31,266	Barnyard grass, Water smartweed
WB-02	PEMA/B, Type 2, Fresh Wet Meadow	1.35 58,780	Common spike rush, Barnyard grass
WB-03	PEMA/B, Type 2, Fresh Wet Meadow	0.55 24,064	Common spike rush, Water smartweed, Lakebank sedge
WB-04	PEMA/B, Type 2, Fresh Wet Meadow	0.91 39,664	Common spike rush, Yellow nut sedge, Barnyard grass
WB-05	PEMA/B, Type 2, Fresh Wet Meadow	.28 12,155	Common spike rush, Barnyard grass
WB-06	PEMF, Type 3, Shallow Marsh	.49 21,351	Narrow leaf cattail, Reed canary grass
WB-07-A/B	PEM/PSS/PFO, Type 2/6/7, Fresh Wet Meadow, Shrub Scrub, Wooded Swamp	3.93 171,257	Reed canary grass, Speckled alder, Quaking aspen, sensitive fern
WB-08	PEMA/B, Type 2, Fresh Wet Meadow	2.66 115,879	Reed canary grass, Yellow nut sedge
WB-09	PEMA/B, Type 2, Fresh Wet Meadow	2.87 125,052	Common spike rush, Yellow nut sedge, Reed canary grass
WB-10*	PEMA/F, Type 2/3, Fresh Wet Meadow, Shallow Marsh	6.42 279,614	Narrow leaf cattail
WB-11	PEMA, Type 2, Fresh Wet Meadow	.70 30,394	Bebb's Sedge, Fowl bluegrass
WB-12	PEMA, Type 2, Fresh Wet Meadow	0.18 7,913	Barnyard grass, Fowl bluegrass
WB-13*	PEMA/PFO, Type 2/7, Fresh Wet	4.05	Speckled alder, Lakebank sedge,

Table 10. Delineated Wetlands			
Wetland ID	**Delineated Wetland Type**	**Wetland Size ac/sf (within Project Area)**	**Dominant Wetland Vegetation**
	Meadow/Wooded Swamp	176,552	American elm
WB-14	PEMB/PFO, Type 2/7, Fresh Wet Meadow/Wooded Swamp	8.40 365,796	Reed canary grass
WB-15*	PEMA/B, Type 2, Fresh Wet Meadow	0.62 27,146	Reed canary grass
Total		**19.35/842,866**	
*Wetlands or a portion of the wetland is within Xcel land.			

Delineated wetland boundaries were reviewed in November, 2014 by the USACE and Chisago County, the Local Government Unit (LGU) that administers the Wetland Conservation Act ("WCA") in this area. Chisago County issued approval of the delineated boundaries on February 3, 2015 (Appendix A-9). Official approval of the delineated wetland boundaries from the USACE is pending. Delineated wetlands comprise approximately 1% within the Solar Project boundary. Appendix C-6 depicts the location and extent of delineated wetland boundaries. Ten of the fifteen delineated wetlands are within cropland, predominantly vegetated with annual weeds and invasive species, and are frequently farmed. The two MNDNR Public Watercourses located within Xcel Energy land were within the delineated boundaries of Wetlands 13 and 15, respectively.

Mitigative Measures

Wetlands and streams within the North Star Solar Project NS HVTL Project are regulated under:

- The Minnesota Wetland Conservation Act of 1991, as amended, administered in this area by Chisago County,
- Section 404 and 401 of the Federal Clean Water Act administered by the U.S. Army Corps of Engineers and the Minnesota Pollution Control Agency, and
- Minnesota Statute 103G.245, administered by the Minnesota Department of Natural Resources (DNR).

The Solar Project and the NS HVTL Project will be designed in a manner to avoid and minimize impacts to wetlands and water resources to the extent practicable. Potential impacts to wetlands within the Solar Project may include temporary impacts associated with the installation of electrical collection lines and temporary access roads during construction of the Solar Project. Permanent impacts may result if direct-embedded piers require concrete foundations to address problematic soil conditions and from the establishment of permanent access roads for operations and maintenance of the Solar Project. Permanent impacts may also result from foundations for the O&M building and Solar Project substation. All of the noted access roads and structures will

be sited to completely avoid permanent direct impacts to wetlands when possible. The driven piers used to support the solar arrays and inverter skids are not anticipated to result in a loss of wetland under the WCA as they would not alter the wetland's cross-section or hydrological characteristics, obstruct flow patterns, change the wetland boundary, or convert the wetland to non-wetland (MN Rule 8420.0111, Subps. 26 and 32). Further, the driven piers are not expected to constitute wetland fill under Section 404 of the Clean Water Act as they are likely to fall under a structural discharge activity of the USACE Minnesota Regional General Permit (RGP)-003.

The preferred NS HVTL Project alignment within the proposed Route Corridor will likely cross one delineated wetland and the unnamed MNDNR protected watercourse located north of the Xcel Energy Chisago Substation. Direct impacts to water resources from the NS HVTL Project can be minimized and avoided by placement of pole structures outside of the wetland and watercourse boundaries and spanning the distance for crossings over wetland and watercourse features to the extent practicable.

Temporary construction impacts will be minimized by using BMP's that include temporary construction mats for work in wetlands, directional bores under wetlands, as necessary, for the installation of electrical collection lines, and other erosion control measures identified in the MPCA Storm Water Best Management Practices Manual, such as using silt fencing to control sediment runoff to adjacent water resources. Disturbed surface soils will be stabilized at the completion of the construction process to minimize the potential for subsequent effects on surface water quality. Construction operations will be designed and controlled to minimize and prevent material discharge to nearby wetlands.

It is likely a Joint Application Form for Activities Affecting Water Resources in Minnesota will be submitted for the North Star Solar Project and NS HVTL Project. This application is the accepted means for initiating review of proposals that may affect a water resource (wetland, tributary, lake, etc.) in the State of Minnesota under state and federal regulatory programs. Applicants for Minnesota DNR Public Waters Work Permits must use the MPARS online permitting system for submitting applications to the DNR.

Minnesota Wetland Conservation Act, as amended

Depending on the final wetland impacts associated with the North Star Solar Project and the NS HVTL Project, activities may qualify for a No Loss, exemption, or require a permit under the WCA. If a permit is required, any proposed wetland impact would require full sequencing under the WCA, and address wetland avoidance, impact minimization, rectification, and replacement (if applicable).

Section 404 of the Federal Clean Water Act

Under Section 404 of the Federal Clean Water Act, the Corps regulates the discharge of dredged and fill material into waters of the U.S. After coordination and application submission, authorization from the USACE would likely fall under one of the categories of activities of the Minnesota Regional General Permit (RGP)-003.

Section 401 Water Quality Certification

Projects required to obtain an Individual Section 404 Permit are also required to obtain an MPCA Section 401 Water Quality Certification to ensure they comply with the state water quality standards in Minnesota Rules Chapter 7050, as amended. Because the North Star Solar Project and the NS HVTL Project are unlikely to require an Individual Section 404 Permit from the Corps, MPCA Section 401 Water Quality Certification is unlikely to be required as part of the wetland permitting process.

Minnesota Public Waters Act and DNR Public Waters Permits

The Minnesota DNR requires a Public Waters Work Permit for any alteration of the course, current, or cross section below the Ordinary High Water Level (OHWL) of DNR public waters, wetlands, and watercourses. Because no alterations below the OHWL of MNDNR Public Waters are planned as part of the Projects, a Public Waters Work Permit will not likely be required.

A MNDNR License to Cross Public Waters will likely be required for construction of the NS HVTL Project. The MNDNR Division of Lands & Minerals is responsible for granting permission to cross state land or public waters with utility infrastructure projects. The permission is in the form of a utility crossing license. The proposed route for the NS HVTL Project will likely cross an unnamed MNDNR watercourse located north of the Xcel Energy Chisago Substation.

Should the North Star Solar Project or the NS HVTL Project result in permanent, unavoidable impacts to wetlands or water resources, impacts will be replaced in accordance with the Minnesota WCA and Section 404 of the Federal Clean Water Act.

4.5.5 Vegetation

A majority of the site lies within the Anoka Sand Plain subsection of the Minnesota and Northeastern Iowa Morainal section of the Eastern Broadleaf Forest Province, as defined by the Minnesota Department of Natural Resources (DNR) Ecological Classification System ("ECS"). Approximately 40 acres of the Solar Project area in the far northeast corner lie within the Mille Lacs Uplands subsection of the Western Superior Uplands section of the Laurentian Mixed Forest Province. The ECS system categorizes regions of the state using associations of factors such as climate, geology, topography, soils, hydrology, and vegetation.

The MNDNR Minnesota Land Cover Classification System ("MLCCS") incorporates more detailed land cover information including human-modified cover classifications; however MLCCS data does not cover the area where the Projects are located. The National Land Cover Database ("NLCD") data was used as an alternative for general land cover descriptions in the area. According to the NLCD, a majority of the Solar Project area consists of cultivated crops

(87%). **Table 11** summarizes the land cover classifications according to the NLCD. NLCD Land cover mapping is depicted in **Appendix C-8**, Land Cover.

TABLE 11: NLCD Land Cover

Table 11. NLCD Land Cover		
Land Cover Type	Acres	Percent of Solar Project Area
Cultivated Crops	970.0	87%
Developed (open space to medium intensity)	52.1	5%
Deciduous Forest	33.0	3%
Hay/Pasture	32.4	3%
Shrub/Scrub and Herbaceous	15.9	1%
Wetlands	9.1	1%
Total	**1,112.5**	**100%**

The Minnesota Biological Survey ("MBS") includes areas of the state with varying levels of native biodiversity and may contain high quality native plant communities, rare plants, animals, and/or animal aggregations. According to the MBS Sites of Biodiversity Significance, an approximately 10-acre portion within the Solar Project boundary is assigned a medium rank for biodiversity significance and is associated with a complex of wetlands in the southwest part of the Solar Project (**Appendix C-8**, Rare and Unique Natural Features and Sensitive Lands). This area was identified as WB_14 as part of the on-site wetland delineation. No sites within the Solar Project boundary or the proposed NS HVTL Route Corridor were identified in a review of the Minnesota County Biological Survey ("MCBS") Native Plant Communities data.

According to the MNDNR Central Region Regionally Ecological Significant Areas ("RSEA") data, areas in the southern portion of the site contain two RSEA's that rank 3 and 1, respectively. RSEA's are identified and defined utilizing MLCCS data; however, because there is not MLCCS coverage in this area, the RSEA rankings here rely more on aerial photography interpretation. Three is the highest ranking and applies to a large polygon that extends onto the Project areas in two locations, one around a MNDNR Public watercourse within the NS HVTL Route Corridor (within Xcel Energy land) and the other location further west in the Solar Project boundary in the area that also contains the medium-ranked MCBS site identified above. The 3 rank, in this case, is primarily because of the overall size of the connected patch of woods and wetland, most of which is outside of the Project boundaries. Another RSEA located at the far southern part of the Xcel Property ranks a 1 and consists of a small patch of woodland.

The National Conservation Easement Database ("NCED") provides a comprehensive picture of privately owned conservation easement lands in the U.S. A review of this data indicated one Board of Water and Soil Resources ("BWSR")-held Reinvest in Minnesota ("RIM") easement over approximately 20-acres located in the NE ¼ of S. 36, T35N, and R21W, which expired in 1997. This information was confirmed by public data available from BWSR. Review of other

available data found no additional private land conservation easements within the Project boundaries.

A desktop ALTA was performed by Westwood to review properties within the Solar Project and NS HVTL Route Corridor boundaries. According to that search no other conservation easements were identified in these areas.

Mitigative Measures

Little overall impact to vegetation will occur as a result of the North Star Solar Project and NS HVTL Project. The proposed Projects completely avoid the identified RSEA's and MCBS sites identified within the Project boundaries with the exception of the location where the NS HVTL Project crosses the MNDNR watercourse within the RSEA. Other wetland, forest and potential native plant communities will be avoided by the Projects to the extent practicable. The Solar Project and the NS HVTL Project were designed to avoid and minimize the need for tree removal as demonstrated by a majority of the Solar Project and NS HVTL Project infrastructure and facilities being located within areas currently in row-crop agriculture.

Some tree clearing over an approximately 2,500-foot distance may be necessary to establish the new NS HVTL Project transmission corridor next to the existing transmission corridors. This potential tree clearing area may include the location where the preferred route crosses the unnamed MnDNR Protected Watercourse. The final extent of tree clearing for the NS HVTL Project will be determined based on the positioning of the NS HVTL ROW relative to the existing HVTL ROW's. A more limited amount of tree clearing may be necessary for the North Star Solar Project to prevent shading of some panels. Even with the potential for some tree clearing, overall the Projects will result in a net improvement to vegetative cover because of revegetation efforts in former agricultural areas and the significant decrease in the use of herbicides and pesticides typical of agricultural practices.

North Star will avoid and minimize impacts to vegetation to the extent practicable within the context of the Solar Project and the NS HVTL Project. The Applicant has designed the Solar Project utilizing a PV system using single-axis trackers which minimize the amount of ground shading on the site. The PV system is installed on driven posts which minimizes the amount of ground disturbance associated with installation. Land disturbance is limited to what's necessary to establish the solar arrays, access roads, O&M facilities, laydown/staging areas, and Solar Project substation. During construction the Applicant will implement and update the SWPPP developed for the North Star Solar Project and the NS HVTL Project and BMP's to prevent erosion and promote soil stabilization in disturbed areas. North Star anticipates seeding disturbed areas and areas below the PV arrays with a low growing, low maintenance seed mix such as a MNDOT 25-121 seed mix or similar mix. This mix is suited to sandy soils of this region, contains a majority of low growing species, and requires maintenance mowing three times a year or less. The Applicant will attempt to conduct any necessary tree clearing during months with the least potential to harm sensitive species. Rare species are further discussed in

Section 4.5.7. North Star continues to work collaboratively with the Minnesota Department of Natural Resources through comments letters and direct correspondence to explore additional seeding options and vegetation management techniques to the benefit of pollinators and other wildlife. Control of invasive and noxious weeds will be ongoing during the operation of the Projects.

4.5.6 Wildlife

As noted in Section 4.5.5, vegetative cover in the Project Area consists of six main cover-types: Cultivated Crops (87% of Project Area), Developed (5%), Forest (3%), Hay/Pasture (3%), Scrub/Shrub and herbaceous cover (1%), and Wetlands (1%).

Overall the site is dominated by agriculture land used for row crop production; primarily corn and soybeans. These are annual temporary cover types that will be utilized by a small number of common wildlife species on a limited seasonal basis. Species that will utilize these areas include white tailed deer, small mammals including mice and vole species, raccoon, striped skunks and woodchucks. Bird species that will utilize these areas include ring-necked pheasant, blackbird species and other small perching birds, and common raptors such as red-tail hawks. After harvest, the fields may offer short term foraging areas for common waterfowl including Canadian geese and mallards.

Reptiles and amphibians accustomed to agriculture habitats, including common garter snake, leopard frog and American toad will also use the cropped fields at certain times of the year for foraging. However, due to the relative lack of diverse vegetation cover and habitat structure, and the temporary seasonal nature of the cover, even these common species' use of the cropped field habitat is likely limited to occasional foraging in the fields.

Forest areas onsite are fragmented and mostly found adjacent to cropped fields. Species that will utilize these areas are animals adapted to small woodlots including white-tailed deer, gray and red fox, gray and fox squirrels, eastern chipmunks, woodchucks, and mice and vole species. Birds that may utilize these areas include common woodlot species including American robin, Blue Jay, catbird, Brown Thresher and other common perching birds. Reptiles and amphibians accustomed to woodlot habitats include common garter snake, wood frog, American toad and tiger salamander. These areas offer more long term permanent habitat than the cropped fields. Developed areas offer very limited, temporary habitat for species accustomed to human disturbance including common mammals such as gray squirrels and eastern chipmunks and common birds such as house sparrows and European starlings.

Hay and pastureland offers very similar habitat and species composition as the cropped areas onsite. Species that will utilize these areas include white tailed deer, cotton-tailed rabbits, and other small mammals including mice and vole species, raccoon, striped skunks and woodchucks. Bird species that will utilize these areas include ring-necked pheasant, blackbird species and other small perching birds and common raptors such as red -tail hawks. Reptiles and amphibians

accustomed to agriculture habitats, including common garter snake, leopard frog and American toad, will also use the hay/pastureland areas at certain times of the year for foraging. However, due to the relative lack of diverse vegetative cover and habitat structure, and regular grazing and hay cutting, this habitat offers mostly temporary habitat for foraging rather than stable long term habitat.

Wetland habitats include both wet meadow and shallow marsh wetlands. These areas offer a habitat for a wider range of species and could include avian species such as red-winged blackbirds, green heron, mallard, blue-winged teal, great blue heron, American bittern, rail species and wood duck, in addition to the more common avian species already noted. In addition to the common mammal species already noted, wetland areas could provide habitat for species such as mink and muskrat.

Many reptiles and amphibians could be found in these wetlands such as common garter snake, painted shell and common snapping turtle, leopard frog, wood frog, American toad and tiger salamander. The reptiles and amphibians all rely on wetlands at certain times of the year, especially for breeding and over-wintering habitat. Wetlands could also potentially provide habitat for Blanding's Turtles, a State Listed Threatened Species. A detailed discussion of Blanding's Turtles, including potential mitigation measures to avoid impacts to Blanding's turtles can be found in Section 4.5.7, Rare and Unique Natural Resources.

Fish habitat is limited to two small streams located within the Xcel Energy land. The northernmost of the two streams is an intermittent stream that was not flowing during an onsite wetland delineation conducted in September, 2014. This stream would provide no additional habitat aside from that described in the wetland habitat discussion. The southernmost stream is a small perennial stream and could offer habitat for warm-water fish species common to central Minnesota including creek chub, red bellied dace, central mud-minnow and brook stickleback.

In recent years there has been concern regarding avian mortality associated with solar facilities. According to a report by the National Fish and Wildlife Forensics Laboratory, which summarized data on bird mortality at three different solar facilities in southern California, the three main causes of avian mortality were impact trauma, solar flux, and predation. The authors emphasized that currently there is very incomplete knowledge concerning bird mortality at solar facilities. Solar facilities can be classified into three major types, photovoltaic (PV) systems, trough systems, and solar power towers. PV systems directly convert sunlight into energy using arrays of solar panels mounted on the ground. Trough systems use parabolic mirrors that focus and reflect the sun to a tube that converts the sun's heat into electricity. The solar power towers use thousands of mirrors that reflect solar energy to a tower where water in a boiler converts to steam, generating electricity.

The report noted that impact trauma and predations occurred at all three types of facilities, however, predation was documented primarily at PV sites. The higher predation at PV sites is thought to be related to stranding or nonfatal impacts with panels that leave birds vulnerable to

resident predators. Solar flux injury was specific to solar power tower facilities which produce intense radiant energy focused on the power-generating tower (solar flux). Objects pass through this flux, such as insects or birds, and experience extreme heat which can burn and injure species. The report also noted that a broad ecological variety of birds were vulnerable to mortality at these facilities. A couple minor trends were found in the data, specifically that more waterbirds were among the species at the facility that had accessible, open water sources nearby, and more insectivores were present at the solar power tower facility where insects are attracted to the solar tower. Particular avian risks identified with PV facilities are the appearance of a large body of water that an expanse of solar arrays can give. Migrating birds can mistake the solar arrays for water and attempt to land, consequently suffering impact trauma. It was also noted that when panels were oriented vertically, typically for washing, that they posed a greater risk for collisions.

The North Star Solar Project is comprised of PV modules, so it is anticipated that the greatest perceived threat to avian species would be its being mistaken as a large body of water. The design of the single-axis tracking system for the North Star Solar Project arrays minimizes this risk to avian species in a few different ways. Because the ground cover ratio is approximately 0.33, when viewed from above, the arrays will occupy approximately 33% of the overall project foot print, so it will not appear as an unbroken expanse of water. Additionally, because the arrays are made up of a series of individual tracker rows, the overhead view will be further broken up by the spacing between tracker rows. Finally, because the tracker rows move across the sky throughout the day, the overhead view will not appear as a fixed expanse of water but will change during the day.

No significant impacts to wildlife are anticipated. During construction, most wildlife, including the common species currently utilizing the habitats at the facility location, will temporarily be displaced due to construction noise and the close proximity of humans. This will be a minor and temporary impact because the wildlife species currently utilizing the area tend to be habitat generalists and can find abundant suitable replacement habitat near the facility location. In addition, most of the disturbance area will be in historically cropped fields and the wildlife using these areas will be acclimated to seasonal disturbances from normal farming practices.

Species that are habitat specialists using the wooded and naturally vegetated wetland areas are unlikely to be affected by construction of the Projects because most of the infrastructure is located outside of wetlands and forested areas. Construction noise and limited tree clearing have the most potential for wildlife impact. These activities could potentially cause temporary reduced nest attendance or nest abandonment in bird and small mammal nests in areas near the perimeter of the construction zone of the Projects. Any impacts from these activities are expected to be short-term, infrequent and temporary in nature.

The operational stage of the North Star Solar Project and NS HVTL Project s is expected to have both positive and negative impacts to wildlife. The positive impacts are that once construction is complete, the majority of the Project areas will be disturbed less regularly than is typical of

normal row crop farming practices. In addition, the Projects will provide more year-round habitat for species that can utilize the habitat in the grasses and forbs growing under the solar modules and across the Project areas. Although the perimeter fence may exclude some large mammals, most small mammals, birds, reptiles and amphibians will still be able to access habitat through and over the fence.

The approximately one mile overhead NS HVTL Project presents a risk of impact to avian species from collisions or electrocutions. These impacts typically affect raptors, waterfowl and other large birds. Because the NS HVTL Project is proposed for a location parallel to existing HVTL's, the NS HVTL Project presents minimal additional risk for avian impacts from collisions and electrocutions than currently exists in the area. The NS HVTL Project will also be constructed according to Avian Powerline Interaction Committee ("APLIC") recommended safety standards.

Because the existing habitats in the Solar Project area will be modified, there will be some overall loss of habitat. However, as noted above, the current habitat is dominated by non-native vegetation cover types manipulated for crop production and are utilized almost exclusively by common habitat generalist species. Therefore, modification of the current habitats will be a negligible negative impact. In addition, the Projects will not disrupt or block access to known regional wildlife movement corridors.

Mitigative Measures

The NS HVTL Project will be constructed according to Avian Powerline Interaction Committee ("APLIC") recommended safety standards in order to reduce the risk of collision to avian species. The Applicant will work with the DOC, DNR, and USFWS to identify any portions of the NS HVTL Project that may require marking, raptor shields or bird diverters to reduce the likelihood of collisions. Because the electrical collection system for the Solar Project is anticipated to be underground, no risk from overhead power poles and lines are expected related to the Solar Project. The Applicant will explore additional measures to reduce the risk of avian collision from the Solar Project. The single-axis tracker design being used already includes several features that will reduce the risk of avian collisions by breaking up the appearance of the Solar Project from overhead. The Applicant will continue to work with the USFWS and MNDNR to identify other measures that may further reduce this risk such as incorporating structural elements or markings that might further break up the appearance of the arrays. Security fencing design will be dependent on required security and to meet all safety standards. The Applicant is planning to coordinate with the Minnesota DNR on the Projects, and is considering the incorporation of appropriate mitigation measures as suggested by the Minnesota DNR to avoid potential negative impacts to Blanding's turtles and other sensitive species.

4.5.7 Rare and Unique Natural Resources

A review of the MNDNR Natural Heritage Information System (NHIS) database licensed to Westwood (LA668, April 2014) was conducted for records of federal or state-listed rare, threatened or endangered species within the Solar Project and Xcel Energy Property boundaries. Results of this review found two records for the Blanding's turtle and one historic record for Tooth-cup (last observed in 1892) located within the Solar Project and Xcel Energy Property boundaries (Appendix C-8). The NHIS data referenced here were provided by the Division of Ecological Resources, Minnesota DNR and were current as of April 2014. These data are not based on an exhaustive inventory of the state. The lack of data for any geographic area shall not be construed to mean that no significant features are present.

The database was also reviewed for areas within one mile of the Solar Project and Xcel Energy property boundaries. **Table 12 s**ummarizes the list of 18 records of species and features that occur outside of these boundaries but within one mile of these areas.

TABLE 12: NHIS Database Search Results

Table 10. NHIS Database Search Results					
Common Name	**Scientific Name**	**Type**	**MN Status [1]**	**Last Obs.**	**Proximity (Miles)**
Black Sandshell	*Ligumia recta*	Invertebrate Animal	SPC	1996-09	0-0.5
Black Sandshell	*Ligumia recta*	Invertebrate Animal	THR	1996-10	0.5-1.0
Blanding's Turtle	*Emydoidea blandingii*	Vertebrate Animal	THR	1992-06-15	0.5-1.0
Blanding's Turtle	*Emydoidea blandingii*	Vertebrate Animal	THR	1995-05-10	0.5-1.0
Blanding's Turtle	*Emydoidea blandingii*	Vertebrate Animal	THR	1988-06-13	0.5-1.0
Blanding's Turtle	*Emydoidea blandingii*	Vertebrate Animal	THR	2001-05-02	0.5-1.0
Creek Heelsplitter	*Lasmigona compressa*	Invertebrate Animal	THR	1996-09	0.5-1.0
Creek Heelsplitter	*Lasmigona compressa*	Invertebrate Animal	THR	1996-09	0-0.5
Dry Barrens Prairie (Southern)	N/A	Terrestrial Community - Other Classification	--	1989-09-11	0-0.5
Elktoe	*Alasmidonta marginata*	Invertebrate Animal	THR	1996-09	0-0.5
Fluted-shell	*Lasmigona costata*	Invertebrate Animal	THR	1996-09	0-0.5
Fluted-shell	*Lasmigona costata*	Invertebrate Animal	THR	1996-10	0.5-1.0
Mucket	*Actinonaias ligamentina*	Invertebrate Animal	THR	1996-09	0-0.5
Mucket	*Actinonaias ligamentina*	Invertebrate Animal	THR	1996-09	0.5-1.0
Round Pigtoe	*Pleurobema sintoxia*	Invertebrate Animal	SPC	1996-09	0.5-1.0
Round Pigtoe	*Pleurobema sintoxia*	Invertebrate Animal	SPC	1996-09	0-0.5
Spike	*Elliptio dilatata*	Invertebrate Animal	THR	1996-09	0-0.5
Spike	*Elliptio dilatata*	Invertebrate Animal	THR	1996-09	0.5-1.0

[1] SPC = State-listed Special Concern, THR = Threatened, END=Endangered (Minnesota DNR 2014)

Six of the total 21 records are for the Blanding's Turtle. Blanding's turtle could potentially use the site for nesting habitat as there are wetland areas with adjacent open areas with sandy soils within the Solar Project boundary. The preferred nesting grounds are typically on undeveloped land of which there is little within the Solar Project boundary as more than 95% of the land is in row crop agriculture, forest, or developed land uses. However, Blanding's turtles have been known to utilize more disturbed landscapes such as farm fields and road shoulders. It is less likely the Blanding's turtle would utilize the site for overwintering habitat as there are no deep marshes or ponds where they can be protected from freezing.

Thirteen of the 21 records are for freshwater mussels associated with a MNDNR Public Watercourse approximately ½ mile east of the Solar Project at the closest point. It is unlikely any of these mussel species would be present because there are no rivers within the site and suitable habitat consists of small to large rivers with sand, gravel, or mud substrates for most of the mussel species identified in the NHIS records. One intermittent stream crosses the Xcel Energy land and consists of a vegetated ditch. A perennial stream intersects the far southeastern corner of the Xcel Energy property for approximately 700 feet. Another habitat requirement is the presence of resident fish species to serve as a host for freshwater mussels to complete their life cycle. It is unlikely the stream resources located within the Xcel Energy land would support an adequate resident fish population to meet the requirements of the mussel life cycle. Impacts to mussels are not anticipated because the Solar Project and the NS HVTL Project are unlikely to result in filling or discharge into streams.

The NHIS record for Toothcup (*Rotala ramosior*) is an historic record (last observation of 1892) and is not anticipated to be on site due to the lack of typical habitat within the Project areas (shallow lakes with a sandy shore).

The remaining record is for a Dry Barrens Prairie terrestrial community approximately ½ mile west of the Projects. Because this community is located outside of the Project boundaries, no impacts are anticipated. It is unlikely similar Dry Prairie habitat occurs within the Project boundaries because nearly all areas that are not wooded, developed, or consist of wetland habitat, are, or were in agricultural production.

On December 15, 2014, Westwood sent a letter to the MNDNR requesting confirmation that the resulting list of rare features from our database review was accurate. Westwood subsequently submitted a formal NHIS Data request for the Solar Project area on January 20, 2015 (Appendix A-1) and a second NHIS data request specific to the NS HVTL Project Route Corridor on January 28th. In response to our initial correspondence, the MNDNR provided information on the Blanding's turtle and wildlife friendly erosion control (**Appendix E,** MNDNR Rare Features Information).

None of the rare species noted above are Federally-listed threatened or endangered species; however, the Solar Project and the NS HVTL Project are located within the known range of the northern long-eared bat (*Myotis septentrionalis*). The northern long-eared bat has been proposed to be federally listed as an endangered species under the Endangered Species Act. Northern long-eared bats spend winter hibernating in caves or mines and during summer, roost singly or in colonies underneath bark, in cavities, or in crevices of live or dead trees. Breeding season for this bat begins in late summer or early fall with a summer maternity roosting season from April through the end of September.

Mitigative Measures

The North Star Solar Project and the NS HVTL Project are designed to avoid portions of the Project areas with the highest concentration of high quality habitat and water resources. Best Management Practices outlined in Sections 4.5.4 and 4.5.5 for Wetlands and Vegetation will serve to protect and prevent impacts to potential rare features within the Solar Project and the NS HVTL Project Route Corridor. North Star will provide training to on–site personnel to educate and avoid impacts to Blanding's turtles. North Star and its contractors will use wildlife-friendly erosion mesh for facilities and activities in the vicinity of such protected species, check any open trenches and holes before back-filling to prevent trapping turtles, and relocate any turtles observed within the construction zone.

If any tree clearing is necessary for the Solar Project or the NS HVTL Project, North Star will make an effort to conduct tree removal outside of the summer maternity roosting season (April 1 to September 30) for the northern long-eared bat.

5.0 SUMMARY AND CONCLUSIONS

The North Star Solar Project and NS HVTL Project will avoid both prohibited and exclusion areas as specified in Minnesota Rules 7850.4400. Furthermore, North Star has sited and will construct the Projects to avoid and minimize impacts to the human and natural environments to the extent feasible. A summary of potential impacts and mitigation measures is presented below with reference to each section previously discussed.

Public Health and Safety (Section 4.2.1)
Impacts – Due to low population density surrounding the Projects, minimal impacts to Public Health and Safety are anticipated. Minimal amounts of EMF are expected to be generated from the buried electrical collection system associated with the Solar Project and the overhead transmission line for the NS HVTL Project.

Mitigation – All Project facilities will be designed, constructed, and operated in compliance with company, local, state, and NESC standards and guidelines. This will include appropriate signage and fencing of the Solar Project facility. Electrical collection lines for the Solar Project will be buried, further minimizing the already minimal amount of additional EMF exposure as a result of the Solar Project.

The NS HVTL will also be designed, constructed, and operated in compliance with company, local, state, and NESC standards and guidelines. The proposed transmission line will be equipped with protective devices to safeguard the public from the transmission line if an accident occurs, such as a structure or conductor falling to the ground. As no residences are located in the Route Corridor, possible exposure to EMF from the transmission line will be negligible and no additional mitigative measures are proposed.

Displacement (Section 4.2.2)
Impacts – No displacement of residential or commercial property is anticipated as a result of the North Star Solar or NS HVTL Projects.

Mitigation – No mitigation is proposed because no property displacement is planned for the Projects.

Noise (Section 4.2.3)
Impacts – Temporary noise impacts will result from equipment used during construction activities. The main source of sound emitted during operation of the Solar Project will be from the inverters. The noise generated from the inverters at 30 feet away will be below the nighttime residential MPCA noise standards. No additional noise impact is anticipated associated with the proposed NS HVTL Project.

Mitigation - During construction, North Star plans to limit construction to the daylight hours. Because noise generated from the NS HVTL and inverters during operation of the Projects are well below MPCA standards, no operational noise impacts are anticipated. As such, no mitigative measures are proposed for the Projects operation.

Aesthetics (Section 4.2.5)
Impacts – Due to the relatively low profile of the arrays and the remote agricultural setting of the area, minimal visual impacts are expected. It is not anticipated that the proposed NS HVTL Project will have a significant visual impact being located in an existing HVTL corridor.

Mitigation – North Star will work with adjacent landowners to identify and address visual impact concerns. Potential mitigative measures may include strategic plantings to screen the Solar Project from adjacent landowners and the preservation of existing tree lines, where practicable, to screen the Solar Project from adjacent landowners and public roadways.

Socioeconomics (Section 4.2.6)
Impacts - Impacts are anticipated to be primarily beneficial via tax revenue to counties and townships, the creation of 250-300 jobs during construction of the Solar Project and NS HVTL Project, and up to 12 permanent positions during operation and maintenance of the Projects. Additionally, the operating Solar Project is expected to generate $2.5 million annually in economic output and distributing $1.5 million in direct earnings.

Adverse impacts to socioeconomics will be limited to the temporary loss of the agricultural production on land currently farmed within the Solar Project boundary. However, these temporary losses are negated by the payments to landowners from the Solar Project. No adverse socioeconomic impacts are anticipated for the NS HVTL Project because agricultural activities can continue during operation.

Mitigation - The owners of the parcels directly affected by Solar Project facilities will be compensated by North Star through the negotiated purchase or lease of the land.

Cultural Values (Section 4.2.7)
Impacts - No impacts to cultural values are anticipated.

Mitigation - No impacts are anticipated; therefore, no mitigation measures are proposed.

Recreation (Section 4.2.8)
Impacts – There are no public recreational areas located within the Solar Project boundary or the NS HVTL Route Corridor with the exception of a snowmobile trail that crosses the Solar Project area within the public rights-of way of 367th Street and Keystone Avenue. No impacts to the trail are anticipated beyond a change in the viewshed from the trail for the approximately 1.25 miles where it crosses the Solar Project area.

Mitigation –No significant impacts to recreational lands within or adjacent to the Solar Project or the NS HVTL Project Route Corridor are anticipated; therefore, no mitigative measures are proposed.

Public Services and Infrastructure (Section 4.2.9)

Utilities and Infrastructure
Impacts-The location information for wells and utilities will be incorporated into the final design of the North Star Solar Project and NS HVTL Project to avoid and minimize impacts to existing utilities and infrastructure. Temporary, short-term outages may occur during interconnection of the Solar Project to the Xcel Energy Chisago Substation.

Mitigation-If impacts to existing wells in the Solar Project Area are unavoidable, North Star will seal the wells and abandon them in place using appropriate regulatory procedures. North Star will work with affected landowners to install new wells as necessary. Final design will avoid and minimize impacts to existing underground utilities to the extent practicable. If conflicts are unavoidable, North Star will coordinate with the applicable utility for a resolution. All underground utilities will be marked prior to construction.

Roadway
Impacts-Traffic for construction and operation of the Projects will utilize existing state, county and township roads. No changes to the existing public roadways are necessary to facilitate the Solar Project and NS HVTL Project construction or operation; however, minor improvements to existing field access roads or driveways may be necessary during construction. The maximum construction workforce is expected to generate 25-35 additional vehicle trips per day which would stay within the AADT capacity ratings for roads utilized for the Projects. Minor, temporary impacts from slow moving vehicles on public roads may occur during Project construction.

Mitigation-No significant impacts to public roadways are anticipated; therefore, no mitigation is proposed. North Star will obtain all relevant permits from road authorities relating to access to the Project through public roads, as well as installation of temporary facilities that may be proposed to occupy portions of public road rights of way during the construction process. North Star will also obtain all relevant permits and/or authorizations from road authorities relating to any electric cables and/or feeder lines that may be placed in or across a public road right of way.

Other Transportation Infrastructure

Impacts-There are no railways crossing the Solar Project or the NS HVTL Project Route Corridor. According to FAA, there are two registered airports within three nautical miles of the Projects. According to the FAA's Notice Criteria, it was determined that no notice or studies were necessary because the Projects do not exceed Notice Criteria. The solar modules are designed to absorb rather than reflect light. The results of the glare analysis of the Solar Project indicated a low potential for after-image to affect area airports.

Mitigation-No impacts to other transportation infrastructure such as railroads, airports or radio and microwave towers are anticipated; therefore, no mitigation is proposed.

Land Use and Zoning (Section 4.2.10)

Impacts – The Solar Project will change the land use from agricultural and rural residential to industrial (solar power plants) in the parcels where the solar facility is built. The Projects are not anticipated to preclude current or planned land use on any of the adjacent parcels; and upon decommissioning and removal of the solar facility, the affected parcels may be returned to the existing agricultural and rural residential land use or transitioned to other planned land uses. The NS HVTL Project will not result in a change of land use as agricultural activities can continue during the NS HVTL Project operation.

Mitigation – Because this Site and Route Permit Application review process takes local ordinances into account through the administrative process, opportunities for local Commissions to comment will be during public notice and meetings set forth in Minnesota Administrative Rules 7850.2100 and 7850.2300. Because no permanent land use impacts are anticipated, no additional mitigative measures are proposed.

Agriculture and Prime Farmland (Section 4.3.1)

Impacts –The Solar Project will temporarily remove less than one percent of the total farmland from the county. The most potential for impacts to topsoil will occur from spot grading for the solar arrays, transmission pole installation, and the construction of access roads, O&M facilities, and the solar Project Substation. No impacts to prime farmland are anticipated because there are no areas of prime farmland within the Solar Project boundary or the NS HVTL Project Route Corridor.

Mitigation - Payments will be made by North Star to the owners of the land directly used for the Solar Projects which will replace the revenue generated if agricultural production were

continued. Top soil removal will be mitigated by limiting removal to those areas where it is necessary for the construction and installation of access roads, Solar Project infrastructure and NS HVTL Project transmission poles. Additional actions to reduce erosion and soil loss consist of the implementation of the SWPPP and associated BMPs.

Forestry (Section 4.3.2)
Because no impacts to forestry resources are anticipated associated with the Solar Project or NS HVTL Project, no mitigation measures are necessary or proposed.

Tourism (Section 4.3.3)
Impacts-Minor changes will occur to the view from the snowmobile trail for the approximately 1.25 miles where it crosses the Solar Project area. Otherwise, no impacts to existing recreational resources or tourism activities will occur as a result of the Projects.

Mitigation-Because no significant impacts to tourism resources are anticipated, no mitigation measures are necessary or proposed.

Mining (Section 4.3.4)
No impacts to mining from the Solar Project or NS HVTL Project are anticipated; therefore, no mitigation measures are necessary or proposed.

Archaeological and Historical Resources (Section 4.4)
Impacts –No previously recorded archaeological sites were recorded in or within one mile of the Project boundaries. Background literature indicated that twelve historic structures are documented within one mile of the Project areas. One of these structures, a railroad bed, is located within the NS HVTL Project Route Corridor, but was previously recommended as not eligible for the National Register of Historic Places in 2007.

Construction of the Solar Project has the potential to impact three historic archaeological sites identified during a Phase I archaeological survey conducted in 2014.

Mitigation – North Star will avoid impacts to historic archaeological sites identified in 2014 to the extent possible. If impacts to these sites are anticipated, the potential eligibility of these sites for the NRHP will be assessed. If these resources are found to be eligible for the NRHP and Project impacts are unavoidable, North Star will consult with the Minnesota SHPO and the State Archaeologist for appropriate mitigative measures prior to construction.

Air (Section 4.5.1)
Impacts – During construction, minor, temporary air quality impacts will occur from construction vehicle emissions and fugitive dust. No air quality impacts are anticipated during operation of the Solar Project or NS HVTL Project.

Mitigation - When necessary, dust from construction traffic will be suppressed using BMPs such as water application to access roads and reduced speed limits. Fugitive dust will be further controlled by implementing stabilization measures for disturbed soils. The SWPPP Plan developed for the Projects will further detail BMPs for control of fugitive dust.

Geology, Soils and Groundwater (Section 4.5.2)

Impacts – No impacts to geology or groundwater are anticipated. The installation of Solar Project and NS HVTL Project infrastructure is anticipated to be limited to the upper soil column and have limited contact with the surficial water table and no contact with deep groundwater or aquifers.

Soil compaction, primarily associated with the access roads, is likely during construction and operation of the Projects. This impact is expected to be negligible and primarily confined to access roads. Additional soil impacts will result from the installation of direct-embedded piers, transmission poles and grading to accommodate Solar Project and NS HVTL Project infrastructure.

Mitigation – North Star will acquire an NPDES permit from the MPCA and implement the associated SWPPP prepared for the Projects to minimize erosion and sediment transport. Soil compaction associated with access roads and from the installation of direct embedded piers may be mitigated by regrading and tilling these areas during the decommissioning process.

A Phase I ESA was completed within the Solar Project boundary and NS HVTL Project Route Corridor to identify the potential for existing soil or groundwater contamination. No RECs were identified in connection with the Project areas based on this Phase I ESA.

Rivers, Streams and Lakes (Section 4.5.3)

No direct impacts to rivers, streams or lakes are anticipated for the Solar Project; therefore, no mitigative measures are proposed. The NS HVTL Project will likely cross a MnDNR Protected Watercourse. Impacts to this resource will be avoided and minimized by placing pole structures outside of the OHW of the watercourse when possible.

Wetlands (Section 4.5.4)

Impacts – Fifteen wetlands totaling 19.35 acres were delineated within the Solar Project boundary and the Xcel Energy land. During construction, temporary impacts may result from the installation of electrical collection lines. Permanent impacts may occur from concrete pier foundations and permanent access roads, and possibly for O&M facility and substation foundations. The driven piers used to support the solar arrays and inverter skids are not anticipated to result in a loss of wetland under the WCA or under Section 404 of the Clean Water Act.

Mitigation – The Projects will be designed in a manner to avoid impacts to wetlands and water resources to the extent practicable. Temporary construction impacts will be minimized by using

Best Management Practices that include temporary construction mats for work in wetlands, directional bores, and other erosion and sediment control measures.

The preferred NS HVTL Project alignment within the proposed Route Corridor will likely cross one delineated wetland and the unnamed MNDNR protected watercourse. Direct impacts to water resources can be minimized and avoided by placement of pole structures outside of the wetland and watercourse boundaries and spanning the distance for crossings over wetland and watercourse features to the extent practicable.

Should the Projects result in permanent, unavoidable impacts to wetlands or water resources, impacts will be replaced in accordance with the Minnesota WCA and Section 404 of the Federal Clean Water Act.

Vegetation (Section 4.5.5)

Impacts – Little overall impact to vegetation will occur as a result of the North Star Solar Project and NS HVTL Project. Some tree clearing over an approximately 2,500-foot distance may be necessary to establish the new NS HVTL transmission and a limited amount of tree clearing may be necessary to prevent shading of some modules for the Solar Project. It is anticipated that the Projects will result in an overall improvement in vegetative cover because of revegetation efforts in former agricultural areas and a decrease in the use of herbicides and pesticides typical of agricultural practices.

Mitigation – North Star will avoid RSEA and MCBS sites identified within the Project areas. North Star will avoid and minimize impacts to vegetation, particularly wooded areas, to the extent practicable. The utilization of a single-axis tracker system minimizes ground shading from the Solar Project. The project utilizes driven piers to support the infrastructure minimizing the grading and ground disturbance necessary for construction. The applicant will implement the SWPPP and associated BMPs to prevent and minimize erosion and sedimentation during construction. Disturbed areas and areas below the modules will be seeded using a low-growing, low maintenance seed mix such as a MNDOT 25-121 mix or similar. The Applicant will attempt to conduct any necessary tree clearing during months with the least potential to harm sensitive species. North Star will work collaboratively with the Minnesota Department of Natural Resources to maximize the opportunity to manage the vegetation at the Solar Project to the benefit of pollinators and other wildlife. Control of invasive and noxious weeds will be ongoing during the operation of the Projects.

Wildlife (Section 4.5.6)

Impacts – No significant impacts to wildlife are anticipated. A majority of the species currently utilizing the Project areas are likely common species and habitat generalists as approximately 87% of the site is in row crop agriculture. During construction, most wildlife will likely be temporarily displaced due to construction activity. Habitat specialists utilizing wooded and wetland habitats are less likely to be affected as these habitats represent minimal cover of the Project areas and will generally be avoided by the Projects. Once construction is complete, the

perimeter fence for the Solar Project may exclude some large mammals, but other wildlife species will be able to access habitat through and over the fence. Positive impacts to wildlife will occur due to the increase in species diversity created by revegetation with permanent vegetation.

The approximately one mile overhead NS HVTL Project presents a risk of impact to avian species from collisions or electrocutions. Because the NS HVTL Project is proposed for a location parallel to existing HVTL's, the NS HVTL presents minimal additional risk for avian impacts from collisions and electrocutions than currently exists in the area.

Mitigation – The Solar Project and NS HVTL Project will make an effort to avoid RSEA and MCBS sites identified within the Project areas as these are most likely to harbor the largest concentration of wildlife species. Security fencing design will be dependent on required security and to meet all safety standards. The Applicant is coordinating with the MNDNR on the Projects and is considering the incorporation of suggested mitigation measures to minimize impacts to wildlife species. The NS HVTL Project will be constructed according to Avian Powerline Interaction Committee ("APLIC") recommended safety standards. The single-axis tracker design being used includes features that will reduce the risk of avian collisions by breaking up the appearance of the Solar Project from overhead. The Applicant will continue to work with the USFWS and MNDNR to identify other measures that may further reduce this risk such as incorporating structural elements or markings that might further break up the appearance of the arrays.

Rare and Unique Natural Resources (Section 4.5.7)

Impacts – There is a low potential for Blanding's turtle to utilize the Solar Project area for nesting and overwintering habitat as more than 95% of the land is in row crop agriculture, forest, or developed land uses and no suitable wetland habitat is present for overwintering. If Blanding's turtle do utilize the Solar Project area, there is the potential to inhibit travel between wetland and sandy upland habitats with the proposed perimeter fence. In general, there are no anticipated impacts from the Projects to rare and unique resources. Due to the habitat (cultivated fields) of the majority of the Solar Project area and NS HVTL Project Route Corridor, little to no potential habitat exists for the rare and unique species identified in Table 8. The Projects are within the range of the northern long-eared bat; however, the Project areas offer no winter habitat and little roosting habitat as less than 5% of the area within the Solar Project boundary and the NS HVTL Route Corridor areas are forested.

Mitigation – The North Star Solar Project and NS HVTL Project are designed to avoid areas with the highest concentration of high quality habitat and water resources, minimizing the potential to impact rare features. North Star will provide training to on–site personnel to educate and avoid impacts to Blanding's turtles. North Star and its contractors will use wildlife-friendly erosion mesh for facilities and activities in the vicinity of such protected species, check any open trenches and holes before back-filling to prevent trapping turtles, and relocate any turtles observed within the construction zone. North Star will attempt to limit any necessary tree

clearing to times outside of the maternity roosting season to minimize potential impacts to the northern long-eared bat.

6.0 COMPLETENESS CHECKLIST

TABLE 13: Completeness Checklist

Table 10. Completeness Checklist		
Authority	**Required Information**	**Where**
2014 Minnesota Statutes 216E.04	**Alternative Review Of Applications**	
Subdivision 1	An applicant who seeks a site permit or route permit for one of the projects identified in this section shall have the option of following the procedures in this section rather than the procedures in section 216E.03. The applicant shall notify the commission at the time the application is submitted which procedure the applicant chooses to follow.	--
Subdivision 2, (8)	Large electric power generating plants that are powered by solar energy.	--
Minn. Rules 7850.1900, Subpart 1.	**Site Permit For Large Electric Power Generating Plant/Route Permit for a HVTL**	
A.	A statement of proposed ownership of the facility as of the day of filing and after commercial operation;	1.2.2
B.	the precise name of any person or organization to be initially named as permittee or permittees and the name of any other person to whom the permit may be transferred if transfer of the permit is contemplated;	1.2.1, 1.2.2, and 1.2.3
C.	at least two proposed sites for the proposed large electric power generating plant and identification of the applicant's preferred site and the reasons for preferring the site; at least two proposed routes for the proposed high voltage transmission line and identification of the applicant's preferred route and reasons for the preference.	Alternatives not required under alternative process (2014 Minnesota Statutes 216E.04 Subdivision 2 and 3)
D.	a description of the proposed large electric power generating plant and HVTL and all associated facilities, including the size and type of the facility;	2.0, Figures 2 and 3
E.	the environmental information required under subpart 3;	4.0

Table 10. Completeness Checklist		
Authority	**Required Information**	**Where**
F.	the names of the owners of the property for the proposed site;	Appendix B
G.	the engineering and operational design for the large electric power generating plant and HVTL;	3.0; Figure 3 and 2
H.	a cost analysis of the large electric power generating plant and HVTL, including the cost of constructing and operating the facility that is dependent on design and site;	2.4
I.	an engineering analysis of the site, including how the site could accommodate expansion of generating capacity in the future;	2.5
J.	identification of transportation, pipeline, and electrical transmission systems that will be required to construct, maintain, and operate the facility;	3.1.4, 3.1.5, and 3.1.6
K.	a listing and brief description of federal, state, and local permits that may be required for the project; and	1.4.3
L.	A copy of the Certificate of Need for the project from the Public Utilities Commission or documentation that an application for a Certificate of Need has been submitted or is not required.	Exemption language included in 1.4.1
Minn. Rules 7850.1900, Subpart 3.	**Environmental Information**	
A.	a description of the environmental setting for the site;	4.1
B.	a description of the effects of construction and operation of the facility on human settlement, including, but not limited to, public health and safety, displacement, noise, aesthetics, socioeconomic impacts, cultural values, recreation, and public services;	4.2
C.	a description of the effects of the facility on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining;	4.3
D.	a description of the effects of the facility on archaeological and historic resources;	4.4
E.	a description of the effects of the facility on the natural environment, including effects on air and water quality resources and flora and fauna;	4.5
F.	a description of the effects of the facility on rare and	4.5.7

Table 10. Completeness Checklist		
Authority	**Required Information**	**Where**
	unique natural resources;	
G.	identification of human and natural environmental effects that cannot be avoided if the facility is approved at a specific site or route; and	4.1 – 4.5
H.	A description of measures that might be implemented to mitigate the potential human and environmental impacts identified in items A to G and the estimated costs of such mitigative measures.	4.1 – 4.5

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8.0 DEFINITIONS AND ABBREVIATIONS

AST	Aboveground Storage Tank
Alternating Current (AC)	The direction of current flowing in a circuit is constantly being reversed back and forth. See Direct Current.
Annual Average Daily Traffic (AADT)	A measure used primarily in transportation planning and transportation engineering. Traditionally, it is the total volume of vehicle traffic of a highway or road for a year divided by 365 days.
APLIC	Avian Power Line Interaction Committee
Avian	Of or relating to birds.
A-weighted scale (dB(A)	An adjustment applied to instrument-measured sound levels in effort to account for the relative loudness perceived by the human ear, as the ear is less sensitive to low audio frequencies.
BSWR	Board of Water and Soil Resources
Bus	An electrical conductor that serves as a common connection for two or more electrical circuits; may be in the form of rigid bars or stranded conductors or cables.
Certificate of Need (CN)	A document that includes forecast information upon which the alleged need for development of a new Large Electric Power Generating Plant (LEPGP) is based
Conductor	A material or object that permits an electric current to flow easily.
Conservation Reserve Program (CRP)	A land conservation program administered by the Farm Service Agency (FSA). In exchange for a yearly rental payment, farmers enrolled in the program agree to remove environmentally sensitive land from agricultural production and plant species that will improve environmental health and quality.
Decibel (dB)	A logarithmic unit used to express the absolute level of sound pressure, using the ratio between power and intensity.
Direct Current (DC)	The unidirectional flow of electric charge. Direct current is produced by sources such as batteries and solar cells.
DNR	Minnesota Department of Natural Resources

Easement	A permanent right authorizing a person or party to use the land or property of another for a particular purpose. In the case of this Project, this means acquiring certain rights to build and maintain a transmission line. Landowners are paid a fair price for the easement and can continue to use the land for most purposes, although some restrictions are included in the agreement.
Ecological Classification System (ECS)	A system ecological mapping and landscape classification developed by the Minnesota Department of Natural Resources and the U.S. Forest Service.
Electric (E) Field	The field of force that is produced as a result of a voltage charge on a conductor or antenna.
Electromagnetic	The term describing the relationship between electricity and magnetism; a quality that combines both magnetic and electric properties.
Electromagnetic Field (EMF)	The combination of an electric (E) field and a magnetic (H) field.
Environmental Bore Hole (EBH)	Drill hole used for testing earth properties, obtaining geologic samples, measuring water levels, determining groundwater flow direction or velocity, venting, vapor extraction, or sparging.
FAA	Federal Aviation Administration
Fauna	The collective animals of any place or time that live in mutual association.
Flora	The collective plants of any place or time that live in mutual association.
Grading	To level off to a smooth horizontal or sloping surface.
Grounding	To connect electrically with a ground; to connect some point of an electrical circuit or some item of electrical equipment to earth or to the conducting medium used in lieu thereof.
Habitat	The place or environment where a plant or animal naturally or normally lives and grows.
Inverter	An electronic device or circuitry that changes direct current (DC) to alternating current (AC).

Jobs and Economic Development Impacts (JEDI) PV tool	An online tool developed by the National Renewable Energy Laboratory that estimates the economic impacts of constructing and operating power generation and biofuel plants at the local and state levels, including wind energy impacts, biofuels, coal, concentrating solar power, geothermal, marine and hydrokinetic power, natural gas, and photovoltaic power plants.
Large Electric Power Generating Plant (LEPGP)	Electric power generating equipment and associated facilities designed for or capable of operation at a capacity of 50,000 kilowatts or more.
Large Generator Interconnection Agreement (LGIA)	The process service providers follow to interconnect generation resources with the Minnesota transmission system. This Business Practice identifies the qualification criteria, forms, submission procedures along with expected steps and timing leading up to interconnection.
Local Government Unit (LGU)	A sub-State level administrative unit (e.g. City, County)
LRR	Land Resource Regions
Magnetic (H) Field	The region in which the magnetic forces created by a permanent magnet or by a current-carrying conductor or coil can be detected. The field that is produced when current flows through a conductor or antenna.
MBS	Minnesota Biological Survey
MCBS	Minnesota County Biological Survey
Megawatt hours (MWh)	Equal to 1,000 kilowatts of electricity used continuously for one hour. It is about equivalent to the amount of electricity used by about 330 homes during one hour.
Megawatts (MW)	A megawatt is a unit for measuring power that is equivalent to one million watts.
MISO	Midwest Independent System Operator
Mitigate	To lessen the severity of or alleviate the effects of.
MLCCS	MNDNR Minnesota Land Cover Classification System

MLRA	Major Land Resource Areas
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
National Pollutant Discharge Elimination System Permit (NPDES)	As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point and nonpoint sources that have potential for the discharge of pollutants into waters of the United States
NCED	National Conservation Easement Database
NEMA	National Electrical Manufacturer Association
NRCS (SCS)	National Resources Conservation Service, formerly known as the Soil Conservation Service (SCS)
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
O&M	Operations and Maintenance
Off-Highway Vehicle (OHV)	Vehicles such as racing motorcycles, trail bikes, mini bikes, dune buggies, all–terrain vehicles, jeeps, and snowmobiles. These vehicles are operated exclusively off public roads and highways on lands that are open and accessible to the public.
OSA	Office of the State Archaeologist
Ozone	A very reactive form of oxygen that combines readily with other elements and compounds in the atmosphere.
Photovoltaic (PV)	A method of converting solar energy into direct current electricity using solar panels composed of a number of solar cells to supply usable solar power.
POI	Point of Interconnect
Raptor	A member of the order Falconiformes, which contains the diurnal birds of prey, such as the hawks, harriers, eagles and falcons.

Reinvest in Minnesota (RIM)	The Reinvest in Minnesota (RIM) Reserve Program is administered by the Minnesota Board of Water and Soil Resources. It protects and improves water quality, reduces soil erosion, and enhances fish and wildlife habitat on privately owned lands by retiring environmentally sensitive lands from agricultural production. Conservation practices are established by planting native vegetation, and restoring wetlands. Other benefits include flood control and groundwater recharge.
Right-of-Way	The physical land area within the approved Route Width over which land rights are actually required to safely construct, operate, and maintain a transmission line.
Route Width	The area in which the utility is allowed by the Public Utilities Commission to locate the necessary Right-of-Way and complete final design of the transmission facilities.
RSEA	MNDNR Central Region Regionally Ecological Significant Areas
Sediment	Material deposited by water, wind, or glaciers.
SGHAT	Sandia National Laboratories' Solar Glare Hazard Analysis Tool
SHPO	Minnesota State Historic Preservation Office
Solar panel (panel)	A set of solar photovoltaic (PV) modules electrically connected and mounted on a supporting structure.
State Scientific and Natural Areas (SNAs)	Preserves for natural features and rare resources of exceptional scientific and educational value.
State Wildlife Management Areas (WMAs)	Preserves established to protect those lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses.
Stormwater Pollution Protection Plan (SWPPP)	The SWPPP includes a description of all construction activity, temporary and permanent erosion and sediment control BMPs, permanent stormwater management, and other pollution prevention techniques to be implemented throughout the life of the construction project. The SWPPP includes a combination of narrative plans and standard detail sheets that address the foreseeable conditions at any stage of construction.

Substation	A substation is a high voltage electric system facility. It is used to switch generators, equipment, and circuits or lines in and out of a system. It also is used to change AC voltages from one level to another. Some substations are small with little more than a transformer and associated switches. Others are very large with several transformers and dozens of switches and other equipment.
USDA	United States Department of Agriculture
Very Small Quantity Generator (VSQG)	Businesses that generate 220 pounds or 22 gallons or less of hazardous waste per month
Voltage	A unit of electrical pressure, electric potential or potential difference expressed in volts. The term used to signify electrical pressure. Voltage is a force that causes current to flow through an electrical conductor. The voltage of a circuit is the greatest effective difference of potential between any two conductors of the circuit.
Wetland	Wetlands are areas that are periodically or permanently inundated by surface or ground water and support vegetation adapted for life in saturated soil. Wetlands include swamps, marshes, bogs and similar areas.
Wetland Conservation Act (WCA)	Legislation designed to maintain and protect Minnesota's wetlands and the benefits they provide. To retain the benefits of wetlands and reach the legislation's goal of no-net-loss of wetlands, the Wetland Conservation Act requires anyone proposing to drain, fill, or excavate a wetland first to try to avoid disturbing the wetland; second, to try to minimize any impact on the wetland; and, finally, to replace any lost wetland acres, functions, and values. Certain wetland activities are exempt from the act, allowing projects with minimal impact or projects located on land where certain pre-established land uses are present to proceed without regulation
Wildlife Management Area (WMA)	Wildlife Management Areas are part of Minnesota's outdoor recreation system and are established to protect those lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses.