Environmental Assessment
Lake Wilson Solar Energy Center Project

The Human and Environmental Impacts of Constructing and Operating the 150 MW Lake Wilson Solar Energy Center Project with 95 MW Battery Energy Storage System

October 2023

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Lake Wilson Solar Energy LLC (Lake Wilson) a wholly owned subsidiary of Invenergy Solar Development North America, proposes to construct, own, and operate a 150-megawatt solar energy generating system and associated facilities in Murray County, Minnesota. Lake Wilson also proposes to construct a 95-megawatt battery energy storage system. Lake Wilson must obtain a certificate of need and a site permit from the Minnesota Public Utilities Commission before it can construct the proposed Lake Wilson Solar Energy Center.

Sources

Much of the information used to prepare this environmental assessment comes from Lake Wilson's certificate of need and site permit application. Additional sources include information from relevant federal and state environmental review documents for similar projects, spatial data, and site visits. Unless otherwise noted, all URL addresses were current as of October 4, 2023.

Document Availability

This environmental assessment and other materials related to this project are available (1) on the Commerce Department's website: https://mn.gov/commerce/energyfacilities, select *Power Plants*, and then select *Lake Wilson Solar Energy Center Project*, and (2) the Commission's website: https://mn.gov/puc, select *eDockets*, enter the year (21) and docket number (791 or 792), and then select *Search*. This document can be made available in alternative formats, that is, large print or audio, by calling (651) 539-1530 (voice).

Project Mailing List

To place your name on the project mailing list contact docketing.puc@state.mn.us or (651) 201-2204 and provide the docket number (21-791 or 21-792), your name, email address, and mailing address. You can indicate how you would like to receive notices—by email or U.S. mail.

How is this document organized?

The EA addresses the matters identified in the scoping decision.

This EA is based on the applicant's certificate of need (CN) application, the site permit application, and public scoping comments. It addresses the matters identified in the August 4, 2023, scoping decision (Appendix B).

Chapter 1 briefly describes the state of Minnesota's role; discusses how this EA is organized; and provides a summary of potential impacts and mitigation. This chapter also analyzes the siting factors that the Public Utilities Commission must consider for the project.

Chapter 2 describes the project—its design, construction, operation, and decommissioning.

Chapter 3 summarizes the regulatory framework, including the CN and site permit processes, the environmental review process, other approvals that might be required for the project, and the criteria the Commission uses to make its decisions.

Chapter 4 describes the environmental setting; details potential human and environmental impacts; and identifies measures to mitigate adverse impacts. It summarizes the cumulative potential effects of the project and other projects, and lists unavoidable impacts and irreversible and irretrievable commitments of resources.

Chapter 5 discusses the feasibility, availability, and potential impacts of system alternatives.

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Acronyms and Abbreviations

AC	alternating current
AIMP	agricultural impact mitigation plan
ALJ	administrative law judge
AQI	Air Quality Index
dBA	A-weighted decibel scale
BESS	battery energy storage system
BMPs	best management practices
BMS	battery management system
BWSR	Board of Water and Soil Resources
CFR	Code of Federal Regulations
CN	certificate of need
CO	carbon monoxide
CSW	construction stormwater
CTU	City, Township, and Unorganized Territory
DC	direct current
DNR	Minnesota Department of Natural Resources
DOT	Minnesota Department of Transportation
DSP	draft site permit
EA	environmental assessment
EAW	Environmental Assessment Worksheet
EERA	Energy Environmental Review and Analysis
EJ	Environmental Justice
ELF	extremely low frequency
EMF	Electric and Magnetic Fields
EPA	United States Environmental Protection Agency
ER	environmental review
ERP	emergency response plan
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
GHG	Greenhouse gases
GIA	generator interconnection agreement
HUC	hydrologic unit code
HVAC	Heating, ventilation, and air conditioning
HVTL	high voltage transmission line
LFP	lithium iron phosphate
LLC	limited liability corporation
LWECS	large wind energy conversion system
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MN	Minnesota

MPCA	Minnesota Pollution Control Agency
MV	medium voltage
MW	megawatt
MWI	Minnesota Well Index
NA	not applicable
NAC	noise area classification
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NHIS	Natural Heritage Information System
NLCD	National Landcover Database
NO2	nitrogen dioxide
NWI	National Wetlands Inventory
OAH	Office of Administrative Hearings
PCA	Minnesota Pollution Control Agency
PM	particulate matter
PUC	Public Utilities Commission
PV	photovoltaic
PWI	public water inventory
RGP	Regional General Permit
RIM	reinvest in Minnesota
ROI	region of influence
ROW	right-of-way
SCADA	Supervisory Control and Data Acquisition
SF6	Sulfur hexafluoride
SHPO	State Historic Preservation Office
SO2	sulfur dioxide
SSURGO	Soil Survey Geographic Database
SWPPP	stormwater pollution prevention plan
US	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VMP	Vegetation Management Plan
WAN	Wildlife Action Network
WCA	Wetland Conservation Act
WMA	Wildlife Management Area

Definitions

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

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

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

distribution line means power lines that operate below 69 kilovolts.

drain tile means underground drainage system for removal of water from soil.

easement means a grant of one or more of the property rights by the property owner to and /or for the use by the public, a corporation, or another person or entity.

gen-tie transmission line means an aboveground 115 kV transmission line proposed by the applicant to connect the project substation to the switching station.

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

land control area means land for which the applicant maintains lease agreement options.

large electric power generating plant means electric power generating equipment and associated facilities designed for or capable of operation at a capacity of 50,000 kilowatts or more (Minnesota Statute 216E.01, subdivision 5).

large energy facility means any electric power generating plant or combination of plants at a single site with a combined capacity of 50,000 kilowatts or more and transmission lines directly associated with the plant that are necessary to interconnect the plant to the transmission system (Minnesota Statute 216B.2421, subdivision 2(1)).

mitigation means to avoid, minimize, correct, or compensate for a potential impact.

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

project area means one mile from the land control area.

project vicinity means 1,600 feet from the land control area and collection line corridor.

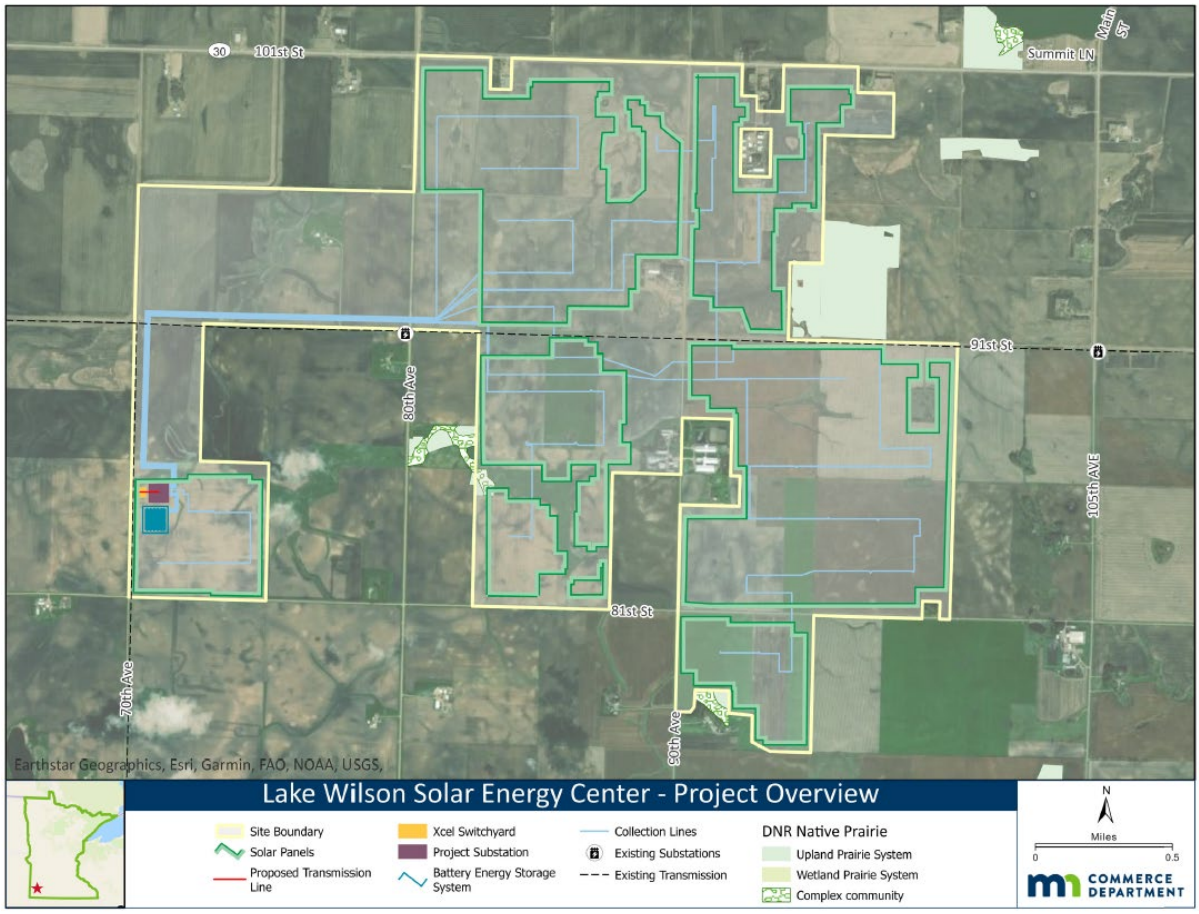
solar facility (or solar facility) means ground-mounted photovoltaic equipment capable of operation at 50,000 kilowatts or more connected directly to the electrical grid and the associated facilities such as a project substation, access roads, operations and maintenance facilities, and collector lines.

solar energy generation system means a set of devices whose primary purpose is to produce electricity by means of any combination of collecting, transferring, or converting solar-generated energy (Minnesota Statute 216E.01, subdivision 9a).

transmission line means power lines that operate at 69 kilovolts and above.

Project Overview Map

Figure 1: Proposed Lake Wilson Solar Energy Center – Project Overview and Location



Chapter 1: Summary

Lake Wilson Solar Energy LLC (applicant), a wholly owned subsidiary of Invenergy Solar Development North America, must obtain a certificate of need (CN) and a site permit from the Minnesota Public Utilities Commission (Commission) before it can construct the proposed Lake Wilson Solar Energy Center Project (project). The project is an up to 150 megawatt (MW) photovoltaic (PV) solar energy generating system with a 95 MW battery energy storage system (BESS) in Leeds Township, Murray County, Minnesota.

The land control area, which is defined as land for which the applicant maintains lease agreement options, occupies approximately 1,526 acres east of the City of Lake Wilson south of Minnesota State Highway 30 (Appendix A, Figure 1). The project will use PV solar panels mounted on linear, single axis tracking systems. Underground collection lines will gather the electric power and route it to a new project substation. The project substation would interconnect to the electrical grid via a 200-400 foot project generation intertie line to a new Xcel Energy Switchyard (Xcel Switchyard), which facilitates the interconnection to the existing Northern States Power Company, d/b/a Xcel Energy (hereinafter Xcel Energy) Fenton - Chanarambie 115 kilovolt (kV) high voltage transmission line (HVTL) transecting the project area. A route permit is not required. The substation and switching station will also be used by the BESS. The Xcel Switchyard and intertie will be permitted, constructed, owned, and operated by Xcel Energy.

The applicant filed a CN and a site permit application on February 9, 2023. The applications were found to be substantially complete by the Commission on April 4, 2023.

Lake Wilson indicates that the project will assist the State of Minnesota in meeting its renewable energy objectives[1], diversify electricity sources, meet anticipated growth in electricity demand, and meet consumers' growing demand for renewable energy. The project is expected to positively impact the electric grid by providing 95 MW of energy storage capacity, thus allowing output timing to the grid to shift from peak solar generation to peak electric demand. Lake Wilson is working to secure a power purchase agreement with wholesale customers (e.g., Minnesota utilities and cooperatives) or commercial and industrial customers to sell the electric power generated by the project.

Lake Wilson indicates that a generator interconnection agreement (GIA) for the project has been executed with the Midcontinent Independent System Operator. Construction is anticipated to begin in the summer of 2024 with completion and operation anticipated in the winter of 2026.

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

An EA is not a decision-making document, but rather an information document. The EA is intended to facilitate informed decisions by state agencies, particularly with respect to the goals of the

[1] Minnesota Statute 216B.1691.

Minnesota Environmental Policy Act: "to create and maintain conditions under which human beings and nature can exist in productive harmony and fulfill the social, economic, and other requirements of present and future generations of the state's people."[2]

What is Minnesota's role?

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

To build the project, the applicant needs two approvals from the Commission – a CN and a site permit. A site permit supersedes local zoning, building, and land use rules.[3] However, the Commission's site permit decision must be guided in part by consideration of impacts to local zoning and land use in accordance with the legislative goal to "minimize human settlement and other land use conflicts".[4] In addition, various federal, state, and local approvals may be required for activities related to the construction and operation of the project. These subsequent permits are referred to as *downstream* permits and must be obtained by the applicant prior to constructing the project.

The project requires a CN from the Commission because it meets the definition of *large energy facility* in Minnesota statute, which is any electric power generating plant with a capacity of 50 MW or more.

The project also requires a site permit from the Commission because it meets the definition of *large electric power generating plant* in Minnesota statute, which is any electric power generating equipment designed for or capable of operation at a capacity of 50 MW or more.

The applicant applied to the Commission for a CN[5] and site permit[6] for the project in February 2023. With these applications, the Commission has before it three considerations:

- Is the project needed? Or would another project be more appropriate for the state of Minnesota, for example, a project of a different type or size, or a project that is not needed until further into the future?
- If the project is needed, what conditions should be placed on the site permit?

To ensure a fair and robust airing of the issues, the Minnesota Legislature set out a process for the Commission to follow when considering CN and site permit applications.[7] In this instance, an EA was prepared, and a public hearing will be held. The goal of the EA is to describe potential human and environmental impacts of the project (*the facts*), whereas the intent of the public hearing is to allow interested persons the opportunity to advocate, question, and debate what the Commission should

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2 Minnesota Statutes 216E.02, subd. 1.

3 Minnesota Statutes 216E.10, subd. 1.

4 Minnesota Statutes 216E.03, subd. 7.

5 Lake Wilson Project, Application to the Minnesota Public Utilities Commission for a certificate of need for a Large Electric Generating Facility, February 9, 2023, eDockets Numbers 20232-193062-01, 20232-193062-02, and 20232-193061-01 (through -05) hereinafter the certificate of need application.

6 Lake Wilson Solar Energy Center Project, Application to the Minnesota Public Utilities Commission for a Site Permit for a Large Electric Generating Facility, February 9, 2023, eDockets Numbers 20232-193056-01 (through -10), 20232-193057-01 (through -10), 20232-193059-01 (through -07), and 20232-193060-01 (through -09) hereinafter the Site Permit Application.

7 *See generally* Minnesota Statutes 216B and 216E.

decide about the project (*what the facts mean*). The record developed during this process—including all public input—will be considered by the Commission when it makes its decisions on the applicant's CN and site permit applications.

What is the public's role?

Minnesota needs your help to make informed decisions.

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

What is an Environmental Assessment?

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

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

What are the potential impacts of the project?

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

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

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

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

Impacts to human settlement as a result of the project are anticipated to be minimal. Impacts range from short-term and positive, such as increased local expenditures during construction, to long-term and negative, such as changes to viewsheds. Aesthetic impacts due to the project are unavoidable and are anticipated to be moderate, but will vary widely as visual impacts are subjective and unique to the individual. Property value impacts could range from minimal to moderate and decrease with

distance and over time – however, changes to a specific property's value are difficult to determine. The following impacts to human settlement are anticipated to be minimal: public health and safety, public services, known archaeological and historic resources, cultural values, environmental justice, land use and zoning, public services, recreation.

Impacts to land-based economies, including agriculture, are anticipated to be minimal. With respect to prime farmland, the applicant indicates that no feasible or prudent alternatives to the project exist. Potential impacts are localized and unavoidable but can be minimized.

Impacts to natural resources such as air quality and climate change are expected to be short-term and minimal during construction, but beneficial over time because the project will reduce the need for carbon-based electric generation processes and additional transmission infrastructure. Impacts to water resources, soils, and vegetation are anticipated to be minimal; such impacts can be mitigated by construction best management practices or with native perennial vegetation cover. Potential impacts to wildlife and habitat may be positive or negative and are species dependent. Negative impacts to individual would be highest during construction, but would improve once the project is restored and provides better habitat than row crops.

What factors guide the Commission's decision?

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

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

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

Certificate of Need

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

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

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

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

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

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

Site Permit

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

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

B. Effects on public health and safety.

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

D. Effects on archaeological and historic resources.

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

F. Effects on rare and unique natural resources.

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

H. Use or paralleling of existing right-of-way (ROW), survey lines, natural division lines, and agricultural field boundaries.

I. Use of existing large electric power-generating plant sites.

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

K. Electrical systems reliability.

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

M. Adverse human and natural environmental effects which cannot be avoided.

N. Irreversible and irretrievable commitments of resources.

The Commission is also guided by the "state's goals to conserve resources, minimize environmental impacts, minimize human settlement and other land use conflicts, and ensure the state's electric energy security through efficient, cost-effective power supply and electric transmission infrastructure."[8] The site must be compatible with environmental preservation and the efficient use of resources while also ensuring electric energy needs are met and fulfilled in an orderly and timely fashion.[9]

[8] Minnesota Statutes 216E.03, subd. 7(a).

[9] Minn. Stat. 216E.02, subd. 1.

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

Application of Siting Factors

This analysis applies the siting factors from Minnesota Rule 7850.4100 to the project. Some factors are described in just a few words. Other factors are more descriptive and include a list of elements that, when grouped, make up the factor. Lastly, certain factors are relatively succinct, but the scoping process identified elements to be analyzed in this EA. For example, the public health and safety factor includes an EMF element.

Factor M (unavoidable impacts) and **Factor N** (irreversible and irretrievable resource commitments) are discussed in Chapter 4 of this EA. **Factor H** (use of existing rights-of-way) and **Factor J** (use of existing infrastructure rights-of-way) apply solely to high voltage transmission lines. **Factor G** (application of design options) and **Factor L** (costs dependent on design) do not apply as the design of the proposed project is the only design under consideration.

Other factors are ranked as follows:

●	Impacts are anticipated to be negligible to minimal and able to be mitigated or consistent with factor.
○	Impacts are anticipated to be minimal to moderate and able to be mitigated in part or less consistent with factor, but nonetheless consistent.
⊘	Impacts are anticipated to be moderate to significant and unable to be mitigated fully or consistent in part or not consistent with factor.

Graphics above are used to illustrate distinct impacts associated with construction and operation. A discussion highlighting differences in the types of impacts follows.

Table 1: Application of Siting Factors

Factor A: Human Settlement		
Element	**Construction**	**Operation**
Aesthetics	○	○
Displacement	●	●
Cultural Values	●	●
Electric Interference	●	●
Environmental Justice	●	●
Floodplains	●	●
Land Use and Zoning	●	●

Noise	⊘	●
Property Values	●	○
Recreation	○	●
Socioeconomics	●	●

Factor A: Public Services

Element	Construction	Operation
Airports	●	●
Roads and Highways	●	●
Utilities	●	●

Factor B: Public Safety

Element	Construction	Operation
EMF	●	●
Emergency Services	●	●
Medical Devices	●	●
Public Safety	●	●
Stray Voltage	●	●
Worker Safety	●	●

Factor C: Land-based Economies

Element	Construction	Operation
Agriculture	●	●
Forestry	●	●
Mining	●	●
Tourism	●	●

Factor D: Archaeological and Historic Resources

Element	Construction	Operation
Archeological	●	●
Historic	●	●

Factor E: Natural Resources

Element	Construction	Operation
Air Quality	●	●
Climate Change	●	●

Geology	●	●
Groundwater	●	●
Soils	●	●
Surface Water	●	●
Topography	●	●
Vegetation	●	●
Wetlands	●	●
Wildlife	○	●
Wildlife Habitat	●	●

Factor F: Rare and Unique Resources

Element	Construction	Operation
Fauna	●	●
Flora	●	●

Factor I: Use of Existing Generating Plants

Element	Construction	Operation
Existing Plants	⊘	⊘

Discussion

The following discussion highlights potential impacts to factor elements that are anticipated to be moderate to significant, as well as siting factors that are less consistent, consistent in part, or not consistent.

Factor A: Human Settlement

Aesthetics

Visual impacts are subjective. Thus, potential impacts are unique to the individual and can vary widely. Although there are a couple of smaller solar facilities in the project area (Appendix A, Figure 1), the project is much larger than existing solar facilities. For those with high viewer sensitivity, for example, neighboring landowners, visual impacts are anticipated to be moderate to significant, while for those that travel by the project area, visual impacts are likely to be minimal.

Cultural Values

The project is not anticipated to impact or alter the work and leisure pursuits of residents in such a way as to impact the underlying culture of the area. Differences between cultural values related to renewable energy and rural character has the potential to create tradeoffs that cannot be addressed in the site permit.

Land Use and Zoning

Land use impacts are anticipated to be long-term, localized, and minimal. The project is preliminarily designed in compliance with the Murray County Zoning Ordinance and Comprehensive Plan. Constructing the project will change land use from agricultural to solar energy production for a minimum of 30 years. Normal agricultural activities can continue within some portions of the project area not converted to infrastructure for the project. After the project's useful life, the land control area could be restored to agricultural use or other planned land uses by implementing appropriate restoration measures. Impacts are unavoidable but can be minimized.

Noise

Distinct noises are associated with the different phases of project construction. These impacts will be temporary and intermittent and range from negligible to significant depending on the construction equipment used and the receptor's location.

Property Values

Impacts in the project vicinity are anticipated to decrease with distance to the project, and significant negative effects to property values are not anticipated. However, impacts to a specific property's value are difficult to determine. Because of this uncertainty, impacts to specific properties could be minimal to moderate.

Transportation

Potential impacts to roads and highways associated with construction are anticipated to be short-term, intermittent, and localized. The impact intensity level is expected to be minimal to moderate. During operation, no impacts to roads are anticipated; negligible traffic increases would occur for maintenance.

Factor C: Land-Based Economics

Agriculture

Potential impacts to agricultural producers are anticipated to be minimal—lost farming revenues will be offset by easement agreements. A negligible loss of farmland in Murray County would occur for the life of the project. Approximately 762 acres of prime farmland, 415 acres of prime farmland if drained, and 7 acres of prime farmland if protected from flooding or not frequently flooded during the growing season are within the areas designated for development within the project area. The applicant indicates that no feasible or prudent alternatives to the project exist. Potential impacts are localized and unavoidable but can be minimized.

Factor E: Natural Resources

Groundwater

Potential impacts to domestic water supplies are not expected. Localized impacts to groundwater resources, should they occur, would be intermittent, but have the potential to occur over the long-term. Indirect impacts from surface waters might occur during construction. Impacts can be mitigated.

Soils

Impacts to soils will occur during construction and decommissioning of the project. The impact intensity level is expected to be minimal to moderate. Potential impacts can be both positive and negative, and short- and long-term. Isolated moderate to significant negative impacts associated with high rainfall events, particularly during construction, could occur. Because the soil at the solar

facility will be covered with native perennial vegetation for the life of the project, soil health is likely to improve overall. Impacts are unavoidable and anticipated to be positive over the long-term.

Wildlife and Habitat

Impacts to wildlife are anticipated to be minimal to moderate during construction and operation of the project.

Factor I: Power Plants

Because the solar facility is not constructed at an existing power plant, the project is inconsistent with this siting factor.

Mitigation Measures

The following summarizes mitigation measures noted in this EA that are not part of the sample site permit issued by the Commission for the project. In addition to the measures summarized below, the Commission could require that a third-party monitor, reporting directly to EERA staff, be employed to monitor compliance with the conditions of any Commission site permit issued for the project (Appendix C, Section 4.3.4).

Aesthetics

The Commission could require downward illumination (shielded lighting) at all locations where lighting is required to mitigate impacts to night sky.

Noise

The Commission could require construction timing restrictions, that is, limiting the duration of certain construction activities, to mitigate impacts to state noise standards (Appendix C, Section 4.3.7).

Emergency Services

The Commission could require notification to emergency responders of traffic interruptions to mitigate impacts to emergency response (Appendix C, Section 8.10).

Recreation

The Commission could require time-of-day or time-of-year restrictions for certain construction activities to mitigate impacts to the Carlson State Wildlife Management Area. Truck routes can be planned to minimize travel near the Wildlife Management Area during construction to reduce impacts from road dust and noise.

Vegetation

The Commission could require continued coordination with state agencies in developing a vegetation management plan to mitigate impacts to vegetation (Appendix C, Section 4.3.17).

What's next?

Public hearings will be held in the project area and virtually; you can provide comments at the hearing. The public can provide comments at either hearing or as part of an associated public comment period. An administrative law judge will consolidate public comments and prepare a report and make recommendations for the Commission to consider. The Commission will then review the record and decide whether to grant a CN and a site permit.

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

The ALJ will also provide the Commission with proposed findings and a recommendation on whether to issue a CN and site permit. The Commission reviews all the information in the project record in determining whether to grant a CN and issue site permits. The Commission may grant a CN for the project as proposed, grant a CN contingent upon modifications to the project, or deny the CN. The Commission may also place conditions on the granting of a CN. If a CN is granted, the Commission will then decide whether to issue a site permit. Site permits define the location of the project and include conditions specifying mitigation measures. The Commission is expected to make a CN and site permit decision in early 2024.

Where do I get more information?

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

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

The CN application and site permit application can be found on eDockets: https://www.edockets.state.mn.us/EFiling/search.jsp by searching "21" for year and either "791" (CN) or "792" (site permit) for number. Information is also available on the commerce webpage: https://apps.commerce.state.mn.us/eera/web/project/14978.

Chapter 2: Proposed Project

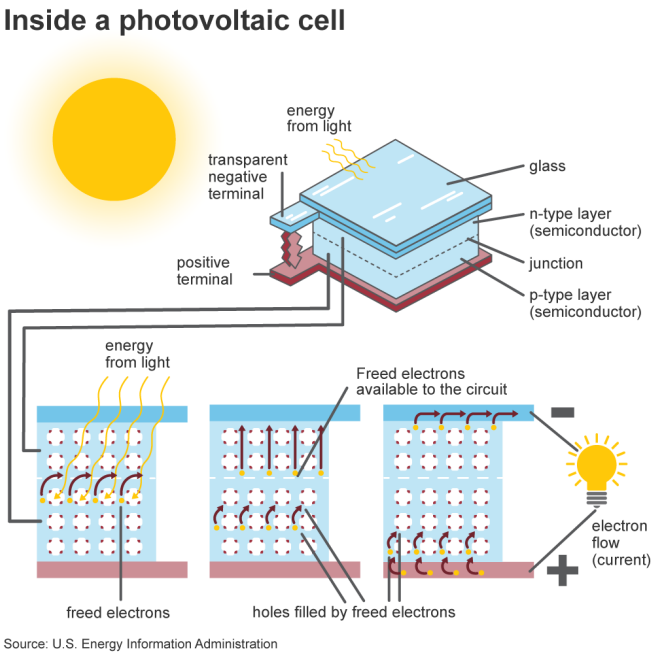
Lake Wilson proposes to construct an up to 150 MW solar facility in Leeds Township in Murray County, Minnesota. The project will occupy approximately 1,526 acres of the 2,621 acres within the project area. This chapter describes the project and how it would be constructed, operated, and decommissioned. Unless otherwise noted, the sources of information for this chapter are the site permit application.

How do solar facilities generate electricity?

The *photovoltaic effect* is the physical process through which a PV cell converts sunlight directly into electricity by capitalizing on nature's inherent desire to keep electrical charges in balance.

When direct and indirect solar radiation (direct and scattered sunlight) strikes a PV cell, some radiation is absorbed, which excites electrons within the cell. This results in a continuous flow of electrons from the front to the back of the panel through electrical connections, which results in a continuous flow of electric current as depicted in Figure 2[10].

Figure 2: Photovoltaic Cell



Source: U.S. Energy Information Administration

Solar panels (sometimes referred to as solar modules) are made up of PV cells that generate direct current (DC) electricity, which must be converted to alternating current (AC) electricity before reaching the electrical grid. Solar panels are arranged into electrically connected blocks and connected to inverters. An inverter converts DC electricity to AC electricity. Transformers then step up the electrical voltage before the electrical power is collected through an above- or below-ground collection system. Collection systems combine the electricity from across the array and deliver it to a project substation.

Where is the project located?

The solar facility is located in Leeds Township in Murray County, Minnesota (Figure 1).

As shown in Figure 1, the solar facility is south of State Highway 30 and east of the City of Lake Wilson. Table 2 summarizes the project location. The solar facility would be on approximately 1,526 acres of land currently used for row crop farming. The applicant holds lease or easement agreements and one land purchase option agreement with all landowners in the project area encompassing 2,621 acres.

[10] U.S, Energy Information Administration (May 26, 2023) *Solar Explained: Photovoltaics and Electricity*. https://www.eia.gov/energyexplained/solar/photovoltaics-and-electricity.php

Table 2: Project Location

Township	Range	Sections	Township	County
106N	42W	15-17, 20-22, 27	Leeds	Murray

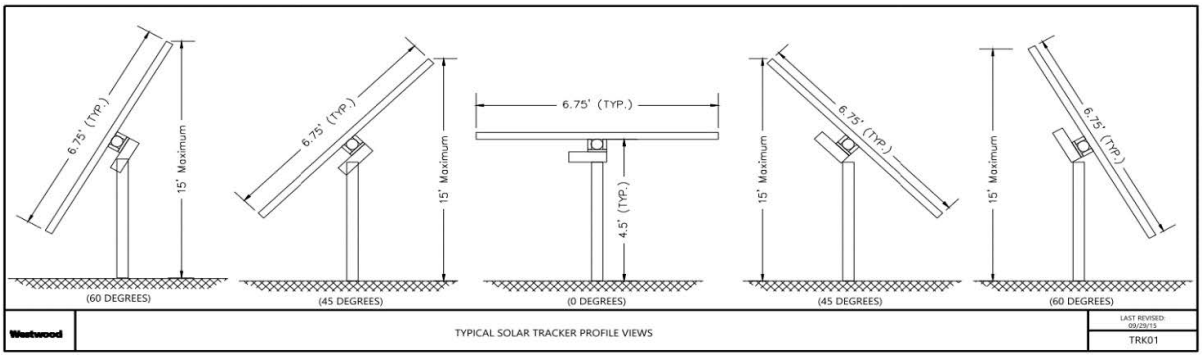
How is the project designed?

The project consists of PV solar panels, a BESS, an electrical collection system, project substation, switchyard, a short transmission line to connect the project to the electrical grid, an operations and maintenance building, fencing, and access roads.

Figure 3: Typical Solar Array

The project will use PV solar panels mounted on single axis tracking systems generally aligned in rows oriented north-south (Figure 3) and a BESS. Motors affixed to the tracking mechanisms rotate modules to track the sun from east to west daily to maximize electricity production (Figure 4). Underground AC collection cables will gather and send the electric power generated by the solar panels to the BESS and a project substation. The substation will interconnect with the electrical grid via a new switching station from a new overhead 115 kV generation intertie (gen-tie) transmission line. The project will also include 95 MW of battery energy storage capacity. The substation and switching station will also be used by the BESS. The switching station and intertie would be permitted, constructed, owned, and operated by Xcel Energy.[11]

Figure 4: Typical Solar Tracking Profile



The project also includes construction of inverters, step-up and power transformers, access roads, security fencing, stormwater treatment areas, Supervisory Control and Data Acquisition (SCADA) system, emergency generators, switchgear, metering equipment, and an operation and maintenance (O&M) facility. The project will rely on up to ten weather stations about 15 feet in height throughout the project area to verify the solar facility is performing as expected and to provide an accurate prediction of the facility output.

[11] Site Permit Application, Section 1.2.1.

Although design and equipment specifications have not been finalized, Lake Wilson anticipates using LONGi LR5 72HBD PV solar panels, but states that several other manufacturers are still under consideration. All modules under consideration are mono- or poly-crystalline models. Solar arrays will typically be less than 12 feet tall, but not more than 15 feet tall, even when tilted to their highest position. The solar panels and tracking system will be installed on driven pier foundations that are driven or screwed into the ground. Lake Wilson indicates that they do not expect the foundations to require concrete as determined by a geotechnical report.

At the time of this report, Lake Wilson had not finalized the make and model of the solar panels and tracking systems that will be used. The applicant notes that new solar panels, with higher efficiencies or outputs, are being introduced into the market regularly. Delaying the selection of solar panels for the project might result in a project with a smaller footprint.

Battery Energy Storage System

The BESS is designed for 95 MW and 380 MW hours of storage capacity. A BESS is accredited capacity based on how much energy it can provide for a minimum of four continuous hours each day. The purpose of the BESS is to shift energy output generated by the solar panels as it is distributed to the overall electric grid. The BESS design is expected to reduce costs and improve wholesale market competition, allowing Lake Wilson to create additional energy and capacity value. The BESS will dispatch stored power during times when less solar energy is being produced. For example, during off-peak times, if the project is producing 100 MW, the BESS could dispatch up to 70 MW of additional power to the grid, fully utilizing the 170 MW of capacity allowed under the Generator Interconnection Agreement.

Figure 3: Typical BESS Container Configuration

Lake Wilson anticipates needing approximately four acres to construct the BESS as a centralized, AC-coupled system, meaning that all batteries will be in one location. An additional two acres around the BESS would be employed for setbacks and fencing. The BESS will be configured of battery cells arranged in modules. The batteries will be housed in racks within a series of outdoor-rated modular enclosures which resemble steel shipping containers (Figure 5). Enclosures will be installed on concrete pads with pier or steel beam foundations, with crushed rock yard-stone filled in the surrounding yard. Standalone enclosures

ensure people cannot enter the enclosures for safety reasons. The BESS will include rows of inverters and medium voltage transformers to transfer the energy to and from the batteries. From the BESS container, low voltage DC cables will connect to an inverter with cabling to a common bus that connects directly to the project substation.

Battery systems produced by several manufacturers are under consideration including but not limited to General Electric and Powin. Lake Wilson Solar will analyze current market offerings during final engineering to make a selection on the specific battery system model. Standard battery storage enclosures are typically 20 feet long, 8 feet wide, and 9.5 feet high. The BESS industry is currently deploying two main types of lithium-ion battery chemistries: nickel manganese cobalt oxide, and lithium iron phosphate (LFP). Lake Wilson Solar states that it intends to use LFP due to its superior safety profile. Similar to solar panels, the options available for the BESS when the project begins procuring infrastructure could be more advanced than those currently available.

Electrical Collection System

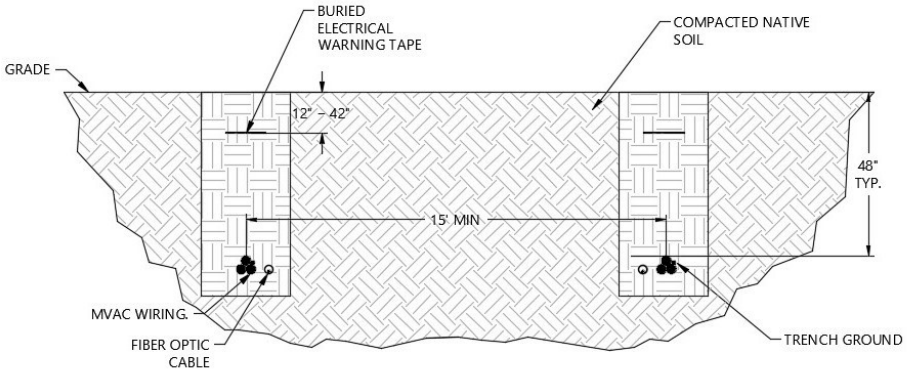
The DC electrical energy generated by the solar panels (about 1,500 volts DC) will be delivered to power inverters throughout the project area that convert the output to 600-660 volts of AC power. A step-up transformer then converts the AC voltage to an intermediate voltage of 34.5 kV for transmission through an underground collector system to the BESS and/or project substation. Step-up transformers are co-located with each inverter. The final number of inverters will depend on the inverter size and availability and the final solar panel configuration.

Figure 4: Typical Inverter Skid

Power DC to AC inverters and step-up transformers, about 10 feet tall, will be placed on a maximum of 55 inverter “skids”, which are concrete pads estimated to be 10 feet wide and 20 feet long (Figure 6). From a distance, inverters skids will look like one-half of a semi-trailer box. The skids will be placed on concrete slabs.

Lake Wilson expects needing 441,000 linear feet of cable. Cabling will be trenched into place to a depth of at two to five feet below ground (Figure 7). AC cabling will need one to two feet of trench width, and DC cabling will require four to ten feet.

Figure 5: Underground Cabling



Project Substation

Lake Wilson will construct and operate a project substation to collect the energy and step it up to 115 kV for transmission to the new Xcel Switchyard via a 200-400 feet long overhead 115 kV gen-tie line connected with conductors in a single span between two A-frame dead-end structures (up to 100 feet high). The project substation is expected to occupy an approximately 3.7 acres fenced area filled with crushed rock in the southwest corner of the project area (Figure 1). The project substation will include high voltage electrical poles, one or two 34.5 kV main power transformers, breakers, lightning protection, control equipment, and metering equipment.

Project Switchyard

A switching station (switchyard) provides a means to safely connect and disconnect the project, as needed, to and from the electrical grid. The new Xcel Switchyard requires Lake Wilson to acquire a purchase option agreement for the land needed. One 250-300 feet long overhead 115 kV gen-tie line would run from west to east from the substation to the Xcel Switchyard. The switchyard and intertie will be permitted, designed, constructed, owned, and operated by Xcel Energy. The Xcel Switchyard will facilitate interconnection to the existing Xcel Energy Fenton - Chanarambie 115 kV HVTL which travels north-south adjacent to the western portion of the project area (Figure 1). This new interconnection will be installed in a new easement area to host new lines approximately 250-300 feet in length with either two dead-end pole structures or six dead-ends depending on Xcel Energy's final design. Upon completion, Lake Wilson will transfer the land interests for the switchyard and interconnection to Xcel Energy.

Operations and Maintenance Building

Lake Wilson plans to construct an O&M facility with a parking area and other associated facilities such as a security gate and lighting. The O&M building will be used to house personnel as well as store administrative, operation, and maintenance equipment. The O&M facility will be on approximately 0.75 acres and co-located with the project substation and Xcel Switchyard (Figure 1). Personnel will use the building to conduct maintenance and repair during operation of the project and remotely monitor solar modules and electrical equipment with the SCADA system.

Fencing

All solar arrays will be permanently fenced in groupings for security. Fencing will consist of a lightweight agricultural woven wire secured to wooden posts which will be directly embedded in the soil or set in concrete foundations as required for structural integrity. The maximum height of fencing is expected to be 8 feet. Gates will be installed at access road entrances on public roads or near transmission lines.

Fencing around the project substation with a lockable gate will consist of a 7-foot chain-link fence with one foot of barbed wire at the top as required by electric code. All fencing will be designed to prevent the public and larger wildlife from entering the project area and accessing electrical equipment that could cause harm or injury.

Access Roads

The preliminary layout includes approximately 11.5 miles of internal graveled access roads leading to inverters and other infrastructure requiring O&M accessibility. When finalized, roads are

expected to be 12 to 20 feet wide along straight portions and approximately 45 feet wide at curves and intersections.

Project Construction

Lake Wilson anticipates construction of the solar facility will take place over two construction seasons or about 13 to 15 months. This section summarizes construction sequencing and activities.

Once workforce mobilization begins, initial site preparation includes vegetation removal, grading, tree removal, general site improvements, and preparation of the two staging and laydown areas 3-10 acres each. The staging/laydown areas will be used for storage of construction materials and equipment shipping containers, receiving construction deliveries, and temporary parking.

The applicant estimates grading discrete areas of approximately 58.5 acres, rather than mass grading of the site, to facilitate usage of the single axis tracking system, access roads, BESS, and the project substation. After initial site preparation, the solar arrays and collection/distribution systems will be installed next. Solar arrays will be constructed in blocks, and multiple blocks will be constructed simultaneously. The tracking system and solar panels will be mounted on steel posts driven into the ground. Final depth will depend on geotechnical analysis and design. Construction of project substation will be done simultaneously with this phase. As a part of this, the grounding grid (an underground conductive mesh to electrically ground equipment to earth's potential) and underground conduit will be installed with the foundations for the transformer, control housing, and high voltage structures. After any secondary containment areas for the transformer(s) is installed, stringing of electrical wires, installing the perimeter fence, and placing of crushed rock will complete the substation area.

The BESS construction will occur along with the arrays and project substation. Site preparation in addition to grading will include installation of substructures and electrical equipment. BESS containers, inverters/power conversion systems, switchboards, medium voltage (MV) cabling, MV switchgear, a junction box, and an auxiliary transformer will follow.

Lake Wilson may or may not perform the grading for the Xcel Switchyard depending on construction timing, Xcel Energy's needs, and contractor availability. Once the switchyard is built, connecting the project to the transmission grid with the new line tap will be the final phase.

Typical construction equipment will be used for the project – scrapers, bulldozers, dump trucks, watering trucks, motor graders, vibratory compactors, and backhoes. Additional specialty equipment could include a skid steer loader, pile driver, crane, forklift, concrete truck, boom truck, high reach bucket truck, and a truck-mounted auger or drill rig.

The applicant estimates that for three to four months, peak delivery of construction components will involve 10-15 semitruck deliveries daily, however the typical volume will be closer to 2-10. Traffic will decrease once components are delivered. Traffic volume during construction will predominantly come from worker travel to the construction site.

The applicant estimates that the project will create up to approximately 250 jobs during the construction and installation phases, and approximately 5 full-time jobs during the operations

phase. When selecting a contractor, the applicant states that they will prioritize the use of local construction craft employees to the greatest extent feasible consistent with project constraints (e.g., budget, timeline, industry standards, and corporate safety policies).

Restoration

After construction, the project area will be graded to natural contours where possible and soils will be de-compacted. Disturbed areas will be reseeded with specific seed mixes in accordance with the project's vegetation management plan (VMP) and stormwater pollution prevention plan (SWPPP). These seed mixes are designed to be used with the vegetation management practices of periodic mowing and selective spot herbicide applications. Erosion control measures will be used on all areas not containing permanent infrastructure until vegetation has established including silt fence, temporary seedings, mulching as needed, and sediment control logs. The applicant indicates that short-term establishment practices will occur from years 0-5, with long-term maintenance practices occurring from year 6 onward.

Lake Wilson has prepared a draft VMP (Appendix L) outlining how the project area will be revegetated, maintained, and monitored over the life of the project to ensure restoration goals and objectives are met. Regular monitoring during the active growing season and adaptive management will guide long-term vegetation management on site.

Project Schedule

Lake Wilson anticipates the project will begin commercial operation by the end of 2026. Table 3 shows Lake Wilson's estimated development and construction milestones.

Table 3: Anticipated Project Schedule

Activity	Date
Task 1 - PV Construction	
Mobilization/Civil Grading	August 2024
Racking Procurement	October 2024
Begin Racking	Installation April 2025
PV Procurement	February 2025
Begin PV Module Installation	August 2025
Begin PV Commissioning	May 2026
Task 2 - Substation Construction	
Mobilization/Civil Grading	May 2025
Begin Substation Construction	August 2025
In-Service	July 2026
Task 3 - BESS Construction	
Mobilization/Civil Grading	May 2025
Begin BESS Construction	September 2025
BESS Commissioning	May 2026
Facility Commercial Operations December 2026	

Operation and Maintenance

Lake Wilson estimates the service life of the project to be 35 years or longer based on the useful commercial lifespan of modules. Following restoration and construction closeout, control of the solar facility will transfer from the construction team to the operations staff. Up to five full time maintenance staff will perform regularly scheduled inspections of electrical equipment, maintain or repair equipment, vegetation management, and snow removal as needed. The generating facility, including the BESS, will be monitored and operated through a real-time control system for most operation functions (e.g., the meteorological station, energy meter, and SCADA system). The SCADA system allows for immediate notification of abnormal operations, which facilitates prompt maintenance and repair. In addition to real time monitoring and support, analysts can see trends in operating data that predict anomalies or failures before they arise. Xcel Energy will operate and maintain the equipment for the Xcel Switchyard and associated line tap.

Repowering and Decommissioning

Commission site permits require that the permittee be responsible for removing all project components and restoring the site to pre-construction conditions at the end of a project's useful life, and that the permittee is responsible for all costs associated with decommissioning the project (see draft site permit in Appendix C of this document). The applicant states that it would obtain all approvals for repowering including a new or amended site permit from the Commission as needed. Any site permit issued by the Commission will specify the maximum generating capacity if applicable when amending the existing site permit.

At the end of the project's service life, the applicant states they will either take necessary steps to continue operation (re-permitting and retrofitting equipment) or decommission the project and remove facilities.

If the project is not repowered, Lake Wilson will decommission the project and remove project facilities. Decommissioning would include removing the solar arrays (modules, racking and steel foundation posts), inverters, fencing, access roads, above-ground portions of the electrical collection system, overhead and underground cables and lines, BESS, substation, and the O&M facility. Standard decommissioning practices will be used such as dismantling and repurposing, salvaging/recycling or disposing of the solar energy improvements, and restoration. Decommissioning is expected to take about 40 weeks. A detailed Decommissioning Plan is included in Appendix G of the site permit application, and will be updated every 5 years to align with future decommissioning costs and salvage values.

If the project is decommissioned, Lake Wilson assumes that most of the project site will be returned to farmland and/or pasture. Appropriate measures to facilitate such uses in accordance with the agricultural impact mitigation plan (AIMP, Appendix E) will be implemented. If no specific use is identified by the landowner of the property, Lake Wilson will vegetate portions of the site disturbed by decommissioning activities with a seed mix meeting the requirements of the landowner. The goal of restoration would be to maintain natural hydrology and plant communities growing on the site to the greatest extent practicable while minimizing new disturbance and removal of native vegetation. Perennial vegetation growing throughout the project area will remain in place wherever possible to serve as a soil stabilization mechanism. When necessary, best management practices (BMPs) will be implemented to minimize erosion and to contain sediment. Any disturbed areas will be contained by installing erosion and sediment control measures, such as silt fences, bio-rolls, and ditch checks in all

disturbance areas where potential for erosion and sediment transport exists, consistent with storm water management objectives and requirements. Decommissioning and restoration activities of the Project site will be completed within 12 months after the end of commercial operations.

Lake Wilson states it will be responsible for all decommissioning costs and will ensure that funds are available to accomplish decommissioning through securing a financial surety such as a surety bond agreement, escrow account, letter of credit, or creating a reserve fund. In addition to complying with site permit conditions and the Decommissioning Plan, Lake Wilson dedicated decommissioning the project components in the corresponding real estate agreements.

Project Costs

Lake Wilson Solar estimates the total installed capital cost for the entire Project will be approximately $450 to $500 million (Table 4). Actual costs will depend on final material, taxes and tariffs, and labor costs. Once operational, the project will require ongoing operations costs, including labor and materials for maintenance, vegetation management, snow clearing, and taxes. Lake Wilson estimates annual operations costs of $2.6 million.

Table 4: Estimated Project Costs

Project Component	Cost (dollars)
Development, Financing, Engineering, Procurement & Construction *(Panels, Panel Racking, Cabling, Batteries, Battery Rack, Inverters, Fencing, Transformers, Construction Contractor/Labor)*	$ 437-483 million
Generation Tie Line	$1-2 million
Interconnection	$12-15 million
Total Costs	**$450-500 million**

Chapter 3: Regulatory Framework

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

Commission Approvals Required

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

The project requires a CN because it meets the definition of *large energy facility*,[12] which means any electric power generating plant—including one powered by solar energy[13]—with a capacity of 50 MW or more and the transmission lines necessary to connect the generation facility with the transmission system.[14] Minnesota Rule 7849.0120 provides the criteria that the Commission must use in determining whether to grant a CN. These factors are discussed in Chapter 1 under the What factors guide the Commission's decision?" Section.

The solar generation facility requires a site permit from the Commission because it meets the definition of *large electric power generating plant*, which means any electric power generating equipment designed for or capable of operation at a capacity of 50 MW or more.[15] Projects powered by solar energy qualify for Commission review under the alternative permitting process described in Minnesota Statute 216E.04. Minnesota Rule 7850.4100 lists 14 factors for the Commission to consider when making a decision on a site permit. These factors are discussed in Chapter 1 under the "What factors guide the Commission's decision?" Section.

Environmental Review

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

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

Certificate of Need

Applications for a CN require preparation of an environmental report (ER).[16] An ER contains "information on the human and environmental impacts of the [project] associated with the size,

[12] Minnesota Statute 216B.243, subdivision 2.

[13] Minnesota Statute 216B.243, subd. 8 (a) (7) was modified on February 7, 2023, to exempt solar energy generating systems from needing a CN (see: https://www.revisor.mn.gov/laws/2023/0/7/laws.0.23.0#laws.0.23.0).

[14] Minnesota Statutes 216B.2421, subd. 2(1).

[15] Minnesota Statutes 216E.01, subd. 1 and 5.

[16] Minnesota Rule 7849.1200.

type, and timing of the project, system configurations, and voltage".[17] It also contains information on system alternatives to the project, as well as mitigation measures.

Site Permits

For solar electric power generating plants, the environmental review document required is an EA.[18] EERA staff prepares the EA on behalf of the Commission. An EA describes the potential human and environmental impacts of a proposed project and possible mitigation measures. It does not advocate or state a preference for a specific project. It may recommend specific mitigation measures. The EA analyzes and describes potential impacts and mitigation measures so that citizens, agencies, and governments can work from a common set of facts.

Joint Proceeding

When there are multiple applications before the Commission for a single project, the environmental review required for each application may be combined.[19] For this project, the Commission has authorized EERA staff to combine the environmental reviews required for the CN (an ER) and site permit (an EA). Thus, the Department developed a combined EA—an EA that addresses both the CN and site permit applications.

Commerce staff prepared an EA in lieu of an ER. The analysis of issues typically reviewed in an EA and the system alternatives studied in an ER are combined into a single document. This is the only state environmental review document required for the project.[20]

What permitting steps have occurred to date?

The Commission accepted the CN and site permit applications as complete on April 4, 2023.[21] A public information and scoping meeting was held in Slayton, Minnesota on May 10, 2023, and virtually on May 11, 2023.

Application Filing and Acceptance

Applicants must provide the Commission with a written notice of their intent to file a site permit under the alternative process,[22] which the applicant did on November 16, 2021.[23] On February 9, 2023, the applicant filed a combined CN and a site permit application. The Commission determined the applications to be complete on April 4, 2023[24]. The order also referred the matter to the Office of Administrative Hearings for appointment of an administrative law judge (ALJ) to conduct a public hearing for the project. Commission staff provided a *Sample Permit for a Solar Energy Generating System* on October 2, 2023.[25]

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[17] Minn. R. 7849.1500.

[18] Minnesota Statutes 216E.04, subd. 2(4and 8).

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

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

[21] Commission Order, April 4, 2023, eDockets Number 20234-194490-01.

[22] Minn. R. 7850.2800, subp. 2.

[23] Lake Wilson, *Notice of Intent to Submit a Site Permit Application Under the Alternative Permitting Process*, eDockets Number 202111-179832-01.

[24] Commission Order, April 4, 2023, eDocket No. 202111-179920-01.

[25] Commission Staff Briefing Papers, October 2, 2023, eDockets No. 202310-199322-01.

Scoping Process

Scoping is the first step in the environmental review process. It helps focus the EA on the most relevant information needed by the Commission to make informed decisions. Scoping comments have been compiled and are available to review or download.

Scoping includes a public meeting and comment period that provide opportunities for interested persons to help develop the scope (or contents) of the EA.[26] The purpose of the public information and scoping meetings is to provide information and answer questions about the project and permitting process. The meeting and associated comment period also provides an opportunity to gather input regarding potential impacts and mitigative measures that should be studied in the EA and to solicit potential site or system alternatives.

On April 24, 2023, the Commission issued a joint *Notice of Public Information and Environmental Assessment Scoping Meeting* and associated public comment period.[27] The notice was sent to individuals on the project contact list and to potentially affected landowners. It was also available on Commerce's webpage for the project.

EERA and Commission staff held a public information and scoping meeting regarding the Lake Wilson Solar Energy Center Project on May 10, 2023 in Slayton, Minnesota. Approximately 11 people attended this meeting; two attendees provided public comment, both expressing support for the project.[28] The following evening, May 11, 2023, the Commission and EERA held a remote-access public meeting. One person attended this meeting and made no comment. A court reporter was present at both meetings to document verbal statements.

A public comment period, ending on May 25, 2023, provided the public an opportunity to submit comments to EERA staff on potential impacts and mitigation measures for consideration in the scope of the EA. Written comments were received from two state agencies, two labor unions, and one nonprofit organization.[29] No alternatives were proposed.

Scoping Decision

The scoping decision identifies the issues to be evaluated in this EA.

After considering public comments and recommendations by staff, the Department issued a scoping decision for the EA on August 8, 2023 (Appendix B). Staff provided notice of the scoping decision to those persons on the Commission's service list. Based on the scoping decision, EERA staff has prepared this EA.

Issues Outside of Scope

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

This EA does not address the following:

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

[27] Notice of Public Information and Environmental Assessment Scoping Meetings, April 24, 2023, eDockets Number 20234-195079-02.

[28] Written and Meeting Comments on Scope of Environmental Assessment, eDockets No. 20235-196213-01.

[29] Written Public Comments on Scope of Environmental Assessment, eDockets Number 20235-196213-01 [hereinafter Written Public Comments].

- Any site alternative other than the site proposed by the applicant and identified in the scoping decision.
- Any system alternative not specifically identified in the scoping decision.
- The manner in which landowners are compensated for the project.

Other Permits and Approvals

Other permits and approvals are required for the project.

A CN and a site permit from the Commission are the only state permits required for siting the project. A site permit supersedes local planning and zoning and binds state agencies; therefore, state agencies are required to participate in the Commission's permitting process to aid the Commission's decision-making and to indicate sites that are not permittable.[30]

However, various federal, state, and local approvals might be required for activities related to construction and operation of the project. These subsequent permits are referred to as "downstream" permits and must be obtained by the applicant prior to construction. Table 5 lists potential downstream permits that may be required, several of which are discussed below.

Federal

The U.S. Army Corps of Engineers (USACE) "regulates the discharge of dredged or fill material into waters of the United States, including wetlands".[31] Dredged or fill material, including material that moves from construction sites into these waters, could impact water quality. A permit is required from USACE if the potential for significant adverse impacts exists. The USACE is also charged with coordinating with Indian Tribes regarding potential impacts to traditional cultural properties.

A permit is required from the U.S. Fish and Wildlife Service (USFWS) for the incidental taking[32] of any threatened or endangered species. The USFWS encourages consultation with project proposers to ascertain a project's potential to impact these species and to identify general mitigation measures for the project.

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

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

[32] 16 U.S. § 1532(19) (defining "take" to mean to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in such conduct).

Table 5: Potential Permits

Government	Type of Application	Purpose
Federal		
Environmental Protection Agency	Spill Prevention, Control, and Countermeasures Plan	Response plan to respond to a worst-case oil discharge or threat of a discharge.
U.S. Army Corps of Engineers	Section 404 Clean Water Act – Dredge and Fill	Protects water quality by controlling discharges of dredged and fill material. *Project layout currently avoids all jurisdictional waters.*
U.S. Fish and Wildlife Service	Threatened and Endangered Species Consultation	Consultation to mitigate impacts to federally-listed species.
Tribal		
American Indian Tribes	National Historic Preservation Act Section 106 Coordination	Coordination to prevent impacts to traditional cultural properties.
State		
Department of Natural Resources	State Threatened and Endangered Species Consultation	Consultation to mitigate impacts to state-listed species.
	Water Appropriation Permit	To balance competing management objectives.
Pollution Control Agency	Construction Stormwater Permit	Minimizes temporary and permanent impacts from stormwater on one or more acres of land.
	Section 401 Clean Water Act – Water Quality Certification	Ensures project will comply with state water quality standards. *Project layout currently avoids all jurisdictional waters.*
State Historic Preservation Office	National Historic Preservation Act Section 106 Consultation	Ensures adequate consideration of impacts to significant cultural resources.
Department of Agriculture	Agricultural Impact Mitigation Plan	Establishes measures for protection of agricultural resources.
Department of Labor and Industry	Electrical Inspection	Necessary to comply with state electric codes.
Department of Transportation	Utility Permit	Controls utilities installed along, across, or within highway rights-of-way. *Project layout currently avoids all MnDOT Right-of-Way with any utilities.*
	Driveway Access Permit	Controls access to driveways along highways. *Project layout currently avoids all MnDOT Right-of-Way with any utilities.*
	Oversize/Overweight Permit	Controls use of roads for oversized or overweight vehicles.
Department of Health	Well Notification	Needed to install a water supply well.
Board of Water and Soil Resources	Wetland Conservation Act (WCA)	Coordination with BWSR and Murray County to ensure conservation of wetlands. *Project layout currently avoids all WCA jurisdictional waters.*
Local		

Government	Type of Application	Purpose
Murray County	Building Permit	Needed for new construction in Murray County.
	Septic Permit	Needed prior to installation of a septic system.
	Utility Permit	Needed to construct or maintain electrical lines along or across county highway right-of-way.
Murray County/ Local Governments	Road Crossing, Driveway, Oversize or Overweight, and Land Permits	Ensures proper use of local roads and lands.
	Tile Crossing Permit	Required for boring or open cut of tile for utility crossings.

State

Potential impacts to state lands and waters, as well as fish and wildlife resources, are regulated by the DNR. Licenses are required to cross state lands or waters.[33] Projects affecting the course, current, or cross-section of lakes, wetlands, and streams that are public waters may require a *Public Waters Work Permit*.[34] Not unlike the USFWS, DNR encourages applicants to consult with the agency to determine if a project has the potential to impact state-listed threatened or endangered species. Additionally, consultation can lead to the identification of measures to mitigate potential impacts associated with the project.

Construction projects that disturb one or more acres of land require a general *National Pollutant Discharge Elimination System / State Disposal System Construction Stormwater Permit* (CSW Permit) from the Minnesota Pollution Control Agency (MPCA). This permit is issued to "construction site owners and their operators to prevent stormwater pollution during and after construction."[35] The CSW Permit requires use of best management practices; development of a Stormwater Pollution Prevention Plan; and adequate stormwater treatment capacity once the project is complete.

Projects must be designed so that stormwater discharged after construction does not violate state water quality standards. Specifically, projects with net increases of one acre or more to impervious surface must be designed to treat water volumes of one-inch multiplied by the net increase in impervious surface. PV panels are impervious, and are counted towards total impervious surface along with access roads, buildings, etc. The area beneath the panel, however, is pervious if properly vegetated. To account for this, MPCA developed a solar panel calculator that estimates the amount of stormwater retained by PV solar facilities. This amount can be applied as a credit towards the total amount of stormwater treatment needed for a project.[36]

A Clean Water Act Section 401 *Water Quality Certification* from MPCA might also be required. "Section 401 of the Clean Water Act requires any applicant for a federal license or permit to conduct an activity that may result in a discharge of a pollutant into waters of the United States to obtain a

[33] Minnesota Statutes 84.415.

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

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

[36] MPCA. *Minnesota Stormwater Manual*. (2022). https://www.pca.state.mn.us/water/minnesotas-stormwater-manual.

certification from the State in which the discharge originates that the discharge complies the applicable water quality standards."[37] The certification becomes a condition of the federal permit.

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

A permit from the Minnesota Department of Transportation (MnDOT) is required for construction, placement, or maintenance of utility lines adjacent or across trunk highway rights-of-way.[38] Coordination would be required to construct access roads or driveways from trunk highways.[39] These permits are required to ensure that use of the right-of-way does not interfere with free and safe flow of traffic, among other reasons.[40]

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

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

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

Local

Murray County oversees local implementation of the WCA in the project area. The WCA requires that any person "proposing to impact a wetland to first, attempt to avoid the impact; second, attempt to minimize the impact; and finally, replace any impacted area with another wetland of at least equal function and value."[41]

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

Access/Driveway

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

Oversize or Overweight Load

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

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

[38] Minnesota. Rules, Part. 8810.3300, subp. 1.

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

[40] MnDOT. *Utility Accommodation on Trunk Highway Right of Way: Policy OP002.* (2017). http://www.dot.state.mn.us/policy/operations/op002.html.

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

Road Crossing and Right-of-Way

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

Electric Safety Codes

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

The project must meet requirements of the National Electrical Safety Code (NESC).[42] Utilities must comply with the most recent edition of the NESC, as published by the Institute of Electrical and Electronics Engineers, Inc., and approved by the American National Standards Institute, when constructing new facilities or upgrading existing facilities.[43] These standards are designed to safeguard human health "from hazards arising from the installation, operation, or maintenance of conductors and equipment in electric supply stations as well as overhead and underground electric supply lines".[44] They also ensure that facilities and all associated structures are built from materials that will withstand the operational stresses placed upon them over the expected lifespan of the equipment, provided that routine maintenance is performed.

The project must be designed to meet North American Electric Reliability Corporation's requirements,[45] which define the reliability requirements for planning and operating the electrical transmission grid in North America.[46]

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

[43] Minnesota Statute 326B.35.

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

[45] **Appendix B**, Section 4.5.1.

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

Chapter 4: Potential Impacts and Mitigation

This chapter describes the environmental setting, affected resources, and potential impacts. It also discusses mitigation of potential impacts.

Measuring Potential Impacts

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

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

Duration

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

Size

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

Uniqueness

Resources are different. Common resources occur frequently, while uncommon resources are not ordinarily encountered.

Location

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

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

This EA analyzes potential impacts of the project on various resources. The context of an impact—in combination with its anticipated on-the-ground effect—is used to determine an overall resource impact level. Impact levels are described using qualitative descriptors along a scale, which is explained below. These terms are not intended as value judgments, but rather a means to ensure common understanding among readers and to compare potential impacts between alternatives.

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

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

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

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

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

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

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

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

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

Regions of Influence

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

Land Control Area

The land control area is the fenced area containing the solar panels and includes the project substation. Specifically, this is the area in which the applicant has lease agreements for use of the land. Most of the potential impacts of the project will occur in this area.

Project Vicinity

The project vicinity is the area within 1,600 feet of the land control area.

Project Area
The project area is the area within 1 mile of the land control area.

County
Murray County is the ROI for certain impacts, including socioeconomic impacts.

The ROI for each resource is the geographic area where the project might exert some influence (Table 6). Impacts to resources may extend beyond these distances but are expected to diminish quickly.

Table 6: Regions of Influence

Resource Type	Resource Element	Region of Influence
Human Settlement	Displacement, Electronic Interference, Land Use and Zoning	Land control area
	Aesthetics, Noise, Property Values, Electronic Interference	Project vicinity
	Cultural Values, Recreation, Public Services	Project area
	Socioeconomics	County
Public Health and Safety	Electric and Magnetic Fields, Implantable Medical Devices, Stray Voltage, Worker and Public Safety	Land control area
Land-based Economies	Agriculture, Forestry, Mining	Land control area
	Tourism	Project area
Archaeological and Historic Resources	—	Project area
Natural Environment	Geology, Soils, Vegetation, Water Resources, Wetlands, Wildlife (except birds), Wildlife Habitat	Land control area
	Wildlife (birds), Rare and Unique Resources	Project vicinity
	Air Quality and Climate Change	County

Environmental Setting
The project area is in a rural area open space. The project area is dominated by agricultural land uses and scattered farmsteads and homesteads. Wooded areas are common around farmsteads.

The proposed solar facility is in Leeds Township in Murray County, Minnesota, east of the City of Lake Wilson and south of Minnesota State Highway 30 (Figure 1). No active or abandoned railways or pipelines are in the project area, however two existing transmission lines are: one is 69kV and borders the west while the other is composed of two 69 kV lines that run in tandem from east to west, bisecting the project area. Built features common to the area include residences and buildings, paved and gravel roads, wind turbines, community-scale solar facilities, and transmission lines (Appendix A, Figure 2).

The topography of the project area is generally flat with areas of rolling hills. The elevation ranges from 600 to 800 feet (1,620 to 1,784 feet above sea level). Row crops are grown on about 95% of the 2,621-acre project area, while the rest is mostly developed or herbaceous grassland.

The project is in the Coteau Moraines subsection of the Prairie Parkland Province.[47] Surface materials are primarily glacial drift deposits. The topography is underlain by calcareous glacial till and characterized by a matrix of sand, silt and clay with scattered pebbles, cobble, and few boulders.

According to the Murray County Drainage Ditch and Tile data, the project area contains multiple segments of private drainage tile and lateral ditches that drain north into Judicial Ditch 14. The eastern portion of the project area contains segments of County Ditch 47 that drain northeast towards Summit Lake.

Human Settlement

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

Aesthetics

The ROI for aesthetics is the project vicinity. The project will introduce new manmade structures into the existing landscape which will cause subjective aesthetic impact. Visual impacts are expected to be minimal for those with low viewer sensitivity, such as people traveling near the project on State Highway 30. For those with high viewer sensitivity, for example, neighboring landowners, visual impacts are anticipated to be moderate to significant. Aesthetic impacts are unavoidable but can be mitigated by screening, preserving natural landscapes, and by using shielded lighting.

Aesthetics refer to the visual quality of an area as perceived by the viewer and forms the impression a viewer has of an area. Aesthetics are subjective, meaning their relative value depends upon the perception and philosophical or psychological responses unique to individuals. Impacts to aesthetics are equally subjective and depend upon the sensitivity and exposure of an individual. How an individual values aesthetics, as well as perceived impacts to a viewshed, can vary greatly.

A viewshed includes the natural landscape and built features visible from a specific location. Natural landscapes can include wetlands, surface waters, distinctive landforms, and vegetation patterns. Homes, businesses, roads, bridges, cell towers, and power lines are examples of built features. Generally, an intact and harmonious viewshed is considered by many to be more aesthetically pleasing. Viewsheds might be important regardless of whether they are considered beautiful by the observer, for example, a scattered stone foundation of a historical resource.

Viewer sensitivity is an individual's interest or concern for the quality of a viewshed and varies depending upon the activity viewers are engaged in, their values and expectations related to the viewshed, and their level of concern for potential changes to the viewshed. High viewer sensitivity is

[47] DNR (n.d.) *Ecological Classification System: Ecological Land Classification Hierarchy*, retrieved from: https://www.dnr.state.mn.us/ecs/index.html

generally associated with individuals engaged in recreational activities; traveling to scenic sites for pleasure and to or from recreational, protected, natural, cultural, or historic areas; or experiencing viewsheds from resorts, road-side pull-outs, or residences. Residents have a higher sensitivity to potential aesthetic impacts than temporary observers. Low viewer sensitivity is generally associated with individuals commuting, working, or passing through an area.

Viewer exposure refers to variables associated with observing a viewshed, and can include the number of viewers, frequency and duration of views, and view location. Viewer exposure would typically be highest for views experienced by high numbers of people, frequently, and for long periods. These variables, as well as other factors such as viewing angle or time of day, affect the aesthetic impact.

The existing landscape in the project area is rural and agricultural consisting of flat to gently rolling row crop fields of corn and dry beans. Built features common to the area include residences and buildings, paved and gravel roads, wind turbines, community-scale solar facilities, and transmission lines. Residences and farmstead are scattered throughout the project area.

There are 3 residences and no businesses within the project area, and 22 residences in the project vicinity (Appendix A, Figure 3). The nearest residence to solar arrays is approximately 238 feet, and the nearest residence to an inverter, electrical collection line, or transformer is 762 feet.

Potential Impacts

The visible elements of the solar facility will consist of new PV arrays, BESS, a substation, a switchyard, an operations and maintenance facility, up to 10 weather stations, up to 55 inverter skids, and 8-foot-high agricultural woven wire fencing. The overhead transmission line taps will be 250-300 feet long on each circuit in and out of the Xcel Switchyard with 2-6 dead end wood or metal pole structures about 100 feet high. Transmission structures for the gen-tie line will be 200-400 feet in a single span between two A-frame dead-end metal structures up to 100 feet high. Alignment visuals for transmission lines can be seen in Figure 4.

For residents outside the project vicinity and for others with low viewer sensitivity, such as travelers along State Highway 30, aesthetic impacts are anticipated to be minimal. For residents in the project vicinity and for others with high viewer sensitivity traveling on local roads in the project vicinity, aesthetic impacts are anticipated to be moderate to significant. Although there are smaller solar facilities in the project area (Appendix A, Figure 1), the project is much larger than existing solar facilities. How an individual viewer perceives the change from a field of row crops to a field of solar panels depends, in part, on how a viewer perceives solar panels. Current agricultural production has a definitive pattern, for example, planting, crop growth, harvesting, cover crop planting, and field rest. Activities at a solar facility do not change over the year. The panels will rotate daily to follow the sun. Vegetation under the panels will be perennial and limited.

At 15 feet tall at the maximum tilt of 60 degrees, the panels will have a relatively low profile. For reference, center pivot irrigation systems for corn are usually 14 to 18 feet in total height. Further, solar panels are constructed of dark, light-absorbing material and covered with an anti-reflective coating to limit reflection. PV panels are designed to absorb light to convert the light to electricity. Compared to clear glass, which typically reflects approximately eight percent of the sunlight, PV panels typically reflect approximately three percent of the sunlight when the panels are directly

facing the sun. Because of this, glare and reflection are expected to be minor. The low profile of the panels will limit the extent of aesthetic impacts.

Murray County zoning ordinance require any use producing light transmission, including solar facilities' solar panels, to prevent light from being detectable at the lot line of the site on which the use is located. There are no airports within three miles of the project area, therefore further solar glare hazard analysis is not required by the County.

The inverter skid sheds would be visible during certain times of day (mid-day), but when the panels are at full tilt, the sheds would likely be obstructed from view. For all residents and viewers, the aesthetic impacts of the project substation, switchyard, and transmission line are anticipated to be minimal. The substation, switchyard, and new transmission lines are relatively low-profile and situated next to existing transmission infrastructure along 70th Avenue (Appendix A, Figure 3). Although dead-end A frame structures and new HVTLs will be up to 100 feet high, thus potentially visible (depending on the landscape) from about a mile away, the new structures will be few added amongst the many distribution lines that exist in the project area and already have similar visual impacts.

Impacts to light-sensitive land uses are not anticipated given the rural project location coupled with minimal required lighting for operations. Exterior security lighting will be installed at the substation, O&M facility, and switchyard. Lights will be used as needed by maintenance personnel if work is required after dark. A motion-sensing, down casting security light will be installed at the entrance, and switch activated lights will be placed at each inverter for repair purposes. The motion-activated and down lit aspects of the lighting system will minimize impacts and effects.

Mitigation

Minimizing aesthetic impacts from solar generating facilities is primarily accomplished by locating the facilities so that they are not immediately adjacent to homes and harmonious with the existing landscape, ensuring that damage to natural landscapes during construction is minimized, and shielding the facilities from view by terrain or vegetation. The Commission could also require downward illumination (shielded lighting) at all locations where lighting is required to mitigate impacts to night sky.

While relatively few trees exist within the project area, Lake Wilson has designed the project to avoid tree clearing which will help break up the view of the arrays in some areas. Further aesthetic impacts can be mitigated by screening such as vegetative tree rows, berms, or fences. Vegetative screening would be most effective in select lines of sight and if the vegetation was coniferous and functional year-round.

Other mitigation techniques to reduce glare in addition to vegetation screening include changes in tracking to reduce glare from backtracking or tilting the arrays a few degrees east or west to minimize glare. Both the changes in tracking and repositioning of the arrays would result in reduction to the annual energy production.[48] Aesthetic impacts can also be mitigated through individual agreements with neighboring landowners (sometimes referred to as good neighbor agreements). Such agreements are not within the scope of this EA.

[48] Olson, Axel. *Reflecting on Solar Panel Glare and How to Mitigate It.* (2021). 1898 Co. https://1898blog.burnsmcd.com/reflecting-on-solar-panel-glare-and-how-to-mitigate-it

Table 15 in the site permit application outlines vegetative screening strategies proposed by Lake Wilson for each residence within 0.25 miles of the project area. Most residences have existing vegetation on sides of their property, but not all will be screened from the solar arrays. Of the residences that appear to have the highest potential for this impact (not including residences voluntarily participating in agreements in the project area), the nearest to the solar arrays (Resident 24) remains 3,699 feet away.

Proposed project facilities have been sited away from residences with Murray County setbacks[49] implemented (Table 7). Residences that are generally nearest to proposed solar arrays are in areas that are participating via a solar agreement (Appendix A, Figure 3). In addition, design complies with setbacks requiring primary structures to be greater than 238 feet from the nearest nonparticipating residence on adjacent property.

Table 7: Murray County Setback Requirements

Setback Type	County Setback Distance (feet)	Project Design* Setback to closest array (feet)
Property lines	30	>50 from non-participating property boundaries
Public road right-of-way (from array)	100	>100
Public road right-of-way (from fencing and all accessory structures)	50	>50
Primary structure on adjacent properties	200	>238 from nearest nonparticipating residence
Buffer protection waters	50 average, 30 minimum	>50 average >30 minimum
Shoreland (from river, stream, landward extent of floodplain)	300	>300
Shoreland (from ordinary high-water level of a lake pond or flowage)	1,000	>1,000

**Based on preliminary design in the site permit application.*

Cultural Values

The ROI for cultural values is the project area. Development of the project will change the character of the area potentially changing residents' sense of place. There are tradeoffs for rural communities between renewable energy projects and retaining the rural character of an area. Construction and operation of the project is not anticipated to impact or alter the work and leisure pursuits of residents in the project area in such a way as to impact the underlying culture or community unity of the area. Impacts are anticipated to be long-term, but minimal. Impacts are unavoidable.

[49] Murray County's Renewable Energy Ordinance, Zoning Ordinance, and Buffer Ordinance.

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

Individual and community-based renewable energy is becoming more valued across the nation. Utility scale renewable projects—generally located far from load centers in rural areas—are also valued, but, at times, opposed by residents. The highly visible, industrial look and feel of these projects can erode the rural feeling that is part of a residents' sense of place.

Cultural values can be informed by ethnic heritage. Residents in Murray County derive primarily from European ancestry. Cultural values are also informed by work and leisure pursuits, for example, farming and snowmobiling, as well as land use, such as agricultural cropland. Community events in the project area are usually tied to geographic features, seasonal/municipal events, and national holidays.

Potential Impacts

The project contributes to the growth of renewable energy and is likely to strengthen and reinforce this value, especially in an area that already has wind farms and community solar generating facilities. At the same time, the development of the project will change the character of the area. The value residents put on the character of the landscape within which they live is subjective, meaning its relative value depends upon the perception and philosophical or psychological responses unique to individuals. Because of this, construction of the project might—for some residents—change their perception of the area's character thus potentially eroding their sense of place. This tension between infrastructure projects and rural character creates real tradeoffs.

The project is not expected to impact the work and leisure pursuits of residents in the project area or land use in such a way as to impact the cultural values of the area. Construction and operation of the project is not anticipated to impact or alter the underlying culture of the area.

Mitigation

No impacts to cultural values are anticipated; thus, no mitigation is proposed.

Environmental Justice

The ROI for environmental justice includes the census tract intersected by the project. A meaningfully greater low-income or minority population does not reside in this census tract. Therefore, disproportionate and adverse impacts to these populations are not expected. Mitigation is not proposed.

Utility infrastructure can adversely impact low-income, minority or tribal populations. Environmental justice is the" fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."[50] The goal of this "fair treatment" is

[50] US EPA Environmental Justice, https://www.epa.gov/environmentaljustice.

not to shift risks among populations, but to identify potential disproportionately high and adverse effects and identify alternatives that may mitigate these impacts.[51]

Minnesota Statute 216B.1691, subd. 1 (e) was recently updated to reflect the definition of an environmental justice area[52]. The data does not define the project area as an environmental justice area based on the population residing in surrounding census tracts. This means that none of the census tracts contain:

1) 40 percent or more nonwhite populations
2) 35 percent or more households with income ≤ 200 percent of the poverty level
3) 40 percent or more residents with limited English proficiency, or;
4) Indian country.

Potential Impacts

The ROI for this analysis includes the census tracts intersected by the project. This census tract is the best approximation of the geographic area within which potential disproportionate adverse impacts from the project could occur. Murray County, which contains this census tract, is considered representative of the general population in the project area against which census tract poverty and demographic data can be compared.

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

Table 8 lists the rounded percentage of individuals living below the poverty level and household income. It also lists the percentage of those persons who did not self-identify as non-Hispanic white alone. Information about Minnesota and Murray County is provided for context.

Table 8 : Environmental Justice Characteristics

Area	% Nonwhite	% income ≤200% of poverty level	% limited English proficiency	Indian Country
Minnesota	20%	23%	2%	NA
Murray County	8%	21%	1%	No
Leeds Township	16%	22%	6%	No
Census Tract 27101900200	16%	22%	6%	No

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

[52] "Environmental justice area" means an area in Minnesota that, based on the most recent data published by the United States Census Bureau, meets one or more of the following criteria:
(1) 40 percent or more of the area's total population is nonwhite;
(2) 35 percent or more of households in the area have an income that is at or below 200 percent of the federal poverty level;
(3) 40 percent or more of the area's residents over the age of five have limited English proficiency; or
(4) the area is located within Indian country, as defined in United State Code, title 18, section 1151.

Source: U.S. Census Bureau 2017-2021 American Community Survey data[53]

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

The US EPA's Environmental Justice Screening Tool (EJ Screen)[54] was also used to evaluate the project area census tract to determine whether there may be disproportionate adverse human health or environmental effects on these populations. This tool suggests the population in the project area's exposure to environmental hazards is similar to, or less than, the state and national average exposure values across a range of variables *relevant* to the project (Appendix O). For instance, the census tract is in the 83rd percentile of the State of Minnesota for ozone on the EJ Index, however, the project will not emit a significant amount of ozone.

Mitigation

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

Land Use and Zoning

The ROI for land use and zoning is the land control area. The impact intensity level is anticipated to be minimal. Land use impacts are anticipated to be long-term and localized. Zoning impacts are not expected because the project qualifies as a conditional use under Murray County Ordinance. Constructing the project will change land use from agricultural to solar energy production for a minimum of 30 years. After the project's useful life, the land control area could be restored to agricultural or other planned land uses by implementing appropriate restoration measures. Impacts can be minimized.

Land use is the characterization of land based on what can be built on it and how the land is used. Zoning is a regulatory tool used by local governments (cities, counties, and some townships) to guide specific land uses within specific geographic areas. Land cover documents how much of a region is covered by forests, wetlands, impervious surfaces, agriculture, and other land and water types, including wetlands. Construction of solar generating facilities will alter current and future land use and land cover.

A site permit from the Commission supersedes local zoning, building, or land use rules.[55] Though zoning and land use rules are superseded, the Commission's site permit decision must be guided, in part, by consideration of impacts to local zoning and land use in accordance with the legislative goal to "minimize human settlement and other land use conflicts."[56]

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

[54] https://www.epa.gov/ejscreen

[55] Minnesota Statutes 216E.10, subd. 1.

[56] Minnesota Statutes 216E.03, subd. 7.

The solar facility is zoned agricultural and the land use at the site is approximately 95 percent agricultural (Appendix A, Figure 5). Solar Energy Systems over 40 kW in areas zoned agriculture require a conditional use permit from the County.[57] This permitted uses requires compliance with the general regulations in Article 17 of Murray County's Zoning Ordinance.

Murray County's Comprehensive Plan sets forth the following project relevant goals for their agricultural districts:

- Agricultural economy is strengthened and diversified. (Goal B.1)
- Agricultural land is preserved for crop and livestock production. (Goal F.1)
- Natural resources are conserved in balance with agriculture and urban development. (Goal F.2)

None of the townships within Murray County have adopted their own zoning regulations – all permitting is handled by the County.

Potential Impacts

The ROI for land use and zoning is the land control area. Constructing the project will change land use from agricultural to industrial for at least 30 years. The project is expected to be compatible with county planning goals and zoning ordinances if the conditional use permit from the County is acquired to employ land zoned as agricultural. Individual perspective largely determine whether the project is compatible with Murray County's Comprehensive Plan. Individuals might believe the project is compatible with local planning goals because it furthers the county's goals of preserving agricultural land and conserving natural resources in balance with agriculture and development. However, the project will remove agricultural land from production, which could be interpreted as being incompatible with the county's planning goals.

After the project's useful life, the land control area could be restored to agricultural or other planned land uses by implementing appropriate restoration measures. The applicant has indicated that the project will be decommissioned such that agricultural activities can resume once decommissioning has been completed. Since most project land will be temporarily leased from participating landowners, the land will return to furthering the County's goals of providing long-term agricultural opportunities once decommissioned.

Mitigation

Many of the county planning and ordinances have to do with the preservation of agricultural land. The primary means to ensure the project is compatible with county zoning is to ensure that the project preserves agricultural land. Preservation can occur at all phases of the project's life. The draft site permit (DSP) (Appendix C) has several permit conditions related to the preservation of agricultural land:

- Section 4.3.17 requires the applicant to prepare a VMP to prevent soil erosion and invests in soil health by establishing a plan to protect soil resources by ensuring perennial cover.
    - The applicant's draft VMP is found in Appendix L.

[57] Murray County Zoning Ordinance, retrieved from: https://cms9files.revize.com/murraycountymn/Government/Ordinances/Zoning/Zoning%20Ordinance.pdf

  - The applicant has prepared the draft VMP in coordination with MDA, EERA, DNR and BWSR.

- Section 4.3.18 requires the applicant to prepare an AIMP that details methods to minimize soil compaction, preserve topsoil, and establish and maintain appropriate vegetation to ensure the project is designed, constructed, operated and ultimately restored in a manner that would preserve soils to allow for the land to be returned to agricultural use.
  - The applicant's draft AIMP is found in Appendix E.
  - The applicant has worked with the MDA to prepare this AIMP.

- Section 9 requires the applicant to prepare a decommissioning plan focused on returning the project site to agricultural use at the end of the project's useful life.
  - The applicant's draft decommissioning plan is found in Appendix G of the site permit application.

Impacts to county zoning can be mitigated by ensuring the project is consistent, to the greatest extent practicable, with the county's renewable energy ordinance. The applicant states that the project will meet all applicable standards of Murray County's Renewable Energy Ordinance and consider the setback requirements where practicable. Lake Wilson has incorporated the regulations into the preliminary design plans. This is compatible given that the Murray County Renewable Energy Ordinance applies to solar energy systems that are not otherwise subject to siting and oversight under the Minnesota Power Plant Siting Act. No additional mitigation is proposed.

Noise

The ROI for noise is the project vicinity. Distinct noises are associated with the different phases of project construction. The impact intensity level during construction will range from negligible to significant depending on the activity. Potential impacts are anticipated to be intermittent and short-term. These localized impacts may affect nearby residences and exceed state noise standards. Impacts are unavoidable but can be mitigated by timing restrictions, that is, limiting the duration of certain construction activities. Noise impacts during operation are anticipated to be negligible to minimal.

Noise can be defined as any undesired sound.[58] It is measured in units of decibels on a logarithmic scale. The A-weighted decibel scale (dBA) is used to duplicate the sensitivity of the human ear.[59] A three dBA change in sound is barely detectable to average human hearing, whereas a five dBA change is clearly noticeable. A 10 dBA change is perceived as a sound doubling in loudness. Noise perception is dependent on a number of factors, including wind speed, wind direction, humidity, and natural and built features between the noise source and the receptor. Figure 8 provides decibel levels for common indoor and outdoor activities.[60]

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

[59] Id.

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

Figure 6: Comparative Noise Levels

Because sounds levels are measured on a logarithmic scale, they are not directly additive. "A doubling of sound energy yields an increase of three decibels."[61] For example, if a sound level of 50 dBA is added to another sound level of 50 dBA, the total sound level is 53 dBA, not 100 dBA. This change in sound level (three dBA) would be barely detectible.

All noises produced by the project must be within state noise standards (Minnesota Rule 7030.0050; Table 9). Noise standards in Minnesota are based on noise area classifications (NACs) that correspond to the location of the listener—referred to as a receptor. These classifications are not necessarily synonymous with zoning classifications. NACs are assigned to areas based on the type of land use activity occurring at that location. Noise standards are expressed as a range of permissible dBA over a one-hour period. L_{10} may be exceeded 10 percent of the time, or six minutes per hour, while L_{50} may be exceeded 50 percent of the time, or 30 minutes per hour. Standards vary between daytime and nighttime hours. There is no limit to the maximum loudness of a noise.

Table 9: Noise Standards (dBA)

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

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

Potential Impacts

The ROI for noise is the project vicinity (1,600 feet). The primary noise receptors are the 25 local residences. Residences are in NAC 1. Noise receptors could also include individuals working outside in the project vicinity. Ambient noise levels in rural areas such as the one surrounding the project

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

are estimated to be 45 dBA.[62] Potential noise impacts from the project are associated with noise from construction and operation.

Construction

Distinct noise impacts during construction are anticipated to be minimal to significant depending on the activity occurring and equipment being used. Construction noise impacts will be temporary, localized, limited to daytime hours, and intermittent. Sound levels from grading equipment are not dissimilar from the typical tractors and larger trucks used in agricultural communities during harvest. The noise from construction activities would dissipate with distance and be audible at varying decibels, depending on the distance from the equipment to the receptor.

Major noise producing activities related to installation of the solar arrays are associated with clearing and grading, material delivery, and driving foundation posts. The majority of the construction equipment that could be used on the site such as grading equipment and bobcats are anticipated to generate noise between 72-85 dBA.[63] Pile driving of the array posts is expected to be the most significant source of construction noise at roughly 101 dBA at 50 feet.[64] This phase of construction will occur intermittently at different locations for a duration of a 30 seconds to a few minutes (depending on soil conditions) for 3-6 months. This is due to the phasing of construction activities, e.g., site grading, post driving, racking and panel assembly may all occur at separate locations at the same time. Other construction activities, for example, installation of solar panels with a forklift, are anticipated to have minimal noise impacts.

Point source sounds, like construction equipment, decrease by six decibels for every doubling in distance.[65] The nearest residence to any project equipment that will be under construction will be approximately 238 feet from a solar array. Thus, noise impacts from most construction activities at this residence will not be within the daytime state noise standards if are continuous for at least six minutes.

Therefore, this construction noise has the potential to exceed state noise standards at select times and locations. For example, the noisiest construction is expected to be 101 dBA, which would exceed state L10 noise standards within 3,200 feet at a residence (101 dBA at 50 feet is perceived as a 65 dBA at 3,200 feet). Exceedances would be short-term and confined to daytime hours. Even without an exceedance, noise impacts will occur, such as with the disruption caused by rhythmic pounding of foundations posts.

Operation

Noise levels during operation of the project are anticipated to be negligible. The primary source of noise from the solar facility will be from inverters, transformers, and the project substation. Noise levels are expected to be constant throughout the day and lower during non-daylight hours. Lake Wilson modeled expected noise level impacts to residents during operation in their site permit application, which concluded that the highest predicted contribution to noise was 38 dBA, and the

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

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

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

[65] MPCA, A Guide to Noise Control in Minnesota (2015).

highest predicted total sound when including an assumed 40 dBA ambient level was 42 dBA. This is inclusive of all residents in the project vicinity; thus, modeling demonstrates compliance with the state noise standards during operation of the project. This does not mean that minor noise impacts will not occur. A person standing outside in the project vicinity during periods of low background noise might be able to discern some portion of the humming noise created by the project's inverters, substation, or switchyard.

Mitigation

Sound control devices on vehicles and equipment, for example, mufflers; conducting construction activities during daylight hours, and, to the greatest extent possible, during normal business hours; and running vehicles and equipment only when necessary are common ways to mitigate noise impacts. Impacts to state noise standards can be mitigated by timing restrictions.

Section 4.3.7 of the DSP requires the permittee to comply with noise standards established under Minnesota Rule, part 7030.010 to 7030.0080, and to limit construction and maintenance activities to daytime hours to the extent practicable. No additional mitigation is proposed.

Property Values

The ROI for property values is the project vicinity. Impacts to property values within the project vicinity could occur; however, changes to a specific property's value are difficult to determine. Because of this uncertainty, impacts to specific properties in the project vicinity could be minimal to moderate and decrease with distance and over time.

A property's value is influenced by a complex interaction of factors, including the presence of a HVTL or substation. Impacts to property values can be measured in three ways: sale price, sales volume, and marketing time. Many of these factors are parcel specific, and can include condition, size, acreage, improvements, and neighborhood characteristics; the proximity to schools, parks, and other amenities; and the presence of existing infrastructure, for example, highways or transmission lines. In addition to property-specific factors, local and national market trends, as well as interest rates, can affect all three measures. The presence of a solar facility becomes one of many interacting factors that could affect a specific property's value.

Because each landowner has a unique relationship and sense of value associated with their property, a landowner's assessment of potential impacts to their property's value is often a deeply personal comparison of the property "before" and "after" a proposed project is constructed. The landowner's judgments, however, do not necessarily influence the market value of a property. Professional property appraisers assess a property's value by looking at the property "after" a project is constructed. Moreover, potential market participants are likely to see the property independent of the changes brought about by a project; therefore, they do not take the "before" and "after" into account the same way a current landowner might.[66] Staff acknowledges this section

[66] Adapted from: Chalmers, James (October 30, 2019) *High Voltage Transmission Lines and Residential Property Values in New England PowerPoint Presentation*, 2019, https://www.nhmunicipal.org/sites/default/files/uploads/Annual_Conference/2019/Sessions/Wednesday/market_effects_of_utility_rows_presentation-1045am.pdf ; Department of Commerce (August 5, 2014) *Rights-of-way and Easements for Energy Facility Construction and Operation*, https://apps.commerce.state.mn.us/eera/web/project-file/12227 .

does not and cannot consider or address the fear and anxiety felt by landowners when facing the potential for negative impacts to their property's value.[67]

Electrical generating and transmission facilities can impact property values. Often, negative effects result from impacts that extend beyond the project location. Examples include emissions, noise, and visual impacts. Unlike fossil-fueled electric generating facilities, the project would not generate emissions through the energy production process. Potential impacts from operational noise are not anticipated. Aesthetic impacts will occur, but because the project is relatively short (in comparison to a wind turbine or a smokestack) impacts would be localized and limited in geographic scope.

Comparably sized PV solar facilities exist in Minnesota; however, limited sales information is available. A review of the literature identified one peer-reviewed journal article that addressed impacts to property values based on proximity to utility-scale, PV solar facilities. The Lawrence Berkeley National Lab studied over 1,500 large-scale PV solar facilities in six states (including Minnesota) to determine whether home sale prices were influenced within 0.5 miles (from over 1.8 million home sale transactions).[68] In summary, the study found that effects, "on home sale prices depend on many factors that are not uniform across all solar developments or across all states."

In Minnesota in particular, homes within 0.5 miles of large-scale PV solar facilities compared to homes 2-4 miles away found a 4% reduction in home sale prices. This finding was considered statistically significant. Additionally, only large-scale PV solar facilities developed on previously agricultural land, near homes in rural areas, and larger facilities (roughly 12 acres or more) were found to be linked to adverse home sale price impacts within 0.5 miles. The analysis did not include consideration of site features or site design, for example setbacks or landscaping features, which could play a role in nearby property valuation. Another limitation of the study was the lack of examination of the broader economic impacts or benefits to host communities from large-scale PV solar facilities, which might positively impact home sale prices.

Site-specific information for Lake Wilson should be considered when comparing the project to this study. The project will be over 12 acres on agricultural land in a rural area, making it relevant to the type of development that had statistically significant findings in the study. There are 23 residences within 0.5 miles of the preliminary development area of the project, e.g., where physical structures will be constructed. Without taking other factors into consideration, these properties could experience minimal to moderate property value impacts.

Considerations such as setbacks, benefits to the community, economic impact, and vegetative features could have an unpredictable range of influence over property value. For instance, project facilities are expected to comply with Murray County Zoning Ordinance setbacks. Additionally, several of the potentially affected properties have vegetative screening. Of the 23 residences, only one does not have any vegetative screening existing on their property. Of the remaining, 6

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

[68] Shedding light on large-scale solar impacts, March 2023. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0301421523000101.

residences have some vegetative screening on their property, which may be enough for some angles of view but not all. Overall, these 7 properties do not have enough existing vegetative screening to shield view of the majority of the solar facilities. Of the 7 residences that will not be fully screened from view of solar facilities, two of them are within the preliminary development area and have participating agreements with Lake Wilson. These two participants would be considered to have mitigated impacts due to the agreements with Lake Wilson.

Studies less expansive in sample size or relevancy to Minnesota offer other evidence. Chisago County Environmental Services and Zoning found that home sales exceeded assessed value near the 100 MW North Star solar facility at a rate comparable to the general real estate market in the area.[69] Additionally, a study prepared by CohnReznick examined compared sale prices of properties near 10 existing large solar facilities (including the North Star project) with comparable properties, and did not find a consistent negative impact to the sales value of properties near large solar facilities.[70]

Potential Impacts

Impacts to the value of specific properties within the project vicinity are difficult to determine but could occur. Because of this uncertainty, impacts to specific properties could be minimal to moderate, but are expected to be within 0.5 miles of the project area and to decrease with distance from the project and with time. The study-specific analysis of Lake Wilson determined that 5 residences are mostly likely to have increased potential impacts on their property values.

Based on analysis of other utility-scale solar projects, significant negative impacts to property values in the project vicinity are not anticipated. Aesthetic impacts that might affect property values would be limited to residences and parcels in the project vicinity where the solar panels are easily visible.

Mitigation

Impacts to property values can be mitigated by reducing aesthetic impacts and encumbrances to future land use. Impacts can also be mitigated through inclusion of specific conditions in individual land use agreements with landowners. Such agreements are not within the scope of this EA.

Recreation

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

Impacts to recreation can be direct or indirect. Direct impacts are impacts that directly impede the use of a recreational resource, for example, closing of a trail to facilitate project construction. Indirect impacts reduce the enjoyment of recreational resources but do not prevent use, for example, aesthetic impacts visible from a scenic overlook.

There are limited specifically designated recreational resources in the project area (Appendix A, Figure 6). There are no snowmobile, biking, or walking trails within the project vicinity. The nearest trail is Beaver Creek snowmobile trail 1 mile north of the project area and parallel to 111th street.

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[69] Kurt Schneider, Environmental Services Director, (October 20, 2017) *Email to Commerce staff*.

[70] Patricia L. McGarr, Andrew R. Lines, Sonia K. Singh. Real Estate Adjacent Property Value Impact Report: Research and Analysis of Existing Solar Facilities, Published Studies, and Market Participant and Assessor Interviews, November 21, 2021, https://www.linncountyiowa.gov/DocumentCenter/View/18016/Real-Estate-Adjacent-Property-Value-Impact-Report-PDF?bidId=

Similarly, no public parks are in the project vicinity. Wildlife Management Areas (WMAs) are in the project vicinity outside of the project area, the nearest being Carlson State WMA which is directly adjacent. Three others are within two miles, including Leeds, Peters State, and Chandler State WMAs. Camp Summit, an RV campground, is 1 mile northeast past Summit Lake in the City of Hadley. Other resources nearby but outside of the project area include a few relatively small, recreationally used lakes including Moon Lake and Lake Wilson.

Potential Impacts

The ROI for recreation is the project vicinity. Impacts to recreation are anticipated to be minimal and temporary. Construction of the project is not expected to impact any recreation areas other than potentially Carlson WMA, which borders the project area. This WMA has a small, high-quality remnant prairie and seeded prairie with primarily deer and pheasants.

A negligible increase in traffic is expected due to construction, and an imperceptible increase is expected during operation. Construction noise is expected to impact nearby resources, especially Carlson WMA which will be across a street from project construction. Pile driving is the loudest expected construction noise at 101 dBA at 50 feet, perceived as 59-65 dBA around 1 mile away at recreational spots like Camp Summit.

The PV panels may be visible to the East for users of Carlson WMA after construction, but their presence is not anticipated to significantly impact users due to significant vegetation buffering within the WMA, and the lack of PV panels on the other WMA borders. In relation to the WMA:

- To the North, only underground transmission lines will be in that project area.
- To the West, the nearest solar array is approximately 0.5 miles away.
- There is no project area to the South.

Mitigation

If construction BMPs are employed properly near the eastern border of Carlson WMA, significant permanent impacts are expected to be mitigated. Truck routes can be planned to minimize travel near the WMA during construction to reduce impacts from road dust and noise. The Commission could require time-of-day or time-of-year restrictions for certain construction activities to mitigate impacts to the Carlson State Wildlife Management Area. Major component deliveries will be required to stagger delivery times and dates so the onsite teams are not overwhelmed with a surge of trucks at one time. Construction will occur intermittently in stages, which should reduce long term noise impacts that could violate state noise standards. For instance, pile driving should not take more than 3 minutes, and will not be done all at once. The majority of the construction will not occur within 1 mile of Carlson WMA. No additional mitigation measures are proposed.

Transportation and Public Services

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

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

Water and Wastewater

The project area is not serviced by city water supply or sanitary sewer and residents in the project area have private wells for domestic or farming water needs and private septic systems of drain fields for domestic wastewater. The Minnesota Well Index (MWI) identifies seven domestic wells or boring holes within the land control area; four of these records are sealed and three are listed as active domestic wells (Appendix A, Figure 7).

Electric Utilities

The electric providers in the project area are Nobles Cooperative Electric and Xcel Energy. Xcel Energy provides electric service to the cities of Lake Wilson and Hadley as well as areas along the Lake Wilson-Chandler Tap 69 kV and the Hadley-Lake Wilson 69 kV HVTL that travel east to west across the center of the project area. Nobles Cooperative Electric provides electric service to the rest of the project area. There are electric distribution lines and four other HVTLs throughout the project area (Appendix A, Figure 2).

Pipelines

No natural gas or hazardous liquid pipelines were identified in the project area.

Roads

Access to the project will be via existing township and county roads. The major roadways in the area are MN State Highway 30 to the north of the project running west/east, and County Highway 28 which is through the project area running north/south. Other roads providing access points to the solar facility are 70th Avenue, 90th Avenue, 81st Street, and 91st Street.

Railroads

The nearest railroad is outside the project area to the north and is abandoned (Appendix A, Figure 2).

Airports

The nearest Federal Aviation Administration (FAA) registered airport to the project is the Slayton Municipal Airport, approximately 4.2 miles east of the solar facility and south of State Highway 30 in Slayton, Minnesota. The airport is owned by the city of Murray Center and operates one paved runway.

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

Emergency Services

Murray County provides police services to the project area. The Lake Wilson Volunteer Fire Department and Chandler Volunteer Fire Department provide fire protection and first responder medical services to the project area.

Potential Impacts

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

Water and Wastewater

Lake Wilson will likely install a single, domestic-sized private well and onsite septic system at the O&M facility to provide potable water for drinking and sanitary services for four to five full time operation employees. Lake Wilson will continue to evaluate whether connection to the Lincoln Pipestone Rural Water system is feasible and practicable. If feasible and practicable, then a well would not be needed.

Roads

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

Traffic during construction is estimated to be approximately 150 trips per day for pickup trucks, cars, and/or other types of employee vehicles onsite during construction. Approximately 2-15 semitrucks per day will be used for delivery of facility components. Major component deliveries will be required to stagger delivery times and dates so the on-site teams are not overwhelmed with a surge of trucks at one time. Since average daily traffic in the area is well below design capacity, this increased traffic may be perceptible to area residents, but the slight increase in volume is not expected to affect traffic function. Overweight or oversized loads are not anticipated except for delivery of the main transformer(s), and appropriate approvals will be obtained as necessary.

Lake Wilson will construct facilities within the limits of the preliminary development area and no road closures are anticipated. Lake Wilson will closely coordinate construction activities with County and Township staff if any closures are determined necessary. With the possible exception of minor field access or driveway changes depending on final design, no changes to existing roadways are anticipated. No impacts to roads are anticipated during the operation; negligible traffic increases would occur for maintenance.

Railroads

No active railroads are near the project area, therefore there will be no impacts.

Electric Utilities

No long-term impacts to utilities will occur as a result of the project. Limited, temporary impacts to service may occur during interconnection of the project into the existing Xcel Energy Fenton -

Chanarambie 115 kV HVTL. These outages are anticipated to be of short duration and closely coordinated with utilities and landowners.

Air Safety

FAA regulation is not expected for the project. The solar facility is not expected to impact air safety given that the nearest airport is over four miles away. PV panels typically reflect approximately three percent of the sunlight when the panels are directly facing the sun. Because of this, glare and reflection are expected to be minor and not affect flight paths or air traffic control.

Mitigation

Water and Wastewater

A well construction permit from the MDH will be required if a well is installed at the O&M facility. A septic system permit is required from Murray County or the MPCA prior to installation of a septic system.

Utilities

Section 4.3.5 of the DSP require the permittee to minimize disruptions to public utilities.

Electrical outages and disruption will be minimized by coordinating with Xcel Energy and communicating to customers. Impacts to electrical infrastructure that cross the project can be mitigated by appropriate coordination with the owners of the existing infrastructure and following industry best practices.

The location of underground utilities can be identified using the Gopher State One Call system before and during construction to fully understand existing infrastructure. Underground utility locations will be marked prior to construction. Lake Wilson Solar will coordinate with the utility to develop an approach to reroute or otherwise protect the utility if applicable.

Roads

Changes or additions to driveways from county roads will require coordination with local authorities and permits from the county. Additional entrances from MnDOT regulated roadways are not anticipated. The applicant indicates that an agreement with Murray County and Leeds Township staff on road use will be completed prior to the start of construction.

Section 4.3.22 of the DSP requires permittees to inform road authorities of roads that will be used during construction and acquire necessary permits and approvals for oversize and overweight loads. Permitted fencing and vegetative screening cannot interfere with road maintenance activities, and the least number of access roads shall be constructed.

In addition to permit requirements for driveway access and the conditions of the DSP, the following practices can mitigate potential impacts:

- Pilot vehicles can accompany movement of heavy equipment;
- Deliveries can be timed to avoid traffic congestion and dangerous situations on the roadway;
- Traffic control barriers and warning devices can be used as necessary;
- Photographs can be taken prior to construction to identify pre-existing conditions. Permittees would be required to repair any damaged roads to preconstruction conditions.

Railroads

No active railroads are near the project area; therefore, no mitigation is required.

Socioeconomics

The ROI for socioeconomics is Murray County. The impact intensity level is anticipated to be positive, in a minimal to significant manner. Effects associated with construction will, overall, be short-term and minimal. Significant positive effects may occur for individuals. Impacts from operation will be long-term and significant. Adverse impacts are not anticipated.

The project is in Leeds Township, a rural area in Murray County. The nearest communities are the cities of Lake Wilson (1.2 miles northwest) and Hadley (less than 1 mile northeast). Murray County and Leeds Township have lower minority populations and median household incomes compared to the State (Table 10).

Table 10: Population Characteristics

Location	Total Population	Percent Minority Population*	Median Household Income	Percent Low Income
Minnesota	5,706,494	17.4	$77,720	9.3
Murray County	8,179	4.8	$69,250	6.3
Leeds Township	189	9.0	$65,625	0.0 (10.1% margin of error)

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

Murray County is part of the Minnesota Department of Employment and Economic Development Region 8, which is in the Southwest Planning Region. Murray County's economy is strongly based on land and animal agricultural economic development with long term goals to protect production of land and character. Other industries include renewable energy industries like wind farms and byproduct services of efficient agriculture such as producing feed for feedlots and applying manure as fertilizer.

Potential Impacts

The ROI for socioeconomics is the county. The impact intensity level is anticipated to be positive. Potential impacts associated with construction will be positive, but minimal and short-term. Significant positive effects might occur for individuals. Impacts from operation will be long-term, positive, and moderate. The applicant indicates that the development of solar energy in this part of Minnesota has been important in diversifying, supporting, and strengthening the personal income tax base of southwestern Minnesota. The project will not disrupt local communities or businesses and does not disproportionately impact low-income or minority populations (see discussion on environmental justice). Adverse impacts are not anticipated.

Lake Wilson states that the BESS will positively impact the grid as the BESS can shift electric generation output from the likely peak of solar generation at noon to a potential peak of electrical

demand in the early evening. Depending on final design, the system may furnish other grid services such as frequency response and voltage support. The BESS could also act as an electrical "suspension" to smooth the output of the project on partly cloudy days. This net power generation system is expected to be more predictable and cost-effective than power generated by a system without a BESS, including a design that can reduce costs for interconnection customers and improve wholesale market competition.

Construction of the project will increase local demand for food, lodging, fuel, and other supplies for local businesses on a short-term basis. The applicant states that the project will create about 250 new job opportunities during construction for various trade professionals that live and work in the area as it is typical to advertise locally to fill positions. Because experience requirements vary widely it is difficult to predict how many jobs may or may not be local jobs. Contractor bids will prefer local employees to the greatest extent feasible for gravel, fill, and civil work. Further, the applicant indicated that they would require the selected contractor to work with labor unions, local subcontractors, or other vendors to implement a project construction staffing model that attempts to maximize local hiring and economic benefits. Further, Minn. Stat. 216E.03, subd. 10 (c) and Section 4.5.3 of the DSP require recipients of site permits from the Commission, including the recipient's construction contractors and subcontractors, pay no less than the prevailing wage rate.

The applicant anticipates the project will require approximately 5 full time onsite jobs during operation, 11 indirect jobs in Murray County, and an additional 19 jobs in the State. Indirect economic benefits will occur from additional local spending on goods and services and local sales tax. Lake Wilson estimates this will amount to an annual $4.5 million in economic output in the State as an operating facility by supporting onsite and indirect jobs with a distribution of nearly $1.7 million in earnings.

Once the project is operational, Lake Wilson will pay property tax and production taxes on the land and energy production to local governments. Property taxes are calculated on the land underlying the facility. The applicant predicts the facility will generate an estimated average annual solar energy production and property tax revenue over the life of the project of approximately $330,000 for Murray County and approximately $75,000 for Leeds Township. Minnesota has adopted a production tax of $1.20/MWh paid 80 percent to the County and 20 percent to the cities and townships.[71] In addition, lease and purchase payments paid to the landowners will be beneficial and offset potential adverse impacts and financial losses associated with removing a portion of their land from agricultural production.

Mitigation

Socioeconomic impacts are anticipated to be positive. Section 8.5 of the DSP requires quarterly reports concerning efforts to hire Minnesota workers. Further, Minn. Stat. 216E.03, subd. 10 (c) requires recipients of site permits from the Commission, including the recipient's construction contractors and subcontractors, pay no less than the prevailing wage rate. No additional mitigation is proposed.

[71] *Minnesota Department of Revenue. 2021.* https://www.revenue.state.mn.us/solar-energy-production-tax#:~:text=The%20Solar%20Energy%20Production%20Tax%20rate%20is%20%241.20%20per%20megawatt,nameplate%20capacity%20exceeding%201%20megawatt

Human Health and Safety

Construction and operation of a solar facility has the potential to impact human health and safety.

Electric and Magnetic Fields

The ROI for EMF is the land control area. Impacts to human health from possible exposure to EMFs are not anticipated.

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

Voltage on a conductor creates an electric field that surrounds and extends from the wire. Using water moving through a pipe as an analogy, voltage is equivalent to the pressure of the water moving through the pipe. The strength of the electric field is measured in kilovolts per meter (kV/m). The strength of an electric field decreases rapidly as it travels from the conductor and is easily shielded or weakened by most objects and materials.

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

Table 11 provides examples of electric and magnetic fields associated with common household items. "The strongest electric fields that are ordinarily encountered in the environment exist beneath high voltage transmission lines. In contrast, the strongest magnetic fields are normally found very close to motors and other electrical appliances, as well as in specialized equipment such as magnetic resonance scanners used for medical imaging."[72]

Table 11: Electric and Magnetic Field Strength of Common Household Objects[73]

Electric Field*		Magnetic Field**			
Appliance	kV/m	Appliance	mG		
	1 foot		1 inch	1 foot	3 feet
Stereo	0.18	Circular saw	2,100 to 10,000	9 to 210	0.2 to 10
Iron	0.12	Drill	4,000 to 8,000	22 to 31	0.8 to 2
Refrigerator	0.12	Microwave	750 to 2,000	40 to 80	3 to 8
Mixer	0.10	Blender	200 to 1,200	5.2 to 17	0.3 to 1.1

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

[73] Ibid.

Toaster	0.08	Toaster	70 to 150	0.6 to 7	< 0.1 to 0.11
Hair Dryer	0.08	Hair dryer	60 to 200	< 0.1 to 1.5	< 0.1
Television	0.06	Television	25 to 500	0.4 to 20	< 0.1 to 1.5
Vacuum	0.05	Coffee maker	15 to 250	0.9 to 1.2	< 0.1

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

Health Studies

In the late-1970s, epidemiological studies indicated a weak association between childhood leukemia and ELF-EMF levels.[74] "Epidemiologists observe and compare groups of people who have had or have not had certain diseases and exposures to see if the risk of disease is different between the exposed and unexposed groups, but does not control the exposure and cannot experimentally control all the factors that might affect the risk of disease."[75]

Ever since, researchers have examined possible links between ELF-EMF exposure and health effects through epidemiological, animal, clinical, and cellular studies. To date, "no mechanism by which ELF-EMFs or radiofrequency radiation could cause cancer has been identified. Unlike high-energy (ionizing) radiation, EMFs in the non-ionizing part of the electromagnetic spectrum cannot damage DNA or cells directly," that is, the ELF-EMF that is emitted from HVTLs does not have the energy to ionize molecules or to heat them.[76] Nevertheless, they are fields of energy and thus have the potential to produce effects.

"The few studies that have been conducted on adults show no evidence of a link between EMF exposure and adult cancers, such as leukemia, brain cancer, and breast cancer."[77] "Overall there is no evidence that exposure to ELF magnetic fields alone causes tumors. The evidence that ELF magnetic field exposure can enhance tumor development in combination with carcinogens is inadequate."[78]

"A number of scientific panels convened by national and international health agencies and the U.S. Congress have reviewed the research carried out to date. Most concluded that there is insufficient evidence to prove an association between EMF and health effects; however, many of them also concluded that there is insufficient evidence to prove that EMF exposure is safe."[79]

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

[75] *Ibid.*

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

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

[78] World Health Organization. *Extremely Low Frequency Fields*. (2007). http://www.who.int/peh-emf/publications/Complet_DEC_2007.pdf?ua=1, page 10.

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

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

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

The Department of Health concludes that the current body of evidence is insufficient to establish a cause and effect relationship between EMF and adverse health effects. However, as with many other environmental health issues, the possibility of a health risk cannot be dismissed.[80]

Regulations and Guidelines

Currently, there are no federal regulations regarding allowable ELF-EMF produced by power lines in the United States; however, state governments have developed state-specific regulations. For example, Florida limits electric fields to 2.0 kV/m and magnetic fields to 150 mG at the edge of the right-of-way for 161 kV transmission lines.[81] Additionally, international organizations have adopted standards for exposure to electric and magnetic fields (Table 12).

Table 12: International Electric and Magnetic Field Guidelines

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

* For persons with cardiac pacemakers or other medical electronic devices

[80] *Id*., page 36.

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

The Commission limits the maximum electric field under high voltage transmission lines in Minnesota to 8.0 kV/m.[82] It has not adopted a standard for magnetic fields.

Potential Impacts

The ROI for EMF is the land control area. Potential impacts are anticipated to be negligible and are not expected to negatively affect human health. Impacts will be long-term and localized but can be minimized. The primary sources of EMF from the generating facility will be from the solar arrays, buried electrical collection lines, and the transformers installed at each inverter.

The EMF generated by solar arrays is at the level generally experienced near common household appliances. Measured magnetic fields at utility-scale PV projects drop to very low levels of 0.5 mG or less at distances of 150 feet from inverters.[83] For electrical collection lines, a study found at 27.5 kV (slightly lower voltage than the project lines) that magnetic fields are within background levels at 1 meter above ground.[84] The nearest residence to solar arrays is approximately 238 feet. At this distance, magnetic fields from the project dissipate to background levels.

Electric field strengths decrease with distance. The nearest residence to an inverter, electrical collection line, or transformer is 762 feet. At this distance, both electric fields from the project dissipate to background levels. For 115 kV transmission lines such as those proposed for the project, typical EMF levels directly below the line are generally 1.0 kV/m and dissipate further to 0.5 kV/m at 50 feet away from the lines, or the approximate edge of the right of way.[85] These electric field levels are consistent with the Commission's electric field limit (less than 8.0 kV/m). Potential health impacts from these electric field levels are anticipated to be negligible.

Mitigation

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

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

[83] George Flowers and Tommy Cleveland, *Health and Safety Impacts of Solar Photovoltaics*, (2017). North Carolina Clean Energy Technology Center, https://content.ces.ncsu.edu/health-and-safety-impacts-of-solar-photovoltaics, p. 13

[84] McCallum L.C., Whitfield Aslund M.L., Knopper L.D., Ferguson G.M., Ollson C.A. 2014. Measuring electromagnetic fields (EMF) around wind turbines in Canada: is there a human health concern? Environ Health. 2014 Feb 15;13(1):9. doi: 10.1186/1476-069X-13-9. PMID: 24529028; PMCID: PMC3943383.

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

Public Health and Safety

The ROI for public and work safety is the land control area. Like any construction project, there are risks. These include potential injury from falls, equipment and vehicle use, electrical accidents, etc. Public risks involve electrocution. Electrocution risks could also result from unauthorized entry into the project area. Potential impacts are anticipated to be minimal. Impacts would be short- and long-term and can be minimized.

During operation there are occupational risks similar to those associated with construction. Construction crews must comply with local, state, and federal regulations when installing the project. This includes standard construction-related health and safety practices such as safety orientation and training as well as routine safety meetings. The project will be designed and constructed in compliance with applicable electric codes. Electrical inspections will ensure proper installation of all components, and the project will undergo routine inspection. Electrical work will be completed by trained technicians. Fencing will deter public access, and signage will provide appropriate public warnings.

Emergency services in the project area are provided by local law enforcement such as the Murray County sheriff's office and emergency response agencies such as the Lake Wilson volunteer fire department. Emergency services in the nearby city of Slayton are provided by the fire department, police department, and emergency medical services. All services are within five miles of the project area.

Lake Wilson will provide training resources for local responders, as well as the collaborative development of an emergency response plan (ERP) specific to the project prior to operation. The project's ERP will require quarterly safety drills for the team and annual safety training with local first responders covering a wide breadth of possible incidents at the site such as fire and medical emergencies. The ERP will provide BESS minimum approach distances for first responders and will require any first responder to wear a self-contained breathing apparatus if they need to enter the minimum approach distance.

Potential Impacts

The ROI for worker and public safety is the land control area. Worker safety issues are primarily associated with construction and BESS maintenance. Public safety concerns would be most associated with unauthorized entry to the project. The inflow of temporary construction personnel could increase demand for emergency and public health services. On the job injuries of construction workers requiring assistance due to slips, trips or falls, equipment use, or electrocution can create a demand for emergency, public health, or safety services that would not exist if the project were not built. As road closures may be required during construction, such closures could impede police, fire, and other rescue vehicles access to the site of an emergency.

Like any construction project, there are risks. These include potential injury from slips and falls, equipment and vehicle use, electrical accidents, etc. Construction might disturb existing environmental hazards on-site, for example, contaminated soils. A review of What's in My Neighborhood, maintained by MPCA, indicates that potentially contaminated sites do not occur within the land control or preliminary development area. Within the project vicinity, there are three active sites: two are feedlots (MPCA site IDs 49519 and 98221) and one is construction stormwater (247798).

BESSs are a relatively new technology that come with inherent risk as they're employed in early phases of implementation, however, there is a growing body of research and standards that have been applied to avoid incidents and enhance safety. The main safety hazard of a BESS is battery failure leading to fire which has the potential to spread to nearby batteries and containers, quickly presenting an emergency situation.

In Minnesota, unless solar panels discarded by commercial entities are specifically evaluated as non-hazardous assumed, the panels are assumed to be hazardous waste due to the probable presence of heavy metals. Heavy metals in solar panels can include arsenic, cadmium, lead, and selenium. If hazardous waste, they must be properly disposed of at a special facility or recycled if recyclers are available.[86] Proper disposal of panels at the end of their useful life is necessary to ensure that leaching of the materials, especially lead, does not reach the environment.

Mitigation

The project will be designed and constructed in compliance with applicable electric codes. Electrical inspections will ensure proper installation of all components, and the project will undergo routine inspection. Electrical work will be completed by trained technicians.

Construction is bound by federal and state Occupational Safety and Health Administration requirements for worker safety, and must comply with local, state, and federal regulations regarding installation of the facilities and qualifications of workers. Established industry safety procedures will be followed during and after construction of the project. Crews will be trained and briefed on safety issues, reducing the risk of injury. The project will be fenced to prevent unauthorized access. A decommissioning plan addresses PV panel end of life issues.

Public safety is addressed in several sections of the DSP:

- Section 4.3.29 requires the permittee to take several public safety measures, including landowner educational materials, appropriate signs and gates, etc.
- Section 8.10 requires permittees file an *Emergency Response Plan* with the Commission and local first responders prior to operation.
- Section 8.11 requires disclosure of extraordinary events, such as fires, etc.
- Section 9.1 requires a decommissioning plan prior to construction and updated every five years. Periodic updates of the plan will address the developing information on end-of-life issues related to PV panels.

No additional mitigation is proposed.

BESS Safety

The BESS will be designed and operated safely by complying with safety codes, regulations, and industry recommendations. Industry recommendations have been developed for fire hazards

[86] MPCA, *2017 Toxics and Pollution Prevention Evaluation Report*, at p. 22 https://www.pca.state.mn.us/sites/default/files/lrp-p2s-2sy17.pdf

associated with a BESS based on a fire incident in Arizona that injured firefighters.[87] That incident resulted in improved fire-safety practices for BESSs, as described in the McMicken Battery Energy Storage System Event Technical Analysis and Recommendations.[88] The newly developed standards, along with 2023 standards from the National Fire Protection Association 855 (NFPA 855) such as the Standard on Explosion Prevention Systems, and design compliance with International Fire Code and National Electric Code will further prevent future incidents. Lake Wilson will stay abreast of new codes and standards to ensure its equipment vendors and designs comply with industry standards and best practices.

Lake Wilson has proactively incorporated safety precautions into the design of the proposed BESS:

- The project's BESS, composed of lithium iron phosphate instead of manganese cobalt oxide, is less prone to thermal runaway and fire. There is also a lower risk of deflagration, which means in the unlikely event of a battery cell failure, the failure is less likely to spread.
- There will be enhanced safety by housing batteries outside of a building that requires emergency personnel to enter potentially unsafe structures in cases of emergency. A non-occupiable containerized solution provides natural segmentation of each BESS and spatial separation of the components, greatly reducing the risk of fire propagation.
- Equipment suppliers will be obtained based on manufacture to stringent quality standards, and equipment must be tested and certified by third party professionals. These will include UL 1973, UL 1741, UL 9540, UL 9540A, and UN 38.3.
- Standards, certifications, and code requirements from multiple nationally recognized organizations will be required for the engineering, design, manufacture, and testing of both the enclosures and equipment included in the BESS.
    - An example of tests employed ensure that a thermal runaway event does not propagate from one battery rack to another.
- The BESS will include a complex monitoring system for each battery system's main monitoring points at the cell level, module level, rack level, and system level. These points produce real-time data that feeds into automatic control logic housed in the battery management system (BMS) and site controller. The BMS and site controller ensure that operation is within the equipment manufacturer operating parameters and warranty requirements. If any operating limit is exceeded or an alarm is triggered, either a fault signal is sent to the whole battery string to disconnect from the inverter, or the rack contacts will open to disconnect individual racks.
- In the unlikely event of a battery off-gas failure, the HVAC system within each enclosure will evacuate combustible gases. The ventilation system is designed to dilute any combustible gases to well below their lower flammability limit.
- The BESS incorporates backup diesel generators, mounted on a concrete foundation, to provide standby power to ensure emergency functions can still be activated when there is a grid failure or power outage for at least two hours.

[87] Arizona Public Service. 2020. McMicken Battery Energy Storage System Event Technical Analysis and Recommendations. Document No.: 10209302-HOU-R-01. Retrieved from: https://coaching.typepad.com/files/mcmicken.pdf.

[88] *Ibid.*

No additional mitigation is proposed.

Land-based Economies

Solar facilities impact land-based economies by precluding or limiting land use for other purposes.

Agriculture

The ROI for agriculture is the land control area. Potential impacts to agricultural producers are anticipated to be minimal—lost farming revenues will be offset by easement agreements. A negligible loss of farmland in Murray County would occur for the life of the project. With respect to prime farmland, the applicant indicates that no feasible or prudent alternatives to the project exist. Potential impacts are localized and unavoidable but can be minimized.

Agricultural use encompasses approximately 95 percent of the land control area, with corn and dry beans as the dominant row crops. The agricultural census is a complete count of farms and ranches and the people who operate them, including small plots with at least $1,000 in annual sales. [89] Agricultural characteristics for Murray County are summarized in Table 13.

Table 13: Agricultural Characteristics - Murray County[90]

Category	2017	Percent change from 2012
Acres of farmland	395,079	-3
Number of Individual farms	864	-3
Average farm size (acres)	457	<0.5
Average value of agricultural production	$391,005	-4
Top crops (in acres)	Corn and soybeans	NA
Largest livestock inventory	Hogs and pigs	NA

Crops comprise most of the market value of agricultural production in the County (approximately 54 percent), with the remainder from livestock, poultry, and products. In terms of acreage, corn and dry beans dominate the landscape, though the County also have thousands of acres of hay, silage, and oats. Cattle and calves comprise the largest portion of livestock revenues with hogs and pigs closely behind.

Although much of the land in Murray County has historically been used for agriculture, there are differences in the quality and suitability of land for agricultural production. Prime farmland is defined by federal regulation in 7 CFR 657.5 (a) (1) as "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses." [91]

[89] USDA, 2017 Census of Agriculture, County Profile: Murray County, Minnesota. Retrieved at: https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Minnesota/cp27101.pdf.

[90] *Ibid.*

[91] Further, "It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no

Although prime farmland characteristics are the same nationwide, certain soils that do not meet these specific characteristics can nevertheless be important at a statewide level. Criteria for defining and delineating farmland of statewide importance are determined by the appropriate state agency or agencies. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some soils might produce as high a yield as prime farmlands if conditions are favorable. In some states, additional farmlands of statewide importance may include tracts of land that have been designated for agriculture by state law.

Approximately 84.5 percent of the soils in Murray County are classified as prime farmland or prime farmland if drained.[92] Nearly all the solar facility land control area are on areas classified as prime farmland or prime farmland if drained (Appendix A, Figures 8a and 8b). Table 14 shows prime farmland classifications within the project area.

Table 14: Prime Farmland within Solar Facility

Farmland Classification	Acres	% of Site
Prime Farmland	1,139	48.7
Prime Farmland if Drained	839	32
Farmland of Statewide Importance	266	10.1
Not Prime Farmland	241	9.2
Total	**2,485**	**100**

Over the past century, many farmers in the area have installed subsurface drainage systems to enhance crop yield. These systems use perforated pipe placed at a slope to move excess water from the crop root zone to a ditch or other outlet. Most drainage pipe used today is plastic, but because concrete or clay pipes were used historically, terms such as tile or tiling or drain tile are still used. Tiling can enhance crop productivity by lowering the water table, improving soil aeration, and allowing the soil to warm and dry more quickly in the spring.[93]

Potential Impacts

The ROI for agriculture is the land control area. Potential impacts are localized and unavoidable but can be minimized. The intensity of the impact is likely to be subjective. For example, conversion of farmland to energy production can be viewed as a conversion from one type of industrial use to another. Conversely, the conversion of farmland to energy production can be viewed as a negative impact to agricultural production. Restoring the site with native grasses and forbs will reduce soil erosion, provide pollinator and wildlife benefits, and improve soil health. This EA acknowledges that the perceived impacts to prime farmland are subjective and may be difficult to assess given the trade-offs associated with utility scale solar projects.

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rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding."

[92] Application, Appendix B, Figure 6 (Natural Resources Conservation Services).

[93] University of Minnesota Extension. *Impact of Agricultural Drainage in Minnesota*. (2018). https://extension.umn.edu/agricultural-drainage/impact-agricultural-drainage-minnesota#sources-1360510 .

Rural areas, with large parcels of relatively flat, open land, are ideal for solar development, which require six to eight acres of land to generate one MW of electricity. The project will result in up to 1,526 acres of cropland taken from current agricultural production for the life of the project. This change in land use would take productive farmland out of production but would result in a negligible loss of farmland in Murray County. As shown in Table 13, Murray County has about 395,079 acres of farmland, whereas the project is expected to remove 1,526 acres of farmland, or <0.5%. The applicant indicates that the land could be returned to agricultural uses after the project is decommissioned and the site is restored.

Construction of the project has the potential to damage agricultural soils through compaction or erosion if BMPs are not implemented to minimize damage. Construction may damage drainage tile that has been installed to enhance crop production. Damage to drainage tile may result in slower drainage or standing water at the site itself. A disruption of the drainage system at the site may also result in a change in the flow of discharge of water into the drainage ditches that collect the discharge from the tiling. Disruptions to the drainage system at the site would be expected to be isolated and would result in localized wet areas or possibly standing water.

Prime Farmland

In Minnesota, no large electric power generating site may be permitted where the developed portion of the plant site includes more than 0.5 acres of prime farmland per megawatt of net generating capacity, unless there is no feasible and prudent alternative. Economic considerations alone do not justify the use of more prime farmland.[94] With a generating capacity of up to 150 MW, the project, by rule, should impact no more than 75 acres of prime farmland. This is substantially less than the actual acreage of prime farmland affected, which is conservatively estimated to be 1,978 acres of prime farmland.[95]

An assessment of the availability of feasible and prudent alternatives is an important component in the Commission's review of the project. Commerce and MDA jointly developed a guidance document to assist developers when evaluating potential solar sites relative to the feasible and prudent language in the rule.[96] Since the state of Minnesota has mandates to both advance solar energy production and protect prime farmland, and due to the inherent difficulties in avoiding prime farmland, the guidance document is meant to assist developers in defining *feasible* and *prudent* in relation to siting alternatives, and to encourage them to build a record early in the site selection process showing whether or not an exception to the prime farmland exclusion is warranted.

The applicant "completed a detailed evaluation of a potential alternative site in an attempt to find a location for the project that would utilize fewer acres of prime farmland and presents evidence that Lake Wilson Solar was unable to find a feasible or prudent alternative to the project." As detailed in Appendix D, another potential site was analyzed in Roseau County near Warroad, Minnesota. Ultimately, Lake Wilson ruled out the site "because the project area did not have a suitable point of

[94] Minnesota Rule 7850.4400

[95] Based on the project boundaries rather than the preliminary development area, thus represents more land than will be constructed on. However, Lake Wilson will have site control over the land up to the project boundary. Compare Figure 10 to Figure 10a for details.

[96] Commerce, MDA. 2020. *Solar Energy Production and Prime Farmland: Guidance for Evaluating Prudent and Feasible Alternatives*. https://apps.commerce.state.mn.us/eera/web/doc/13929

interconnection… and was unable to meet the 0.5 acre of prime farmland per MW of net generating capacity limit set in the Rule due to existing environmental constraints." As such, the applicant indicates that no feasible or prudent alternatives to the project exist.

Mitigation

Several sections of the DSP address agricultural mitigation and soil-related impacts:

- Section 4.3.9 requires protection and segregation of topsoil.
- Section 4.3.10 requires measures to minimize soil compaction.
- Section 4.3.11 require the permittee to "implement erosion prevention and sediment control practices recommended by the [MPCA]" and to "obtain a [CSW Permit]." A CSW Permit requires both temporary and permanent stormwater controls to ensure that stormwater does not become a problem on or off-site.
- Section 4.3.16 requires that "site restoration and management" practices enhance "soil water retention and reduces storm water runoff and erosion".
- Section 4.3.18 requires the permittee to develop an AIMP with MDA. Lake Wilson's draft AIMP (Appendix E) details methods to minimize soil compaction, preserve topsoil, control noxious weeds and invasive species, maintain the existing drainage conditions through appropriate maintenance and repair of existing drain tile, and establish and maintain appropriate vegetation to ensure the project is designed, constructed, operated and ultimately restored in a manner that would preserve soils to allow for the land to be returned to agricultural use.
- 4.3.17 requires the permittee to develop a VMP that defines how the project area will be revegetated and monitored over the life of the project. Appropriate seeding rates and timing of revegetation will stabilize soils and improve overall soil health. Lake Wilson has included a draft VMP as shown in Appendix L.
- Section 4.3.20 require the permittee to develop an Invasive Species Management Plan to prevent introduction and spread of invasive species during construction of the project.
- Section 4.3.21 require the permittee to take reasonable precautions against the spread of noxious weeds.
- Section 4.3.28 require the permittee to fairly restore or compensate landowners for damages to crops, fences, drain tile, etc. during construction.

Reduced or lost farming revenues may be offset by leasing agreements, which are outside the scope of this document. The applicant has developed and is committed to an AIMP (Appendix E) that details methods to minimize soil compaction, preserve topsoil, and establish and maintain appropriate vegetation to ensure the project is designed, constructed, operated and ultimately restored in a manner that would allow the land to be returned to agricultural use.

Archeological and Historic Resources

The ROI for archeological and historic resources is the project area. Potential impacts are not expected. Impacts, should they occur, will be localized and affect a unique resource. Impacts can be mitigated.

Archeological resources are locations where objects or other evidence of archaeological interest exist, and can include aboriginal mounds and earthworks, ancient burial grounds, prehistoric ruins,

or historical remains.[97] Historic resources are sites, buildings, structures, or other antiquities of state or national significance.[98] The land control area is within actively cultivated farmland.

Potential Impacts

The applicant conducted a desktop review, file searcher, and survey fieldwork of the project area by coordinating with the State Historic Preservation Office (SHPO), contacting Minnesota Tribal Nations, and using the Office of the State Archaeologist data (Appendix F and H). The Tribal Nations' Tribal Historic Preservation Officers and the Minnesota Indian Affairs Council did not have additional comments that affected the project. Their responses are provided in Appendix G.

A review of archaeological data indicated that no previously recorded archaeological sites were identified in the project area, and two archaeological sites have been recorded in the one mile buffer. Both are alpha sites; they were identified through historic documentation or landowner/collector's reports but have not been verified by a professional archaeologist. They are unevaluated for eligibility in the National Register of Historic Places. Documentation indicates that a third recorded site in the buffer was mistakenly identified and is a natural geographic feature. Twenty resources were inventoried in the one-mile buffer. Of those, two are immediately adjacent to the project's northern boundary and the others are over 0.65 miles northwest in the City of Lake Wilson. SHPO confirmed that no historic/architectural resources have been previously recorded in the project area (Appendix H).

Lake Wilson submitted information to SHPO on July 29, 2022, for review in the project area. SHPO recommended that a Phase IA archaeological assessment be completed for this project. The applicant first hired a contractor to perform the Phase I Archaeological field survey for the original planned development areas in November 2021 (Appendix F). Survey methods for the analysis included background research, a literature review, and field investigations in the form of a pedestrian survey. The pedestrian visual ground surface survey analyzed the Preliminary Development Area in 15-meter interval transects. Results of the field investigation concluded that no new or previously recorded archaeological, architectural, or historic sites were present in the preliminary development area. An additional Phase I Archaeological field survey of areas not previously surveyed due to the shift east in the project's preliminary development area was completed in late October 2022 with similar results – an updated report is included in Appendix F.

Impacts to archaeological and historic resources are not expected.

Mitigation

Prudent siting and routing to avoid impacts to archaeological and historic resources is the preferred mitigation. Section 4.3.23 of the DSP addresses archeological resources and require the permittee to avoid impacts to archaeological and historic resources where possible and to mitigate impacts where avoidance is not possible. If previously unidentified archaeological sites are found during construction, the permit requires the permittee to stop construction and contact SHPO and the state archaeologist to determine how best to proceed. Ground disturbing activity will stop and local law enforcement will be notified should human remains be discovered. Because impacts to archeological and historic resources are not anticipated, additional mitigation is not proposed.

[97] Minnesota Statutes, Section. 138.31, subd. 14.

[98] Minnesota. Statutes, Section 138.51.

Natural Resources

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

Air Quality

The ROI for air quality and climate change is Murray County. Distinct impacts to air quality during construction such as fugitive dust and exhaust would be intermittent, localized, short-term, and minimal. Impacts can be mitigated. Once operational, the solar array will not generate criteria pollutants or carbon dioxide. Negligible fugitive dust and exhaust emissions would occur as part of routine maintenance activities. Impacts are unavoidable and do not affect a unique resource. Impacts can be minimized.

Air quality is a measure of how pollution-free the ambient air is and how healthy it is for humans, other animals, and plants. Emissions of air pollutants will occur during construction and operation of new infrastructure for the project. Overall air quality in Minnesota has improved over the last 20 years, but current levels of air pollution still contribute to health impacts.[99] Air quality in the project area is relatively better than more populated areas of the state such as the Twin Cities metro region. According to MPCA models, air pollution in the project area's census tract is in the lowest 20% of all air scores in Minnesota.[100]

"Regulation and voluntary actions have reduced air pollution over time. Most reductions have come from permitted facilities and electrical generation. Daily fine particle concentrations have increased in recent years due to wildfire smoke. To achieve further improvements in air quality, transportation and neighborhood air sources will need to reduce their emissions. Minnesota meets all current federal standards, but… air pollution levels remain elevated in many areas of concern for environmental justice compared to state averages." (Figure 9).[101]

In Minnesota, air quality is tracked using air quality monitoring stations across the State. The MPCA uses data from these monitors to calculate the Air Quality Index (AQI) on an hourly basis, for ozone (O3), particulate matter (PM10/PM2.5), sulfur dioxide (SO2), nitrogen dioxide (NO2), and carbon monoxide (CO). The AQI is used to categorize the air quality of a region as one of five levels: good, moderate, unhealthy for sensitive groups, unhealthy, or very unhealthy. The nearest air quality monitor to the project is in Marshall, Minnesota. Air quality in the area has been considered "good" between 289 and 333 days of the year from 2017-2021. During the same time period, the number of days classified as moderate were between 30 and 65. Air quality was considered unhealthy for sensitive groups for no days in 2017-2020, and three days in 2021, with one day classified as unhealthy in 2021. No days were considered very unhealthy throughout 2017-2021. [102]

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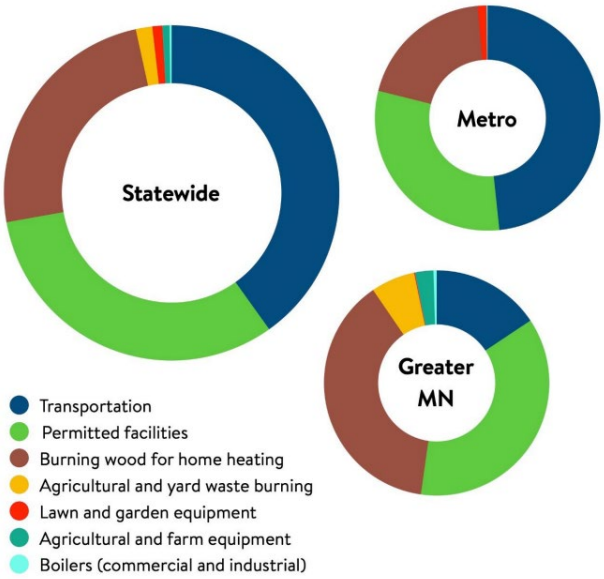
[99] The State of Minnesota's Air Quality, January 2023 Report to the Legislature, https://www.pca.state.mn.us/sites/default/files/lraq1sy23.pdf.

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

[101] Ibid.

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

Figure 7: Air Pollution Sources by Type



Potential Impacts

Construction

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

All projects that involve movement of soil, or exposure of erodible surfaces, generate some type of fugitive dust emissions. Construction activities within the site such as clearing vegetation and driving foundational poles may create exposed areas susceptible to wind erosion. The project will generate fugitive dust from travel on unpaved roads, grading, and excavation.

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

Operation

Once operational, the solar array would not generate criteria pollutants or carbon dioxide. Emissions associated with maintenance are dependent upon weather conditions and the specific activity occurring. Vehicle exhaust will be emitted during maintenance visits to the generating facility. The applicant indicates that, over the life of the project, fugitive dust emissions will be reduced by the elimination of farming and establishment of permanent vegetative cover.

Transmission Lines

Transmission lines produce ozone and nitrous oxide through the corona effect—the ionization of air molecules surrounding the conductor. Ozone production from a conductor is proportional to temperature and sunlight and inversely proportional to humidity. Nitrogen oxides can react to form

ground-level ozone. Ozone is one of the most impactful pollutants in Minnesota and can contribute to health issues even as the State continues to meet all current federal standards. Ozone and nitrous oxide are reactive compounds that contribute to smog and can have adverse impacts on human respiratory systems.[103] Accordingly, these compounds are regulated and have permissible concentration limits. The State of Minnesota has an ozone standard of 0.07 parts per million (ppm) through an 8-hour averaging time[104] which conforms to the federal ozone standard.[105]

Nitrous oxide is regulated indirectly through the state and federal standards for nitrogen dioxide (NO_2). Nitrogen oxides are a criteria pollutant under the Clean Air Act, and the standards for them are set by using NO_2 as the indicator of the larger group of nitrogen oxides[106]. Ozone and nitrous oxide emissions are anticipated to be well below these limits. Impacts are unavoidable and do not affect a unique resource.

Mitigation

Exhaust emissions can be minimized by keeping vehicles and equipment in good working order, not running equipment unless necessary, and minimizing the number of driving trips. Additionally, utilizing existing power sources, for example, grid supplied-power, or cleaner fuel generators and vehicles rather than diesel-powered generators and vehicles, wherever practical could reduce emissions. Watering exposed surfaces, utilizing chemical stabilization, covering disturbed areas, covering open-bodied haul trucks, and reducing speed limits on-site are all standard construction practices.

The Agricultural Impact Mitigation Plan and Vegetation Management Plan identify construction best management practices related to soils and vegetation that will help mitigate fugitive dust emissions. Several sections of the DSP indirectly mitigate impacts to air quality, including sections related to soils, vegetation removal, restoration, and pollution and hazardous wastes.

Greenhouse Gases

The project will help to shift energy production in Minnesota and the upper Midwest toward carbon-free sources. Total GHG emissions for project construction are estimated to be approximately 8,426 short tons of carbon dioxide (CO2). The applicant estimates the project is expected to offset 244,500 short tons of CO2 annually. Potential impacts due to both construction and operational GHG emissions are anticipated to be negligible.

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

Potential Impacts

Construction activities will result in short-term increases in GHG emissions because of the combustion of fossil fuels in construction equipment and vehicles. Sulfur hexafluoride (SF6), a GHG, will be used at the substation, but not the BESS. SF6 is a common gas used in high voltage circuit

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

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

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

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

breakers to extinguish arcs formed when the circuit breaker opens. Small releases will occur as part of regular breaker operation and maintenance. SF6 will be sealed during regular circumstances with no active emissions.

Total GHG emissions for project construction are estimated to be approximately 8,426 short tons of carbon dioxide (CO_2) as shown in Appendix I. The majority of emissions are due to the use semi-trucks and trailers and light-duty pickup trucks. Total emissions for the state of Minnesota in 2020 were approximately 137 million tons.[107] Thus, GHG emissions for project construction are anticipated to be an insignificant amount relative to the state's overall annual emissions. Potential impacts due to construction GHG emissions are anticipated to be negligible.

Once operational, the project will generate considerably less GHG emissions than construction. Generally, the amount of CO2 equivalent (CO2e) produced during the lifespan of a solar project comes out to be approximately 20-50 grams per kilowatt.[108] About 60-70% of that comes from the manufacturing of the panels and construction of the solar farm. Another 20% comes from the operational processes such as O&M building, lighting, monitoring equipment and emergency generators, with the remaining portion coming from decommissioning and disposal. The applicant estimates the project is expected to offset 244,500 short tons of CO2 annually by displacing energy that would otherwise be generated by carbon-fueled power plants.[109] Thus, compared to non-renewable energy generation, the project would be beneficial with respect to GHG emissions.

Emissions that do occur would result from vehicle usage to and from the solar array, substation, and BESS for maintenance and operation. GHG emissions for project operation are negligible in comparison to project offsets, however, annual tons of CO2 generated are provided in Appendix I. Operational emission sources include emergency generators, commuter and onsite vehicle traffic, and offsite electricity purchased. Potential impacts due to operational GHG emissions are anticipated to be negligible.

Mitigation

Currently, there are no Minnesota-specific thresholds of significance for determining impacts of GHG emissions from an individual project on global climate change. In the absence of such a threshold, Minnesota Rule 4410.4300, Subpart 15, Part B, establishes a mandatory category requiring preparation of an Environmental Assessment Worksheet (EAW) for stationary source facilities generating 100,000 tons of GHGs per year. The purpose of an EAW is to assess whether a proposed project has the potential to result in significant environmental effects, which aids in determining whether an Environmental Impact Statement is needed. Regarding GHG emissions, state regulations establish 100,000 tons per year as the threshold to prepare an EAW to aid in determining if potential significant environmental effects might exist. A reasonable conclusion is that a project with GHG emissions below 100,000 tons per year does not have the potential to result in significant GHG effects.

[107] Minnesota Pollution Control Agency, Greenhouse gas emissions data, retrieved from: https://www.pca.state.mn.us/air/greenhouse-gas-emissions-data.

[108] National Renewable Energy Laboratory. 2012. Life Cycle Greenhouse Gas Emissions from Concentrating Solar Power. Retrieved from: https://www.nrel.gov/docs/fy13osti/56416.pdf.

[109] Based on the U.S. EPA Greenhouse Gas Equivalencies Calculator and 313,000,000 kWh (313,000 MWhs) under the annual production PVsyst model.

Climate Change

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

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

In 2020, the electricity sector was the second largest source of Minnesota GHG emissions at 15.8 million tons of 137 million tons, or 11.5%.[110] GHG from electricity generation have decreased by about 60% in Minnesota since 2005 due to a shift in generation to lower- and non-emitting sources and an increase in end-use energy efficiency.[111]

Potential Impacts

General

Using the DNR Climate Trends website[112] to retrieve data from 1895-2023 for the Des Moines River Headwaters watershed (as representative geographic unit of the project area) showed a mean precipitation of 26.67 inches annually. This model estimated a 0.30-inch increase in precipitation per decade. Therefore, the annual rainfall is estimated to increase to 0.9 inches over the 30 year life of the project.

From the same climate data set and geographic unit, the annual mean temperature from 1895-2023 was determined to be 43.51 °F with an annual mean temperature increase of 0.17 °F per decade. Thus, the mean annual temperature is expected to increase by 0.51°F over the 30 year life of the project.

Construction

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

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

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

[111] Ibid.

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

Deforestation is another source of carbon dioxide release to the atmosphere, as trees act as a carbon sink, absorbing carbon dioxide from the atmosphere and storing it. Removing trees releases most of the stored carbon stock, either through burning or decay. In addition, future carbon dioxide capture is eliminated. Because revegetation is expected to offset these effects, impacts should be temporary and minimal.

Operation

In some ways, the project is expected to beneficially impact climate change because it will reduce the need for carbon-based electric generation processes and additional transmission infrastructure. The project's design incorporates elements that minimize impacts from more extreme weather events such as increased rainfall and flooding, storms, high winds, and heat waves that are expected to accompany a warming climate. These events, especially an increased number and intensity of storms, could increase risks to the electrical grid via high winds that could damage system components such as solar panels and cause outages. More extreme storms also mean more frequent heavy rainfall events. The project is in a low-lying area; therefore, extreme rain events might cause localized soil erosion or flooding. Flooding could damage the project's electrical collection system including inverters and collection wiring.

Heat waves could change demands on the electrical transmission and generation systems, especially as more indoor space is equipped with cooling systems. Because this is a solar project, it may improve the resiliency of the electrical transmission system by reducing the potential for peak overloads during heat wave events.

Mitigation

Construction

Mitigation to reduce emissions during construction is discussed in the GHG Emissions section of this EA. Vegetation clearing that will be a part of the project will be offset by the more than 1,000 acres of perennial grasses to be established in the project area after construction which is expected to increase the carbon storage capacity of the land.

Heavy rainfall events could lead to increased soil erosion. While the project requires grading, the existing terrain will be smoothed to accommodate array installation, rather than significantly changing grades or slopes. The grading is thereby designed to maintain existing drainage patterns. As a result, the proposed perennial vegetation allows for water to filter into the soil for treatment. Accordingly, water quality and soil erosion concerns are minimized.

Operation

Project developers can employ location, design, and construction strategies to mitigate impacts resulting from a warmer, wetter, and more energetic climate by:

- Avoiding sites with high probability for extreme weather events to the extent possible.
- Designing solar panels and solar arrays to withstand stronger storms and winds as well as resistance to flooding damage.
- Planning for the potential repair and replacement of solar arrays damaged by storms.
- Designing the project's stormwater system to prevent flooding during heavy rainfall events.
- Designing the project's electrical collection system to be resistant to flooding damage.

- Avoiding or mitigating impacts to wetlands and vegetation during construction to the extent possible.

Increased chance of severe climate events requires adequate planning and preparation. Maintenance and repair plans should anticipate future changes to climate. Lake Wilson sited the project with climate resiliency in mind. For example, original portions of the project location were omitted following a hydrology report (Appendix N) that found those areas would be susceptible to inundation of 100-year flood depths up to 5 feet, which would have made infrastructure installation and maintenance difficult. As a result, the project was instead sited on areas with lower potential for increase in flood depths. This will also abate ponding water in the project area in the future as precipitation increases.

The solar facility site is outside of the 100-year FEMA flood zone and the preliminary development area is not within a FEMA floodplain. Any areas identified as a concern flooding area in Lake Wilson's hydrology report (Appendix N) were avoided in site layout. Additionally, FEMA lists the flood risk index for the project area as "very low".[113]

There are several wetlands in the area, which serve to further alleviate flooding certain extent for a heavy rainfall or flooding event. Lake Wilson also states that stormwater ponding will be sized appropriately to account for the expected increase in precipitation and will store and treat any runoff before discharging offsite. The existing drainage patterns will be maintained and the increase in perennial vegetation under the panels is expected to both increase the uptake of water and reduce the rate of runoff. Ultimately, the preliminary development area is not within a Federal Emergency Management Agency (FEMA) floodplain, e.g. any areas identified as a concern flooding area in the hydrology report were avoided in site layout. All of these features will assist in managing impacts from increased storm intensity and frequency but may not fully mitigate the anticipated effects from climate change.

Lake Wilson reports that they reviewed the climate history to screen the site for the probability of extreme weather events such as temperature, precipitation, wind, and mechanical loading. The results from the screening informed the selection of the site, design and engineering of the facility, and equipment selection. In addition, solar modules will meet international standards for hail ratings, operating temperature ranges, and utilize safety features such as "stowing" which rotates the modules to an angle that best protects the equipment from severe weather damage such as high wind speed, hail damage, or snow loading.

Groundwater

The ROI for groundwater is the land control area. Impacts to domestic water supplies are not expected. Localized impacts to groundwater resources, should they occur, would be intermittent, but have the potential to occur over the long-term. Indirect impacts from surface waters might occur during construction. Impacts can be mitigated through use of BMPs for stormwater management.

[113] FEMA, National Risk Index, https://hazards.fema.gov/nri/map.

The project is within the 5-Western Groundwater Province where which is characterized by loam and clay loam glacial sediment with limited surficial and buried sand aquifers.[114] Aquifers are typically limited due to the underlying fractured bedrock commonly buried deeply beneath glacial sediment.[115] General availability of groundwater in the province is limited, moderate, and limited in bedrock, surficial sands, and buried sands, respectively.[116]

Pollution sensitivity of near surface materials in the project area ranges from "very low" to "moderate", with the highest percentage largely in the "very low" category. The sensitivity to pollution of near-surface materials is an estimate of the time it takes for water to travel through the unsaturated zone to reach the water table, which for the purposes of the model was assumed to be 10 feet below the land surface.[117] This means that the project area is generally expected to have "very low" groundwater pollution sensitivity where contaminants from the land surface would not reach groundwater for months to a year.[118] Low sensitivity does not guarantee protection. Leakage from an unsealed well for example, may bypass the natural protection, allowing contamination to directly enter an aquifer.

Depth to groundwater in the preliminary development area ranges from just below the surface to more than 80 inches depending on the soil type.[119] Depth to groundwater is shallower in the mapped hydric soils and areas delineated as wetland, and deeper in the non-hydric soil units. In some of the areas with drain tile, depth to groundwater is altered and likely deeper than what's reported in the US Department of Agriculture's Web Soil Survey. The possibility of groundwater level fluctuations due to seasonal variations will be considered before final engineering and design, with a final geotechnical study to be completed prior to construction.

The Minnesota Department of Health (MDH) maintains the MWI, which provides basic information (e.g., location, depth, geology, construction, and static water level) for wells and borings drilled in Minnesota.[120] The MWI identifies six wells within the solar facility boundary; three of these records are sealed boreholes, two are listed as active domestic wells, and the last is active with an undefined use (Appendix A, Figure 7).

Wellhead protection areas are determined by MDH as "areas surrounding public water supply wells that contribute groundwater to the well. In these areas, contamination on the land surface or in water can affect the drinking water supply"[121]. There are no wellhead protection areas within the ROI. The nearest wellhead protection areas are in Slayton, approximately 0.8 miles northwest of the solar facility and in Byron, approximately one mile east of the nearest Project boundary.[122]

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[114] DNR, Minnesota Groundwater Provinces 2021, retrieved from: https://www.dnr.state.mn.us/waters/groundwater_section/mapping/provinces.html

[115] *Ibid.*

[116] *Ibid.*

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

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

[119] Retrieved from: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

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

[121] MDH, Source Water Protection Web Map Viewer, https://www.health.state.mn.us/communities/environment/water/swp/mapviewer.html

[122] Joint Application, at p.102.

Potential Impacts

The ROI for groundwater is the land control area. The impact intensity level is anticipated to be minimal. Localized impacts, should they occur, would be intermittent, but have the potential to occur over the long-term. Impacts can be mitigated. Impacts to surface waters can lead to indirect impacts to groundwater. Surface water impacts are anticipated to be minimal (see subsequent Surface Water section in this EA).

Potential impacts to groundwater can occur directly or indirectly. Direct impacts are generally associated with construction, for example, structure foundations that could penetrate shallow water tables. Because groundwater levels will be considered before final engineering and design, with a final geotechnical study to be completed prior to construction, impacts will be minimized. Indirect impacts could occur through spills or leaks of petroleum fluids or other contaminants that could ultimately contaminate groundwater.

Because of the shallow depth to groundwater in some areas of the project, dewatering may be required during construction. If dewatering exceeds 10,000 gallons of water per day, a DNR water appropriation permit will be required.[123] Project structures as proposed are generally a suitable distance from areas of sloping which are near large drainage features.

Project facilities will also avoid the wells mapped by MDH in the project area. Although design is not finalized, Lake Wilson will likely install a single domestic sized well at the O&M facility to provide water for drinking and sanitary services for employees at approximately 350 gallons per day. Lake Wilson is evaluating whether connection to the Lincoln Pipestone Rural Water system is feasible and practicable, which would remove the need for a well.

Mitigation

Stormwater management is important to ensure that structure foundations maintain integrity and that runoff drains away from the site in a way that does not adversely affect existing drainage systems, roads, or nearby properties. Appropriate permanent stormwater management measures, including minimizing the area of impervious surfaces at the site to reduce the volume and velocity of the stormwater runoff and the establishment of stormwater ponds, will address drainage from the newly established impervious areas.

While the project requires grading, the existing terrain is smoothed to accommodate array installation rather than significantly changing grades or slopes. The grading is thereby designed to maintain existing drainage patterns, minimizing water quality concerns due to the low percentage of disconnected impervious surfaces. As a result, sheet flow runoff will filter through vegetation into the soil for treatment on-site prior to discharging. This will also decrease the amount of nutrients leaving the site when compared to the current row crop agriculture, which is expected to benefit water quality and onsite plant communities.

Because the project will disturb more than one acre, Lake Wilson must obtain a CSW Permit from the MPCA. The CSW Permit will identify BMPs for erosion prevention and sediment control. As part of the CSW Permit, Lake Wilson will also develop a Stormwater Pollution Prevention Plan (SWPPP)

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

that describes construction activity, temporary and permanent erosion and sediment controls, BMPs, permanent stormwater management that will be implemented during construction and through the life of the project. Implementation of the protocols outlined in the SWPPP will minimize the potential for soil erosion and detail stormwater management methods during construction and operation of the facility. Section 4.3.11 of DSP require permittees to obtain an MPCA CSW Permit and implement the BMPs within for erosion prevention and sediment control.

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

Soils

The ROI for the soils is the land control area. Impacts to soils will occur during construction and decommissioning of the project. The impact intensity level is expected to be minimal. Potential impacts will both positive and negative, and short- and long-term. Isolated moderate to significant negative impacts associated with high rainfall events could occur. Because the soil at the solar facility will be covered with native perennial vegetation for the life of the project, soil health is likely to improve.

The soils in the project area mainly consist of silty clay loams, clay loam and loamy soils and are listed in Table 15. Soils at the solar facility are classified as silty clay loam formed from till sediments or alluvial deposits. The majority of soil is classified as "predominantly non-hydric" (38.6 % or 1,012.0 acres).

Approximately 43.5% of the project area is considered prime farmland, 32% prime farmland if drained, 10.1% farmland of statewide importance, 5.2% prime farmland if protected from flooding or not frequently flooded during the growing season, and 9.2% is not prime farmland or farmland of statewide importance. Impacts to prime farmland are discussed in Chapter 4's Land-based Economies section in the Agriculture subsection.

Table 15: Soil Types in Solar Facility Land Control Area

Soil Type	Acres	%	Soil Type	Acres	%
Parnell silty clay loam, depressional, 0 to 1 percent slopes	61.8	2.4%	Lamoure silty clay loam, 0 to 2 percent slopes, frequently flooded	19.9	0.8%
Sverdrup sandy loam, 2 to 6 percent slopes	15.5	0.6%	Buse, stony-Wilno complex, 25 to 40 percent slopes	1.4	0.1%
Egeland sandy loam, 0 to 2 percent slopes	4.7	0.2%	Barnes-Buse complex, 6 to 12 percent slopes, moderately eroded	163.9	6.3%
Egeland sandy loam, 2 to 6 percent slopes	2.5	0.1%	Buse, eroded-Wilno complex, 12 to 18 percent slopes	31.8	1.2%
Vallers clay loam, 0 to 2 percent slopes	280.4	10.7%	Hokans-Svea complex, 1 to 4 percent slopes	311.2	11.9%
Dassel mucky loam	41.1	1.6%	Svea loam, 1 to 3 percent slopes	93.4	3.6%
Quam silty clay loam, depressional, 0 to 1 percent slopes	11.2	0.4%	Arvilla sandy loam, Till Prairie, 0 to 2 percent slopes	16.7	0.6%
Lamoure silty clay loam, 0 to 2 percent slopes, occasionally flooded	135.0	5.2%	Barnes-Buse-Svea complex, 1 to 6 percent slopes	429.4	16.4%
Darnen loam, 2 to 6 percent slopes	54.7	2.1%	Lakepark-Roliss-Parnell, depressional, complex, 0 to 3 percent slopes	395.9	15.1%
Arvilla-Sandberg complex, 2 to 6 percent slopes	53.16	5.7%	Poinsett-Waubay silty clay loams, 1 to 6 percent slopes	33.1	1.3%

Bigstone silty clay loam, depressional, 0 to 1 percent slopes	12.5	0.5%	Forada loam, 0 to 2 percent slopes	24.2	0.9%
Sandberg-Arvilla complex, 6 to 12 percent slopes	27.0	1.0%	Fulda silty clay, 0 to 2 percent slopes	12.1	0.5%
Balaton loam, 1 to 3 percent slopes	53.2	2.0%	Buse, moderately eroded-Sandberg complex, 12 to 18 percent slopes	10.5	0.4%
Fordville loam, coteau, 0 to 2 percent slopes	4.2	0.2%	Barnes-Buse-Arvilla complex, 2 to 6 percent slopes	137.7	5.3%
Renshaw-Fordville loams, coteau, 2 to 6 percent slopes	15.2	0.6%	Buse-Barnes-Arvilla complex, 6 to 12 percent slopes, moderately eroded	70.1	2.7%
			Total (rounded)	**2,620**	**100**

Source: Soil Survey Geographic Database (SSURGO)

Potential Impacts

The impact intensity level is expected to be minimal. Potentials impacts will be both positive and negative, and short- and long-term. Isolated moderate negative impacts associated with high rainfall events could occur. Significant impacts to topography, such as the creation of abrupt elevation changes or modifications to natural drainage patterns, are not expected. Inadvertent disturbance of drain tile from construction activities could disrupt existing drainage. Because the soil would be covered with native perennial vegetation for the life of the project, soil health would likely improve over time.

Soil cover and management will change from cultivated cropland to a mixture of impervious surfaces, for example, PV panels, access roads, BESS, substation, switchyard, etc., underlain and surrounded by native groundcover plantings. Once permanent vegetation is established, stormwater management, as well as general soil health, might improve due to use of native plants. These benefits could extend beyond the life of the project if these benefits are preserved through decommissioning practices and the land control area is returned to agricultural use. Benefits would likely not extend to access roads and foundation footprints.

As with any ground disturbance, there is potential for soil compaction and erosion. Primary impacts to soils include compaction from construction equipment, soil profile mixing during grading and structure auguring, rutting from tire traffic, drainage interruptions, and soil erosion. Impacts to soils are likely to be greatest with the below-ground electrical collection system because trenching will be required to bury cables.

Some soil mixing may occur during the installation of the transmission structures. Construction requires removing and handling soils, which will expose soils to wind and water erosion. Topsoil could be lost to improper handling or erosion. Soil compaction and rutting will occur from movement of construction vehicles. Should high rainfall events occur during construction or prior to establishment of permanent vegetation, significant sedimentation might occur.

Construction will disturb approximately 1,526 acres. Of this, about 58.5 acres will be graded. Grading with the greatest potential for impacts to topsoil condition include construction of the access roads, substation, BESS, Xcel Switchyard, and O&M facility. Cut and fill volume estimates for the access roads, basins, inverter pads, substation, BESS, Xcel Switchyard, and O&M Facility are pending further design engineering.

As discussed in the SWPPP, AIMP, and VMP, topsoil will be separated from the other subsoil materials when earthmoving activities, excavation, or trenching are taking place. Stripped topsoil will be stored on site and any topsoil that is respread will be loosely compacted. While performing foundation work, stripped topsoil will be stored for later use and once the construction is complete, topsoil piles will be distributed in a thin layer adjacent to the substation and switchyard. Once the electric conductor collection lines are laid in the trench, the trench will be backfilled with subsoil followed by segregated topsoil.

Impacts to prime farmland are discussed in Chapter 4's Land-based Economies section in the Agriculture subsection.

Mitigation

The use of best management practices can protect topsoil and minimize the potential for soil erosion. These practices include temporary and permanent topsoil stabilization measures in accordance with the project's construction stormwater (CSW) permit; restoring disturbed areas to pre-construction conditions to the extent practicable; minimizing erosion by implementing environmental control measures, such as, temporary and permanent seeding, mulching, filter strips, erosion blankets, and sod stabilization.

Several sections of the DSP address soil-related impacts:

- Section 4.3.9 of the DSP requires protection and segregation of topsoil;
- Because the project will disturb more than one acre, Lake Wilson must obtain a CSW Permit from the PCA. The CSW Permit will identify BMPs for erosion prevention and sediment control. As part of the CSW Permit, Lake Wilson will also develop a SWPPP that describes construction activity, temporary and permanent erosion and sediment controls, BMPs, permanent stormwater management that will be implemented during construction and through the life of the project. Section 4.3.11 of DSP require permittees to obtain a MPCA CSW Permit and implement the BMPs within for erosion prevention and sediment control.
- Section 4.3.16 of the DSP requires that "site restoration and management" practices enhance "soil water retention and reduces storm water runoff and erosion".
- Section 4.3.18 of the DSP requires the permittee to develop an AIMP which details methods to minimize soil compaction, preserve topsoil, and establish and maintain appropriate vegetation to ensure the project is designed, constructed, operated and ultimately restored in a manner that would preserve soils to allow for the land to be returned to agricultural use. Lake Wilson has included a draft AIMP as shown in Appendix E.
- Section 4.3.17 of the DSP requires the permittee to develop a VMP that defines how the project area will be revegetated and monitored over the life of the project. Appropriate seeding rates and timing of revegetation will stabilize soils and improve overall soil health. Lake Wilson included a draft VMP (Appendix L).

Surface Water

The ROI for surface water resources is the land control area. The impact intensity is anticipated to be minimal. Direct impacts to surface waters are not expected. Indirect impacts to surface waters might occur. These impacts will be short-term, small in size, and localized. Impacts can be mitigated.

The project is in the hydrologic unit code (HUC)-8 Des Moines River – Headwaters Watershed. The DNR's Public Waters Inventory identified no basins and approximately 2,614 feet of one public watercourse (Judicial Ditch 14) within the solar facility site. Public waters include wetlands, water basins, and watercourses of significant recreational or natural resource value in Minnesota. A public waters designation means that DNR has regulatory jurisdiction over the water.[124] Lake Wilson also hired a third-party contractor to delineate wetlands and other watercourses. The field delineation identified 36 wetlands and six watercourses in the project area (Appendix A, Figure 9).

According to the Murray County Drainage Ditch and Tile data, the project area contains multiple segments of private drainage tile and lateral ditches that drain north into Judicial Ditch 14. The eastern portion of the project site contains segments of County Ditch 47 that drains northeast towards Summit Lake.

The MPCA does not designate any waters as impaired in the project area. The nearest are a quarter mile north (Beaver Creek, AUID: 07100001-664) and one mile southeast (Unnamed creek, AUID: 10170204-591) of the project boundary as shown in Appendix A, Figure 9.

Potential Impacts

The project is designed to avoid direct impacts to surface waters by siting project components such as access roads, solar arrays, inverters, etc. away from surface waters and wetlands (Appendix A, Figure 4). Construction of the project creates a potential for indirect impacts if sediment or fugitive dust created by excavation, grading, vegetation removal, and construction traffic reaches nearby surface waters. Overall, and due to the establishment of perennial vegetation at the solar facility, the project is expected to have a long-term positive impact on water quality.

Mitigation

Standard construction management practices, including, but not limited to containment of excavated soils, protection of exposed soils, stabilization of restored soils, and controlling fugitive dust would minimize the potential for eroded soils to reach surface waters.

Several sections of the DSP address potential impacts to surface waters:

- Section 4.3.11 of the DSP requires the permittee to "implement erosion prevention and sediment control practices recommended by the [MPCA]" and to "obtain a [CSW Permit]." A CSW Permit requires both temporary and permanent stormwater controls. This section also requires implementation of erosion and sediment control measures, contours graded to provide for proper drainage, and all disturbed areas be returned to pre-construction conditions. Lake Wilson will also develop a SWPPP that complies with MPCA rules and guidelines. The SWPPP describes construction activity, temporary and permanent erosion

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

and sediment controls, BMPs, permanent stormwater management that will be implemented during construction and through the life of the project. Implementation of the protocols outlined in the SWPPP will minimize the potential for soil erosion during construction.

- Section 4.3.16 of the DSP requires that "site restoration and management" practices enhance "soil water retention and reduces storm water runoff and erosion".

Wetlands

The ROI for wetlands is the land control area. The impact intensity level is anticipated to be minimal. Although there is a potential for wetlands to be indirectly affected, direct impacts are not expected. These impacts will be short-term, small in size, and localized. Impacts can be mitigated.

Wetlands are areas with hydric (wetland) soils, hydrophilic (water-loving) vegetation, and wetland hydrology (inundated or saturated during much of the growing season). Wetland types include marshes, swamps, bogs, and fens. Wetlands vary widely due to differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors.[125]

Wetlands are important to the health of waterways and communities that are downstream. Wetlands can be one source of hydrology in downstream watercourses and water bodies, detain floodwaters, recharge groundwater supplies, remove pollution, and provide fish and wildlife habitat. Wetland health also has economic impact because of their key role in fishing, hunting, agriculture, and recreation. These large infrastructure projects could temporarily or permanently impact wetlands if these features cannot be avoided through project design. During construction, temporary disturbance of soils and vegetative cover could cause sediment to reach wetlands which could affect wetland functionality.

The USFWS National Wetlands Inventory (NWI) identified 39 wetlands, including 25 freshwater emergent wetlands, 12 riverine wetlands, one freshwater pond, and one freshwater forested/shrub wetland totaling 78.6 acres, or less than 3% of the project area and zero acres of the preliminary development area. Project design relating to distance to wetlands was coordinated between Lake Wilson and the DNR, which resulted in the project completely avoiding wetlands.

Lake Wilson also hired a third-party contractor to delineate wetlands and other watercourses. The field delineation identified 36 wetlands encompassing 38.3 acres or approximately 1.5% of the project area. No calcareous fens were detected. The results of the delineation are detailed in Appendix J.

Potential Impacts

Although there are approximately 79 acres of wetland identified within the project area, the preliminary site layout for the solar facility avoids all of these acres by locating solar arrays and associated facilities away from wetlands. There may be potential for temporary, short-term impacts to wetlands during installation of the electrical collection lines and temporary access roads. Collection lines will be directional bored under waterbodies, if needed, depending upon depths of water in the channels or wetlands at the time the construction work is performed.

[125] USEPA. 2022. *What is a Wetland* https://www.epa.gov/wetlands/what-wetland

Permanent impacts may result if direct-embedded piers require concrete foundations to address problematic soil conditions or from the establishment of permanent access roads. These impacts may be necessary to install fence and wet sedimentation where soils and vegetation within the wetland would be disturbed.

Mitigation

Lake Wilson has initiated a 100-foot setback in project design from all wetlands. Since no impacts are expected to public watercourses, the DNR buffer rule around public ditches and Public Waters Permits do not apply as the project is currently designed.

Current design avoids all wetlands and would not require any approvals under the Wetland Conservation Act (WCA) and Section 404 of the Federal Clean Water Act. Depending on the final project design, construction activities may qualify for a No Loss exemption under WCA but otherwise would require a permit under WCA or approvals under Section 404. If a permit is required, any proposed wetland impact would require full sequencing under the WCA to address wetland avoidance, impact minimization, rectification, and replacement. Additionally, under Section 404, discharge of dredged and fill material into waters of the U.S. would be regulated, most likely under the USACE Regional General Permit (Minnesota RGP-003). If the project needs approval under this general permit, Section 401 Water Quality Certification would be automatically granted as well.

Section 4.3.13 of the DSP generally prohibits placement of the solar energy generating system or associated facilities in public waters and public waters wetlands. The permit condition does allow for electric collector or feeder lines to cross or be placed in public waters or public waters wetlands subject to permits and approvals by the DNR and the USACE, and local units of government as implementers of the Minnesota Wetlands Conservation Act.

Vegetation

The ROI for vegetation is the land control area. The solar facility will convert row crop farmland to perennial vegetation for the life of the project. Potential impacts will be positive and long-term (30 years) or otherwise mitigated through development of a VMP. Impacts are not expected, so no additional mitigation is proposed.

Prior to European settlement vegetation in the project area was primarily upland prairie, containing bluestems, and Indian, needle, and grama grasses. Few remnants of pre-settlement vegetation remain.[126] Current land-use in the project area is predominately agricultural. The land control area is dominated by cultivated crops established and maintained by humans. Non-native invasive species are limited due to weed management associated with agriculture. Trees in the project area are largely limited to homes and farmsteads.

The land control area consists of open land habitat. Open land habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants.[127]

[126] DNR. *Ecological Classification System: Ecological Land Classification Hierarchy*,(n.d.). retrieved from: https://www.dnr.state.mn.us/ecs/index.html

[127] This description is commonly used in County Soil Surveys prepared by the U.S. Department of Agriculture (1990) Soil Survey of Murray County, Minnesota, retrieved from: https://archive.org/details/murrayMN1990.

After coordination with the DNR, Lake Wilson confirmed with a native prairie field survey that no native prairies exist in the preliminary development area (Appendix K). As a result of this coordination, Lake Wilson removed two trackers from the project that were originally proposed in suspect native prairies mapped by the DNR after further review (Appendix A, Figure 10). Due to this adjustment, DNR determined that no prairie protection management plan would be required for the project.

The National Land Cover Database provides "spatial reference and descriptive data for characteristics of the land surface" nationwide.[128] The land cover within the project area (Table 16) is dominated by cultivated agriculture, with scattered areas of grassland and developed areas around farmsteads.

Table 16: Land Cover

Type	Acres (rounded)
Developed	81
Grassland	43
Hay/Pasture	4
Cultivated Crops	2,491
Deciduous Forest	<1
Herbaceous Wetlands	2

Source: National Landcover Database (NLCD)
Land cover in the project area.

Potential Impacts

The ROI for vegetation is the land control area. Construction of the project will eliminate vegetative cover at access roads, project substation, operation and maintenance building, and parking lot. Tall growing woody vegetation in the land control area will be removed. Agricultural row crop fields at the solar facility would be converted to perennial, low growing vegetative cover, resulting in a net increase in vegetative cover for the life of the project. Native seed mixes developed in cooperation with state agencies will be used. Once established, vegetation would most likely be maintained by mowing.

Construction activities at both the solar facility and the transmission line could introduce invasive species. The early phases of site restoration and seeding of native species can also result in populations of non-native and invasive species on site.

DNR was originally concerned about impacts to native prairie in the preliminary development area, but after coordination with Lake Wilson which resulted in the removal of two trackers in the project design, concluded that no prairie protection management plan would be required. Thus, impacts to native prairie are not expected.

[128] U.S. Geological Survey *The National Land Cover Database*. (February 2012), retrieved from: http://pubs.usgs.gov/fs/2012/3020/fs2012-3020.pdf.

Mitigation

The applicant has prepared a draft VMP to guide site preparation, installation of prescribed seed mixes, and management of invasive species and noxious weeds (Appendix L). As required in the DSP Section 4.3.17, Permittees must file their final VMP prior to a pre-construction meeting.[129] Lake Wilson states that the project will use an adaptive management approach for vegetation maintenance, an important aspect being monitoring vegetation during the active growing season (June-September). All areas that will not contain permanent facilities will be stabilized with erosion control measures, such as silt fence, sediment control logs, temporary seeding, and mulching as needed, until permanent vegetation has been established. Monitoring and treating invasive species, mowing, and re-seeding are main VMP establishment and maintenance tasks.

Several sections of the DSP (Appendix C) address impacts to vegetation:

- Section 4.3.17 of the DSP requires the permittee to develop a VMP in coordination with state agencies and to file the VMP prior to construction. The applicant has prepared a draft VMP as shown in Appendix L. The VMP must include the following:
    - Management objectives addressing short term (Year 0-3, seeding and establishment) and long term (Year 4 through the life of the permit) goals.
    - A description of planned restoration and vegetation management activities, including how the site will be prepared, timing of activities, how seeding will occur (broadcast, drilling, etc.), and the types of seed mixes to be used.
    - A description of how the site will be monitored and evaluated to meet management goals.
    - A description of the management tools used to maintain vegetation (e.g., mowing, spot spraying, hand removal, fire, grazing, etc.), including the timing and frequency of maintenance activities.
    - Identification of the third-party (e.g., consultant, contractor, site manager, etc.) responsible for restoration, monitoring, and long-term vegetation management of the site.
    - Identification of on-site noxious weeds and invasive species (native and non-native) and the monitoring and management practices to be utilized.
    - A site plan showing how the site will be revegetated and that identifies the corresponding seed mixes. Best management practices should be followed concerning seed mixes, seeding rates, and cover crops.
- Section 4.3.18 of the DSP requires the permittee to develop an AIMP which details methods to minimize soil compaction, preserve topsoil, and establish and maintain appropriate vegetation to ensure the project is designed, constructed, operated and ultimately restored in a manner that would preserve soils to allow for the land to be returned to agricultural use. Lake Wilson has included a draft AIMP as shown in Appendix E.
- Section 4.3.15 of the DSP requires the permittee to minimize the number of trees removed and to leave existing low growing species in the ROW undisturbed to the extent possible, or to replant to blend in with adjacent areas following construction.

[129] Minnesota Public Utilities Commission (April 26, 2021) *Order Granting Certificate of Need and Issuing Site Permit*, eDockets No. 20214-173356-01.

Wildlife and Habitat

The ROI for non-avian wildlife and their habitats is the land control area, the ROI for birds is the project area. Potential impacts may be positive or negative and species dependent. Long-term, minimal positive impacts to small mammals, insects, snakes, etc. would occur. Impacts to large wildlife species, for example, deer, will be negligible. Significant negative impacts could occur to individuals during construction and moderate impacts during operation of the project. Once restored, the land control area will provide native grassland habitat for the life of the project. The project does not contribute to significant habitat loss or degradation or create new habitat edge effects. The introduction of PV panels, fencing, and the transmission line to the project area creates the potential for collision or electrocution for birds. Potential impacts can be mitigated in part through design and BMPs. The impact intensity level is expected to be minimal.

The project landscape is dominated by agriculture and developed areas (roads, railroads, farmsteads). Landscape types and vegetation communities vary throughout the project vicinity. Fencerows and woodlots, as well as small grassland pockets, provide habitat for terrestrial and avian wildlife.

Wildlife utilizing the land control area are common species associated with disturbed habitats and are accustomed to human activities (e.g., agricultural activities and road traffic) occurring in the area. Mammals, reptiles, amphibians, and insects are present. Most notably, state special concern species that may occur within the project area include the little brown bat *(Myotis lucifugus)* and big brown bat *(Eptesicus fuscus*), however, none have been documented in the project area. Species that may use habitats typical of land cover within the project area include:

- Mammals near agricultural areas such as white-tailed deer, mice, voles, raccoons, skunk, and ground squirrels as well as mammals nearer to woodland habitats such as bats, and opossum, and lastly mink and muskrats possible near wetlands;
- Reptiles near plant diverse areas or wetlands such as garter and redbelly snakes, painted and snapping turtles, and skinks;
- Amphibians near agricultural, grassland, or wetland areas such as the northern leopard frog, American toads, and Great Plains toads;
- A variety of insects including native bees, butterflies, and moths;
- Bird species near open fields and agricultural areas such as geese, turkey vultures, red-tailed hawks, wild turkeys, crows, common grackles, robins, and goldfinches;
- Waterfowl and shorebirds near wetlands areas such as mallards, red-winged blackbirds, and common yellowthroats; and
- Common forest bird species such as woodpeckers, blue jays, cardinals, chickadees, and nuthatches.

Section 15 and 22 (Public Land Survey Town 106, Range 42) are partially within the project boundary and contain an area marked by the DNR as part of the Wildlife Action Network (WAN). The WAN identifies significant aquatic and terrestrial biological areas across the state with the intent of aiding conservation efforts to address large-scale threats, including climate change, invasive species, habitat loss, etc. The WAN was developed by the DNR by compiling data layers that represent

quality habitat to rank areas on a scale from poor to excellent.[130] The area within the project boundary is ranked as low-medium, however, Cannon River Community Solar Garden takes up more of these acres than the project. To the southwest outside of the project boundary there is a significant area ranked as high and medium-high. This may be considered a core area of connection that facilitates species movement and supports the biological diversity already present in the network.[131] These areas could indicate several qualities composing of habitat important for "species in greatest conservation need".[132] Although some of this data is still considered draft, the WAN is used to target conservation within the network to increase the effectiveness and efficiency of actions to reduce the primary causes of wildlife population declines.

Potential Impacts

The impact intensity level is expected to be minimal. Impacts could be positive or negative and depend on species type. Potential impacts will be short- and long-term and can be mitigated.

Wildlife

Individuals will be displaced to adjacent habitats during construction. Because the land control area does not provide important habitat, this should not impact life cycle functions, for example, nesting. Direct significant impacts to individuals might occur, that is, small species might be crushed or otherwise killed during construction. Population level impacts are not anticipated.

The largest impact to wildlife associated with solar facilities is fencing. Studies estimate that one hoofed mammal (ungulate) per year becomes entangled for every two and one-half miles of fence.[133] Although deer can jump many fences, they can become tangled in both smooth and barbed-wire fences, especially if the wires are loose or installed too closely together.[134] Predators can use fences to corner and kill prey species.[135]

Plastic erosion control netting is frequently used for erosion control during construction and landscape projects and can negatively impact wildlife populations. Wildlife entanglement and death from plastic netting and other plastic materials has been documented in birds, fish, mammals, and reptiles.[136]

Reduced pesticide use, as compared to agricultural production, has the potential to benefit insects, including pollinators, and smaller wildlife such as rodents, birds, insects, and reptiles. These same species might benefit from increased cover and foraging habitat. Revegetating the site with pollinator friendly species will also benefit these species.

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[130] University of Minnesota Natural Resource Atlas (2022), retrieved from: https://mnatlas.org/resources/wildlife-action-network/

[131] Ibid.

[132] The Wildlife Action Network developed for the 2015-2025 MN Wildlife Action Plan (April 2016), retrieved from: https://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/mnwap/mndnr_wildlife_action_network_description.pdf

[133] Arizona Game and Fish (2011) *Wildlife Compatible Fencing.* (2011). https://www.azgfd.com/wildlife/planning/wildlifeguidelines/ page 4.

[134] Colorado Division of Wildlife. *Fencing with Wildlife in Mind.* (2009). https://cpw.state.co.us/Documents/LandWater/PrivateLandPrograms/FencingWithWildlifeInMind.pdf, page 3.

[135] Marcel Huijser, et al. *Construction Guidelines for Wildlife Fencing and Associated Escape and Lateral Access Control Measures* (April 2015). http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP25-25%2884%29_FR.pdf, page 27.

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

Birds

Bird injuries or mortality occurs from fencing "due to lack of visibility"—raptors in pursuit of prey "are particularly vulnerable to the nearly invisible wire strands".[137] Other low flying birds such as grouse and owls are also vulnerable to fence collisions.

Risks to birds have been identified near PV solar facilities. Preliminary findings in one report, based on limited data, suspect a large expanse of reflective, blue panels may be reminiscent of a large body of water, causing migrating birds to attempt to land, consequently incurring trauma and related predation.[138]

Birds are also susceptible to electrocution from transmission lines. Electrocution is a risk if the conductors or ground wires are close enough together that a bird can touch two conductors simultaneously with its wings or other body parts. Independent of the risk of electrocution, birds might be injured or killed by colliding with transmission line structures and conductors. The risk of collision is influenced by several factors including habitat, flyways, foraging areas, and bird size. Waterfowl, especially larger waterfowl such as swans and geese, are more likely to collide with transmission lines.

Habitat

There are WMAs in the project vicinity outside of the project boundary, the nearest being Carlson State WMA. This WMA is directly adjacent to the boundary and has moderate biodiversity significance. No other WMAs are as near to the project area, as discussed in the Recreation section of this EA. There are no Aquatic Management Areas, Scientific and Natural Areas, or USFWS Waterfowl Production Areas within the project vicinity.

There are Sites of Biodiversity Significance including Leeds 21S and Leeds 16, totaling about 4 and 27 acres respectively within the project area. Leeds 16 is partially cropped with agriculture. Most of the sites appear to encompass grassland or wetland habitats. Many of the acres within these sites also were thought to contain native prairie, which was assessed with the DNR with the conclusion that no native prairies exist in the preliminary development area (Appendix K). Regardless, only 0.25 acres of any biodiversity significance site is mapped within the proposed project fence line.

Row crop habitat is not crucial to wildlife populations, although the land control area may be used as a travel corridor or, occasionally, as a food source (for example, standing corn). Once restored, the land control area will provide native grassland habitat for the life of the project. This change might be attractive to some species, and not others. Fencing will restrict ingress and egress of larger wildlife, and habitat benefits will be limited to small mammals, birds, insects, etc. accustomed to human disturbance. The habitat will be mowed periodically, which might limit nesting opportunities. Overall, the project will not contribute to significant habitat degradation or create new habitat edge effects.

[137] Arizona Game and Fish (2011), page 6.

[138] USFWS Forensics Lab . *Avian Mortality at Solar Energy Facilities in Southern California*. (2014). http://www.ourenergypolicy.org/wp-content/uploads/2014/04/avian-mortality.pdf

Mitigation

Existing Habitat

Although two overlapping (ranked low-medium and low) WAN areas are near the project boundary, only about 31 acres overlap the preliminary development area. For comparison, Cannon River Community Solar Garden currently occupies at least double this amount. Lake Wilson states that the shifted project layout from the previous project area was designed to largely avoid the highest concentration of high-quality habitat and water resources. Once permanent vegetation is established, restricting mowing from April 15 to August 15 will improve the potential for ground nesting habitat.

Sites of Biodiversity Significance

Although coordination has been completed with the DNR (Appendix M), the DNR recommends the following mitigation in project design around sites of biodiversity significance to avoid impacts to these ecologically significant areas:

- Retain a buffer between proposed activities and the site
- Minimize project footprint within the site
- Operate within already disturbed areas
- Minimize vehicular disturbance within the site
- Do not park equipment or stockpile supplies within the site
- Do not place spoil within the site
- Inspect and clean equipment prior to operating within the site, and follow other recommendations to prevent the spread of invasive species
- Conduct the work under frozen ground conditions
- Use effective erosion prevention and sediment control measures
- Revegetate disturbed soil with native seed mixes suitable to the local habitat as soon after construction as possible
- Use only weed-free mulches, topsoils, and seed mixes.

Fencing

Lake Wilson has committed in their application to utilizing lightweight agricultural woven wire fencing to reduce entanglements. This fencing would remain approximately 8 feet high to discourage human access. This type of barrier or exclusion fence should be set back sufficiently to encourage wildlife (primarily deer) to follow the fence line around the project away from roads, instead of pushing them into the roadway.[139] The design incorporates wide corridors between fenced areas relative to roads and utilities which attempts to provide various pathways for wildlife to cross. The site permit could require that visibility markers be placed at appropriate locations on perimeter fencing. Should wildlife, such as deer, enter the fenced area they would need an escape. The site permit could require that wildlife ramps be constructed "at corners where an accidentally trapped animal is more likely to find an escape."[140]

Construction

Avoiding use of plastic erosion-control materials where possible and using biodegradable materials (typically made from natural fibers) instead can minimize the impact to wildlife. The site permit

[139] Department of Natural Resources (January 3, 2020).

[140] Ibid., p. 29.

could include the use of natural fiber materials as a standard condition or as a special condition for facilities where there is greatest concern.

Checking open trenches during construction of the below-ground collection system and removing any wildlife caught in trenches before backfilling mitigates impacts.

Several sections of the DSP specify measures that will minimize impacts to wildlife:

- Section 4.3.16 requires use of "site restoration and management practices that provide for native perennial vegetation and foraging habitat beneficial to gamebirds, songbirds, and pollinators".
- Section 4.3.31 requires the permittee to coordinate with the DNR to ensure that the fence used in the project minimizes impacts to wildlife.
- Section 8.12 requires permittees to report "any wildlife injuries and fatalities" to the Commission on a quarterly basis.

Unavoidable Impacts

Resource impacts are unavoidable when an impact cannot be avoided even with mitigation strategies.

Potential impacts and the possible ways to mitigate against them were discussed in this chapter. However, even with mitigation strategies, certain impacts cannot be avoided. Most adverse unavoidable impacts are associated with construction; therefore, they would be temporary.

Unavoidable adverse effects associated with construction of the project (in some instances a specific phase of construction) would last through the construction period and include:

- Fugitive dust.
- Noise disturbance to nearby residents and recreationalists.
- Visual disturbance to nearby residents and recreationalists.
- Soil compaction and erosion.
- Vegetative clearing (loss of shelter belts).
- Disturbance and temporary displacement of wildlife, as well as direct impacts to wildlife inadvertently struck or crushed.
- Minor amounts of marginal habitat loss.
- Possible traffic delays.

Unavoidable adverse impacts associated with the operation would last as long as the life of the project, and include:

- Visual impacts of the project.
- Cultural impacts due to a change in the sense of place for local residents.
- Loss of land for agricultural purposes.
- Injury or death of birds that collide with or are electrocuted by conductors.
- Injury or death of birds that collide with PV panels.
- Injury or death of birds and mammals from fencing.
- Potential decrease to property values.

Irretrievable or Irreversible Impacts

Resource commitments are irreversible when it is impossible or very difficult to redirect that resource to a different future use; an irretrievable commitment of resources means the resource is not recoverable for later use by future generations.

Irreversible and irretrievable resource commitments are primarily related to project construction, including the use of water, aggregate, hydrocarbons, steel, concrete, wood, and other consumable resources. Some, like fossil fuel use, are irretrievable. Others, like water use, are irreversible. Still others might be recyclable in part, for example, the raw materials used to construct PV panels would be an irretrievable commitment of resources, excluding those materials that may be recycled at the end of the panels' useful life. The commitment of labor and fiscal resources to develop, construct, and operate the project is considered irretrievable.

Resource Topics Receiving Abbreviated Analysis

Resource topics that will have negligible impacts from the project and that do not impact the Commission's site permit decision receive less study and analysis.

Many environmental factors and associated impacts from a project are analyzed during the environmental review process. However, if impacts are negligible and will not impact the permit decision, those resource impacts receive less study and analysis. The following resource topics meet this threshold, which is based on information provided by the applicant, field visits, scoping comments, environmental analysis, and staff experience with similar projects. Additional information regarding these topics is provided in the site permit application.

Displacement

Displacement can occur when residences or other buildings are within a proposed site or right-of-way. If the buildings would potentially interfere with the safe operation of a project, they are typically removed and relocated. Displacements from large energy facilities are rare and are more likely to occur in heavily populated areas where avoiding all residences and businesses is not always feasible than in rural areas where there is more room to adjust boundaries to accommodate the project. Displacement will not occur, therefore, no mitigation is proposed.

Electronic Interference

The project area is served by several AM and FM radio stations, and digital television channels. There are no cellular, AM, FM, Microwave, TV, or other broadcast transmission towers within one mile of or within the project area according to publicly available Federal Communications Commission sources. However, three Private Mobile Transmission Towers are within one mile of the project boundary.

Electronic interference associated with electrical infrastructure is related to a phenomenon known as corona. Impacts are not expected, because anticipated electric fields are below levels expected to produce significant levels of corona. Section 4.3.24 of the DSP requires permittees to take whatever action is feasible to restore or provide equivalent reception should interference occur to "radio or television, satellite, wireless internet, GPS-based agriculture navigation systems or other communication devices" as a result of the project. Additional mitigation is not proposed.

Floodplain

Floodplains prevent flood damage by detaining debris, sediment, water, and ice. The FEMA delineates floodplains and determines flood risks in areas susceptible to flooding. At the state level, the DNR oversees the administration of the state floodplain management program by promoting and ensuring sound land use development in floodplain areas in order to promote the health and safety of the public, minimize loss of life, and reduce economic losses caused by flood damages. The DNR also oversees the national flood insurance program for the state of Minnesota. Floodplains are also regulated at the local level.

The solar facility site is outside of the 100-year FEMA flood zone and the preliminary development area is not within a FEMA floodplain. Any areas identified as a concern flooding area in Lake Wilson's hydrology report (Appendix N) were avoided in site layout. Additionally, FEMA lists the flood risk index for the project area as "very low".[141] The project will not significantly impact FEMA-mapped floodplains and no mitigation is proposed.

Forestry

Active forestry operations, including commercial timber harvest, woodlots, or other forestry resources do not occur within the land control area. Impacts to forestry operations will not occur.

Geology

Depth to bedrock is between 251 and 550 feet in the land control area. There are no mapped karst features in the land control area and the project is outside of areas prone to surface karst development. Impacts to geology are not expected to occur.

Implantable Medical Devices

EMFs might interfere with implantable electromechanical medical devices, such as pacemakers, defibrillators, neurostimulators, and insulin pumps. Impacts to implantable medical devices and persons using these devices are not expected to occur, but, if they did occur, moving away from the project would return the pacemaker to normal operation. Section 4.3.29 of the DSP requires the permittee to provide educational materials about the project to adjacent landowners. Additional mitigation is not proposed.

Mining

There are no mines, rock quarries, prospective sites, or gravel or commercial aggregate pits within one mile of the solar facility. In fact, they are quite uncommon in the southwest part of the State. The applicant will lease or purchase the underlying land; therefore, even if mining resources were available, the current and new landowners choose energy production as the higher and greater economic use. Impacts to mining will not occur. Impacts to mining will not occur and no mitigation is proposed.

Rare and Unique Resources

Although the Natural Heritage Information System (NHIS) review (Appendix M) documented the possibility of rare features in the vicinity of the project, features will be avoided as they're not in the preliminary development area, or delineations have been discussed with the DNR as explained in

[141] FEMA, National Risk Index, https://hazards.fema.gov/nri/map.

other parts of this EA. See the Wildlife Habitat section for a discussion on the sites of biodiversity significance and the Vegetation section for a discussion of native prairies with native plant communities. The NHIS report documents a potential calcareous fen in the project vicinity, however, Lake Wilson states that no calcareous fens were detected in the project area during wetland delineations (Appendix J).

No federally or state-listed endangered or threatened species have been documented in the vicinity of the project. The mentioned red three-awn in the NHIS report are not federally protected or regulated under Minnesota's Endangered Species Statute. Lake Wilson states that the Native Prairie Assessment outlined a lack of suitable habitat for this species within the project area, thus, likelihood of its occurrence within the project area is low.

The project is not expected to negatively affect any known occurrences of rare features. Regardless, techniques for minimizing impacts to wildlife and vegetation already planned to be taken by Lake Wilson also minimize impacts to rare species.

Topography

While grading will occur, significant impacts to topography, such as the creation of abrupt elevation changes or modifications to natural drainage patterns, are not expected. The project substation, switchyard, O&M building, and access road will be constructed at grade to the extent possible. Appropriate permanent stormwater management measures will address drainage from the newly established impervious areas. Impacts to topography will be negligible.

Tourism

The project will have a negligible impact on tourism in Murray County. Tourist activities within the project area are largely related to the recreational activities discussed in the Recreation Section of this EA such as the Murray County Fair on a large scale or the nearby Carlson State WMA on a small scale. Annual events hosted by the County do not occur within the project area. Potential impacts to tourism can be mitigated by reducing noise and aesthetic impacts, especially during construction, as well as impacts to natural landscapes. Long-term impacts can be mitigated through appropriate screening. Various sections of the DSP indirectly address impacts to recreation, such as noise, aesthetics, soils, etc. and as a result indirectly mitigate impacts to tourism. No additional mitigation is proposed.

Stray Voltage

The project will not result in the construction of large transmission lines; interconnect to businesses, farms, or residences; or change local electrical service. Therefore, impacts from stray voltage are not expected. Mitigation is not proposed.

Cumulative Potential Effects

Cumulative potential effects result from the incremental effects of a project in addition to other projects in the environmentally relevant area. Impacts will be "cumulative" with the Xcel Switchyard and intertie.

Minnesota Rule 4410.0200, subpart 11a, defines "cumulative potential effects," in part, as the "effect on the environment that results from the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same

environmental resources, including future projects ... regardless of what person undertakes the other projects or what jurisdictions have authority over the project."

The "environmentally relevant area" includes locations where the potential effects of the project coincide with the potential effects of other projects to impact the elements studied in this EA. Generally, this area includes the ROI for the different resource elements.

EERA staff analyzed what projects are "reasonably likely to occur."[142] To staff's knowledge, there are no planned, privately-sponsored projects in the project area. This is based on information from the applicant, such as responses they received from other State, County, Township, and local agencies as stated in the application, as well as a review of other public projects within the County or from MnDoT. Additionally, no relevant projects were found on the Environmental Quality Board's interactive project database.[143]

Thus, the only reasonably likely project to occur in the environmentally relevant area is Xcel Energy's construction and operation of the switchyard and intertie for the project. The Xcel Switchyard and intertie will be permitted, constructed, owned, and operated by Xcel Energy. The following subsection analyses the cumulative potential effects of the project and the switchyard where potential effects coincide.

Analysis Assumptions

The following assumptions regarding the construction and operation of the project were used for the purposes of this cumulative potential effects analysis:

- The switchyard will be constructed, maintained, and operated in a similar manner as the project's substation.
- The switchyard will not be decommissioned and removed at the end of the project's useful life.

Analysis Background

The ROI for cumulative potential effects varies across elements and is consistent with the ROI identified in Chapter 4: Potential Impacts and Mitigation in this document. Cumulative potential effects—where they coincide—increase or decrease the breadth of the impact to the resources and elements studied in this section. This may or may not change the impact intensity level assigned to the resource or element.

Cumulative effects are discussed here for projects that are foreseeable in the next five years in the project area. It is assumed that the construction-related impacts of these projects are short-term, for example, construction impacts will cause local disturbances, such as increased noise levels, and traffic delays/and reroutes. Thus, the discussion here is focused on the potential long-term impacts of these projects.

Where cumulative effects are anticipated, a written description is provided. Where cumulative potential effects are not anticipated, no further analysis is provided. For the purposes of this EA, actions that have occurred in the past and their associated impacts are considered part of the

[142] Minn. R. 4410.0200, subp. 11a.

[143] Retrieved from: https://webapp.pca.state.mn.us/eqb-search/search

existing environmental and were analyzed in this section. The source of information regarding the switchyard is the site permit application.

Human Settlement

Aesthetics

Cumulative potential effects on human settlements are anticipated to be minimal to moderate, depending on viewer sensitivity and distance to the projects, such as a neighboring landowner. New transmission lines and the Xcel Switchyard will result in aesthetic impacts by permanently converting land use and adding an additional industrial feature to the landscape that will be lit at night. Thus, aesthetic impacts will increase in the project area as a result of foreseeable projects.

Socioeconomics

Construction of Lake Wilson and the Xcel Switchyard will generate construction related jobs and material sales. These jobs and materials may or may not be sourced locally. Impacts are anticipated to be positive, but negligible. None of the identified projects are anticipated to create significant numbers of long-term jobs. The increase in energy projects in the area may increase tension in the project area between renewable energy and rural character.

Noise

Construction of both projects will also create increased vehicle traffic and noise, such as heavy traffic delivering material along haul routes. Once operational, the Xcel Switchyard is not expected to cause noise impacts.

Property Values

Property values may be affected minimally to moderately within 0.5 miles compared to homes 2-4 miles away with an approximate 4% reduction in home sale prices. Residences within the local vicinity might see both the project and the switchyard in their viewsheds. Short-term cumulative effects will occur. Staff is uncertain if long-term impacts will occur. It is unlikely that impacts will be permanent. Impacts can be mitigated. The overall impact intensity level is anticipated to remain minimal and dissipate at distance. Because of the uncertainty associated with property value impacts, potential impacts to specific properties could be moderate to significant.

Land Based Economies

Additional lands will be taken out of agricultural production. Impacts to the total amount of agricultural land in Murray County are negligible. Farming revenues lost will be offset by easement agreements. Potential impacts can be mitigated. The overall impact intensity level will remain minimal.

Public Health and Safety

Electromagnetic Fields

The switchyard will add to background EMF levels. Impacts are anticipated to be negligible. Impacts can be mitigated. The overall impact intensity level is anticipated to remain minimal.

Worker Safety

Construction activities and maintenance of electrical equipment has inherent risks. These risks are minimal to trained personal. Potential impacts can be mitigated through worker training, safety equipment, etc. The overall impact intensity level is anticipated to remain minimal.

Public Services

Emergency Services

Increased traffic might cause minor traffic delays, which could impact emergency response vehicles. The overall impact intensity level is anticipated to remain minimal.

Roads

Increased construction and delivery traffic might cause minor traffic delays along local roads. Potential impacts can be mitigated. The overall impact intensity level is anticipated to remain minimal.

Utilities

Minor electrical outages might be associated with construction of the switching station. Potential impacts can be mitigated. The overall impact intensity level is anticipated to remain minimal.

Archaeological and Historic Resources

Because archaeological resources are unidentified, cumulative potential effects are unknown. The overall impact intensity level is expected to remain negligible.

Natural Resources

Air Quality

Impacts associated with construction vehicles will occur over the short term (emissions and fugitive dust). Electrical lines within the switchyard will produce ozone and nitrous oxide through the corona effect. Impacts would be long term, permanent, and negligible. The overall impact intensity level is expected to remain minimal.

Soils

Soils within the footprint of the switchyard will be permanently compacted, and may experience compaction or rutting from movement of construction vehicles. The overall impact intensity level is expected to remain minimal.

Wildlife

Wildlife might be inadvertently harmed or killed during construction. Long term impacts include a greater risk of bird electrocution or collision due to increased electrical equipment on the landscape. Potential impacts can be mitigated. The overall impact intensity level is expected to remain minimal.

Chapter 5: System Alternatives

To aid the Commission in its decision-making, this chapter discusses and compares the potential human and environmental impacts of system alternatives. Before the applicants can construct the project, the Commission must determine if the project is needed or if another project is more appropriate for Minnesota, such as a project of a different size or type. These alternatives to the project itself are referred to as "system alternatives."

The EA must provide a general description, discuss potential human and environmental impacts and possible mitigation measures, and analyze the feasibility and availability of each system alternative studied. It must also describe specific emissions, water, and waste related impacts.

The applicant requested exemptions from certain CN filing requirements concerning alternatives to the project that otherwise must be discussed under Minnesota Rule 7849.1500. The Commission authorized these exemptions. As a result, the following system alternatives are not studied: purchased power; facilities using a non-renewable energy source; upgrading existing facilities; and transmission rather than generation.[144]

Because the project is powered by renewable energy (solar power), and in accordance with the scoping decision for this EA (Appendix B), this chapter discusses the following system alternatives:

- No-build Alternative
- Generic 150 MW Solar Farm with 95 MW of battery storage
- Generic 150 MW Wind Farm with 95 MW of battery storage

Need for the Project

The project could contribute to satisfying the demand for renewable energy.

The applicant proposes to construct the project to assist the State of Minnesota in meeting its renewable energy objectives[145], diversify electricity sources, meet anticipated growth in electricity demand, and meet consumers' growing demand for renewable energy. Minnesota's renewable energy objectives, in part, require that 55 percent of utility electric sales be generated by renewable energy technologies by the year 2035.[146] In addition, the state has a solar-specific goal that requires certain electric utilities to obtain at least one and one-half percent of their total Minnesota retail sales from solar energy by the end of 2020, with a goal of obtaining 10 percent of these sales from solar energy by 2030.[147] Most recently, the state established a carbon-free standard for each electric utility to provide 100 percent carbon-free electricity to retail customers by 2040.[148]

[144] Public Utilities Commission (July 25, 2023) *Order Approving Certificate of Need Exemption Requests,* eDocket No. 20221-181183-01.

[145] Minnesota Statute 216B.1691.

[146] Minnesota Statute 216B.1691, subd. 2a.

[147] Minnesota Statute 216B.1691, subd. 2f.

[148] Minnesota Statute 216B.1691, subd. 2g.

The applicant also points out that the project can help meet the growing demand for renewable energy. For example, corporations are setting carbon reduction and renewable energy goals. It is estimated that U.S. companies will purchase 85 gigawatts of renewable energy by 2030.

At the time this report was prepared, Lake Wilson did not have a buyer for the power. Lake Wilson is working to secure a power purchase agreement with wholesale customers (e.g., Minnesota utilities and cooperatives) or commercial and industrial customers to sell the electric power generated by the project.

System Alternatives

The project is one way to satisfy utility and consumer demands for renewable energy. Other ways include a solar facility in a different location or a wind farm.

The system alternatives studied in this EA are those noted in the scoping decision. They include a 150 MW solar energy generating system in a different location and a 150 MW large wind energy conversion system. A no-build alternative is also studied. The analysis in this EA describes the differences between the project and system alternatives and assumes alternatives are sited on agricultural lands in other areas of the state.

Potential impacts are difficult to assess for generic projects because the environmental setting for the generic alternative is unknown. Many impacts are site specific and determined by location. Impacts for system alternatives are discussed in generic terms.

Associated facilities are similar for both solar facilities and wind farms. The size and length of these facilities would vary depending on the location of the project and type of electrical interconnect, making potential impacts difficult to quantify; however, impacts generally increase with size and length. Generally, above-ground facilities cause greater aesthetic impacts and potential impacts to birds and bats. Below-ground facilities can mitigate some above-ground impacts but cause greater impacts to soils.

No-Build Alternative

Under the no-build alternative, the project would not be constructed. The analysis for this alternative considers potential impacts if the project is not constructed. This could occur if the Commission determines that the need for additional solar generation is not clearly established; no CN would be issued, and the project would not be constructed. This alternative is both feasible and available.

If the project is not constructed, the potential human and environmental impacts associated with the project would not occur. For example, land that would otherwise be removed from agricultural production would remain in production. While there are solar and wind resources in other parts of the state that could replace the project, the land on which to site these resources is finite. If the project is not built, it would reduce the available options to meet, or as easily meet, the state's renewable energy objectives and solar energy goals.

If the project is not built, certain economic benefits would be lost. Project landowners would lose land lease payments. Wages to employees, including union employees, to construct the project would not be paid. Local governments would lose energy production tax revenues. The estimated

annual revenue for this tax is $333,000 for Murray County and approximately $75,000 for Leeds Township.

Finally, if the project is not constructed, and electricity consumption increases in the Upper Midwest, the electrical energy that would have been produced by the project might be replaced by a carbon-emitting, non-renewable energy source, for example, coal or natural gas, which would lead to further global climate change.

Generic 150 MW Solar Farm with 95 MW of Battery Storage

A generic 150 MW solar energy generating system with 95 MW of battery storage sited elsewhere in Minnesota would support the need for additional solar energy. Such an alternative could be a single 150 MW solar facility with 95 MW of battery storage or a combination of smaller distributed solar facilities and/or battery storage systems. Sited elsewhere, the system(s) could address potential human and environmental impacts associated with the project. That is, an alternative site might have fewer potential impacts or a different mix of impacts. This is both feasible and available.

Figure 8: Solar Irradiance in Minnesota

The U.S. Energy Information Administration projects the levelized total system cost for new ground-mounted single axis tracking solar PV generation resources entering service in 2027 to be $36.09 per megawatt hour (MWh) ($33.46/MWh with tax credit).[149] After a period of rapid decreases in solar generation costs, solar PV is now competitive with other generation technologies. In 2013, there were approximately 15 MW of solar generation installed in Minnesota. In 2021 that amount had grown to 1,357 MW, accounting for approximately 3.2 percent of the state's generation.[150] This increase has been driven by state and federal policies, technology advances, and economics.

The Commission has permitted several solar facilities in Minnesota. Although solar generation is moving outside of areas traditionally used to generate wind power, for example the North Star project in Chisago County, solar irradiance in Minnesota is highest in southwest and south-central areas of the state that are primarily agricultural (Figure 10). The analysis that follows assumes that a generic 150 MW solar facility with 95 MW of battery storage would likely be located in southern Minnesota in a row-crop agricultural setting, similar to the project. Ten utility-scale solar energy generating systems have been permitted by the Commission.[151] The analysis for this alternative relies on data from these, and other, solar projects.

[149] United States Energy Information Administration, *Levelized Costs of New Generation in the Annual Energy Outlook 2022*. Table 1a. March 2022, https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf

[150] Commerce. *Minnesota Solar Fact Sheet*, https://mn.gov/commerce-stat/pdfs/solar-fact-sheet-2022.pdf

[151] Aurora Distributed Solar Project (Docket No. E6928/GS-14-515); North Star Solar Project (Docket No. IP6943/GS-15-33); Marshall Solar Project (Docket No. IP6941/GS-14-1052), Regal Solar Project (Docket No. IP-7003/GS-19-395), Elk Creek Solar Project (Docket No. IP-7009/GS-19-495), Louise Solar Project (Docket No. IP-7039/GS-20-647), Red Rock

The locality, capacity, and availability of the interconnection point to the electrical grid is a significant consideration in planning new solar farms—not unlike wind farms—and can be a significant contributor to overall cost. Most renewable energy projects are sited as close as possible to a suitable interconnection point. The developer absorbs costs associated with permitting and constructing power lines to the interconnection point, making the interconnection, and needed upgrades to the electrical grid so that it can accommodate output from the facility.

The types of impacts associated with a 150 MW solar facility with 95 MW of battery storage constructed in another location (or multiple locations) would be similar to those of the project. For example, a solar facility in another location would also be powered by solar energy, and, as result would not emit criteria pollutants. However, there are differences between locations that would influence or change potential impacts.

Archeological and Historic Resources

Because this analysis assumes this system alternative would be constructed on previously disturbed farmland, potential impacts would be similar. Should the alternative be constructed near or adjacent to historic features, or constructed on pastureland as opposed to cultivated land, the potential for impacts may increase.

Human Settlement

Impacts to human settlements are impacts related to quality of life, for example, aesthetics, noise, cultural values, public services. For a generic 150 MW solar farm with 95 MW of battery storage, these impacts are anticipated to be minimal and comparable to impacts associated with the project.

Potential aesthetic and noise impacts are highly dependent on the number of neighboring receptors and their distance from the system alternative. A system alternative may have more or fewer nearby receptors than the project, so the impact on human settlement may be relatively greater or less than the proposed project.

The project will be visible from roadways and will further alter the local landscape. Depending on location, a system alternative constructed away from a major highway may have a smaller aesthetic impact to the travelling public while still impacting residents. Topography, landscape features, and vegetation influence noise related effects. System alternatives with landforms or dense vegetation between the project and the receptor would likely reduce noise related impacts.

A solar facility can change neighboring landowners' sense of place. Differing views regarding a solar facility (or any large infrastructure project) can erode a community's shared sense of self. These impacts to cultural values can, at times, be mitigated by the presence of existing infrastructure, such as highways or electric infrastructure. The project is located near highways and other wind and solar generation facilities, which may mitigate potential impacts to cultural values in the project area. A generic 150 MW solar facility with 95 MW of battery storage may or may not be located near existing infrastructure.

Solar Project (Docket No. IP-7014/GS-19-620), Sherco Solar Project (Docket No. E-002/GS-21-191), Hayward Solar Project (GS-12-113), Byron Solar Project (IP-7041/GS-20-763).

A system alternative of a similar type and location is expected to have similar potential impacts from stray voltage and electronic interference.

The project is not expected to impact public services, disrupt local communities or businesses, and does not disproportionately affect low-income or minority populations. Negative socioeconomic impacts would occur if an alternative location does not meet these same thresholds. The project is required to pay production taxes, which positively impacts the operating budgets of local units of government. Economic benefits associated with using local labor rather than non-local labor are difficult to assess because they are influenced by a variety of factors, including the number of supplies and materials that can be purchased locally, the availability of local (including skilled) workers, and other market factors.

Potential impacts to property values are difficult to determine because they are influenced by a complex interaction of factors; however, impacts would be expected to be similar to the proposed project. Site specific constraints such as existing topography or vegetation and distance between affected parcels could influence the impact. The project does not displace any residences or buildings and it is assumed that any system alternative also would not displace residences or buildings.

Human Health and Safety

Impacts to public health and safety relate to the generation of electrical energy. This energy has the potential to cause harm or injury. For a generic 150 MW solar farm with 95 MW of battery storage, these impacts are anticipated to be minimal and similar to the impacts anticipated for the project.

A generic 150 MW solar farm with 95 MW of battery storage and substation, like the project, would be fenced and signed to indicate the danger of electrocution. Further, solar projects are monitored remotely in real time and in person on a regular schedule to ensure electrical safety mechanisms (for example, circuit breakers) are working correctly. No health impacts from electrical cabling, including impacts from EMFs or to implantable medical devices (pacemakers), are anticipated for the project or for a generic 150 MW solar farm with 95 MW of battery storage. These impacts might increase should an alternative be constructed near a sensitive receptor, such as a hospital or nursing home.

There is a possibility that components of a solar farm, such as solar panels, could be removed by high winds or other strong weather. Components leaving the project site could injure nearby persons. The project is designed to prevent solar farm components from the leaving the project site; a generic 150 MW solar farm with 95 MW of battery storage would include similar design measures.

Impacts to emergency services would, in a rural area, be similar; however, should a system alternative be constructed in a more populated area, indirect impacts to emergency services resulting from traffic delays or detours could be more prevalent during construction.

Public Services

Public services, such as airports, utilities, and roadways can be impacted by utility infrastructure. Solar facilities do not impact airport operations; therefore, effects would be similar regardless of location. Potential impacts to local utilities depend upon the utilities present. As with the proposed project, service interruptions may occur when the project is interconnected to the grid and during system maintenance but would not cause long-term (more than 24 hours) interruptions. Roads and

highways are impacted primarily by increased traffic and some heavy haul loads during construction. Potential impacts to roads and highways would be similar. Local roadways are more likely to experience impacts due to the rural nature and size of the project. A system alternative would have similar impacts on highways and local roads.

Land-based Economies

Because this analysis assumes that the system alternative would be constructed on farmland, impacts to agriculture would be similar in terms of total acres taken out of production. The majority of the project's generation site impacts prime farmland. Depending on location with respect to prime farmland, a solar system may have lesser impacts. Though solar farms remove land from agricultural production, Commission permits require permittees to conserve and maintain soil resources at each project site so that projects can be decommissioned at the end of their lives and the land returned to agricultural production.

Mining and forestry operations are not compatible with solar facilities. Because solar farms require relatively large acreages of unshaded, contiguous land, they are not sited in areas that support forestry or mining. A system alternative located on forested land would have a significant impact on forest resources. Avoidance of these resources is the primary mitigation.

There are no potential impacts to tourism from the proposed project. A system alternative may impact tourism depending on location and the level of tourism and related resources in a given area.

Natural Resources

For a generic 150 MW solar farm with 95 MW of battery storage, impacts to air and water resources, flora, and fauna are anticipated to be minimal and similar to the impacts of the project.

The project is not proposed to be constructed in a floodplain. These features are generally avoided when siting solar facilities and impacts would likely be similar in a different location. There are also few water resources in the project area. Though there are water resources in southern Minnesota, many wetlands were drained during settlement of the land and conversion from prairie to farmland. Further, Minnesota now has a policy to protect wetlands.[152] Thus, it is likely that a generic 150 MW solar farm with 95 MW of battery storage would have minimal impacts on wetlands.

Because this analysis assumes a system alternative would be constructed on farmland, impacts to wildlife and wildlife habitat would be similar. An alternative constructed in further from DNR Wildlife Management Areas, Sites of Biodiversity Significance, native prairie, or Scientific and Natural Areas could decrease impacts. Conversely, alternatives closer to DNR Aquatic Management Areas or USFWS Waterfowl Production Areas could increase impacts due to both the potential for greater numbers of wildlife in the area and heavily trafficked wildlife movement corridors. If the alternative were not to use agricultural woven fencing, impediment of wildlife movement or the risk of wildlife entanglement and injury would be greater. Should a system alternative project be constructed in an area with higher numbers of rare and unique natural resources, effects are expected to be greater. Database queries for rare and unique resources can be conducted prior to selecting a solar farm site. Additionally, on-the-ground surveys can be conducted. Thus, impacts to rare and unique resources can generally be avoided by prudent siting.

[152] Wetland Conservation Act; Minnesota Rule 8420.

Similar to the resources discussed above, impacts to vegetation are expected to be minimal. Impacts to soil resources vary by soil type – thus, impacts at a different location could be greater or lower. Impacts to topography would be similar.

Generic 150 MW Wind Farm with 95 MW of battery storage

A generic 150 MW large wind energy conversion system (LWECS or wind farm) with 95 MW of battery storage is an alternative renewable energy source. Such an alternative could be a single 150 MW wind farm with 95 MW of battery storage or a combination of smaller dispersed wind farms and/or battery storage systems. A 150 MW wind farm with 95 MW of battery storage sited elsewhere in Minnesota could address potential human and environmental impacts associated with the project. That is, this alternative type of project might have fewer potential impacts or a different mix of impacts.

Wind energy conversion technology consists of a set of wind-driven turbine blades that turn a mechanical shaft coupled to a generator, which in turn produces electricity. The major components of a wind turbine include rotor blades, shaft, gear box, generator, nacelle (which houses the shaft, gear box, and generator), safety lighting (attached to nacelle), yaw system (orientates turbine towards the wind), tower, power cables, and foundation. Modern wind turbines are mounted on towers that are 80 to 100 meters tall with turbine rotors that range from 120 to 150 meters in diameter. Total tip heights are usually between 195 and 200 meters.

Most turbines have a dedicated or shared access road. Multiple turbines are connected via electrical collection lines, often buried, which collect and funnel the generated electricity to a project substation. The substation is connected to the electrical grid.

Electrical energy produced by wind generation is among the lowest-cost energy available to consumers in the United States. The U.S. Energy Information Administration projects the levelized total system cost for new onshore wind generation resources entering service in 2027 to be $37.80 per MWh. Over the past 20 years, the generation of electricity in Minnesota has shifted from a reliance on coal and nuclear power generation to a more diverse mix that includes an increasing amount of wind generation (wind accounts for approximately 16 percent of electricity generated in Minnesota). This increase has been driven by state and federal policies, favorable wind resources, technology improvements, and economics.

While the footprint of the turbines is relatively small, wind farms require large land areas (thousands of acres) for siting and installation of infrastructure where developers have obtained wind rights. Due to the size of wind turbines, internal and external setbacks are necessary for operational efficiency. Turbines are sited in discrete locations that avoid impeding air flow between the other turbines. Like solar facilities, wind farms include multiple construction sites for installing individual components, such as turbines, substation, access roads, etc.

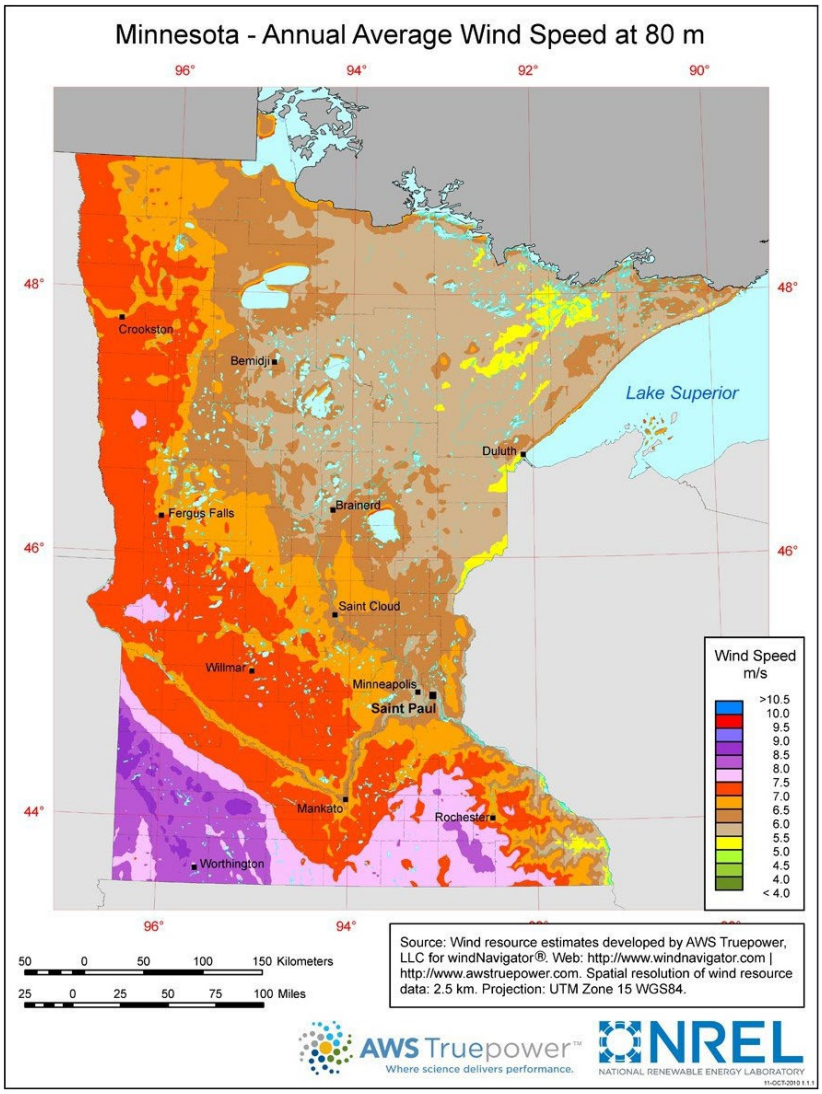
The locality, capacity, and availability of the interconnection point to the electrical grid is a significant consideration in planning new wind farms—not unlike solar facilities—and can be a significant contributor to overall cost. Most wind farms are sited as close as possible to a suitable interconnection point. The developer absorbs costs associated with permitting and constructing power lines to the interconnection point, making the interconnection, and needed upgrades to the electrical grid so that it can accommodate output from the facility.

Multiple large wind energy conversion systems have been permitted by the Commission. The analysis for this alternative relies on data from these projects.

The types of impacts associated with a 150 MW wind farm with 95 MW of battery energy storage constructed in another location(s) would be similar to those of the project. For example, wind farms do not emit criteria pollutants and are strategically sited to have few or minimal impacts to the human environment and natural resources. However, there are differences between solar and wind generation, for example, tower height and rotor swept zone, that influence or change potential impacts. Another notable difference between wind facilities and solar facilities is the land use conversion that occurs while a solar facility is operational. Most farming activities can continue in the presence of wind turbines, whereas on a solar facility, land is converted to renewable energy production until the project is decommissioned.

A generic 150 MW wind farm with 95 MW of battery energy storage is feasible and available. The Commission has permitted many wind farms in Minnesota. Wind resources in Minnesota are greatest in the southern portion of the state (Figure 11). This area of the state is primarily agricultural. Accordingly, a generic 150 MW wind farm would likely be located in southern Minnesota in an agricultural setting similar to the project.

Figure 9: Wind Speeds in Minnesota



Archeological and Historic Resources

Potential impacts are expected to be similar or greater depending on location. Wind turbines can be seen from a further distance, thereby increasing potential effects to the viewshed and use of nearby historic resources. Should the wind farm be constructed on pasture as opposed to cultivated land, the potential for negative effects to archeological resources could increase.

Human Settlement

Aesthetic impacts are greater at wind farms due to turbine height, shadow flicker, noise, and nighttime lighting. If the wind farm was constructed in an area without wind generation on the landscape, it would be more noticeable. Wind turbines can be seen for

several miles in an agricultural landscape; solar panels have a lower profile and would be visible only to neighboring properties and to travelers on adjacent roads and highways. Topography, landscape features, and vegetation influence visual and noise impacts. Nighttime lighting impacts can potentially be mitigated by utilizing available and approved light mitigating technologies, which reduce the number of lights, the duration, or the intensity.

Sunlight on rotating wind turbine blades creates moving shadows on the landscape, a phenomenon known as "shadow flicker." Shadow flicker can cause adverse aesthetic and quality of life impacts. Though Commission permits minimize shadow flicker through prudent siting of wind turbines, shadow flicker will occur to some extent in the project area. Solar farms do not produce shadow flicker and are designed to absorb sunlight.

Both a generic 150 MW wind farm and the project will produce noise while generating electricity and must operate within Minnesota state noise standards. However, a generic 150 MW wind farm is louder. Wind turbine generators and blades create higher noise levels than solar farm inverters. Additionally, wind turbines can operate around the clock, whenever the wind is blowing; solar inverters are working at full power (at their rated noise level) only on clear days. Thus, a generic 150 MW wind farm would be noisier than the project.

Mechanical noise can be omitted by the gear box inside the nacelle, as well as when the blades sweep past the tower. The actual sound perceived by the receptor would depend on the type and size of the turbine, the speed of the turning turbine, and distance from the turbine. Operational noise is greater at a wind farm than solar facility. Turbines also generate low frequency noise, which is omitted at a frequency below the normal range of human hearing. Individuals highly sensitive to low frequency noise—provided their residence is very close to an operating turbine—could perceive it as pressure, vibration, or a pulse. Low frequency noise has not been shown to cause negative health impacts to humans.

Due to turbine height, wind farms are visible from greater distances, potentially impacting recreationalists at greater distances. A system alternative near a campground or other recreational opportunities would have greater potential impacts than the project. Wind farms could preclude future land use or zoning.

A wind farm could change neighboring landowners' sense of place. Differing views concerning infrastructure project can erode a community's shared sense of self. These impacts to cultural values can, at times, be mitigated by the presence of an existing infrastructure, such as areas with significant electrical, rail, road, or other built infrastructure such as existing wind turbines. Some individuals or communities might accept wind generation more than others. Significant tension between wind generation and cultural values has occurred in Minnesota for select projects.

Because wind farms are electrically grounded, impacts from stray voltage would not be expected. Electronic interference is not expected and would be like the project. Wind turbines can block or partially block the line-of-sight path between microwave transmitters and receivers causing interference. Wind turbines can interfere with over-the-air television signals when the turbine—including the rotor swept area—is within the signal path between the broadcaster and receiver.

The project would not disrupt local communities or businesses and does not disproportionately impact low-income or minority populations. Negative socioeconomic impacts would occur if a wind

farm does not meet these same characteristics. Similar to the project, a wind farm would be required to pay production taxes. Benefits of using local labor verse non-local labor are difficult to determine because they are influenced by a variety of factors, including the amount of supplies and materials that can be purchased locally, the availability of local (including skilled) workers, and other market factors. Local businesses, for example, restaurants and grocery stores, would likely see a temporary positive increase in business from non-local labor.

Potential impacts to property values are difficult to determine because they are influenced by a complex interaction of factors. There is no evidence that wind farms cause widespread, negative impacts to property values; however, that does not mean that negative effects do not occur.[153] If the wind farm was constructed in an area without wind generation on the landscape there could be more noticeable short-term impacts to property values. While extremely rare, wind farms have potential to displace residences or buildings, should this occur, impacts are mitigated through financial payments.

Health and Human Safety

Potential impacts from EMF and to implantable medical devices would be similar. Like the project, all equipment is electrically grounded. When operating, wind turbines generate EMF from mechanical components located within the nacelle. Minimum setback distances (1,000 feet) minimize potential impacts to residents and residences given that EMF generated by turbines dissipates to minimal levels within 500 feet of the nacelle. Potential impacts might be greater should a wind farm be constructed near a sensitive receptor, such as a hospital or nursing home.

A generic 150 MW wind farm with 95 MW of battery storage, like the project, would have limited access and would be signed to indicate the danger of electrocution. Further, wind projects are monitored remotely in real time and in person on a regular schedule to ensure electrical safety mechanisms are in place and working correctly. No health impacts from electrical cabling, including impacts to implantable medical devices (pacemakers) are anticipated for either to project or the wind farm alternative.

Potential impacts to worker safety would be similar given adherence to Occupational Safety and Health Administration standards. Impacts to emergency services would, in a rural area, be similar; however, should a wind farm be constructed in a more populated area, indirect impacts to emergency services resulting from traffic delays or reroutes could be more prevalent during construction.

Public Services

Potential impacts to public services due to a wind farm are not anticipated. Due to the height of wind turbines, a generic 150 MW wind farm with 95 MW of battery storage has relatively greater potential to impact aviation operations and traffic. Potential impacts are mitigated by siting wind farms away from airports. Additionally, proposed turbine locations must be reviewed by the Federal Aviation Administration (FAA) and appropriately lighted per FAA requirements. Permittees are required to notify local airports prior to construction.

[153] Department of Commerce (May 2018) *Environmental Report: Bitter Root Wind Project*, retrieved from: https://mn.gov/eera/web/file-list/2015/.

Potential impacts to local utilities depend upon the utilities present. As with the project, service interruptions are likely to occur, but would likely not cause long-term (more than 24 hours) interruptions.

Roads and highways are impacted primarily by increased traffic and some heavy-haul loads during construction. More heavy-haul and oversized loads are required when constructing wind farms. Because of this, increased levels of structural damage can occur to local roads. Damages created by wind farm construction must be repaired by the permittee, but associated road construction can potentially impact local traffic routes and flow. Permittees are required to acquire permits and approvals from MnDOT, and to develop road use, or development, agreements with county and township road authorities. These permits, approvals, and agreements minimize traffic impacts, including potential for accidents.

Land Based Economies

If constructed on farmland, impacts to agriculture would be significantly less in terms of total acres taken out of production. A wind farm does not preclude agricultural production, although it might limit certain activities in select locations, such as aerial spraying. In general, wind farms require about 0.3 acres of land per MW; solar farms about 6 to 10 acres of land per MW. Further, the land removed for a wind farm is discrete, whereas the land removed for a solar farm is typically contiguous. Farmers are compensated for construction impacts, such as crop loss, reduced yields, or drain tile damage.

Mining and forestry operations would be precluded near individual turbines but would not necessarily be precluded entirely. Impacts to forestry operations is very rare as heavily wooded areas are not typically targeted for wind farm development.

Potential impacts to tourism would be expected if the wind farm can be heard or seen at tourism type locations. Impacts can potentially be minimized through setbacks to structures or non-participating property boundaries. Wind turbines are significantly taller than solar panels; accordingly, they can be seen from a greater distance. This greater visibility could create impacts to tourist or recreational attractions, with the extent of the impact decreasing with distance from the wind farm. However, on whole, impacts to tourism from a generic 150 MW wind farm with 95 MW of battery storage are not anticipated.

Natural Resources

Developers generally avoid surface waters and wetlands, but impacts do occur from placement of underground collector lines and if construction crane paths cross wetlands. Permittees must obtain necessary permits and approvals to cross surface waters and wetlands, and impacts are generally temporary. Significant wetland impacts can be mitigated through compensatory wetland banking. Surface waters are generally avoided. Groundwater impacts could be greater from concrete leaching due to the significantly larger size and depth of turbine foundations. Depending on water quantity needs and location, a DNR Water Appropriations Permit may be required, which monitors and minimizes groundwater impacts.

Wind turbines and associated facilities are rarely located in floodplains. Should a wind farm be constructed within a floodplain, potential impacts could occur; however, wind farms would not noticeably reduce flood storage capacity of the floodplain cross-section.

For a generic 150 MW wind farm with 95 MW of battery storage, impacts to air and water resources, flora, and fauna are anticipated to be similar to the project, except for impacts to fauna. Wind farm development causes direct impacts to wildlife as turbine blades can strike and kill various bat and bird species. Wind farms operating in Minnesota show higher bat fatalities than bird fatalities. Bat fatalities are thought to increase when the turbine is operating at low wind speeds. Bat fatalities also increase from mid-July through September during bat migration periods. Operational adjustments, such as "feathering" the blades, which stops the turbine blades from spinning until wind speeds are high enough to begin generating electricity, can minimizes bat fatalities at times of low wind speed.

Bird impacts are not as clearly attributed to seasonality. Most birds demonstrate some degree of turbine avoidance during flight. The majority of bird strikes are thought to result from situations of reduced visibility (heavy fog), distracted flight behavior (courtship or prey pursuit), difficult flight conditions (high or gusty winds), or increased exposure to the wind turbine locations (species that appear to prefer disturbed areas). Impacts to some avian species can be mitigated by locating turbines away from preferred habitat types, nesting areas, and known flight and migration corridors.

Potential impacts to wildlife habitat would be similar; however, an alternative constructed closer or further from DNR Wildlife Management Areas, Aquatic Management Areas, Sites of Biodiversity Significance, or Scientific and Natural Areas; or USFWS Waterfowl Production Areas could result in greater or lesser impacts to wildlife and their habitats. Impacts could increase because of a greater amount of wildlife in the area, the potential for the to be heavily used as a movement corridor, or reduced use of available habitat. State and Federally owned lands, managed for wildlife, are non-participating lands. Proposed wind turbine locations must be setback from property boundaries to meet required wind access buffers. Wind access buffers are thought to help reduce impacts to wildlife habitat utilization.

Should a wind farm be constructed in an area with higher numbers of rare and unique natural resources, potential impacts are expected to be greater. Rare and unique resources are recorded by natural resource agencies, for example, DNR and USFWS. Database queries for rare and unique resources can be conducted prior to selecting wind turbine locations. Additionally, on-the-ground surveys can be conducted. Thus, impacts to these resources can generally be avoided by prudent siting.

Impacts to vegetation and soils would be similar in type, although somewhat more limited in scale. Effects from clearing, sedimentation, erosion, and compaction are dependent on location. Permit requirements limit unnecessary vegetative clearing, and that impacts be mitigated to the extent possible. Wind farm construction and operation would impact less land area per MW of electricity produced. On average, a wind farm requires approximately two to three acres of land per MW, whereas a solar facility requires about six to eight acres.

Fossil Fuel Power Plant Pollutants

Minnesota Rule 7849.1500 requires that this EA discuss certain pollutants that can be emitted from large electric power generating plants. The rule is directed primarily at generating plants that use fossil fuels that have air emissions and that reject waste heat into the environment, typically through cycled water. Though the rule is not directed to generating plants that use solar or wind energy, the pollutants noted in the rule are discussed here.

Air Pollutants

Sulfur dioxide, nitrogen oxides, carbon dioxide, mercury, and particulate matter are known as primary pollutants. Primary pollutants form directly and must be emitted by a source.[154] Because solar facilities and wind farms do not burn fuel, they do not emit primary pollutants during operation.

Air pollutants would be emitted during construction of both solar facilities and wind farms. These pollutants include construction equipment exhaust and fugitive dust. Exhaust emissions from construction equipment and vehicles traveling to and from the facility would occur during construction. Fugitive dust occurs from earth moving activities and vehicle travel on unpaved roads. These impacts are influenced by weather conditions and the type of construction activity. Once the solar facility or wind farm is constructed, exhaust and dust emissions would be greatly reduced. Limited emissions would occur during routine maintenance and repairs.

Hazardous Air Pollutants and Volatile Organic Compounds

"Hazardous air pollutants, also known as toxic air pollutants or air toxics, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects."[155] Minor emissions of toxic air pollutants at solar facilities would occur from vehicle and equipment use and from solvents and coatings used during equipment maintenance and building upkeep. Emissions at wind farms would be similar, with the addition of petroleum-based fluids used in the operation of wind turbines, such as gear box oil, hydraulic fluid, and grease.

Ozone

A secondary pollutant, ground level ozone "is not emitted directly into the air but is created by chemical reactions between nitrogen oxides and volatile organic compounds. This happens when pollutants emitted by [different] sources chemically react in the presence of sunlight."[156] Solar facilities and wind farms do not produce ozone or ozone precursors. However, any transmission line associated with a project, whether new or existing, would generate small amounts of ozone and nitrous oxide.

Water Appropriation and Wastewater Streams

According to the U.S. Geological Survey, 133 billion gallons of water are withdrawn each day in the United States to cool thermoelectric power plants.[157] The majority of this water is returned to the source. Solar facilities and wind farms are not thermoelectric power plants—they do not use water to generate electricity or for cooling. Water is not "appropriated to operate" these facilities, and they do not discharge wastewater.

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[154] University of Calgary. *Energy Education: Primary Pollutant*. (2018). https://energyeducation.ca/encyclopedia/Primary_pollutant.

[155] U.S. Environmental Protection Agency. *What are Hazardous Air Pollutants?* (2022). https://www.epa.gov/haps/what-are-hazardous-air-pollutants.

[156] U.S. Environmental Protection Agency. *Ground-level Ozone Basics*. (2022). https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics#formation.

[157] U.S. Geological Survey. *Total Water Use*. (n.d.) https://www.usgs.gov/mission-areas/water-resources/science/total-water-use?qt-science_center_objects=0#qt-science_center_objects.

Solid and Hazardous Wastes

If not properly handled, solid and hazardous wastes can contaminate air, soils, and water, which can cause a variety of human and environmental impacts depending on the type and amount of contamination.

Solar facility and wind farm construction generates solid waste, such as scrap wood and metal, plastics, and cardboard. Petroleum products would be present on-site, including engine and hydraulic oil, lubricants, grease, cleaning solvents, and fuel. Operation is not expected to generate significant qualities of solid and hazardous wastes—but more so for wind farms. Small quantities of petroleum products would be kept onsite for routine maintenance activities. Certain electronic components in both solar facilities and wind farms, such as circuit boards, contain hazardous materials commonly found in electronic devices.

Decommissioning of solar facilities and wind farms will generate solid wastes. Certain electronic components in both solar facilities and wind farms, such as circuit boards, contain hazardous materials commonly found in electronic devices. In Minnesota, solar panels must be assumed to be hazardous waste due to the probable presence of heavy metals, unless they are specifically evaluated as non-hazardous. Heavy metals in solar panels can include arsenic, cadmium, lead, and selenium. Panels must be properly disposed of in a special facility or recycled if recyclers are available."[158]

About 85 percent of wind turbine components can be recycled or reused, including steel, copper, and electronics.[159] Wind turbine blades are difficult to recycle and must be cut into pieces for proper disposal.[160]

[158] MPCA. *2017 Toxics and Pollution Prevention Evaluation Report*. (2018). https://www.pca.state.mn.us/sites/default/files/lrp-p2-2sy17.pdf, page 22; *see also* California Department of Toxic Substance Control (n.d.) *Solar Panel FAQs*.: https://dtsc.ca.gov/solar-panel-faqs/#easy-faq-348310 (solar panel wastes include heavy metals such as silver, copper, lead, arsenic, cadmium, selenium that at certain levels may be classified as hazardous wastes).

[159] Martin, C. (February 7, 2020) Wind Turbine Blades Can't be Recycled, So They're Piling up in Landfills, retrieved from: https://www.bloomberg.com/news/features/2020-02-05/wind-turbine-blades-can-t-be-recycled-so-they-re-piling-up-in-landfills.

[160] *Ibid.*

Geospatial Sources

Unless otherwise noted, all links were valid as of October 2023.

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Minnesota Department of Natural Resources.

- *Minnesota County Boundaries*. Available from https://gisdata.mn.gov/.
- *Public Waters Inventory (PWI) Basin and Watercourse Delineations*. Available from https://gisdata.mn.gov/.
- *MBS Sites of Biodiversity Significance*. Available from https://gisdata.mn.gov/.
- *Minnesota Snowmobile Trails*. Available from https://gisdata.mn.gov/.
- *National Wetland Inventory of Minnesota*. (2015). https://resources.gisdata.mn.gov/pub/gdrs/data/pub/us_mn_state_dnr/water_nat_wetlands_inv_2009_2014/metadata/metadata.html#Distribution_Information
- *State Administered Lands – DNR Management Units, Minnesota*. Available from https://gisdata.mn.gov/.
- *DNR Native Plant Communities*. Available from https://gisdata.mn.gov/.

Minnesota Department of Transportation. *Roads, Minnesota, 2012*. Available from https://gisdata.mn.gov/.

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