Combined Environmental Assessment and Environmental Report: Byron Solar Project

Human and Environmental Impacts of Constructing and Operating the 200 MW Byron Solar Project and Associated 345 kV Transmission Line

September 2022

COMMERCE DEPARTMENT

PUC Docket Nos. IP7041/CN-20-764, GS-20-763, TL-20-765

OAH Docket No. 82-2500-38038

Project Contacts

Responsible Government Unit

Public Utilities Commission
121 Seventh Place East, Suite 350
Saint Paul, MN 55101-2147

Commission Representative

Michael Kaluzniak
(651) 201-2257
mike.kaluzniak@state.mn.us

Preparer

Department of Commerce
85 Seventh Place East, Suite 280
Saint Paul, MN 55101-2198

Commerce Representative

Suzanne Steinhauer
(651) 539-1843
suzanne.steinhauer@state.mn.us

Project Proposer

EDF Renewables
Byron Solar Project, LLC
10 NE 2nd Street, Suite 400
Minneapolis, MN 55413

Byron Solar Representative

Scott Wentzell
(612) 486-4523
scott.wentzell@edf-re.com

Byron Solar, LLC, (Byron Solar) a wholly owned subsidiary of EDF Renewables, Inc, proposes to construct, own, and operate a 200-megawatt solar energy generating system and associated facilities in Dodge County, Minnesota. Byron Solar also proposes to construct approximately three to 4.5 miles of 345 kV transmission line in Dodge and Olmsted counties to connect the solar facility with the electric transmission grid at the Byron Substation. Byron Solar must obtain a certificate of need, a site permit, and a route permit from the Minnesota Public Utilities Commission before it can construct the proposed Byron Solar Project.

Sources

Much of the information used to prepare this environmental assessment comes from the certificate of need application and the joint site and route permit application. Additional sources include information from relevant federal and state environmental review documents for similar projects, spatial data and site visits.

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 (20-763, 20-764, or 20-765), your name, email address, and mailing address. Please indicate whether you would like to receive notices by email or U.S. mail.

Alternative Formats

This document can be made available in alternative formats, that is, large print or audio, by calling (651)539-1530(voice).

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 and the joint site and route permit application (joint application) and public scoping comments. It addresses the matters identified in the May 23, 2022, scoping decision (**Appendix A**)

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 both the solar facility and the high voltage transmission line elements of the project—their design, construction, operation, and decommissioning.

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

Chapter 4 describes the environmental setting; details potential human and environmental impacts from the Byron Solar Project; 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.

Contents

Appendices

Figures

Tables

Acronym/Abbreviation	Description
AC	alternating current
ALJ	administrative law judge
applicant	Byron Solar, LLC
BMP	best management practice
BWSR	Board of Water and Soil Resources
Byron Solar	Byron Solar, LLC
Commerce	Department of Commerce
CN	Certificate of Need
Commission	Public Utilities Commission
CSW Permit	Construction Stormwater Permit
dBA	A-weighted sound level recorded in units of decibels
DC	direct current
DNR	Department of Natural Resources
DRP	draft route permit
DSP	draft site permit
EA	environmental assessment
EMF	electromagnetic fields
EPA	United States Environmental Protection Agency
ER	environmental report
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
kV	kilovolt
MBS	Minnesota Biological Survey
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MW	megawatt
MWh	megawatt hour

mG	milligauss
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MWI	Minnesota Well Index
NAC	noise area classification
NEV	Neutral-to-earth voltage
NHIS	Natural Heritage Information System
NLEB	Northern Long Eared Bat
NWI	National Wetland Inventory
NWI-MN	National Wetland Inventory for Minnesota
project	Byron Solar Project
PV	photovoltaic
ROI	region of influence
ROW	right-of-way
SCADA	supervisory control and data acquisition
SHPO	State Historic Preservation Office
SMMPA	Southern Minnesota Municipal Power Agency
SWPPP	Stormwater Pollution Prevention Plan
task force	Advisory Task Force
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WCA	Wetland Conservation Act

Definitions

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

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

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 the area for which an applicant is assumed to have site control through ownership, a lease agreement, or an easement. For this document, it applies to both the area for the

solar facility and the final ROW for the transmission line. The term is used to bound a review area and should not be understood to imply the applicant has secured or will definitely secure the land.

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)).

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

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 and collection line corridor.

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

route Defined by Minnesota Statute 216E.01, subdivision 8, "route" means the location of a high voltage transmission line between two end points. The route may have a variable width of up to 1.25 miles

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.

1 Summary

Byron Solar, LLC (applicant), a wholly owned subsidiary of EDF Renewables, Inc., must obtain a certificate of need (CN), a site permit, and a route permit from the Minnesota Public Utilities Commission (Commission) before it can construct the proposed Byron Solar Project (project). The project would interconnect to the electrical grid at the existing Byron Substation owned by Southern Minnesota Municipal Power Agency (SMMPA).

The applicant filed a CN application and a joint site and route permit application (joint application) on August 30, 2021. The applications were found to be substantially complete by the Commission on November 17, 2022.

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.[1] 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 Minnesota Power Plant Siting Act to "minimize adverse human and environmental impacts while insuring continuing electric power system reliability and integrity and ensuring that electric energy needs are met and fulfilled in an orderly and timely fashion".[1]

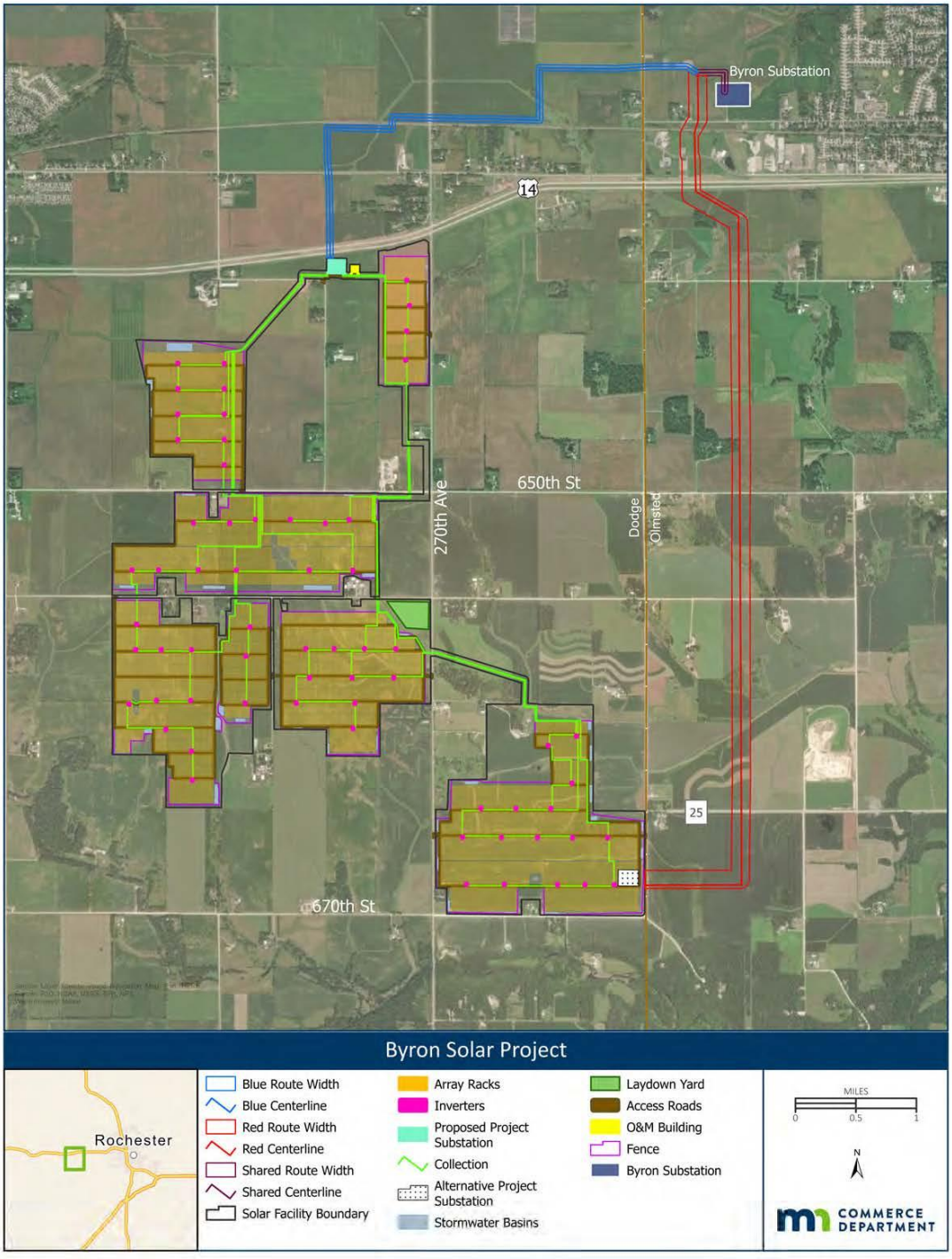
1.1 What does the applicant propose to construct?

A 200-megawatt solar energy generating system and associated facilities. Byron Solar also proposes to construct approximately three to 4.5 miles of 345 kV transmission line to connect the solar facility with the electric transmission grid at the Byron Substation.

The project's primary components include solar panels affixed to a linear ground-mounted single-axis tracking system, inverters and transformers housed in electrical cabinets, electrical collection system, collection line, project substation, and supervisory control and data acquisition ("SCADA") systems and metering equipment. It also requires fencing, approximately 35.3 miles of access roads, laydown areas, up to 5 weather stations, and an operation and maintenance facility. The project would interconnect to the electrical grid at the existing Byron substation through approximately three to four and a half miles of new 345 kV overhead transmission line.

[1] Minnesota Statutes 216E.02, subd. 1.

Figure 1. Proposed Byron Solar Project



Byron Solar is proposing the project to meet growing demand from commercial and industrial customers for renewable energy resources and to help reach clean energy requirements in Minnesota and neighboring states. Byron Solar has not secured a power purchase agreement at this time.

Byron Solar anticipates construction will begin in mid-2024 and the project will begin operation by the end of 2025.

1.2 What is the state of Minnesota's role?

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

To build the project, the applicant needs three approvals—a CN, a site permit, and a route permit—from the Commission. In addition, the project might require additional approvals from other federal and state agencies and local governments, for example, a driveway permit from Dodge County or a Construction Stormwater Permit from the Minnesota Pollution Control Agency (MPCA) . A site permit supersedes local zoning, building, and land use rules.[2] The Commission's site permit decision must be guided, in part, however, 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".[3]

The applicant applied to the Commission for a CN, a site permit, and a route permit for the project in August 2021.[4,] 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?
- If the project is needed, where is the route best located and what conditions should be placed on the route permit?[5]

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, site, and route permit applications.[6] In this instance, an EA was prepared, and a public hearing will be held. The goal of the EA is to describe potential human and environmental impacts of the project (*the facts*), whereas the intent of the public hearing is to allow interested persons the opportunity to advocate, question, and debate what the Commission should decide about the project (*what the facts mean*). The record developed during this process—including all public input—will be considered by the Commission when it makes its decisions on the applicant's CN and site permit applications.

---

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

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

[4] Byron Solar, LLC. *Certificate of Need Application for a Solar Electric Generating Facility and 345 kV Transmission Line*.(August 27, 2021, herein after CN Application) 20218-177516-03, 20218-177516-04 and *Joint Application to the Minnesota Public Utilities Commission for a Site and Route Permit* (August 30, 2021)herein after *Joint Application),* eDockets No. 20218-177521-02 , 20218-177521-04 , 20218-177523-01, 20218-177523-03, 20218-177524-01, 20218-177524-03, 20218-177524-05 , 20218-177524-07, 20218-177527-02, 20218-177527-04, 20218-177540-02, 20218-177540-04, 20218-177540-06, 20218-177540-08, 20218-177540-10, 20218-177540-12, 20218-177540-14, 20218-177540-16, 20218-177541-02, 20218-177541-04, 20218-177541-06, 20218-177541-08, 20218-177541-10, 20218-177541-12, 20218-177541-14, 20218-177541-16, 20218-177541-18, 20218-177541-20

[5] If the Commission grants a site or route permit, it chooses which of the studied locations is most appropriate. In this matter only one site location is studied, while two routes are studied

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

1.3 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.

1.4 What is an Environmental Assessment?

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

This Environmental Assessment (EA) contains an overview of affected resources and discusses potential human and environmental impacts and mitigation measures. Energy Environmental Review and Analysis staff within the Commerce Department (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.

1.5 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: Suzanne Steinhauer (suzanne.steinhauer@state.mn.us),(651) 539-1843 or the public advisor: Cezar Panait (publicadvisor.puc@state.mn.us, (651) 201-2257.

The CN application and joint application can be found on eDockets: https://www.edockets.state.mn.us/EFiling/search.jsp by searching "20" for year and either "764" (CN), "763" (site permit), or "765" (route permit) for number. Information is also available on the commerce webpage: https://apps.commerce.state.mn.us/eera/web/project/14509.

1.6 Where is the project located?

The solar facility is in Mantorville and Canisteo townships in Dodge County, Minnesota. Depending upon the route selected, the transmission line is in Mantorville Township in Dodge County and Kalmar Township in Olmsted County (Blue Route) or Canisteo Township in Dodge County and Salem and Kalmar townships in Olmsted County (Red Route).

The Project is located in a rural area near the cities of Kasson and Byron. The solar facility is south of US Highway 14, approximately one-half mile southeast of Kasson and one mile southwest of Byron, Minnesota. Of the 1801 acres leased, the applicant anticipates that approximately 1,553 will be developed for the project. The land within the project site that is not developed for the Project will be returned to the landowner following termination of the lease.

The 345 kV transmission line will travel north and east between the project substation and the Byron Substation. Depending upon the route selected, the transmission line will be approximately three miles long, generally following section lines and a railroad (Blue Route) or 4.5 miles long, largely paralleling existing transmission lines northward into the Byron Substation (Red Route).

1.7 What permits are needed?

A CN, site permit, and a route permit from the Commission are required. Federal, state, and local permits may also be necessary to construct 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 megawatts ("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 project also requires a route permit from the Commission because it meets the definition of *high voltage transmission line* in Minnesota statute, which is a conductor of electric energy and associated facilities designed for and capable of operation at a nominal voltage of 100 kV or more and longer than 1,500 feet.

Various federal, state, and local approvals will be required for activities related to the construction and operation of the project. These permits are referred to as "downstream permits" and must be obtained by the applicant prior to constructing the project.

1.8 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: archeological and historic resources, human settlement, human health and safety, public services, land-based economies, and natural resources.

Select resource topics received abbreviated study because they were deemed to be of minor importance to the Commission's site and route permit decisions. Potential impacts are anticipated to be negligible to displacement, communication, implantable medical devices, tourism, forestry, mining, and floodplains.

1.8.1 Human Settlement

Large energy projects can impact human settlement. Impacts range from short-term, such as increased local expenditures during construction, to long-term, such as changes to viewsheds.

Aesthetics: The impact intensity level is expected to be moderate and long-term. Locations where visual impacts may potentially be the greatest are adjacent to residences and along public roadways.

The solar arrays will be visible from nearby residences and adjacent roadways. The transmission line will be visible from a greater distance than the panels, but the change is likely to be minimal given its short length and proximity to the Byron Substation and other existing transmission lines.

Cultural Values: The impact intensity level is anticipated to be minimal. 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: The impact intensity level is anticipated to be moderate. Land use impacts are anticipated to be long-term and localized. The proposed solar facility is inconsistent with some local land use ordinances. 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.

Noise: 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 might exceed state noise standards. Impacts are unavoidable but can be minimized. Operational impacts are anticipated to be negligible.

Property Values Impacts to property values within the local vicinity could occur; however, changes to a specific property's value are difficult to determine. Impacts in the local vicinity are anticipated to be minimal and significant negative effects to property values are not anticipated. Impacts to the value of specific properties within the local vicinity are difficult to determine but could occur.

Recreation: The ROI for recreation is the project area. Because few recreational resources exist in the project area, potential impacts to these resources are anticipated to be minimal and temporary. Impacts to a snowmobile trail can be mitigated.

Public Services: 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.

Socioeconomics: The impact intensity level is anticipated to be minimal to significant and positive. 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.

Economic Justice: The project will not have disproportionately high and adverse human health or environmental effects on low-income, minority, or tribal populations

1.8.2 Human Health and Safety

Large energy projects have potential to impact human health and safety. Most concerns are related to the construction phase.

Electronic and Magnetic Fields (EMF): Impacts to human health from possible exposure to EMFs are not anticipated. Potential impacts will be long-term and localized. These unavoidable impacts will be of a small size. Impacts can be mitigated.

Public Safety and Emergency Services: 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.

1.8.3 Land-based Economies

Large energy projects can impact land-based economies by limiting land use for other purposes.

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 Dodge and Olmsted counties 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.

1.8.4 Archeological and Historic Resources

The impact intensity level is anticipated to be negligible to minimal. Impacts would be localized. Impacts can be mitigated through siting and routing

1.8.5 Natural Resources

Large energy projects can 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. Impacts vary significantly within and across projects.

Air Quality Potential impacts to air quality during construction would be intermittent, localized, short-term, and minimal. Impacts are associated with fugitive dust and exhaust. Impacts can be mitigated. Once operational, the solar array will not generate criteria pollutants or carbon dioxide. Ozone and nitrous oxide emissions from the transmission line are anticipated to be well below state and national limits 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.

Geology and Groundwater Because of the presence of karst in the project area, there is potential for both direct and indirect impacts to groundwater due to construction and operation of the project. Direct and indirect impacts are anticipated to be minimal to moderate. Impacts can be mitigated through adherence to best management practices (BMPs) for construction in karst areas and BMPs for stormwater management, incorporating recommendations on project design and construction in areas of karst geology from a knowledgeable geotechnical engineer, and avoiding construction activity and location of project infrastructure within at least 150 feet from documented active karst features.

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 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.

Surface Water: The impact intensity level is anticipated to be minimal. Direct impacts to surface waters are not expected. Indirect impacts to surface waters may occur. These impacts will be short-term, of a small size, and localized.

Wildlife and Habitat: Potential impacts may be positive or negative and are 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 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.

Rare and Unique Resources: The impact intensity level is anticipated to be minimal. Impacts could be both short and long term and could be positive (e.g., through introduction of habitat), or negative (e.g., by removing trees during breeding season). Impacts can be mitigated.

1.9 What criteria does the Commission use to make decisions?

Minnesota statute and rule identify the factors the Commission must consider when determining whether to issue a CN, a site permit, and a route 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?
- If the project is needed, should a site permit be issued for the project, and, if so, what permit conditions are appropriate?
- If the project is needed, which route should be selected, and what permit conditions are appropriate?

1.9.1 Certificate of Need

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

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

B. A more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record.
C. The proposed facility, or a suitable modification of the facility, will provide benefits to society in a manner compatible with protecting the natural and socioeconomic environments, including human health.
D. The record does not demonstrate that the design, construction, or operation of the proposed facility, or a suitable modification of the facility, will fail to comply with relevant policies, rules, and regulations of other state and federal agencies and local governments.

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

1.9.2 Site Permit

If the Commission determines the solar facility is needed, it must determine where it will be located. Minnesota Statutes 216E.03 lists considerations that guide the study, evaluation, and designation of site permits. Minnesota Rule 7850.4100 lists the 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 rights-of-way, survey lines, natural division lines, and agricultural field boundaries.
I. Use of existing large electric power generating plant sites.
J. Use of existing transportation, pipeline, and electrical transmission systems or rights-of-way.
K. Electrical system reliability.
L. Costs of constructing, operating, and maintaining the facility which are dependent on design and route.
M. Adverse human and natural environmental effects which cannot be avoided.
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."[7]

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

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.

A draft site permit (DSP)for the Project is included in **Appendix C**.

1.9.3 Route Permit

If the Commission determines the transmission line is needed, it must determine where it will be located. Minnesota Statutes 216E.03 lists considerations that guide the study, evaluation, and designation of site permits. The Commission must consider the same factors identified in Minnesota Rule 7850.4100 in making a route permit decision that they do with a site permit decision.

In addition to these considerations, Minnesota Statutes 216E.03, subdivision 7(12) (e) requires that the Commission must make findings that it has considered locating a route on or parallel to existing high voltage transmission routes or highway rights of way. If the Commission determines not to use or parallel existing transmission or highway rights-of-way, it must state the reasons for its decision.

A draft route permit (DRP) is included in **Appendix D**.

1.10 Solar Facility Siting Factors – Analysis and Discussion

This analysis applies the siting factors 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. Finally, certain factors are relatively succinct, but the scoping process identified elements to be analyzed in this EA. For example, the public health and safety factor includes an EMF element.

Factor M (unavoidable impacts) and **Factor N** (irreversible and irretrievable resource commitments) are discussed in Section 4.8 and Section 4.9, respectively, of this EA.. **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. **Factors H**, **J**, and **K** relate to transmission lines and are discussed in Section 1.11.

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

Table 1 Application of Siting Factors- Solar Facility

Application of Siting Factors	Construction	Operation
Factor A: Human Settlement		
Aesthetics	○	○
Displacement	●	●
Cultural Values	○	○
Electric Interference	●	●
Floodplains	●	●
Land Use and Zoning	○	○
Noise	⊘	●
Property Values*	○	●
Recreation	●	●
Socioeconomics	●	●
Factor A: Public Services		
Airports	●	●
Roads	●	●
Utilities	●	●
Factor B: Public Safety		
EMF	●	●
Emergency Services	●	●
Medical Devices	●	●
Public Safety	●	●
Stray Voltage	●	●
Worker Safety	●	●
Factor C: Land-based Economies		
Agriculture	○	○
Forestry	●	●
Mining	●	●
Tourism	●	●
Factor D: Archaeological and Historic Resources		
Archeological	●	●
Historic	●	●
Factor E: Natural Resources		
Air Quality	●	●
Geology and Groundwater	○	○
Soils	○	●
Surface Water	●	●

Application of Siting Factors	Construction	Operation
Topography	●	●
Vegetation	●	●
Wetlands	●	●
Wildlife	●	●
Wildlife Habitat	●	●
Factor F: Rare and Unique Resources		
Fauna	●	●
Flora	●	●
Factor I: Use of existing large electric power generating plant sites	⊘	⊘

1.10.1 Discussion

The following discussion highlights potential impacts to factor elements that are anticipated to be moderate to significant, and factors determined 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 many smaller solar facilities in the project area (Figure 10), the project is much larger than existing solar facilities. For those with high viewer sensitive, for example, neighboring landowners, visual impacts are anticipated to be moderate to significant, while for those that travel through 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 and localized. The proposed solar facility is inconsistent with some local land use ordinances. 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.

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 location of the listener.

Property Values On whole, impacts to property values are anticipated to be minimal and to decrease with distance and over time. 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 Dodge and Olmsted counties would occur for the life of the project. Nearly all of the solar facility is located on land classified as prime farmland or prime farmland if drained. The project will impact approximately 1,550 acres of 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.

FACTOR E: NATURAL RESOURCES

Geology and Groundwater Because of the presence of karst in the project area, there is potential for both direct and indirect impacts to groundwater due to construction and operation of the project. Direct and indirect impacts are anticipated to be minimal to moderate. Impacts can be mitigated through adherence to best management practices (BMPs) for construction in karst areas and BMPs for stormwater management, incorporating recommendations on project design and construction in areas of karst geology from a knowledgeable geotechnical engineer, and avoiding construction activity and location of project infrastructure within at least 150 feet from documented active karst features.

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 will both positive and negative, and short- and long-term. Isolated moderate to significant negative impacts associated with high rainfall events could occur, but can be mitigated with erosion prevention and sediment control BMPs. 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.

FACTOR I: POWER PLANTS

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

1.11 Transmission Line Routing Factors – Analysis and Discussion

This analysis applies the routing factors 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. Finally, certain factors are relatively succinct, but the scoping process identified elements to be analyzed in this EA. For example, the public health and safety factor includes an EMF element.

Factor I does not apply to transmission lines and is discussed in Section 1.10.. It is assumed that all routing options maximize energy efficiencies and accommodate expansion of transmission capacity (**Factor G**), and all routing options are electrically reliable (**Factor K**). **Factor M** (unavoidable impacts) and **Factor N** (irreversible and irretrievable resource commitments) are discussed in Section 4.8 and Section 4.9, respectively, of this EA.. Other factors are ranked as follows:

Table 2 Application of Routing Factors - Transmission Line

Application of Routing Factors	Blue Route	Red Route
Factor A: Human Settlement		
Aesthetics	○	○
Displacement	●	●
Cultural Values	●	●
Electric Interference	●	●
Floodplains	●	●
Land Use and Zoning	○	○
Noise	⊘	⊘
Property Values	●	●
Recreation	●	●
Socioeconomics	●	●
Factor A: Public Services		
Airports	●	●
Roads	○	○
Utilities	○	○
Factor B: Public Safety		
EMF	●	●
Emergency Services	●	●
Medical Devices	●	●
Public Safety	●	●
Stray Voltage	●	●
Worker Safety	●	●
Factor C: Land-based Economies		
Agriculture	●	●
Forestry	●	●
Mining	●	●
Tourism	●	●
Factor D: Archaeological and Historic Resources		
Archeological	●	●
Historic	●	●
Factor E: Natural Resources		
Air Quality	●	●
Geology and Groundwater	●	○
Soils	●	●
Surface Water	●	●

Application of Routing Factors	Blue Route	Red Route
Topography	●	●
Vegetation	●	●
Wetlands	●	●
Wildlife	●	●
Wildlife Habitat	●	●
Factor F: Rare and Unique Resources		
Fauna	●	●
Flora	●	●
Factor H: Use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries	●	●
Factor J: Use of existing transportation, pipeline, and electrical transmission systems or rights-of-way.	○	○
Factor L: Costs of constructing, operating, and maintaining the facility which are dependent on design and route	●	⊘
Minnesota Statute 216E.03, Subdivision 7(12)(e): Existing HVTL route and Highway right-of-way (ROW)	⊘	⊘

1.11.1 Discussion

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

FACTOR A: HUMAN SETTLEMENT

Aesthetics: Both routes will introduce new transmission infrastructure into the project area. Potential impacts to aesthetics are expected to be minimal to moderate for those with low viewer sensitivity, such as passing motorists along U.S. Highway 14. For those with high viewer sensitivity, such as residents near the transmission lines, the impact intensity level is anticipated to be moderate to significant. Impacts will be short- and long-term, and localized. They will be subjective to the individual.

Land Use and Zoning: The Blue Route would require placement of a handful of transmission poles within Dodge County's floodplain overlay zone. The Red Route may affect the development of two platted commercial properties near the Byron Substation.

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 location of the listener.

Transportation: Temporary road or lane closures may be required during the construction of the transmission line to ensure safety of the construction crews and the traveling public. Any road closures or restrictions are typically related to the stringing and tensioning of the conductor and, depending upon the location, would be expected to last from minutes to hours. Both transmission

routes cross the Canadian Pacific Railway and the Blue Route would parallel the railroad for approximately one mile. The ROW along this portion of the Blue Route is located approximately 85 feet from the railroad tracks.

Utilities: Limited, temporary impacts to service may occur during interconnection of the project at the Byron Substation. These outages are anticipated to be of short duration and closely coordinated with utilities and landowners. Any outage would be coordinated with the interconnecting utility (SMMPA) and communicated to electric customers in the project area.

Factor E: Natural Resources

Geology and Groundwater: Because of the presence of karst in the project area, there is potential for both direct and indirect impacts to groundwater due to construction and operation of the project. Direct and indirect impacts are anticipated to be minimal to moderate. Due to the Red Route's proximity to identified active karst features, construction of the alternate substation location and transmission structures in the southern-most area of the Red Route has an increased potential for groundwater contamination. Structures along the Red Route are more likely to require concrete pier foundations due to the potential for shallow bedrock. Impacts can be mitigated through adherence to best management practices (BMPs) for construction in karst areas and BMPs for stormwater management, incorporating recommendations on project design and construction in areas of karst geology from a knowledgeable geotechnical engineer, and avoiding construction activity and location of project infrastructure within at least 150 feet from documented active karst features.

Factor J: Use of Existing Transportation, Pipeline, and Electrical Transmission Systems or Rights-of-Way

Although both routes parallel existing rights-of way, natural division lines, and agricultural field boundaries for most of their length, neither route uses the electrical transmission system or is located within an existing transportation, pipeline, or electric transmission system right of way.

Factor L: Costs dependent on design and route

Construction costs are anticipated to be higher for the Red Route due to the longer length of the route.

Minnesota Statute 216E.03

The Red Route parallels, but does not use, existing transmission ROW for approximately two-thirds of its length. The Blue Route does not use or parallel either transmission or highway ROW.

1.12 What's next?

A public hearing will be held in the project area; you can provide comments at the hearing. The Commission will then review the record and decide whether to grant a CN and issue a site permit and a route permit.

An administrative law judge ("ALJ") from the Office of Administrative Hearings will hold a public hearing after the EA is complete and available. At the hearing you 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 will also provide the Commission with proposed findings and a recommendation whether to issue a CN, a site permit, and a route permit.

The Commission reviews all the information in the project record in determining whether to grant a CN and issue site and route permits. If the Commission issues a CN and site and route permits for the project, it may identify measures to mitigate potential impacts. The Commission is expected to make a decision in early 2023.

2 Proposed Project

Byron Solar proposes to construct an up to 200 MW solar facility in Canisteo and Mantorville townships in Dodge County, Minnesota. The project will occupy approximately 1550 acres of the 1801 acres under lease. The project would interconnect to the electrical grid at the existing Byron substation through approximately three to four and a half miles of new 345 kV overhead transmission line This chapter describes the project and how it would be constructed, operated, and decommissioned.

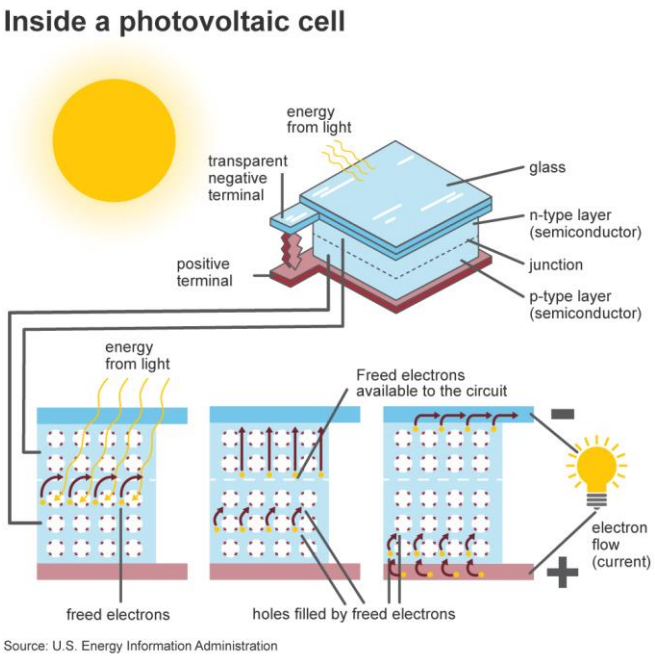
2.1 Solar Facility

2.1.1 How do solar facilities generate electricity?

The *photovoltaic effect* is the physical process through which a PV cell coverts 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[8].

Figure 2 Photovoltaic Cell



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.

2.1.2 Where is the solar facility located?

The solar facility is located Canisteo and Mantorville townships in Dodge County, Minnesota (Figure 1).

[8] US EIA, *Solar Explained: Photovoltaics and Electricity*. (2022). https://www.eia.gov/energyexplained/solar/photovoltaics-and-electricity.php

As shown in Figure 1, the solar facility is located south of US Highway 14, between the cities of Kasson and Byron. Table 3 summarizes the project location. The solar facility would be located on approximately 1,550 acres of row crop farmland. The applicant holds lease option agreements for this portion of the project on about 1,800 acres.

Table 3. Solar Facility Project Location

Township	Range	Section	Political Township	County
106N	16W	2, 3, 10, 11, 12, 12, 14, 15	Canisteo	Dodge
107N	16W	35	Mantorville	

The project site was selected due to its proximity to the Byron Substation, supportive landowners, and no competition with other potential renewable energy projects in the area.

2.1.3 How is the solar facility designed?

The generation facility consists of PV solar panels mounted on a single-access linear axis tracking system, inverters and transformers housed in electrical cabinets, electrical collection system, collection line, project substation, and supervisory control and data acquisition ("SCADA") systems and metering equipment. It also requires fencing, approximately 35.3 miles of access roads, laydown areas, up to 5 weather stations, and an operation and maintenance facility. Byron Solar estimates the capacity factor of the project to be approximately 24 to25 percent,[9] which is consistent with PV capacity factors reported by the United States Energy Information Administration.[10]

SOLAR ARRAYS

Although design and equipment specifications have not been finalized , Byron Solar anticipates using PV solar panels with dimensions of approximately 4 to 6.5 feet long by 2 to 3.5 feet and a thickness of approximately 2 inches The applicant proposes to place one to two solar panels in a portrait configuration on a single-access tracker (Figure 3). The solar panels and tracking system will be installed on metal foundations that are driven or screwed into the ground. The arrays are arranged in rows oriented north and south. Small motors rotate the panels to follow the sun throughout the day, tilting at 60 degrees east in the morning, paralleling the ground at zero degrees mid-day, and tilting at 60 degrees west in the afternoon (Figure 4[11]. This tracking of the sun maximizes the project's electrical production. When tilted to their highest 60-degree position (early and late in the day), the top edge of the solar panels will be not more than 15 feet above the ground and the bottom edge approximately two to three feet off the ground.

Figure 3. Typical Solar Array

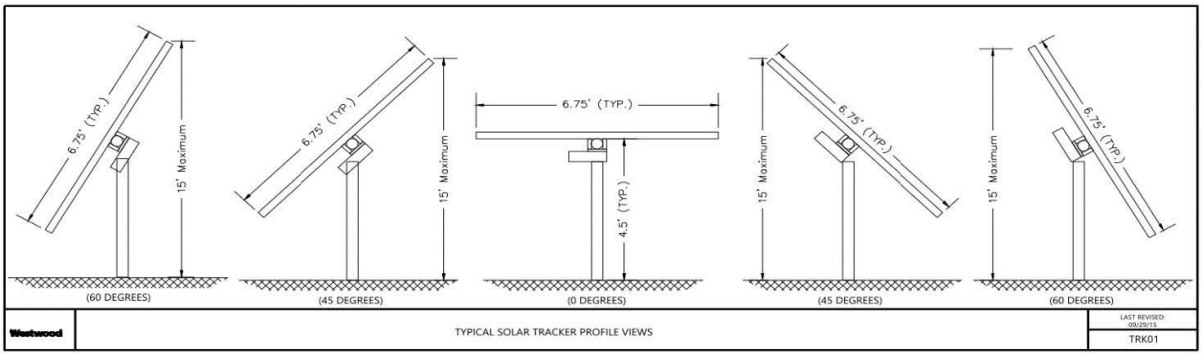
[9] CN application, at p. 34

[10] US EIA, *Electric Power Monthly*, Table 6.07b, Capacity Factor for Utility Scale Generators Primarily Using Non-Fossil Fuels, https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_6_07_b)

[11] Joint Application, Figure 4 at p. 28

At the time of this report, Byron Solar had not yet selected the make and model of the solar panels and tracking systems that will be used for the solar facility. The applicant notes that new solar panels, with higher efficiencies or outputs, are being introduced into the market regularly.[12] Depending upon the solar panels selected, the footprint of the solar generating facility may be smaller than anticipated.

Figure 4. Typical Solar Tracking Profile



Byron Solar will rely on up to five weather stations.to verify the solar facility is performing as expected and to provide an accurate prediction of the facility output. These weather stations, up to 20 feet in height, would be located throughout the fenced area of the facility, generally co-located with inverters.[13]

Electrical Collection System

The direct current (DC) electrical energy generated by the solar panels (about 1,500 volts DC) will be delivered to approximately 64 power inverters located throughout the project area

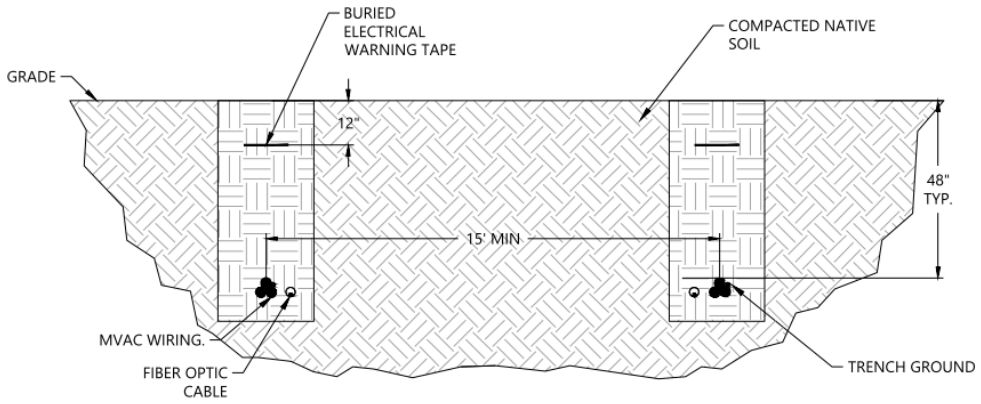
Figure 5: Typical Inverter Skid

The inverters convert the electricity to about 600 to 900 volts alternating current (AC) and then the transformer will step up the power to an intermediate voltage (up to 34.5 kV) for transmission through an underground collector system to the project substation. Power inverters, approximately 8 to 12 feet tall, and step-up transformers, about 9 feet tall, will be placed on inverter "skids," concrete pads approximately 10 feet wide by 25 feet long.[14] From a distance, inverters skids will look like one-half of a semi-trailer box (**Error! Reference s ource not found.**). The skids will be placed on concrete slab or pier foundations. The final number of inverters will depend on the inverters selected for the project as well as the final solar panel configuration.

[12] Joint Application, at p. 28
[13] **Appendix E**, response to Question 7.
[14] Joint Application, Appendix D, at pp. 4-5

Electrical energy (34.5 kV AC) will be transmitted from inverter skids to the project substation through approximately 35.3 miles of underground cabling (Figure 6).[15] Cabling will be trenched or plowed into place to a dept of at least four feet, deeper if necessary to avoid other utilities or infrastructure.[16]

Figure 6: Underground Cabling



Operations and Maintenance Building

Byron Solar also plans to construct an operation and maintenance (O&M) facility for the project. The O&M building will be used to remotely monitor solar modules and electrical equipment using a SCADA system, conduct maintenance and repair of project equipment (e.g., solar panels) provide parking for maintenance staff, and to store maintenance supplies (e.g., materials for cleaning solar panels). The O&M facility will be located adjacent to the project substation (Figure 1), with a developed site of approximately 2.6 acres to accommodate parking, storage and a building of approximately 70 feet by 30 feet.[17]

Fencing

All solar arrays will be fenced for security. Fencing will be secured to posts that will be directly embedded in the soil or set in concrete foundations as required for structural integrity. Fencing will consist of either a 6-foot chain link fence with a top guard angled out and upward at 45degrees with 3-4 strands of smooth wire (no barbs) or an 8-foot chain link fence. Agricultural fencing may be used as an alternative to the chain link fencing. [18]

The solar facility will be accessed through locked gates at five locations:[19]

- The northeastern portion of the Solar Facility will be accessed from 270th Avenue,
- the northwestern portion will be accessed from 650th Street,
- the central portion will be accessed from 655th Street and 660th Street, and
- the southeastern portion will be accessed from 120th Avenue SW.

[15] **Appendix E**, response to Question 6
[16] Joint Application, at p. 28
[17] Joint Application, at p. 32
[18] Joint Application, at p. 132 and Appendix D (AIMP), at pp. 5-6
[19] Joint Application, at p. 33

ACCESS ROADS

Although the total length of access roads will depend upon final site design, the preliminary layout anticipates approximately 22.7 miles of internal graveled access roads. These roads will be used for operations and maintenance activities. Roads will be 12 to 16 feet in width, with wider sections of up to 45 feet at curves and intersections.[20]

PROJECT SUBSTATION

Byron Solar will construct and operate a project substation to collect the energy and step it up to 345 kV for transmission to the Byron Substation. The project substation is expected to occupy a fenced and graveled area of approximately 6.8 acres. of agricultural land outside of the fenced solar arrays. The project substation will include two 34.5 kV/345 kV step-up transformers, a 345 kV circuit breaker, relay and protective equipment, SCADA equipment, telecommunication equipment, and metering equipment.[21]

The location of the project substation is dependent upon the route selected.

- If the Blue Route (applicant's proposed route) is selected, the substation will be located in Section 35 of Mantorville Township, in the northeastern portion of the solar facility, approximately one-half mile south of U.S. Highway 14
- If the red route (alternative route) is selected, the substation will be located Section 13 of Canisteo Township in the southeast portion of the facility.

2.1.4 How would the solar facility be constructed?

Byron Solar anticipates that construction of the solar facility will take place over two construction seasons. This section summarizes construction activities. Unless otherwise noted, this summary has been adapted from Section 5.1, 5.3.1, and Appendix D, the *Agricultural Impact Mitigation Plan* (AIMP) of the joint application.

Byron Solar anticipates that construction will be spread over two construction seasons due to the project's size and restrictions on winter construction activities. Byron Solar anticipates approximately 12 to 18 months of active construction over a 24-month window. The actual construction schedule is dependent upon permitting, final design, delivery of equipment, and workforce availability.

Work force mobilization and initial site preparation will begin after all necessary permits and approvals have been received and the interconnection process is finalized. Initial site preparation includes vegetation removal, grading, tree removal, site access improvements, and preparation of a staging and laydown area of approximately 12.2 acres. The applicant estimates grading approximately 937 acres to flatten areas to accommodate the panels, inverters, access roads, project substation, and O&M facility. preliminary engineering estimates a total of approximately 729,000 cubic yards of cut and fill will be required for project construction.

Typical construction equipment will be used for the project – scrapers, bulldozers, dump trucks, watering trucks vibratory compactors, and backhoes. Additional specialty equipment could include a pile driver, crane, forklift, and a truck-mounted auger or drill rig.

[20] Joint Application, at p. 33
[21] Joint Application, at pp. 3, 29, and 31

The applicant estimates that for several weeks – during delivery of the trackers and solar panels – there will be between 10 and 20 semi-truck deliveries daily. Traffic will decrease once these components are delivered. Traffic volume during construction will predominantly come from worker travel to the construction site. Byron Solar estimates daily construction traffic of about 50 to 100 light duty trucks and cars during the 12 – 18 months of construction.[22]

The applicant estimates that the project will create approximately 300 temporary construction jobs and four full-time operational jobs. The applicant indicates that it will prioritize the use of local, union construction craft employees to the greatest extent feasible consistent with project constraints (e.g., budget, timeline, industry standards, and corporate safety policies).[23]

After initial site preparation, access roads, solar arrays, inverters, electrical collection cables, fencing, the O&M building, and the project substation would be constructed.

Access Roads

Construction of permanent site entrances, access roads and turnouts will start with the stripping and segregating of topsoil materials from the proposed roads. Topsoil removed from permanent access roads will be stockpiled in suitable locations on-site to facilitate final reclamation during decommissioning After the topsoil has been segregated, the contractor will compact the subgrade materials along the access roads (typically 16 feet wide) to the specified compaction requirements specified in the civil and geotechnical engineer plans. Depending on the soil type and location, a geo fabric may be spread on the compacted area. A layer of 4 to 12 inches of gravel will be applied level with the existing grade to facilitate drainage and minimize ponding. The gravel will then be compacted. Following compaction of the access roads, the Contractor will shape drainage ditches as specified in the grading plan.

Solar Arrays

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 five to 12 feet into the ground.[24] Pier depth will depend on final geotechnical analysis and design. The tracking system and supports for the solar panels (racking) will be bolted to the posts. Solar panels, including electrical connections, grounding, and cable management systems, will be installed by crews using hand tools.

Inverters and Step-up Transformers

Premanufactured inverter skids (each containing and inverter, transformer, and SCACA equipment) will be installed on concrete or pier foundations. Topsoil at inverter locations will be scraped and stockpiled for later use in site restoration. Concrete foundations may be poured on-site or pre-cast and then assembled. A flatbed trailer truck will deliver the premanufactured skids to each foundation where the skids will be set in place using a hydraulic crane.

Electrical Collector System

Cable for the AC electrical collection system will be placed at least four feet underground. A trench will be excavated for the cabling in accordance with the agricultural impact mitigation plan (AIMP); topsoil and subsoil will be segregated and stockpiled. Once cabling is installed in the trench, the trench

[22] Joint Application, at. P, 37
[23] Joint Application, at p. 38.
[24] Joint Application, at p. 103

will be backfilled with subsoil followed by topsoil. At some locations the underground collectors will be installed with horizontal directional drilling under roadways.

PROJECT SUBSTATION

As construction of the solar arrays begins, construction will proceed on the project substation. After scraping and segregating topsoil, the foundation and grounding grid for the substation will be installed using trenching machines, concrete trucks, pumpers and vibrators, forklifts, boom trucks, and cranes. Substation equipment will be delivered and stored on the foundations. Crushed rock will be placed over the substation footprint and lighting will be installed around the substation for worker safety during construction and operation. The substation will be fenced.

STORMWATER PONDS

Byron Solar anticipates constructing stormwater ponds in low areas throughout the solar facility site. After the location of the stormwater ponds is finalized, contractors would remove topsoil to be temporarily stored at a suitable location. Subsoil would be excavated in accordance with design depths and slopes to accommodate inlets and outlets. Excavated subsoil would be distributed throughout the site as fill material in areas where grading is required. Topsoil would be replaced, and the basis will be seeded with a seed mixture that is tolerant of wet conditions.[25] Although the exact number and location is subject to final design, preliminary design included 38 stormwater ponds.

FENCING

Byron Solar will contract with a fencing company to construct perimeter fencing surrounding the solar arrays. A separate fence will be constructed around the substation. Fenceposts will be spaced approximately 10 feet apart. Corner and gate posts will be embedded in concrete to a depth of 3.5 feet and tangent posts will be direct buried.at the same depth. Doors and gates installed, as needed.

RESTORATION

After construction, the project area will be graded to natural contours (as possible) and soils will be de-compacted. Disturbed areas will be reseeded with native seed mixes in accordance with the project's vegetation management plan (VMP) and stormwater pollution prevention plan (SWPPP). Erosion control measures will be used until seeded vegetation has established – e.g., silt fences, hydro-mulch, sediment control logs. Additionally, a cover crop will be planted to prevent erosion during the time it takes for native seeds / vegetation to establish. The applicant indicates that post-construction clean-up and restoration will take four to six months.

Byron Solar has prepared a draft VMP (Appendix E of the joint application) 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. Mowing, grazing, and selective use of herbicides are possible management strategies. Regular monitoring and adaptive management will guide long-term vegetation management on site.

2.1.5 How would the solar facility by operated and maintained?

Byron Solar estimates the service life of the project to be 35 years or longer Following restoration and construction closeout, control of the solar facility will transfer from the construction team to the operations staff. Up to four full time maintenance staff will perform regularly scheduled inspections of electrical equipment, maintain or repair equipment as needed, maintain vegetation at the site, and

[25] Vegetation Management Plan, at p. 9

remove snow as needed. The applicant indicates that maintenance of the project will include inspection of electrical equipment, vegetation management, and snow removal (as needed). The electrical performance of the project will be monitored in real-time by a supervisory control and data acquisition (SCADA) system. The SCADA system allows for early notification of abnormal operations, which facilitates prompt maintenance and repair. Byron Solar may use its own employees or contract with an experienced provider for O&M services. [26] Xcel Energy will operate and maintain the equipment at the Byron Substation.[27]

2.1.6 What happens at the end of the solar facility's useful life?

As the project progresses through its service life, the applicant may seek to repower the project. The applicant's decision on whether to pursue repowering will consider the equipment performance, maintenance costs, extending the useful life of the project, or a desire to increase generation output. with new, more efficient solar panels. The applicant notes that the trend in the PV industry is for increasing efficiency and decreasing costs.[28] Repowering with more efficient panels could result in a smaller project footprint or a project of the same size with a greater electrical capacity. The applicant states that it would obtain all federal, state, and local approvals for repowering including, if needed, a new or amended site permit from the Commission. Any site permit issued by the Commission will specify the maximum generating capacity, so if the generation capacity increase, the existing site permit must be amended.

Commission issued site permits require that the permittee be responsible for removing all project components and restore 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 Section of DSP in **Appendix C** of this document).

If the project is not repowered, Byron Solar will decommission the project and remove the project facilities. Decommissioning would include removal of the solar arrays (panels, racking, and steel posts), inverters, fencing, access roads, lighting, the project substation, the project O&M building, and the transmission line. Above-ground electrical cabling would be removed; below-ground cabling would be removed. If the project is decommissioned, Byron Solar assumes the site will return to agricultural use. To this end, best management practices will be used during decommissioning to minimize soil erosion and maintain natural hydrology. Areas of compacted soils will be de-compacted to support agricultural use. Decommissioning and site restoration is estimated to take approximately 40 weeks.[29]

Byron Solar states it will be responsible for all decommissioning costs and will ensure that funds are available to accomplish decommissioning through establishment of a surety bond, letter of credit, or parental guarantee. Byron Solar's draft decommissioning plan is included as Appendix H of its joint application.

[26] Joint Application, at pp 39-42
[27] **Appendix E**, Response to Question 15
[28] Joint Application, at p. 49
[29] Joint Application, at pp. 45-48

2.2 Transmission Line

Byron Solar proposes to construct, own, and operate a 345 kV transmission line to connect the project substation with SMMPA's existing Byron Substation. Depending upon the route selected, the transmission line would be either three or four and one-half miles. This chapter describes the design of the transmission line and project substation, the routes evaluated, how it would be constructed, operated, and decommissioned, and the system alternatives to the proposed 345 kV transmission line.

2.2.1 What route alternatives are studied in this EA?

This EA studies two route alternatives, the Blue Route was proposed by the applicant and the Red Route proposed during the scoping comment period.

The Blue Route was proposed by Byron Solar in its joint application and follows section lines and a railroad for most of its 2.8-mile length. The Blue Route begins at the project substation located in the northern portion of the solar facility, just south of U.S. Highway 14 near 640th St and 265th Ave. From the Project Substation. the route travels north crossing U.S. Highway 14 and then through agricultural fields for about 0.6 miles, crosses County Road 34 and then turns east for approximately one mile along a railroad, turning north along a section line for approximately 0.25 miles, before turning east for approximately one mile. The last 0.25 miles into the Byron Substation is shared with the red route. The Blue Route crosses the east and west bound lanes of U.S. Highway 14; three existing electrical distribution lines; four existing transmission lines; three local roads; Cascade Creek, and one the Canadian Pacific Railway.

The Red Route is approximately 4.5 miles long and was proposed by a citizen during the scoping comment period. If the red route is selected, the project substation would be located in Section 13 of Canisteo Township, to allow the project transmission line to parallel Xcel Energy's existing 345 kV and 161 kV transmission lines north towards the Byron Substation. The Red Route exits the alternate location for the project substation and travels east for approximately 0.4 miles, before turning north for approximately three miles along a section line to parallel an existing 345 kV transmission line towards the Byron Substation. Just south of US Highway 14, the Red Route jogs to the northwest for approximately 0.25 miles to avoid the congestion, before proceeding northward for approximately 0.6 miles to join with the last 0.25 miles of the Blue Route to enter the Byron Substation from the north. The Red Route crosses; five existing transmission lines; seven local roads; an unnamed creek; Cascade Creek, the east and west bound lanes of U.S. Highway 14, and the Canadian and Pacific Railway.

Table 4. Transmission Route Location

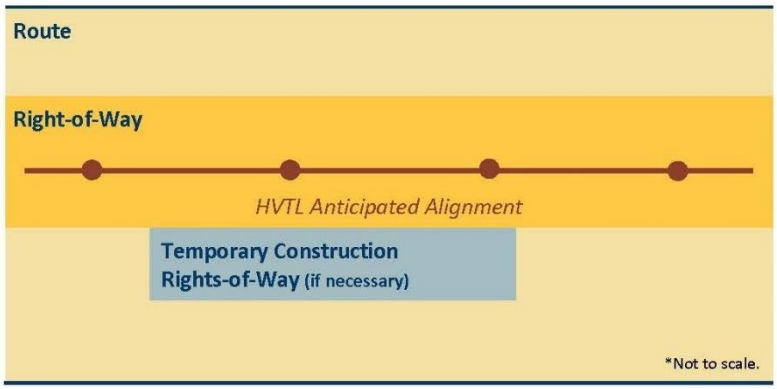
County	Township Name	Township	Range	Section
Blue Route				
Dodge	Mantorville	107N	16W	25, 35, 36
Olmsted	Kalmar	107N	15W	30, 31
Red Route				
Dodge	Canisteo	107N	16W	35
Olmsted	Salem	106N	15W	6,7,18
	Kalmar	107N	15W	30, 31

2.2.2 What does the Commission approve in a Route Permit?

The Commission approves a route and anticipated alignment. The route is a temporary designation; the transmission line must be constructed within the route. The permit also authorizes permittees to obtain permanent ROW for the transmission line and any associated facilities.

When the Commission issues a route permit it designates a route and an anticipated alignment (Figure 7). The ROW is the area required for safe operation of the transmission line. It must be within the designated route and is the area from which the permittee may obtain easements to construct and operate the transmission line. The route width is typically wider than the actual ROW needed for the transmission line.

Figure 7. Example of Route, Alignment and ROW



This extra width provides flexibility when constructing the transmission line, but is not so wide that it is impossible to determine where the transmission line would be constructed. This makes predicting potential impacts possible. A wider route width also allows permittees to work with landowners to address their concerns and to address engineering issues that may arise after a permit is issued. The route width, in combination with the anticipated alignment, is intended to balance flexibility and predictability.

The transmission line must be constructed within the Commission's designated route and along the anticipated alignment. The anticipated alignment is the anticipated location of the structures and transmission line within the ROW and route. It is NOT the final alignment. The anticipated alignment is considered the centerline of the project for review purposes only—the structures and alignment might ultimately be located elsewhere within the route.

Notwithstanding the previous paragraph, the transmission line must be constructed along the anticipated alignment unless subsequent permissions are requested and approved by the Commission. "Any [ROW] modifications within the designated route [must be] located so as to have comparable overall impacts relative to the factors in Minnesota Rule 7850.4100, and shall be specifically identified and documented in and approved as part of the plan and profile." Modifications to the anticipated alignment generally result from landowner requests or unforeseen conditions.

The route permit also outlines conditions specifying construction and operation standards. A draft route permit (DRP) is included in **Appendix C.**

2.2.3 How is the transmission project designed?

The transmission project is designed to deliver power generated by the solar facility to the existing Byron Substation to connect to the electrical grid. Byron Solar will construct, own, and operate the single-circuit 345 kV transmission line between the project substation and the Byron Substation. The transmission line will be designed in compliance with all National Electric Safety Code (NESC)

standards regarding clearance to ground, clearance to existing utilities, clearance to buildings, and strength of materials. Crews will follow standard construction practices and industry safety procedures.

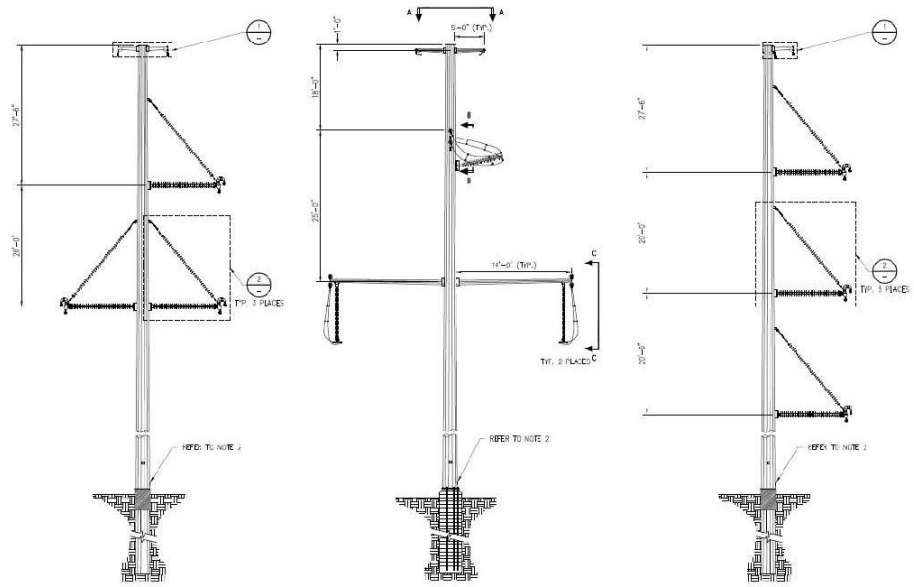
TRANSMISSION LINE

Alternative current transmission lines, such as the proposed project, consist of three separate phases, each phase requiring a conductor to carry the electrical power. There will be a shield wire strung above the phases to prevent damage from lightning strikes. Byron Solar proposes to use a two bundled 795 kcmil 26/7 ACSR "Drake" as the conductor with a single 48 fiber optical ground wire (DNO-10926) and an additional 3/8" EHS 7-strand steel overhead groundwire for additional shielding.

Byron Solar proposes to construct the transmission line on weathering steel monopoles, ranging between 90 to 170 feet in height. Preliminary engineering anticipates a span between structures of approximately 232 to 974 feet. Three types of structures will be used for the transmission line (Figure 8):[30]

- **Tangent** structures for in-line (straight segments)
- **Small angle** structures in locations where the are slight shifts in the alignment direction
- **Deadend** structures withing the project substation, at locations with 90 degree turns, and as the transmission line approaches and enters the Byron Substation.

Figure 8: Proposed Transmission Structures



Single Circuit Tangent | Single Circuit Small Angle | Single Circuit Deadend

There will be a single collector pole structure within the project substation and at least one dead-end pole structure used to enter the Byron Substation. The exact length and position of the line and poles will be determined by on-going engineering. The final placement and design of the transmission line will incorporate feedback from the owners of several transmission lines the transmission line may need to cross before entering the Byron Substation. Both route alternatives are shown in the maps in

[30] Joint Application, at pp. 30-31

Appendix B. An approximate location for the Blue Route is provided in the Plan and Profile in Appendix G of the joint application.

ROUTE WIDTH, RIGHT-OF-WAY, ANTICIPATED ALIGNMENT

Byron Solar proposed to construct the transmission line within a 150-foot right-of-way, 75 feet on either side of the centerline, for the entire route. The right-of-way along the Blue Route will share existing transmission and railroad rights-of-way for about one mile, reducing the overall width of the easement required from the private landowners.

BYRON SUBSTATION IMPROVEMENTS

Improvements at the Byron Substation to accommodate interconnection of the Project will be constructed and maintained by SMMPA and Xcel Energy. The responsibility for improvements and maintenance of the equipment at the Byron Substation is defined under agreements between Byron Solar and SMMPA and Xcel Energy. SMMPA will install a new 345 kV circuit breaker, switches, a dead-end structure, protection and control equipment. Xcel Energy is responsible for installing metering at the Byron Substation and operating and maintaining the Byron Substation.[31]

2.2.4 How would the applicant acquire land rights?

Byron Solar intends to acquire rights for the land required for the transmission project through voluntary easements with landowners. Byron Solar states that it has acquired a 150-foot-wide permanent right-of-way along the entire length of the Blue Route through voluntary easements with landowners.[32] Byron Solar has not acquired land rights along the Red Route. If the Red Route is permitted, Byron Solar will seek voluntary easements along approximately 4.25 miles of the Red Route; Byron Solar has obtained easements for the 0.25 miles where both routes share the same ROW as the route enters the Byron Substation.

Applicants must apply to the Minnesota Department of Natural Resources (DNR) Division of Lands and Minerals for permission to cross state lands and waters in the form of a utility crossing license.[33] The license is usually granted for 25 to 50 years and may be renewed when it expires.

2.2.5 How would the transmission line be constructed?

HVTL construction practices are similar for both routing options. More detailed descriptions are found in the joint application.[34]

TRANSMISSION LINE

Construction will not begin until Byron Solar obtains necessary approvals and land rights, soil conditions are determined, and final design has been completed.

Typical construction equipment for transmission lines includes tree removal equipment, mowers, cranes, backhoes, digger-derrick line trucks, track-mounted drill rigs, dump trucks, front-end loaders, bucket trucks, bulldozers, pullers, tensioners, flatbed tractor-trailers, flatbed trucks, pickup trucks, concrete trucks, and various trailers. Excavation equipment can be wheel or track-driven.

---

[31] **Appendix E**, response to question 15
[32] Joint Application, at p. 3
[33] DNR, Utility Crossing License, https://www.dnr.state.mn.us/permits/utility_crossing/index.html
[34] Joint Application, at Section 5.3.2

The temporary laydown area at the southeast corner of the intersection of 270th Avenue and 655th Street would serve as the storage and staging area for both the solar facility and the transmission project.

Construction in environmentally sensitive areas such as stream crossings and wetlands generally require specialized techniques discussed further in Sections 4.7.4 and 4.7.5.

Notification: Prior to the beginning of construction, the permittee typically notifies landowners and local governments of anticipated construction schedule. Anticipated schedules may vary due to permit conditions, weather, and availability of workforce and materials
Survey and Marking:

ROW Preparation Before ground disturbance occurs underground utilities will be marked using Gopher State One Call and surveyors will mark the anticipated alignment and ROW boundary. The pre-construction survey will also identify areas requiring special restoration procedures. Construction begins by removing trees and other vegetation from the ROW that will interfere with safe construction and operation of the HVTL. Byron Solar anticipates clearing vegetation to create a 20-foot-wide temporary access road along the length of the ROW as well as vegetation at the site of pole locations and taller trees and shrubs within the ROW. The Commission requires that applicants minimize tree removal to the maximum extent practicable and leave undisturbed low growing species that will not interfere with operation or construction.

Access to the transmission ROW typically made directly from existing roads or farm field access roads that run parallel or perpendicular to the ROW. However, improvements to existing access (temporary culverts) or new access roads could be required to accommodate construction equipment. Byron Solar will coordinate with landowners and local governments where new roads or improvements to existing roads are required.

Structure Installation Structures are generally installed at existing grade. Because the topography is relatively flat and significant grading is not anticipated. Structure locations with more than 10 percent slope will have working areas graded level or have fill brough in for working pads. Crews will install erosion control where needed. Where possible the leveled areas and working pads will remain in place for future maintenance activities; if this is impractical the site will be graded back to its original condition and imported fill removed.

Structures will be delivered to the installation location from the laydown area. Crews will install hardware while the structure is on the ground. The structure is then lifted, placed, and secured.

Deadend structures will be installed on drilled piers. Depending upon soil conditions and structure dimensions, drilled pier foundations will vary from three to six feet in diameter and 20 to 30 feet deep. Once crews have augured the foundation hole, steel reinforcing bars and anchor bolts are installed. Concrete is poured—usually to 12 to 18 inches above grade. After the foundation is set, structures are bolted to it.

Tangent structures and small angle structures will be directly embedded; and backfilled with concrete slurry. Most structures are expected to be directly imbedded into augured holes between 4.5 and 6.5

feet in diameter and approximately 20 feet deep.[35] The holes are partially filled with crushed rock before the structure then set in the hole with concrete slurry and the hole backfilled with crushed rock and/or soil once the pole is set.

All structure types might generate excess soil. Crews will spread and level excess soil from excavation near the structure or remove it from the site, as requested by the landowner or required by permit conditions. If a structure is located within a wetland, excess soil must be placed in uplands.

Conductor Stringing: Once structures are installed conductors are strung along the line. Conductors and a shield wire will be strung, tightened, and, once appropriate tension is obtained, secured to each structure. Crews will use temporary guard or clearance structures to provide adequate clearance over roads, existing power lines, waterways, or other potential obstructions, as well as to protect the conductor. Crews will install avian flight diverters on the shield wire in select locations determined in coordination with DNR.

Restoration: Restoration includes removal of debris and all temporary facilities, implementing erosion control measures, and reseeding with appropriate seed mixes. Following the conclusion of construction, which may take several weeks at any one location, Byron Solar or its contractors will remove equipment and debris from the ROW. Crews will repair disturbed areas to pre-construction contours to the greatest extent practicable so that all surfaces drain naturally, blend with natural terrain, and facilitate revegetation. Soil compaction is alleviated as negotiated by landowners.

After construction is complete Byron Solar or its contractor will contact landowners to determine if restoration has been completed to their satisfaction and to identify damages that might have occurred during construction of the transmission project. Byron Solar will compensate landowners for damages or hire a contractor to restore damaged property per the terms of individual easement agreements between the landowner and Byron Solar.

2.2.6 How would the transmission project be operated and maintained?

Byron Solar would be responsible for the operation, maintenance, and, when necessary, repair of the transmission line and project substation for the transmission project's estimated service life of 35 years. Xcel Energy will be responsible for operating and maintaining the equipment at the Byron Substation.

As with the solar facility, the expected service life of the transmission project is 35 years, although in practice large transmission lines typically operate for longer. Byron solar will perform monthly inspections of the transmission line, and ROW by truck. The inspections will look for things such as pole or component problems, cracked or broken insulators, frayed or damaged conductor, hardware missing or loose, rusted poles, and ROW encroachments. Native shrubs that will not interfere with the safe operation of the HVTL will be allowed to reestablish in the ROW and vegetation within the ROW that has the potential to interfere with the operation of the transmission line will removed. When necessary, problem vegetation will be cleared through a combination of mechanical and hand clearing, along with herbicide application where allowed to remove or control vegetation growth.

A certain amount of maintenance would be required at the substation to ensure proper operation within NESC and NERC standards. Transformers, circuit breakers, batteries, protective relays, and

[35] **Appendix E**, response to Question 11

other equipment would need to be serviced periodically in accordance with the manufacturer's recommendations.

2.3 Project Costs

Byron Solar estimates the total cost to construct the project to be between $256 million and 258.9 million (Table 5). Actual costs will depend on final material and labor costs. Construction costs are anticipated to be higher for the Red Route due to the longer length of the route.

Table 5. Estimated Project Costs[36]

Project Component	Estimated Cost (millions)	
	Blue Route	Red Route
Solar Generating Facility		
Design, procurement, and construction contractor	$225.5	$225.5
Development expense*	$5.0	$5.0
Substation	$10.3	$10.3
Interconnection (preliminary)	$10.0	$10.0
Financing	$2.0	$2.0
, Subtotal – Solar Facility	$252.8	$252.8
Transmission		
Design, procurement, and construction contractor	$3.0	$5.5
Development Expenses	$0.2	$0.6
Subtotal – Transmission	$3.2	$6.1
Total Project Cost	$256.0	$258.9

Once operational, the project will require ongoing operations costs, including labor and materials for maintenance, annual property taxes, and annual taxes on the energy produced. Byron Solar anticipates annual operations costs of approximately $3.2 million.[37]

2.4 Project Schedule

Byron Solar anticipates the project will begin commercial operation by the end of 2025. Table 6 shows Byron Solar's estimate of anticipated development and construction milestones.

[36] Joint Application, Table 5, at p. 16, **Appendix E,** response to Question 14
[37] Joint Application, at p. 16, **Appendix E,** response to Question 14

Table 6. Anticipated Project Schedule[38]

Activity	Anticipated Timeframe
Interconnection Request	GIA for 100 MW (J1124) finalized December 2021, GIA for 100 MW (J1534) anticipated March 2023
Commission Permits	Q2 2023
Downstream Permits	Q3, 2023
Construction	Q3/Q4 2024 Q3/Q4 2025
Testing and Commissioning	Q3/Q4 2025
Commercial Operation Date	Q4 2025

[38] **Appendix E**, Response to Question 13

3 Regulatory Framework

Chapter 3 discusses the approvals required from the Commission—a CN, a site permit, and a route permit. It describes the environmental review process and lists the factors the Commission considers when making decisions. This chapter also discusses required approvals from federal and state agencies and local units of government with permitting authority for actions related to the project. Lastly, it lists topics outside the scope of this EA.

3.1 What Commission approvals are required?

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

The project requires a CN because it meets the definition of *large energy facility*,[39] which means any electric power generating plant—including one powered by solar energy—with a capacity of 50 MW or more and the transmission lines necessary to connect the generation facility with the transmission system.[40]

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.[41]

The new 345 kV transmission line connecting the project to the electrical grid at the existing Byron substation requires a route permit from the Commission because it meets the definition of a *high-voltage transmission line*, which 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 longer than 1,500 feet.[42]

3.2 What is 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, a site permit, and route permit. This analysis is called environmental review.

CERTIFICATE OF NEED

Applications for a CN require preparation of an environmental report (ER).[43] An ER contains "information on the human and environmental impacts of the [project] associated with the size, type, and timing of the project, system configurations, and voltage".[44] It also contains information on system alternatives to the project, as well as mitigation measures.

---

[39] Minnesota Statute 216B.243, subdivision 2.
[40] Minnesota Statutes 216B.2421, subd. 2(1).
[41] Minnesota Statutes 216E.01, subd.1 and 5.
[42] Minnesota Statutes 216E.01, subd. 2 and 4.
[43] Minnesota Rule 7849.1200.
[44] Minn. R. 7849.1500.

Site and Route Permits

Minnesota law provides the Commission with two processes to review site and route permit applications. The alternative process, which applies to both solar projects and high voltage transmission lines over 200 kV with a length of less than five miles in Minnesota,[45] requires an EA instead of an environmental impact statement and a public hearing instead of the more formal contested-case hearing.[46,]

Joint Proceeding

When there are multiple applications before the Commission for a single project, the environmental review required for each application may be combined. The Commission authorized Commerce to combine the environmental review required for the CN, the site and the route permits; therefore, these applications are being processed jointly using Minnesota Rule 7829.1200 and Minnesota Rule 7850.2800 to 7850.3900.

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.[47]

3.3 What permitting steps have occurred to date?

The Commission accepted the CN and joint site and route permit applications as complete on November 17, 2021.[48] A public information and scoping meeting was held in Kasson, Minnesota on January 25, 2022, and online on January 26, 2022.

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.[49] The applicant provided notice on June 4, 2021.[50] On August 30, 2021, the applicant filed a CN application and a joint application. The Commission determined the applications to be complete on November 17, 2021[51]. 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 Site Permit for a Solar Energy Generating System* on October 21, 2021.[52]

Figure 9. outlines the permitting process as it has unfolded for this project.

---

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

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

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

[48] Commission, *Order Accepting Applications, Setting Review Procedures, Authorizing Task Force, and Granting Variances*, November 17, 2021, eDocket No. 202111-179920-01

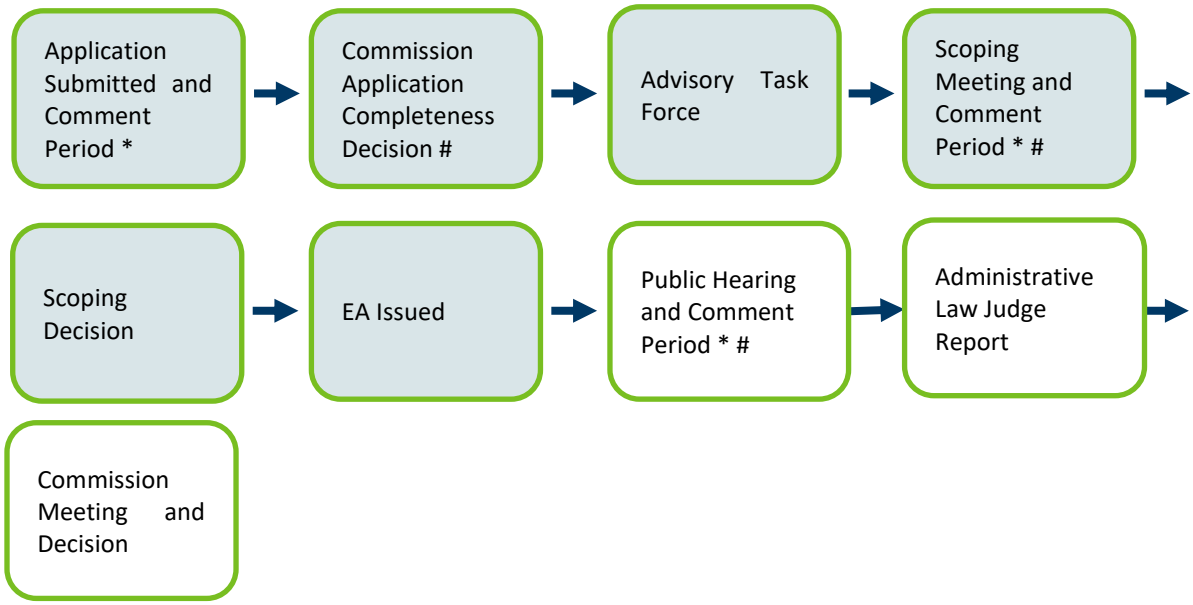
[49] Minn. R. 7850.2800, subp. 2.

[50] Byron Solar, *Notice of Intent to Submit Joint Application for a Site Permit and HVTL Route Permit Under the Alternative Permitting Processes.*, June 4, 2021, eDocket ID: 20216-174818-02 .

[51] Commission, *Order Accepting Applications, Setting Review Procedures, Authorizing Task Force, and Granting Variances*, November 17, 2021, eDocket No. 202111-179920-01

[52] Commission Staff Briefing Papers, October 21, 2021, eDockets No. 202110-179018-02

Figure 9. Simplified Process Summary[53]



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.[54] The purpose of the public information and scoping meetings is to provide information and answer questions about a proposed project and the 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 January 4, 2022, the Commission and Commerce issued a joint *Notice of Public Information and Environmental Assessment Scoping Meeting* and associated public comment period.[55] The notice was sent to those individuals on the project contact list and to potentially affected landowner and was also available on Commerce's webpage for the Project. Byron Solar published notice in the *Rochester Post Bulletin* on January 8, 2022, and in the *Dodge County Independent* on January 6, 2022.[56]

Commission and Commerce staff held a public meeting regarding the Byron Solar Project on January 25, 2022, in Kasson, Minnesota. Approximately 50 persons attended the meeting and 13 attendees

[53] Read from left to right; shaded steps are complete; "*" means public comment opportunity and "#" means public meeting opportunity.)
[54] Minn. R. 7850.3700, subp. 2.
[55] Commission and Commerce *Notice of Public Information and Environmental Review Scoping Meeting*, January 4, 2022 eDocket ID: 20221-181191-02
[56] Compliance filing of publication requirement, March 17, 2022, eDockets No. 20223-183926-03 .

provided public comments.[57] The following evening, January 26, 2022, three attendees provided comments at the remote-access public information and scoping meeting held by Commission and Commerce staff.[58] A court reporter was present at both meetings to document verbal statements.

A public comment period provided an opportunity for interested persons to identify issues, mitigation measures, and site or system alternatives for study in the EA. Written comments were received from 11 commenters during the comment period ending on February 15, 2022, and seven people responded to the survey on the Commerce's website. Two site alternatives and one route alternative were proposed.

In addition to general statements of support for or opposition to the proposed Byron Solar Project, commenters identified a range of potential impacts, potential benefits, and potential mitigation strategies related to the proposed project. Comments addressed whether valuable farmland should be used for power generation, the project's inconsistency with local land use regulations, impact from stormwater runoff and flooding both during construction and operation, impact to existing drain tile and drainages, potential job creation from the project, potential employment losses from the replacement of agricultural land, visual impacts, the availability and suitability of other site or transmission alternatives, impacts to property values, the impacts to wildlife, potential impacts to groundwater from construction activity near karst features, and decommissioning requirements.

Several commenters made general comments that the proposed project would be better suited to another place without specifying an alternate location. In addition to the general comments about site or route alternatives, two site alternatives and one route alternative were proposed for evaluation in the EA. One citizen proposed either relocating the entire site to areas of Kalmar and Salem townships on Olmsted County that have a lower Crop Productivity Index [59] than the applicant-proposed location, or by adjusting the site boundary proposed in the joint application by removing one parcel on the western edge of the site and adding a similarly sized parcel near the southwestern portion of the proposed site. The same commenter requested that a route alternative near 670th Street be evaluated. The proposed route alternative would move the project substation from its proposed location just south of US Highway 14 in Section 35 of Mantorville Township to a location in Section 13 of Canisteo Township, in the southeastern portion of the proposed site to allow the project transmission line to parallel Xcel Energy's existing 345 kV and 161 kV transmission lines north towards the Byron Substation.[60]

Pursuant to Minnesota Rule 7850.3700, subpart 2(B), applicants have the right to review proposed alternatives. Byron Solar's response to comments received during the scoping period addressed the proposed site and route alternatives and responded on the feasibility of certain mitigation options

[57] Oral Comments, Public Information and Environmental Scoping Meeting, January 25, 2022 eDocket ID: 20221-181191-02; Oral Comments, Public Information and Environmental Scoping Meeting, January 26, 2022 Remote Access Meeting eDocket ID: 20222-182558-06

[58] Oral Comments, Public Information and Environmental Scoping Meeting, January 26, 2022 Remote Access Meeting eDocket ID: 20222-182558-06

[59] The Crop Productivity Index represents a relative ranking of a soil's potential for intensive commodity crop production. The Crop Productivity Index is not defined in either Minnesota or federal law, but it is a tool developed by the Natural Resources Conservation Service to compare the potential yield of one soil against another.

[60] Public Comment, February 13, 2022,eDocket ID: 20222-182943-02 at pp. 10-18 and February 28, 2022 eDocket ID: 20222-182957-03

identified in the task force report and in scoping comments. Byron Solar rejected the site and route alternatives as unviable for a variety of reasons:

- Byron Solar does not have voluntary site control over the alternative locations.
- The alternatives shift human and environmental impacts to different landowners and resources.
- Alternative substation and transmission alternative increase the length of the transmission line by approximately one mile and require over three additional miles of collection lines to connect to the substation, resulting in increased environmental and human resources, higher electrical losses, and higher capital costs.

Neither of the site alternatives were included in the scope because, on balance, the proposed site alternatives shift the impacts to other areas with a different group of landowners and neighbors.

The route alternative is evaluated in this EA to develop a more robust record for the Commission's decision. Comparing the route alternatives will help establish whether there is potential mitigation value by following an existing transmission corridor (Red Route) compared to following existing section lines, railroad, and roadways (Blue Route).

ADVISORY TASK FORCE

Dodge County requested appointment of an Advisory Task Force to assist in identifying impacts and potential mitigation measures, including site or route alternatives, to be analyzed in the EA.

As authorized by the Commission, Commerce established an advisory task force (task force) to assist in identifying impacts and mitigation measures to be evaluated in the EA. Commerce solicited task force members from local governments surrounding the project as well as the Minnesota Department of Transportation (MnDOT). The appointed task force members represented Dodge and Olmsted counties, the cities of Byron and Kasson, and Canisteo and Mantorville townships (Dodge County), and MnDOT.[61]

Commerce charged the task force members to assist in identifying impacts and issues of local concern that should be analyzed in the EA and mitigation measures, including site or route alternatives, which should be analyzed in the EA. The task force met three times to discuss impacts associated with the proposed project and potential mitigation measures. Task force members ranked the impacts in order of importance:

1. Agriculture
2. Zoning and Land Use Compatibility
3. Water Resources
4. Natural Resources
5. Economics
6. Public Infrastructure (non-transportation)
7. Property Values
8. Decommissioning and Project End-of-Life
9. Visual / Aesthetics
10. Jobs / Employment
11. Tax Revenue
12. Transportation
13. Energy

[61] Department of Commerce, *Advisory Task Force Report for Byron Solar Project,* March 4, 2022, eDocket ID: 20223-183423-01

Task force members also discussed a variety of potential permit conditions and other mitigation measures. The task force did not identify any site or route alternatives.

SCOPING DECISION

The scoping decision identifies the issues studied in this EA.

After considering public comments and recommendations by staff, the assistant commissioner of commerce issued a scoping decision on May 23, 2022 (**Appendix A**). The scoping decision identifies the issues, system alternatives, and route alternatives to be evaluated in this EA.

3.4 Are other permits or approvals required?

Yes, other permits and approvals are required for the project.

A CN. a site permit, and a route permit from the Commission are the only state permits required for siting the project. 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.[62] **Table 7** lists potential downstream permits that might be required, several of which are discussed below.

3.4.1 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".[63] 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[64] of any threatened or endangered species. As a result, USFWS encourages project proposers to consult with the agency to determine if a project has the potential to impact federally listed threatened or endangered species. Additionally, consultation can lead to the identification of measures to mitigate potential impacts associated with the project.

[62] Appendix C, Section 4.5.2 (stating the permittee "shall obtain all required permits for the project and comply with the conditions of those permits").

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

[64] 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 7. Potential "Downstream" Permits

Unit of Government	Type of Application	Purpose
Federal		
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
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	License to Cross Public Lands and Waters	Prevent impacts associated with crossing public lands and waters
	State Threatened and Endangered Species Consultation	Consultation to mitigate impacts to state-listed species
	Water Appropriation Permit	Balances competing management objectives
Minnesota Pollution Control Agency	Construction Stormwater Permit	Minimizes temporary and permanent impacts from stormwater
	Section 401 Clean Water Act – Water Quality Certification	Ensures project will comply with state water quality standards
State Historic Preservation Office	National Historic Preservation Act Section 106 Consultation	Ensures adequate consideration of impacts to significant cultural resources
Department of Agriculture	Agricultural Impact Mitigation Plan	Establishes measures for protection of agricultural resources
Department of Labor and Industry	Electrical Inspection	Necessary to comply with electric
Department of Transportation	Utility Permit	Controls utilities being placed along highway rights-of-way (ROW)
	Oversize/Overweight Permit	Controls use of roads for oversize or overweight vehicles
Department of Health	Well Notification	Needed to install a water-supply well
Board of Water and Soil Resources	Wetland Conservation Act	Ensures conservation of wetlands
Local		
Dodge County and Olmsted County	Utility Permit	Needed to construct or maintain electrical lines along or across county highway ROW
	Work in right-of-way permit	Needed to work within county road ROWs
	Application for driveway/entrance	Needed to move, widen, or create a new driveway access to county roads
	Septic System Permit	Needed prior to installation of a septic system
	Wetland Conservation Act Permit	Ensures conservation of wetlands
	Moving Permit/ Oversize/Overweight Vehicle Permit	Needed to transport oversized and overweight loads on county roads

3.4.2 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.[65] Projects affecting the course, current, or cross-section of lakes, wetlands, and streams that are public waters may require a *Public Waters Work Permit*.[66] Not unlike the USFWS, DNR encourages project proposers 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 MPCA. This permit is issued to "construction site owners and their operators to prevent stormwater pollution during and after construction."[67] 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 times 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.[68]

A Clean Water Act Section 401 *Water Quality Certification* from MPCA might also be required. "Section 401 of the Clean Water Act requires any applicant for a federal license or permit to conduct an activity that may result in a discharge of a pollutant into waters of the United States to obtain a certification from the State in which the discharge originates that the discharge complies the applicable water quality standards."[69] The certification becomes a condition of the federal permit.

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

A permit from MnDOT is required for construction, placement, or maintenance of utility lines adjacent or across trunk highway rights-of-way.[70] Coordination would be required to construct access roads or

[65] Minnesota Statutes 84.415.

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

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

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

[69] 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.

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

driveways from trunk highways.[71] 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.[72]

The State Historic Preservation Office (SHPO) is charged with preserving and protecting the state's historic resources. SHPO consults with project proposers 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.

3.4.3 Local

Dodge 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."[73]

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.
- Overwidth Load Coordination may be required to move over-width or heavy loads on county or township roads.
- Road Crossing and Right-of-Way Coordination may be required to cross or occupy county or township road rights-of-way.

3.5 Do electrical codes apply?

Yes, if constructed the project must meet electrical safety code requirements.

The project must meet requirements of the National Electrical Safety Code.[74] 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 and overhead and underground

[71] Mn DOT *Land Management*. (2022). https://www.dot.state.mn.us/utility/forms.html:.
[72] MnDOT. *Utility Accommodation on Trunk Highway Right of Way: Policy OP002.* (2017). http://www.dot.state.mn.us/policy/operations/op002.html.
[73] Minnesota. Rule. 8420.0100, subp. 2.
[74] *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)

electric supply lines".[75] 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 operational maintenance is performed.

The project must be designed to meet North American Electric Reliability Corporation requirements,[76] which define the reliability requirements for planning and operating the electrical transmission grid in North America.[77]

3.6 Are any issues outside the scope of this EA?

Yes, the scoping decision identified several issues that will not be studied.

This EA does not address the following:

- Any site alternative other than the site proposed by the applicant and identified in the scoping decision.
- Any route alternative other than those identified in the scoping decision.
- Any system alternative not specifically identified in the scoping decision.
- The way landowners are compensated for use or sale of their land.

.

[75] 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.

[76] **Appendix C**, Section 4.5.1.

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

4 Project - Potential Impacts and Mitigation Measures

Chapter 4 describes the environmental setting, affected resources, and potential impacts. It also discusses mitigation of potential impacts.

4.1 How are potential impacts measured?

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.

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 further 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.

4.1.1 Potential Impacts and Mitigation

The following terms and concepts are used to describe and analyze potential impacts:

- 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.

The context of an impact—in combination with its anticipated on-the-ground effect—is used to determine an impact intensity level, which can range from beneficial to harmful. Impact intensity levels are described using a qualitative 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 avoid, minimize, or compensate 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 to repair, rehabilitate, or restore the affected resource.
- To compensate for an impact means replacing it or providing a substitute resource elsewhere, or by fixing it by repairing, rehabilitating, or restoring the affected resource. Compensating 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 compensation can be applied. The level at which an impact can be mitigated might change the impact intensity level.

4.1.2 Regions of Influence

Potential impacts to human and environmental resources are analyzed within specific geographic areas called regions of influence (“ROI”). This EA uses the following ROIs:

- Land control area (land control of the solar generating facility and transmission line ROW)
- Local vicinity (1,600 feet from the boundary of the solar generating facility and transmission ROW)
- Project area (one mile from the boundary of the solar generating facility and transmission ROW)
- region (Dodge and Olmsted counties)

Impacts to resources may extend beyond these distances but are expected to diminish quickly. ROIs vary between resources. Table 8 summarizes the ROIs used in this EA.

Table 8 Regions of Influence for Human and Environmental Resources

Resource Type	Resource Element	Region of Influence
Human Settlement	Displacement, Electrical Interference, Land Use and Zoning	Land control area
	Noise, Property Values	Local vicinity
	Aesthetics, Cultural Values, Recreation	Project area
	Socioeconomics	Region
Public Services	Airports, Roads, Emergency Services, Public Utilities	Project area
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	Site control area
	Tourism	Project area
Archaeological and Historic Resources	—	Project area
Natural Environment	Geology and Groundwater, Soils, Vegetation, Water Resources, Wetlands, Wildlife (except birds), Wildlife Habitat	Land control area
	Wildlife (birds), Rare and Unique Resources	Local vicinity
	Air Quality	Region

4.2 Project Setting

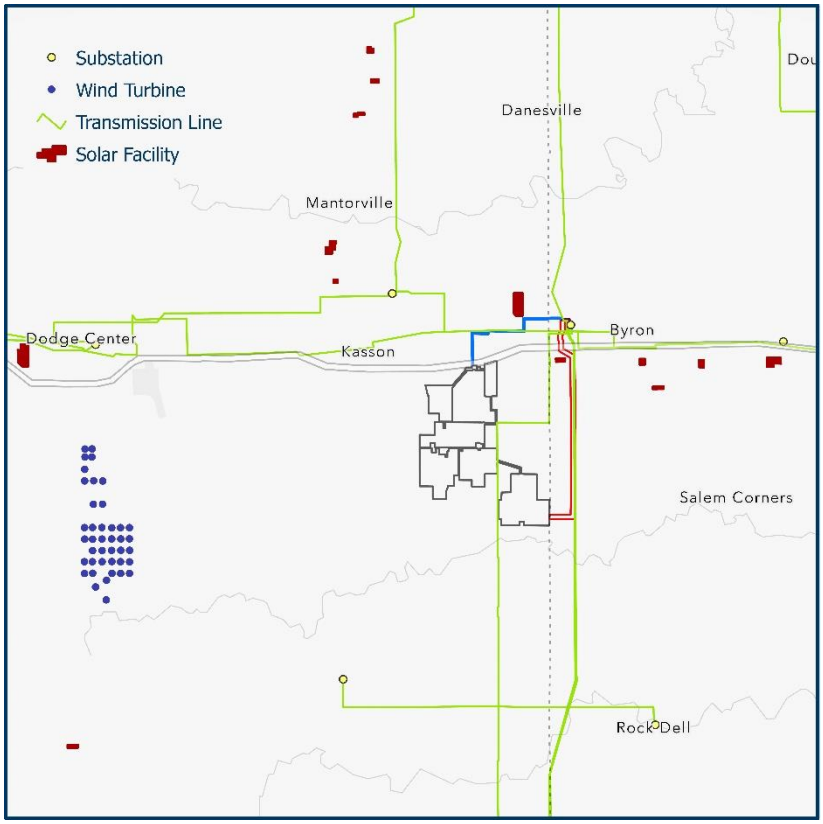
The project area is in a rural area in southeastern Minnesota. The project area is dominated by agricultural land uses and scattered farmsteads and homesteads. Wooded areas are common around farmsteads. Along the transmission routes the land is a mixture of agricultural, rural residential, with commercial and industrial near the Byron Substation.

The ROI for aesthetics if the project area. The proposed solar facility is in Canisteo and Mantorville townships in Dodge County, Minnesota, south of US Highway 14, near the cities of Kasson and Byron (Figure 1). The topography of the project area is generally flat with areas of rolling hills. The surface elevation ranges from approximately 1,224 to 1,310 feet. The topography is underlain by surficial glacial and post glacial alluvium deposits, glacial outwash, and till, overlaying sedimentary rock. Karst topography is present in the area. Surface water in the project area is dominated by streams, with few lakes or ponds, and drainage in the project area is well developed. [78].

[78] Joint Application, at p. 100

The project is in the Oak Savanna (222Me) and Rochester Plateau (222 Lf) subsections of the Eastern Broadleaf Forest Province.[79] Prior to European settlement vegetation in the project area was primarily bur oak savanna, with areas of tallgrass prairie and maple-basswood forest also present. Few remnants of pre-settlement vegetation remain.

Figure 10. Area Energy Infrastructure



Land use in the Project Area is dominated by agricultural; approximately 97 percent of the 1,800- acre solar facility site and nearly 85 percent of the land use along both transmission routes used for cultivated agriculture. Some of the land is tiled to facilitate drainage Built features common to the area include residences and buildings, paved and gravel roads, wind turbines, community-scale solar facilities, and transmission lines. There are also several energy infrastructure projects in the region including wind farms, community-scale solar facilities, and transmission lines feeding into the Byron Substation in the project area (Figure 10).

4.3 Human Settlement

Both solar facilities and transmission lines can impact human settlement. Impacts might be short-term, such as increased local expenditures during construction, or long-term, such as changes to viewshed.

4.3.1 Aesthetics

The ROI for aesthetics is the project area. The project will introduce new manmade structures into the existing landscape. Portions of the project will be visible from local roads, US Highway 14, and nearby residences. For most people who pass through the project area on US Highway 14 or local roads the impact intensity level is expected to be minimal. For individuals with greater viewer sensitivity, such as people who live in the project area, the impact intensity level is anticipated to

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

be moderate to significant. Impacts will be short- and long-term, and localized. Potential impacts are unavoidable but can be mitigated in part.

Aesthetics refers to the visual quality of an area as perceived by the viewer and forms the impression a viewer has of an area. Aesthetics are 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. Buildings, roads, bridges, and power lines are examples of built features.

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. For example, a high exposure viewshed would be observed frequently by large numbers of people. 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 is area is rural and agricultural consisting of flat to gently rolling row crop fields of corn and soybeans. The built environment includes roads, a railroad, transmission and distribution lines, the existing Byron Substation, small solar facilities, and wind turbines. Residences and farmstead are scattered throughout the project area. There are no residences or businesses within the area of site control; however, there are 17 residences and several agricultural buildings adjacent to the site boundary (see maps in **Appendix B**). There are no homes closer than 200 feet from either transmission alignment. On the blue route there two homes approximately 280 feet and 380 feet from the anticipated alignment. There are two homes and two businesses within 400 of the Red Route alignment: the homes are about 250 feet and 350 feet from the proposed alignment and the businesses are both approximately 240 feet.

Potential Impacts

The visible elements of the solar facility will consist of new PV arrays, a project substation, an operations and maintenance facility, up to five weather stations and approximately 19 miles of chain link fencing. The overhead transmission line will be approximately three to four and a half miles long. Transmission structures will be steel monopoles with heights between 90 and 170 feet.

Although there are many smaller solar facilities in the project area (Figure 10), the project is much larger than existing solar facilities. How an individual viewer perceives the change from a field of corn to a field of solar panels depends, in part, on how a viewer perceives solar panels. Will the viewer consider the harvesting of solar energy to be like harvesting crops or will the viewer see an agricultural use be replaced by an industrial use?

For residents outside the project vicinity and for others with low viewer sensitivity, such as travelers along U.S. Highway 14, aesthetic impacts are anticipated to be minimal. For these viewers, the solar panels would be relatively difficult to see or would be visible for a very short period. 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.

Current fields of corn and soybeans will be replaced with acres of solar panels. At 15 feet tall at maximum tilt, panels will have a relatively low profile.[80] For reference, center pivot irrigation systems, for corn, which are not part of the project landscape but are common in many agricultural areas, are usually 14 to 18 feet in total height, with the sprinkler drop heads between seven and nine feet tall. 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.

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.

Dodge County's performance standards require glare studies as part of the conditional use permit application. The zoning ordinance prohibits the siting of solar energy farms in areas where glare poses a risk to airports of traffic on public roadways.[81] The applicant modeled glare at residences and roads within approximately 500 feet of the solar arrays and flight paths and air traffic control towers within 10 miles of the arrays using the Forge Solar Glare Hazard and Analysis Tool.[82] (**Appendix F**). Modeling results for flight paths and airports is discussed in Section 4.3.7. The modeling shows potential for some after images at all 17 of the residences modeled and seven of the 11 road locations modeled. The modeling assumes a worst-case scenario where the sun is shining 365 days per year and there is no screening (e.g. trees, hills, or buildings) around the receptors.

Operational lighting will be installed at the substation, O&M facility, and at gates and various locations along the fence line for safety and security. Lighting will be motion-activated and down lit to minimize impacts and effects.[83] Impacts to light-sensitive land uses are not anticipated given the rural project location coupled with minimal required lighting for operations.

MITIGATION

Minimizing aesthetic impacts from solar generating facilities is primarily accomplished by locating the facilities so that they are not immediately adjacent to homes, ensuring that damage to natural landscapes during construction is minimized, and shielding the facilities from view by terrain or vegetation.

Section 4.3.8 of the DSP (**Appendix C**) and Section 5.3.6 of the DRP (**Appendix D**) require permittees to consider landowner input with respect to visual impacts and to use care to preserve the natural landscape.

Site-specific landscaping plans can minimize visual impacts to adjacent land uses and homes through vegetation screening, berms, or fencing. The applicant has proposed a screening plan as Appendix L of the joint application.

[80] Joint Application, at p. 27

[81] Dodge County Zoning Ordinance, https://cms4files.revize.com/dodgecountymn/Chapter%2016%20%20Performance%20Standards%208-9-22.pdf at Section 16-46, pp. 16-86 to 16-92.

[82] Forge Solar. PV Planning and Glare Analysis. https://www.forgesolar.com/help/#intro

[83] Joint Application, P. 70.

In addition to minimizing general aesthetic impacts, vegetation screening can also minimize the glare from the solar facility. Other mitigation techniques to reduce glare 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.[84]

Although Dodge County does not have siting authority over the proposed project, the standards are representative of the local expectations for solar energy facilities. Consistency with Dodge County performance standards for solar farms is discussed in Section 4.3.3 of this document.

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.

4.3.2 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 of the area.

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 individuals and community thought and action. 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 of in the project area 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.

The 2019 Dodge County *Comprehensive Plan* identifies maintaining the county's rural values and character and maintaining prime farmland as priorities for the county.[85]Canisteo Township, where the

[84] 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

[85] Dodge County *Comprehensive Plan, Dodge County, Minnesota*. (2019) https://cms4files.revize.com/dodgecountymn/EnvironmentalServices/Final%20Adopted%20Comprehensive%20Plan%209-10-19.pdf

bulk of the solar facility is located, is very restrictive with development on prime farmland.[86] The Olmsted County General Land Use Plan strives to balance the growth in the area with preservation of natural and scenic resources.[87]

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. 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 of the area.

The project contributes to the growth of renewable energy and is likely to strengthen and reinforce this value in the area. 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.

MITIGATION

There are no conditions included in the DSP or DRP that directly address mitigation for impacts to cultural values. No mitigation is proposed.

4.3.3 Land Use and Zoning

The ROI for land use and zoning is the land control area. The impact intensity level is anticipated to be moderate. Land use impacts are anticipated to be long-term and localized. The proposed solar facility is inconsistent with some local land use ordinances. 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 and transmission line will alter current and future land use and land cover.

---

[86] Canisteo Township. 2012. *Canisteo Township Zoning Ordinance No. III*. (2012) http://nebula.wsimg.com/ec9c8c94b41c849acc5ba6ee2367048e?AccessKeyId=6EE0A5039D19E4433884&disposition=0&alloworigin=1 (Herein after "Canisteo Township Zoning Ordinance)

[87] Olmsted County, *Olmsted County General Land Use Plan*. (2014). https://www.olmstedcounty.gov/sites/default/files/2020-10/Olmsted%20County%20Land%20Use%20Plan.pdf

A site permit from the Commission supersedes local zoning, building, or land use rules.[88] 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."[89]

Solar Facility: The solar facility is zoned agricultural (**Appendix B**) and the land use at the site is approximately 97 percent agricultural. Solar Energy Farms over 40 kW in areas zoned agriculture require a conditional use permit from the county. Table 9.summarizes the performance standards for solar energy farms codified in Section 16.46 of the Dodge County zoning ordinance.[90].

Table 9. Dodge Count Performance Standards for Solar Farms

Standard	Dodge County Standard
Height	20' at maximum tilt
Stormwater	• Consistent with MPCA Stormwater Permit • $20,000 performance bond with the County • Requirement for stormwater basins
Power and Communication Lines	Underground
Glare	• Requires glare study • Precludes location where glare poses risk to airports or traffic • Requires mitigation for glare impacts to residences
Decommissioning	• Removal of all portions of the solar, both above and below ground (regardless of depth) • Letters of credit (LOC) are not acceptable as financial assurance for decommissioning • Requires recycling of PV panels
Setbacks	• 200 feet from dwellings • 50 feet from property lines • 50 feet or more from public roads • 60 feet from wetlands, with certain exemptions • 100 feet from public watercourses
Vegetation Management	meet the pollinator-friendly vegetation standard established by Minnesota Statutes Section 216B.1642, Subd. 2, and prevent and control the spreading of noxious/invasive weeds to surrounding properties
Visual Screening	• Screening plan submitted as part of joint application • Three rows of trees planted at minimum 200 FT from road center line. The rows will be spaced 16 FT, 10 FT and 8 FT off center apart. The first two rows closest to the boundary line will be shrubs to achieve a mature height of 8-30 FT and the third row will be evergreens to achieve a mature height of 30-60 FT

[88] Minnesota Statutes 216E.10, subd. 1.
[89] Minnesota Statutes 216E.03, subd. 7.
[90] Dodge County Zoning Ordinance https://cms4files.revize.com/dodgecountymn/Chapter%2016%20%20Performance%20Standards%208-9-22.pdf at Section 16-46, pp. 16-86 to 16-92.

Canisteo Township, where the bulk of the solar facility is located, has adopted the County Zoning Ordinance and has also adopted more stringent land use standards for dwellings and animal feedlots located on prime farmland.[91] The township's zoning ordinance does not specifically address solar generating facilities or transmission lines.

Transmission Line: Portions of the Blue Route are located within the city of Kasson's Urban Expansion Area. Zoning in Kalmar and Salem townships, where the transmission routes are proposed, is administered by the Township Cooperative Planning Association. [92]Both Kalmar and Salem townships have land use ordinances that are based on Olmsted County zoning ordinances. Under Kalmar Township[93] and Salem Township[94] zoning ordinances, transmission lines are considered essential services and are a permitted use.

Potential Impacts

Constructing the project will change land use from agricultural to industrial for at least 30 years. During this time, the project may or may not be considered compatible with county planning goals and zoning ordinances—it depends on one's perspective. Individuals might believe the project is compatible with local planning goals because it furthers the county's goals of preserving agricultural land and providing long-term agricultural opportunities to residents. However, the project will remove agricultural land from production, which could be interpreted as being incompatible with the county's planning goals.

Solar generating facilities are permitted in agricultural zoning provided the facility meets certain performance standards. Based on the preliminary project design, the solar facility meets some, but not all, of the solar energy farm performance standards required by Dodge County.

While neither route alternative will result in displacement of homes or businesses, the Red Route crosses two undeveloped parcels near the Byron Substation. Depending upon the alignment within these currently undeveloped parcels, the presence of a transmission ROW may make the parcels more difficult to develop.

Mitigation

Many of the county and township ordinances have to do with the preservation of agricultural land. The DSP (**Appendix C**) has several permit conditions related to the preservation of agricultural land:

- Section 4.3.17 requires the applicant to prepare a vegetation management plan 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 E of the joint application.
- Section 4.3.18 requires the applicant to prepare an agricultural impact mitigation plan (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

[91] Canisteo Township Zoning Ordinance
[92] Township Cooperative Planning Association https://tcpamn.org/
[93] Kalmar Township, April 18, 2018, *Kalmar Township, Olmsted County, Minnesota Zoning Ordinance* https://kalmartownship.org/vertical/sites/%7B635CF471-CBED-41DA-A029-A7AC2AE42286%7D/uploads/Kalmar_Update_2016_FINAL.pdf
[94] Salem Township, June 4, 2014, *Salem Township Zoning Ordinance,* http://salemmn.org/main/?page_id=321

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 D of the joint application.

- 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 H of the joint application.
- Section 9.2 requires removal of all project-related infrastructure. This condition is consistent with Dodge County's performance standard and is more restrictive than the removal of facilities to a depth of48 inches as described in the applicant's draft decommissioning plan. The permit condition does not prescribe what financial assurance instruments an be used to ensure that decommissioning funds are available; Dodge County limits financial assurance instruments to secure decommissioning costs to performance bonds or cash escrow, while the draft decommissioning plan describes a wider range of financial assurance options.

Impacts to local zoning can be mitigated by ensuring the project is consistent, to the greatest extent practicable, with Dodge County's performance standards for solar farms.

- The solar facility is generally consistent with setback requirements in Section 16.46.2G of the Dodge County Zoning Ordinance. The preliminary layout shows one home located within 200 feet of solar arrays and the array within 50 feet of a wetland. Byron Solar indicates that final layout will meet setback requirements for homes and will meet the county's wetland setback "to the extent practicable."[95]
- The project does not pose a glare risk to airports.
- Dodge County zoning ordinance prohibits the siting of solar energy farms in areas where glare poses a risk to airports of traffic on public roadways. The zoning ordinance also indicates that solar energy farms will not be permitted in areas where glare poses a nuisance to nearby receptors unless the impact can be adequately mitigated through screening or other methods.
- The applicant has proposed a conceptual planting plan as Appendix L of the joint application. The conceptual planting plan is not as prescriptive as the Dodge County performance standards. The Dodge County performance standards require solar farms to be screened from residences by earthen mounds or berms, fencing, or landscaping of 80 percent opacity. The county ordinance requires screening plans to be submitted with the CUP application. Screening may include earthen mounds/berms/ neutral colored fences, or landscaping of 80% opacity prior to energizing of the solar facility. Any screening plan must be submitted as part of the application and approved by the Planning Commission and County Board. The performance standards prescribe requirements of the vegetative screening:

  "*Three rows of trees planted at minimum 200 FT from road center line. The rows will be spaced 16 FT, 10 FT and 8 FT off center apart. The first two rows closest to the boundary line will be shrubs to achieve a mature height of 8-30 FT and the third row will be evergreens to achieve a mature height of 30-60 F.*"[96]

Compatibility with local land use and zoning was an area of focus for the task force. The task force recommended several mitigation measures to address this concern:

[95] Joint Application, at p. 35

[96] Dodge County Zoning Ordinance, https://cms4files.revize.com/dodgecountymn/Chapter%2016%20%20Performance%20Standards%208-9-22.pdf at p. 16-90.

- Incorporation of Dodge County performance standards for solar farms
- Setbacks for solar infrastructure to allow agricultural equipment to pass on local roadways
- Requiring permits and approvals from local jurisdictions (e.g. review of stormwater plans, roadway modifications, grading).

4.3.4 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 might exceed state noise standards. Impacts are unavoidable but can be minimized. Operational impacts are anticipated to be negligible.

Noise can be defined as any undesired sound. It is measured in units of decibels on a logarithmic scale. The A-weighted scale ("dBA") is used to duplicate the sensitivity of the human ear.[97] 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 11 provides decibel levels for common indoor and outdoor activities.[98]

Figure 11 Comparative Noise Levels

In Minnesota, noise standards are based on *noise area classifications* ("NAC") corresponding to the location of the listener, referred to as a receptor. NACs are assigned to areas based on the type of land use activity occurring at that location. Household units, designated camping and picnicking areas, resorts and group camps are assigned to NAC 1; recreational activities (except designated camping and picnicking areas) and parks are assigned to NAC 2; agricultural and related activities are assigned to NAC 3. A complete list is available at Minnesota Rule 7030.0050.

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

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

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

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 10 provides current Minnesota noise standards.

Table 10. Noise Area Classifications (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 MPCA 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 primary noise receptors are the 17 local residences. Residences are in NAC 1. Noise receptors could also include individuals working outside in the project vicinity. Ambient noise levels in the project area are generally in the range of 30 to 60 dBA.[99] Potential noise impacts from the project are associated with construction noise and operational noise.

Construction Noise from construction will be temporary in duration, limited to daytime hours and potentially moderate to significant depending in location. Sound levels from grading equipment are not dissimilar from the typical tractors and larger trucks used in agricultural communities during harvest. Pile driving of the array posts will be the most significant source of construction noise. The applicant modeled noise from the noise from the pile drivers to be 82 dBA at 200 feet (the minimum setback from residences).[100] The noise from construction activities would dissipate with distance and be audible at varying decibels, depending on the locations of the equipment and receptor.

Thus, this construction noise would exceed state noise standards at select times and locations. Exceedances would be short-term and confined to daytime hours. Even without an exceedance, noise impacts will occur. Rhythmic pounding of foundations posts would be disruptive even if the noise associated with that activity is within state standards.

Other construction activities, for example, installation of solar panels, are anticipated to have minimal noise impacts. A forklift is typically used to place solar panels on the racking system. Construction activities will be sequenced, that is, site grading may occur at one location while posting driving occurs at another location while racking and panel assembly might occur at another location, at the same time.

[99] Joint Application, at p. 58
[100] Joint Application, at p. 59.

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. The applicant modeled a maximum daytime noise level of 42 dBA at nearby receptors, well below the daytime L_{50} dBA noise standard of 60 dBA.[101] Noise from routine maintenance activities is anticipated to be negligible to minimal. Transmission lines can generate a cracking or buzzing sound (referred to as corona noise). The corona noise is greater in rain or fog conditions. Noise from the electrical collection system and gen-tie transmission line is not expected to be perceptible.

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 and Section 5.3.5 of the DRP require the permittee to comply with noise standards established under Minnesota noise standards as defined 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.

4.3.5 Property Values

The ROI for property values is the local vicinity. Impacts to property values within the local vicinity could occur; however, changes to a specific property's value are difficult to determine. Impacts in the local vicinity are anticipated to be minimal and significant negative effects to property values are not anticipated. Impacts to the value of specific properties within the local vicinity are difficult to determine but could occur.

Impacts to property values can be measured in three ways: sale price, sales volume, and marketing time. These measures are influenced by a complex interaction of factors. 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.[102]

[101] Joint Application, at p. 60

[102] 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/m

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. Potential impacts from operational noise are not anticipated. Aesthetic impacts will occur, but because the project is relatively short – as compared to a wind turbine or a smokestack – impacts would be localized.

The 100 MW North Star Solar project located in Chisago County covers 800 acres. Chisago County found that between January 2016 and October 2017 the median ratio between sales price and assessed value of homes near the North Star project was 87.8 percent—this includes properties surrounded by the solar array. This ratio is comparable with Sunrise and North Branch Townships, which had median ratios of 88.2 percent and 85.6 percent, respectively.[103] Home sales exceeded assessed value near the solar facility at a rate comparable to the general real estate market in the area.

A study prepared by CohnReznick for a large solar facility in Iowa examined the impact of large solar facilities on property values by reviewing studies by academics and real estate appraisal professionals, comparing sale prices of properties near 10 existing large solar facilities (including the North Star project) with comparable properties, and interviewing over 45 county and township assessors with solar facilities in their jurisdictions. The CohnReznick study did not find a consistent negative impact to the sales value of properties located near large solar generating facilities in.[104]

POTENTIAL IMPACTS

Based on analysis of other utility-scale solar projects, significant negative impacts to property values in the local vicinity are not anticipated. Impacts to the value of specific properties within the local vicinity are difficult to determine, but could occur

MITIGATION

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

4.3.6 Recreation

The ROI for recreation is the project area. Because few recreational resources exist in the project area, potential impacts to these resources are anticipated to be minimal and temporary. Impacts to a snowmobile trail can be mitigated.

---

arket_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 .

[103] Kurt Schneider, Environmental Services Director, Chisago County Environmental Services and Zoning (October 20, 2017) *Email to Commerce staff*.

[104] 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=

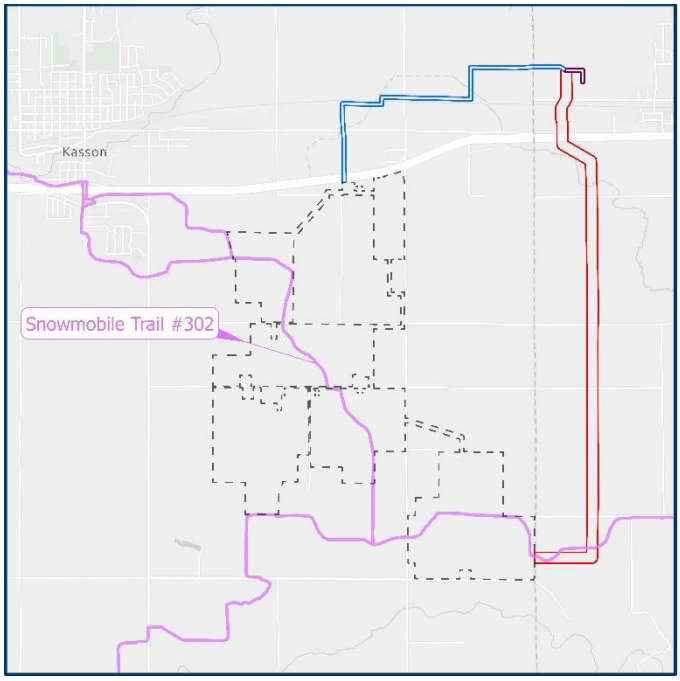
Impacts to recreation can be direct or indirect. Direct impacts are impacts that directly impede the use of a recreational resource, for example, closing of a trail to facilitate project construction. Indirect impacts reduce the enjoyment of a recreational resources but do not prevent use, for example,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

There are limited specifically designated recreational resources in the project area. Trail 302, a Grant-In-Aid (GIA) snowmobile trail passes through the solar facility site (Figure 12). The trail is mapped by the DNR, sponsored by Dodge County, and managed by Kasson-Mantorville Trails. There are no biking or walking trails within the project area, but the 16th Street NE Trail, 5th Avenue NE Trail, Sunrise Trail, and Sunset Trail, all located north of the solar facility. Five Wildlife Management Areas (WMAs) are located outside of the project area, but within five miles of the project (Tri-Cooperative WMA, South Fork Zumbro River WMA, Pheasants Forever WMA, Bud Jensen WMA, and Vernon WMA). Lions Park is located approximately 1.6 miles northwest of the solar facility.

POTENTIAL IMPACTS

Impacts to recreation are anticipated to be minimal and temporary. Construction of the project will require Snowmobile Trail 302 to be re-routed outside the fenced area of the solar facility. The applicant has discussed re-route options with the local snowmobile association, and the association indicates it agrees with rerouting the trail to maintain its use. The PV panels and transmission line will be visible to users of the re-located snowmobile trail, but their presence is not anticipated to significantly impact users of the trail.

Figure 12. Snowmobile Trail 302



MITIGATION

Byron Solar has proposed to relocate Snowmobile Trail 302 around the solar facility. DNR recommends that coordination is necessary to allow time to accommodate changes to the snowmobile trail and allow for re-routing and mapping. Applications for state grants are due by May 15th for the trail season running December through April. No additional mitigation measures are proposed.

4.3.7 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.

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 water needs and private septic systems of drain fields for domestic wastewater. The MWI identifies nine domestic wells or boreholes within the solar facility boundary; six of these records are sealed boreholes and three are listed as active domestic wells.[105]

Electric Utilities: The primary electric provider in the project area is Peoples Cooperative Service. Kasson Public Utilities provides electric service within the city of Kasson and Xcel Energy provides electric service to the city of Byron and in areas generally north of US Highway 14.[106] There are electric distribution lines throughout the project area. There are several high voltage transmission lines that run to and from the Byron Substation including: the Byron- North Rochester 345 kV line runs north from the Byron Substation, two Xcel Energy lines, a 161 kV line and a 345 kV line that run south from the Byron Substation, and two GRE lines – a 161 kV line and a 69 kV line, that runs east-west through the city of Kasson to the Byron Substation.

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

Roads: Access to the project will be via existing township, county, and state roads. The major roadway in the area is US Highway 14, which bounds the solar facility on the north. Other roads accessing the solar facility are 270th Avenue, 650th Street, 655th Street, 660th Street, and 120th Avenue.

Railroads: The Canadian Pacific Railway travels east-west between Kasson and Byron.

Airports: The nearest Federal Aviation Administration (FAA) registered airport to the project is the Dodge Center Municipal Airport, located approximately 5.2 miles west of the solar facility south of U.S. Highway 14 in Dodge Center, Minnesota. The airport is owned by the city of Dodge Center and operates one paved runway and one turf runway.[107] In order to assure safety, both the FAA and MnDOT office of Aeronautics have established guidelines for the location of 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. the Minnesota Department of Transportation (MnDOT) has zoning areas around public airports that restrict the area where buildings and other structures can be placed.

POTENTIAL IMPACTS

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.

---

[105] Joint Application, at p. 101

[106] Minnesota Public Utilities Commission, Electric Service Area Map. https://minnesota.maps.arcgis.com/apps/webappviewer/index.html?id=95ae13000e0b4d53a793423df1176514/

[107] United States Federal Aviation Administration, *Airport Data and Information Portal* https://adip.faa.gov/agis/public/#/public

Water and Wastewater: Byron Solar will likely install a well and septic system at the O&M facility to provide water for drinking and sanitary services for approximately four employees. [108]

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. Traffic during construction is estimated to be approximately 200 pickup trucks, cars, and/or other types of employee vehicles onsite during construction. Approximately 10-20 semi-trucks per day will be used for delivery of facility components. Since average daily traffic on 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. 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. Overweight or oversized loads are not anticipated. [109]

With the exception of minor field access or the addition of new driveways, no changes to the existing public roads are anticipated.[110] New driveway access from existing public roads will be required at each of the five locked access gates at 270th Avenue, 650th Street, 655th Street, 660th Street, and 120th Avenue:[111] If the Blue Route is selected, the new driveway to the project substation will likely be near the intersection of 265th Avenue and 640th Street. If the Red Route is selected, the new driveway is anticipated to be off of CR 8/CR 25 (the county line between Dodge and Olmsted counties). The applicant does not propose adding any direct access to the project from US Highway 14.

Temporary road or lane closures may be required during the construction of the transmission line to ensure safety of the construction crews and the traveling public. Any road closures or restrictions are typically related to the stringing and tensioning of the conductor and, depending upon the location, would be expected to last from minutes to hours. No impacts to roads are anticipated during the operation; negligible traffic increases would occur for maintenance.

Railroads: Both transmission routes would cross the Canadian Pacific Railway and the Blue Route would parallel the railroad for approximately one mile. The ROW along this portion of the Blue Route is located approximately 85 feet from the railroad tracks.[112]

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 at the Byron Substation. These outages are anticipated to be of short duration and closely coordinated with utilities and landowners. Any outage would be coordinated with the interconnecting utility (SMMPA) and communicated to electric customers in the project area.

Air Safety: The solar facility does not impact air safety. The glare study performed for the project (**Appendix F**) did not identify glare impacts to flight paths or air traffic control. The applicant used the FAA's Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) Notice Criteria Tool to determine if

[108] Joint Application, at Table 2, p. 103
[109] Joint Application, at p. 86, **Appendix E**, response to Question 4
[110] Joint Application, at p. 88
[111] Joint Application, at p. 33
[112] Joint Application, at p. 89

further aeronautical study or FAA filing is needed (FAA, 2021). Structures ranging in height from 20 to 151 feet were filed. The response from the FAA's screening tool indicates that at least one of the proposed structures is in proximity to a navigation facility and may impact the assurance of navigation signal reception. Because the FAA Obstruction evaluation requires some detail in engineering, it has not been done for the Red Route.

MITIGATION

Water and Wastewater: A well construction permit from the MDH if a well is installed at the O&M facility. A septic system permit is required from Dodge County prior to installation of a septic system.

Utilities: Section 4.3.5 of the DSP and Section 5.3.3 of the DRP require the permittee to minimize disruptions to public utilities.

Electrical outages can be minimized by coordinating with SMMPA to minimum disruption and informing customers of the outage well in advance. 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 during engineering surveys and marking the underground utility locations prior to construction. If a utility is identified, the project component or the utility itself might need to be relocated if it cannot be successfully crossed. Relocation, as well as any necessary crossing, would need to be coordinated with the affected utility.

Roads: Changes or additions to driveways from county roads will require permits from the county. Likewise, any entrance from US Highway 14 will require a driveway permit from MnDOT.

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. Section 5.3.3 of the DRP requires permittees to consult with landowners and local governments along the route in considering tree clearing and placement of transmission structures. The same section also requires permittees to coordinate with local governments to develop signage and traffic management during construction.

In addition to permit requirements for driveway access and the conditions of the draft site permit, 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.
- Temporary guard structures should be used to support the conductor above vehicle traffic if necessary, to string collection lines over the roadway.
- 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: Approval from Canadian Railway is required to work under, over, or beside Canadian Railway tracks. Byron Solar states its intention to coordinate with the railroad to schedule electrical conductor stringing over the railroad to ensure safety of construction personnel and the continued safe operation of rail operations.[113]

4.3.8 Socioeconomics

The ROI for socioeconomics is the region. The impact intensity level is anticipated to be minimal to significant and positive. 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.

Dodge and Olmsted counties have slightly lower minority populations than the state as a whole and somewhat higher median household incomes (Table 11). Compared to Dodge and Olmsted counties as a whole, the townships where the project is proposed have a lower percentage of minority population and a higher median income.[114]

Table 11. Population Characteristics

Area	Total Population*	Percent Minority Population‡	Median Household Income**	Percent Below Poverty Level
Minnesota	5,563,378	20.2	$71,306	9.7
Dodge County	20,669	7.8	$74,575	5.1
Canisteo Township	583	2.6	$99,375	3.1
Mantorville Township	1,817	2.5	$118,625	1.3
Olmsted County	154,809	19.9	$76,951	8.4
Kalmar Township	1,113	10.9	97,083	7.3
Salem Township	1,094	3.7	$81,736	2.0

* U.S. Census Bureau,
** 2020 American Community Survey5-year Estimate
‡ Minority population includes all persons who do not self-identify as white alone.

Dodge County's economy is strongly based on agricultural products and services. Other industries include health care, and retail trade.[115] Olmsted County has a diverse economic base, with a particular emphasis on healthcare. Both Dodge and Olmsted counties are part of the Minnesota Department of Employment and Economic Development Region 10, which is in the Southeast Planning Region. Between 2010 and 2020, the population growth in Dodge County was 4.5 percent for Dodge County and 10.4 percent for Olmsted County compared with Minnesota's 6.7 percent population increase at the same time. The region continues to suffer from a shortage of workers, slowing economic growth.

[113] Joint Application, at p. 89
[114] U.S. Census, Explore Census Data, https://data.census.gov/cedsci/
[115] Dodge County Comprehensive Plan, https://cms4files.revize.com/dodgecountymn/EnvironmentalServices/Final%20Adopted%20Comprehensive%20Plan%209-10-19.pdf at p. 48.

Unemployment rates fluctuate with the economy, but the unemployment rate for Region 10 has been consistently about 0.1 to 0.5 percent below Minnesota's unemployment rate.[116] In 2021, both Dodge and Olmsted counties had lower unemployment rates (3.1 and 2.8 percent respectively) than the state average (3.4%).[117]

Potential Impacts

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 project will not disrupt local communities or businesses and does not disproportionately impact low-income or minority populations (see discussion of environmental justice in 4.3.9). Adverse impacts are not anticipated.

Construction of the project is likely to result in increased expenditures for food and fuel, at local businesses during construction. The applicant indicates that some materials might be purchased locally depending on availability, terms, and conditions, etc. The applicant anticipates up to 300 workers might be employed during construction. The applicant indicates that "it is typical to advertise locally to fill required construction positions."[118]. However, "[t]he experience and training requirements for [renewable energy production] workers vary widely: from positions that require specialized skills, years of experience, and a license or certification; to jobs that can be filled by individuals with little or no construction experience."[119]

Because experience requirements vary widely it is difficult to predict how many jobs may or may not be local jobs. Approximately 8,730 people are reported as employed in construction and extraction jobs in Region 10, the same percentage of the labor force (3.8 percent) as in Minnesota.[120]

Once the project is operational, Byron Solar 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. Because the land for the solar generating facility is used primarily for solar generation, the land is classified as Class 3a (commercial/industrial/public utility) which is taxed at a higher rate than land used primarily for homestead or agriculture. The value of the generation equipment is exempted from the property tax.[121] Minnesota has adopted a production tax of $1.20/MWh paid 80 percent to counties and 20 percent to the cities and townships.[122] Byron Solar estimates the project will provide annual production tax revenues to Dodge County of approximately $400,000-$450,000 and Canisteo

[116] Minnesota Department of Economic Employment and Development (DEED). *Economic Development Region 10: 2021 Regional Profile*. (2021) https://mn.gov/deed/assets/2021_EDR10RP_MS_tcm1045-133258.pdf

[117] DEED. County Profiles for Dodge County. (2021) https://mn.gov/deed/assets/080122_dodge_tcm1045-407635.pdf and Olmsted County https://mn.gov/deed/assets/080122_olmsted_tcm1045-407643.pdf

[118] Joint Application, at p. 75

[119] Lucas Franco (August 2019) *Catching the Wind 2.0: An Update on Changing Employment Practices in Minnesota's Wind Energy Industry*, retrieved from: https://d3ciwvs59ifrt8.cloudfront.net/19d28156-d283-4f19-aa25-a3a81dcfffdf/94a68b0d-c092-4d05-9abc-b452e02aba21.pdf ,page 16.

[120] DEED, Economic Development Region 10: 2021 Regional Profile. https://mn.gov/deed/assets/2021_EDR10RP_MS_tcm1045-133258.pdf.

[121] Minnesota Statutes 272.02, subdivision 24; Minnesota House Research, *Property Tax 101: Property Tax Variation by Property Type*, July 2022, https://www.house.leg.state.mn.us/hrd/pubs/ss/ssptvart.pdf .

[122] *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

township will receive approximately $100,000-$125,000 annually over the operating life of the project.[123] Local governments will receive a nominal amount of annual property tax on the transmission infrastructure. In addition, lease and purchase payments paid to the landowners will offset potential financial losses associated with removing a portion of their land from agricultural production.[124]

The applicant anticipates the project will require approximately 300 jobs during the construction and installation phases, and up to 4 full time permanent jobs during the operations phase.[125] Indirect economic benefits will occur from additional local spending on goods and services and local sales tax.

If the project is constructed, approximately 1550 acres will be removed from agricultural production that currently used to produce corn and soybeans. The removal of cultivated land is likely to result in an incremental decrease to agricultural-related businesses, such as farm dealerships, seed dealers, and dealers of agricultural inputs such as fertilizer and pesticides, in the area. The extent of any decrease in sales is difficult to determine, but the removal of approximately 0.06 percent of the approximately 248,036 acres of farmland in Dodge and Olmsted counties is unlikely to have a significant impact. Adverse impacts associated with the loss of agricultural land and agricultural production will be mitigated through lease payments to landowners.

MITIGATION

Socioeconomic impacts are anticipated to be positive. Section 8.5 of the DSP requires quarterly reports concerning efforts to hire Minnesota workers. No additional mitigation is proposed.

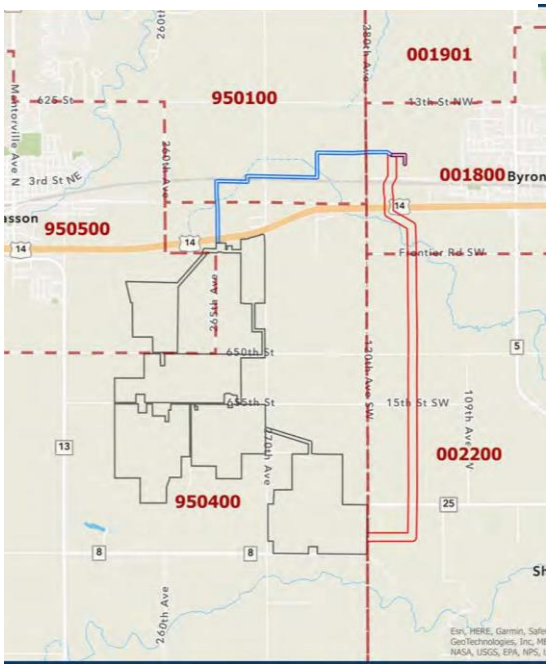
4.3.9 Environmental Justice

The ROI for economic justice analysis is the region. The project will not have disproportionately high and adverse human health or environmental effects on 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."[126] The goal of this "fair treatment" is not to shift risks among populations, but to identify potential disproportionately high and adverse effects and identify alternatives that may mitigate these impacts.[127]

[123] **Appendix E**, response to Question 14
[124] Joint Application, at p.76.
[125] Joint Application, at p. 38.
[126] US EPA Environmental Justice, https://www.epa.gov/environmentaljustice .
[127] US EPA, Guidance for Incorporating Environmental Justice Concern in EPA's NEPA Compliance Analyses (pdf),

Figure 13. Census Tracts in Project Area



Potential Impacts

Utility infrastructure can adversely impact low-income, minority or tribal populations. To identify potential environmental justice concerns in the project area, the US EPA's EJ Screening Tool was used to consider the composition of the affected area to determine whether low-income, minority or tribal populations are present and whether there may be disproportionately high and adverse human health or environmental effects on these populations.[128] Low-income and minority populations are determined to be present in an area when the low-income percentage or minority group percentage exceeds 50 percent or is "meaningfully greater" than in the general population. In this analysis, a difference of 10 percentage points or more was used as the threshold to distinguish whether a "meaningfully greater" low-income or minority population resides in the ROI.

Staff conducted a demographic assessment of the affected community to identify low-income and minority populations using U.S. Census data. Table 12 provides low-income and minority population data and Figure 13 shows the census tracts used to compare the project area with the region of comparison (Dodge and Olmsted counties).

Table 12 Low-Income and Minority Population Characteristics

Area	% Below Poverty*	Median Household Income ($)	% Minority**
Dodge & Olmsted Counties	Region of Comparison		
	7.93	76,687	18.51
Project Census Tracts	Dodge County		
27039950100	2.51	100,948	4.97
27039950500	2.73	74,758	5.65
27039950400	5.82	71,071	3.53
	Olmsted County		
27109002200	3.93	89091	3.59
27109001800	1.01	91538	5.99

[128] US EPA EJ Screen, https://www.epa.gov/ejscreen..

Source: U.S. Census Bureau, 2020 American Community Survey
* The ROI is calculated by dividing the total minority population in the ROI by the total population of the ROI.
** Minority population includes all persons excluding those who self-identified as non-Hispanic white alone.

MITIGATION

The project will not create disproportionate or adverse impacts to low income or minority populations because the low-income or minority residents of the project area not a meaningfully greater than the area of comparison. Mitigation is not proposed.

4.4 Human Health and Safety

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

4.4.1 Electronic and Magnetic Fields

The ROI for EMF is the area of land control. 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"). 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.

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). Electric fields decrease rapidly as they travel from the conductor and are 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 13 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."[129]

[129] 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

Table 13. Electric and Magnetic Field Strength of Common Household Objects[130]

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

* 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. "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."[131]

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.[132] 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."[133] "Overall there is no evidence that exposure to ELF magnetic fields alone causes tumors. The evidence that ELF

[130] Ibid.
[131] 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
[132] National Cancer Institute. *Magnetic Field Exposure and Cancer*. (2016). http://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/magnetic-fields-fact-sheet.
[133] National Institute of Environmental Health Sciences. *Electric and Magnetic Fields*, (2018). http://www.niehs.nih.gov/health/topics/agents/emf/index.cfm.

magnetic field exposure can enhance tumor development in combination with carcinogens is inadequate."[134]

"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."[135]

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.*[136]

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 ROW for 161 kV transmission lines.[137] Additionally, international organizations have adopted standards for exposure to electric and magnetic fields (Table 14**)**

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

[135] 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.

[136] *Id*., page 36.

[137] 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.

Table 14. 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[a]
National Radiological Protection Board	4.2	—	830	4,200

[a] For persons with cardiac pacemakers or other medical electronic devices

The Commission limits the maximum electric field under high voltage transmission lines in Minnesota to 8.0 kV/m.[138] It has not adopted a standard for magnetic fields.

Potential Impacts

Potential impacts are anticipated to be negligible and are not expected to negatively affect human health. Impacts will be long-term and localized but can be minimized.

Solar Facility: 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.[139]

Transmission Line: 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. The maximum electric field level for the transmission line is estimated to be 4.7 kV/m directly under the transmission line. As shown in Table 15, electric field strengths decrease with distance; at the edge of the ROW (75 feet either side of the center line) electric field levels are approximately 1.1 kV/m. Byron Solar suggests that the EMF profile could be somewhat higher for the Red Route due to its proximity to two transmission lines but has not modeled EMF for the Red Route.[140] 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.

---

[138] *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.

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

[140] **Appendix E**, Response to Question 5

Table 15: Calculated Electric and Magnetic Fields[141]

Distance from Center Line (feet)	-75	-45	-20	0	20	45	75
Estimated Electric Field (kV/m)	0.06 – 1.1	0.58 – 2.63	0.84 – 4.73	0.96 – 4.74	1.82 – 4.09	0.73 – 2.5	0.04 – 1.1
Estimated Magnetic Field (mG)	7.2 – 51.2	4.8 – 54.3	6.4 – 55.7	7.8 – 55.7	8.8 – 54.8	9.8 – 52.3	8.6 - 49.8

The maximum magnetic field level for the transmission line is estimated to be 56 mG. As shown in Table 15, magnetic fields decrease with distance, and the maximum modeled magnetic field at the edge of the transmission ROW is approximately 51 mG. Potential health impacts from these magnetic 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.

4.4.2 Stray Voltage

The ROI for stray voltage is the land control area. Potential impacts from stray voltage are anticipated to be minimal. Potential impacts to residences or farming operations from neutral-to-earth stray voltage are not anticipated because, unlike distribution lines, high voltage transmission lines, like the proposed line, do not directly connect to businesses, residences, or farms. Constructing the project to NESC standards and Commission route permit requirements mitigates induced voltage, which happens when the electric field from the transmission line extends to nearby conductive objects. Potential impacts can be mitigated.

In general terms, stray voltage is "voltage caused by an electric current in the earth, or in groundwater, resulting from the grounding of electrical equipment or an electrical distribution system."[142] Stray voltage encompasses two phenomena: neutral-to-earth voltage (NEV) and induced voltage.

Neutral-to-Earth Voltage NEV is a type of stray voltage that can occur where distribution lines enter structures. "Electrical systems—farm systems and utility distribution systems—are grounded to the earth to ensure safety and reliability…. Inevitably, some current flows through the earth at each point where the electrical system is grounded and a small voltage develops."[143] This extraneous voltage appears on metal surfaces in buildings, barns, and other structures.

---

[141] Joint Application, at p. 26, **Appendix E**, Response to Question 5

[142] Edison Electric Institute. Glossary of Electric Industry Terms, Washington, DC: Edison Electric Institute (2005)

[143] Wisconsin Public Service Corporation. Answers to Your Stray Voltage Questions: Backed by Research, (2011). https://www.wisconsinpublicservice.com/partners/agriculture/stray-voltage/pdf/stray-voltage.pdf , page 1

NEV is typically experienced by livestock that contact one or more metal objects on a farm, for example, feeders, waterers, or stalls. Metal objects on a farm are grounded to earth through electrical connections. Livestock, by virtue of standing on the ground, are also grounded to earth. If an animal touches two points at different voltages (one at neutral voltage and the other near true ground),[144] a small current will flow through the livestock to the ground because the animal completes the electrical circuit.[145]

Despite metal objects and livestock both being grounded to the earth many factors affect the effectiveness of their respective ground, that is, a good or poor ground. In metal objects these include wire size and length, quality of connections, number and resistance of ground rods, and electrical current being grounded.[146] Likewise, a number of factors also determine the extent to which livestock are grounded, for example, if the animal is standing on wet or dry ground.[147] Stray voltage results from this difference in the effectiveness of grounding and on the resulting electrical currents. It can exist at any farm, house, or business that uses electricity, independent of a nearby transmission line.

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

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

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

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

---

[144] North Dakota State University Agricultural Engineering Department. *Extension Publication #108: Stray Voltage* (1986)

[145] Michigan Agricultural Electric Council. *Stray Voltage: Questions and Answers*. (2008). http://maec.msu.edu/Stray%20Voltage%20Brochure%202008.pdf

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

[147] Ibid.

POTENTIAL IMPACTS

The proposed transmission line does not interconnect to businesses or residences and does not change local electrical service. As a result, impacts to residences or farming operations from NEV are not anticipated. The transmission line might induce a voltage on insulated metal objects within the ROW.

MITIGATION

Section 5.4.2 of the DRP requires that transmission lines be constructed and operated to meet NESC standards as well as the Commission's own electric field limit of 8 kV/m reducing these impacts. No additional mitigation is proposed.

4.4.3 Public Safety and Emergency Services

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.

Like any construction project, there are risks. These include potential injury from falls, equipment and vehicle use, electrical accidents, etc. Construction might disturb existing environmental hazards on-site, for example, contaminated soils. During operation there are occupational risks similar to those associated with construction. Public risks would result from unauthorized entry into the facility.

Construction crews must comply with local, state, and federal regulations when installing the project. This includes standard construction-related health and safety practices. This generally includes safety orientation and training, as well as daily/weekly safety meetings.

Emergency services in the project area are provided by local law enforcement and emergency response agencies located in nearby communities. Law enforcement in the project area is provided by the sheriff's offices of Dodge and Olmsted counties. Law enforcement in the nearby cities of Kasson, Dodge Center, and Rochester is provided by local police departments. Fire service is provided by city and community fire departments from Byron, Kasson, Dodge Center, Mantorville, and Rochester. Ambulance response is provided by local ambulance services out of Dodge Center, Hayfield, and West Concord.

POTENTIAL IMPACTS

The ROI for worker and public safety is the land control area. Worker safety issues are primarily associated with construction. Public safety concerns would be most associated with unauthorized entry to the project and transmission line downing or failure.

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 to be 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.

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 in a special facility or recycled if recyclers are available.[148]

The proposed transmission line will be equipped with switching devices (circuit breakers and relays located in the substations where the transmission lines terminate). These devices are intended to make, carry, and break line currents under normal conditions and in specified abnormal conditions such as a short circuit or fault. The circuit breakers stop the specified current and can protect other equipment and the extended power system from damaging currents and more extensive outages; however, any electrical facility which becomes isolated by operation of circuit breakers should not be considered de-energized or safe. Downed power lines and other damaged electrical equipment should always be assumed to be energized and dangerous.

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 (OSHA) 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 The periodic updates of the decommissioning plan required under

Public safety is addressed in several sections of the DSP (**Appendix C**):

- 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.

Section 5.4 of the DRP require that the transmission line be properly grounded and limits the electric field to no more than 8 kV/m. Section 5.5.2 of the DRP requires permittees to design and operate the line to meet or exceed all relevant local and state codes, the NESC and NERC requirements.
No additional mitigation is proposed.

4.5 Land-based Economies

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

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

4.5.1 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 Dodge and Olmsted counties 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 97 percent of the area of site control, with corn and soybean as the dominant crops. Agricultural characteristics for both Dodge and Olmsted counties are summarized in Table 16.

Table 16. Agricultural Characteristics - Dodge and Olmsted Counties[149]

Category	Dodge County	Olmsted County
Acres of farmland	248,036	285,944
Percentage of total land	88.2	68.4
Number of Individual farms	611	1,139
Average farm size (acres)	406	251
2017 value of agricultural production	$238.400,000	$ 214,415,000
Top crops (in acres)	Corn, soybeans	Corn, soybeans
Top livestock category	Hogs and pigs	Dairy cows

Crops comprise most of the market value of agricultural production in both counties (approximately 57 to 58 percent), with the remainder from livestock. In terms of acreage, corn and soybeans dominate the landscape, though both counties also have thousands of acres of hay, vegetables, and sweet corn. Hogs and pigs comprise the largest portion of livestock revenues in Dodge County, while dairy operations are the largest portion of livestock revenues in Olmsted County.

Prime farmland is defined by Federal regulation at 7 C.F.R.657.5(a)(1) "is 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." Approximately 91 percent of the soils in Dodge County are classified as prime farmland or prime farmland if drained; that figure is 60.9 percent in Olmsted County.[150] Nearly all the solar facility site control area is located on areas classified as prime farmland or prime farmland if drained. Table 17 shows prime farmland classifications within the project boundary.

[149] USDA, 2017 Census of Agriculture, County Profile: Dodge County, Minnesota https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Minnesota/cp27039.pdf USDA, 2017 Census of Agriculture, County Profile: Olmsted County, Minnesota https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Minnesota/cp27109.pdf

[150] Joint Application, at p. 19

Table 17. Solar Facility - Prime Farmland

Farmland Classification	Acres	% of Site
Prime Farmland	1214.9	67.7
Prime Farmland if Drained	508.8	28.3
Farmland of Statewide Importance	51.4	2.9
Not Prime Farmland	20.2	1.1
Total	1705.2	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.[151]

Potential Impacts

The ROI for agriculture is the land control area. The impact intensity level will range from moderate to significant. 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.

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 1550 acres of farmland being removed from agricultural production for the life of the project. This change in land use would take productive farmland out of production for the life of the project but would result in a negligible loss of farmland in Dodge and Olmsted counties. 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 best management practices (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.

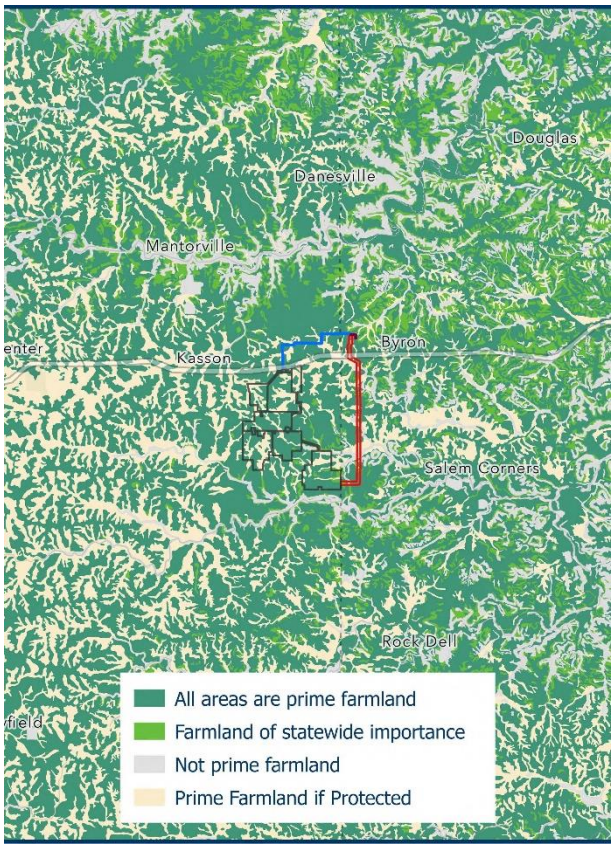
[151] University of Minnesota Extension. *Impact of Agricultural Drainage in Minnesota*. (2018). https://extension.umn.edu/agricultural-drainage/impact-agricultural-drainage-minnesota#sources-1360510 .

Prime Farmland

Approximately 96 percent of farmland in the area is prime farmland (Table 17, Figure 14). Based on this percentage and the proposed layout of the project, the project is anticipated to impact about 1550 acres of prime farmland or prime farmland if drained.

In Minnesota, no large electric power generating plant 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.[152] With a generating capacity of up to 200 MW, the project, by rule, should impact no more than 100 acres of prime farmland, substantially less than the actual acreage of prime farmland affected.

Figure 14. Prime Farmland in Project Area



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.[153] 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 conducted a screening analysis to assess whether the project meets the "feasible and prudent alternative" threshold. The analysis looked at factors such as high solar resource areas, interconnect locations with sufficient capacity, and open farmland, focusing on the southern portion of the state. Within this area, the applicant screened for substations and transmission lines with available capacity which identified a relatively small number of possible points of interconnection (POI) with low or no network upgrade requirements. Financial constraints further focused on potential locations within five miles of the identified POIs which had to meet the following criteria: "cleared and otherwise undeveloped, not currently encumbered by other easements (wind farms, etc.), contained minimal wetlands, streams, transmission lines, pipelines, roads, or other obstacles that would limit the buildable land or lead to irregularly shaped development

[152] Minnesota Rule 7850.4400

[153] 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

areas. Once potential sites were identified, the applicant approached landowners for voluntary leases and easements. Following the screening, the applicant concluded that no feasible or prudent alternatives to the project exist [154]

MITIGATION

Several sections of the DSP (**Appendix C**) and DRP (**Appendix D**) address agricultural mitigation and soil-related impacts:

- Section 4.3.9 of the DSP requires protection and segregation of topsoil.
- Section 4.3.10 of the DSP requires measures to minimize soil compaction.
- Section 4.3.11 of the DSP and Section 5.3.7 of the DRP 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 of the DSP requires that "site restoration and management" practices enhance "soil water retention and reduces storm water runoff and erosion".
- Section 4.3.17 of the DSP requires the permittee to develop an AIMP with MDA. Byron Solar's draft AIMP (Appendix D of its joint application) 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.
- 4.3.18 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. While this has been required for solar site permits, it is also frequently included as a special condition in route permits issued by the Commission and is included as a special condition in Section 6.1 of the DRP. Byron Solar has included a draft VMP as Appendix E of its joint application.
- Section 4.3.20 of the DSP and Section 5.3.11 of the DRP 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 of the DSP and Section 5.3.12 of the DRP require the permittee to take reasonable precautions against the spread of noxious weeds.
- Section 4.3.28 of the DSP and Section 5.3.19 of the DRP require the permittee to fairly restore or compensate landowners for damages to crops, fences, drain tile, etc. during construction.

The task force recommended that the solar facility be set back sufficient to allow agricultural equipment to pass on local roadways

Reduced or lost farming revenues may be offset by leasing agreements, which are outside the scope of this document.

4.6 Archeological and Historic Resources

[154] Joint Application, at pp. 16-22

The ROI for archeological and historic resources is the project area. The impact intensity level is anticipated to be negligible to minimal. Impacts would be localized. Impacts can be mitigated through siting and routing.

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.[155] Historic resources are sites, buildings, structures, or other antiquities of state or national significance.[156]

POTENTIAL IMPACTS

No previously recorded archaeological or historic sites will be directly impacted by the proposed Project. A Phase I archaeological survey of the project area and vicinity, including the Blue Route, was completed in May 2021, and is included as Appendix J of the joint application. In addition to reviewing records from the Minnesota State Historic Preservation Office (SHPO) and Minnesota Office of the State Archeologist for an area within one mile of the solar facility and Blue Route, the survey also included field investigations in October 2020 and May 2021. The field investigations identified one previously unrecorded archaeological site consisting of utilized flake. The isolated find was not considered significant, and SHPO concurred with the finding that the site is not eligible for listing in the National Register of Historic Places (NRHP).[157]

The applicant also reached out to the eleven Minnesota Tribal Nations' Tribal Historic Preservation Officers and the Minnesota Indian Affairs Council for additional information or comment on the project

MITIGATION

Prudent siting and routing to avoid impacts to archaeological and historic resources is the preferred mitigation. Section 4.3.23 of the DSP (**Appendix C**)) and Section 5.3.14 of the DRP (**Appendix D**) address archeological resources and require the permittee to avoid impacts to archaeological and historic resources where possible and to mitigation 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 to determine how best to proceed. Ground disturbing activity will stop and local law enforcement will be notified should human remains be discovered.

Prior to construction, Byron Solar will prepare an Unanticipated Discoveries Plan outlining steps to be taken if previously unrecorded cultural resources or human remains are encountered during construction.[158].

Additional mitigation is not proposed

4.7 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.

[155] Minnesota Statutes, Section. 138.31, subd. 14.
[156] Minnesota. Statutes, Section 138.51.
[157] See *Phase I Archaeology Report*, Appendix J of the Joint Application.
[158] Joint Application, at p. 97.

Other factors, for example, the environmental setting, influence potential impacts. Impacts can and do vary significantly both within, and across, projects.

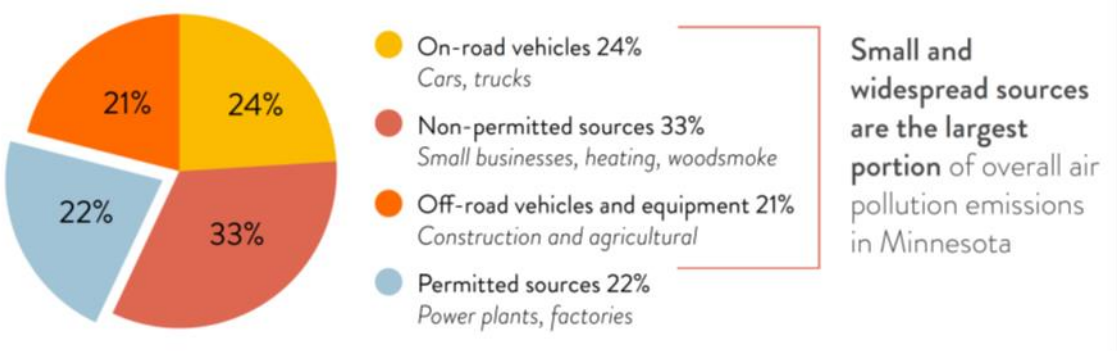
4.7.1 Air Quality

The ROI for air quality and climate change is the region. Potential impacts to air quality during construction would be intermittent, localized, short-term, and minimal. Impacts are associated with fugitive dust and exhaust. Impacts can be mitigated. Once operational, the solar array will not generate criteria pollutants or carbon dioxide. Ozone and nitrous oxide emissions from the transmission line are anticipated to be well below state and national limits 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.

"In general, the state of Minnesota's air quality is improving. Levels of pollution in outdoor air have been going down for nearly all measured air pollutants. Since 1990, annual air pollution emissions in Minnesota have fallen by nearly half." "Today, most of our air pollution comes from smaller, widespread sources … the rest comes from a wide variety of things we use in our daily lives: our vehicles, local businesses, heating and cooling, and yard and recreational equipment" (Figure 15).[159]

The nearest air quality monitor to the project is in Rochester, Minnesota. Air quality in the area has been considered "good" between 292 and 325 days of the year from 2017-2021. During the same time period, the number of days classified as moderate occurred varied between 40 and 69. Air quality was considered unhealthy for sensitive groups on one day in 2020 and two days in 2021., with zero days classified as unhealthy or very unhealthy. [160]

Figure 15. Air Pollution Sources by Type



[159] MPCA. *The Air We Breath: The State of Minnesota's Air Quality 2017*. https://www.pca.state.mn.us/sites/default/files/lraq-1sy17.pdf, pp. 4- 5.

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

Potential Impacts

Minimal intermittent air emissions are expected during construction of both the solar generating facility and the transmission line. 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. Once operational, neither the generating facility nor the transmission line will generate criteria pollutants or carbon dioxide.

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.

All projects that involve movement of soil, or exposure of erodible surfaces, generate some type of fugitive dust emissions. The project will generate fugitive dust from travel on unpaved roads, grading, and excavation.

Power lines produce ozone and nitrous oxide through the corona effect—the ionization of air molecules surrounding the conductor. Ozone production from a conductor is proportional to temperature and sunlight and inversely proportional to humidity. These compounds contribute to smog and adverse health effects.[161] Minnesota has an ozone standard of 70 parts per billion (ppb) measured over a daily eight-hour average of the three-year average of the annual fourth-highest daily maximum.[162] The national ozone standard is 0.070 ppm over a 3-year average of the annual fourth-highest daily maximum eight-hour average concentration.[163] Ozone and nitrous oxide emissions are anticipated to be well below these limits.

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.

Mitigation

Exhaust emissions can be minimized by keeping vehicles and equipment in good working order, and not running equipment unless necessary.

Watering exposed surfaces, covering disturbed areas, 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 to mitigate against fugitive dust emissions. Several sections of the draft site and route permits indirectly mitigate impacts to air quality, including sections related to soils, vegetation removal, restoration, and pollution and hazardous wastes.

---

[161] EPA. *Ozone Pollution*. https://www.epa.gov/ozone-pollution.
[162] Minnesota Rule. part. 7009.0080.
[163] U.S. EPA. *National Ambient Air Quality Standards.* https://www.epa.gov/criteria-air-pollutants/naaqs-table.

4.7.2 Geology and Groundwater

The ROI for geology and groundwater is the land control area. Because of the presence of karst in the project area, there is potential for both direct and indirect impacts to groundwater because of construction and operation of the project. Direct and indirect impacts are anticipated to be minimal to moderate. Impacts can be mitigated through adherence to BMPs for construction in karst areas and BMPs for stormwater management.

The Geotechnical Engineering Report (Geotech Report) prepared for the project states that the site is underlain by the bedrock Stewartville Formation, which has known karst features and includes limestone bedrock in the ROI. The western portion of the project was mapped within an area noted to have carbonate bedrock underlying more than 50 feet of sediments and the eastern portion with carbonate bedrock underlying less than 50 feet of sediments. Areas where 50 feet or less of unconsolidated material overly bedrock are more prone to karst feature development on the land surface and where karst conditions are likely present in the subsurface.

The DNR describes karst as "terrain with distinctive landforms and hydrology created primarily from the dissolution of soluble rocks. It is characterized by sinkholes, caves, springs, and underground drainage dominated by rapid conduit flow. Karst allows a direct, very rapid exchange between surface water and groundwater and significantly increases groundwater contamination risk from surface pollutants."[164] It is mainly, but not exclusively, formed on limestone. In Minnesota, karst topography is generally found in the southeastern portion of the state.

Based on the borings for the study, the depth to bedrock ranges from approximately three to 18.5 feet below grade. The more shallow bedrock is concentrated in the southern portion of the solar facility, particularly in the southeastern portion of the facility north of 670th Street, and at the extreme southwestern corner of the solar facility. The Geotech Report and DNR Karst database identified three sinkholes in the southeastern portion of the solar facility site, but the Report did not identify significant depressions. No additional sensitive geologic features (e.g. shallow limestone formations of unconfined or shallow aquifers) in the vicinity of the project were identified.

The Project is located in the Karst Groundwater Province, which is characterized by "thin glacial sediments overlying thick and extensive bedrock (carbonate and sandstone) prone to karst features such as solution conduits, sinkholes, and caves."[165] In this province, groundwater is typically derived from bedrock aquifers below the glacial sediment cover. Groundwater is generally readily available, but water quality is susceptible to pollution from surface activity due to karst and bedrock propensity to be near the surface generally causing rapid vertical transmission of water. This means that the Project area is generally expected to have high groundwater pollution sensitivity where contaminants from the land surface could reach groundwater in less than a month.

The Report identified shallow groundwater at depths of 3.7 to 23.6 feet throughout the project area.[166] Consistent with the relatively shallow groundwater found in glacial terrains with interbedded outwash seams typical of the project area, most of the indications of groundwater are shallower than

[164] DNR. Minnesota Regions Prone to Surface Karst Feature Development. (2016). http://files.dnr.state.mn.us/waters/groundwater_section/mapping/gw/gw01_report.pdf

[165] Joint Application, at p. 101, DNR. 2001. Groundwater Provinces. https://www.dnr.state.mn.us/groundwater/provinces/index.html.

[166] Joint Application, at p. 103

10 feet below grade, with several of the Report's readings indicating groundwater shallower than 5 feet below grade.

The Minnesota Department of Health (MDH) maintains the Minnesota Well Index (MWI), which provides basic information (e.g., location, depth, geology, construction, and static water level) for wells and borings drilled in Minnesota.[167] The MWI identifies nine domestic wells or boreholes within the solar facility boundary; six of these records are sealed boreholes and three are listed as active domestic wells.[168] There are no MWI records within either route alternative.

All drinking water used by cities, businesses, residents, and farms in the surrounding area comes from wells accessing groundwater aquifers. Dodge County has identified preserving groundwater quality as a priority of its water management plan.[169]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"[170]. There are no wellhead protection areas within the ROI. The nearest wellhead protection areas are in Kasson, approximately 0.8 miles northwest of the solar facility and in Byron, approximately one mile east of the nearest Project boundary.[171]

POTENTIAL IMPACTS

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 or groundwater usage. Indirect impacts could occur through spills or leaks of petroleum fluids or other contaminants that contaminate surface waters which could ultimately contaminate groundwater. The concern with groundwater contamination in karst areas is that due to permeability any contamination on the surface or in the shallow groundwater can quickly migrate from the surface to the aquifer even if construction activities are confined to areas above the aquifer. Due to the Red Route's proximity to identified active karst features, construction of the alternate substation location and transmission structures in the southern-most area of the Red Route has an increased potential for groundwater contamination.

PV arrays will be installed on direct-embed pier foundations with a depth of approximately five to 12 feet below the soil surface and transmission structures will be installed on direct-embed or concrete pier foundations with a depth of approximately 20 to 30 feet below the soil surface. Depending upon the subsoil strength, location, deeper foundations or structural fill may be required at some locations to ensure stability of the project infrastructure.

PV foundations and transmission structures in areas with shallow bedrock (more likely to occur in the southeastern and southwestern portions of the solar facility site) may require concrete foundations

---

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

[168] Joint Application, at p. 101

[169] Dodge County, *Dodge County Comprehensive Plan*, at p. 48 https://cms4files.revize.com/dodgecountymn/Comprehensive%20Plan%20Final%20Adopted%20Version.pdf

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

[171] Joint Application, at p.102.

instead of driven piers.[172] Transmission structures along the Red Route are more likely to require concrete pier foundations due to the potential for shallow bedrock. If concrete foundations are used, some portion of the soluble components of the cement paste might leach into groundwater prior to the setting and hardening of the concrete. This will change the pH of groundwater around the surface of the concrete but should not extend far from the foundation.[173]

Because of the shallow water table in areas of the project, dewatering may be required during construction. The Geotech Report recommended a dewatering system using a sump and pump to discharge to the surrounding surface to allow infiltration back into the ground.[174] Project structures as proposed in the Geotech Report are generally situated a suitable distance from areas of moderate sloping which are near large drainage features.

Although design is not yet finalized, Byron Solar will likely install a well at the O&M facility to provide water for drinking and sanitary services for approximately four employees. If installed, water draw would be similar to a single family residence. [175]

MITIGATION

Stormwater management is important to ensure that structure foundations maintain their integrity and that rainwater and surface runoff drain away from the project structures and roads 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 multiple stormwater ponds, will address drainage from the newly established impervious areas.

Because the project will disturb more than one acre, Byron Solar 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, Byron Solar will also develop a Stormwater Pollution Prevention Plan (SWPPP) that describes construction activity, temporary and permanent erosion and sediment controls, BMPs, permanent stormwater management that will be implemented during construction and through the life of the project. Implementation of the protocols outlined in the SWPPP will minimize the potential for soil erosion and detail stormwater management methods during construction and operation of the facility. Section 4.3.11 of DSP (**Appendix C**) and Section 5.3.7 of the DRP (**Appendix D**) require permittees to obtain a MPCA CSW Permit and implement the BMPs within for erosion prevention and sediment control. Impacts to groundwater can also be minimized by mitigating impacts to and soils and surface waters as discussed in Sections 4.7.3 and 4.7.4.

Any new wells require notification to MDH and would be constructed by a well borer licensed by MDH. If any previously unmapped wells are discovered, Byron Solar will cap and abandon the well in place in accordance with MDH requirements.

---

[172] Joint Application, at p. 100

[173] See Department of Commerce (May 14, 2018) *Potential Human and Environmental Impacts of the Freeborn Wind Transmission Line Project,*: https://mn.gov/eera/web/project-file?legacyPath=/opt/documents/34748/1%20Text%20Figures%20Tables.pdf , pp. 66-67.

[174] Joint Application, at p. 103

[175] Joint Application, at Table 2

If dewatering of more than 10,000 gallons per day or 1,000,000 gallons per year, a Water Appropriations Permit from DNR is required.

Consistent with the recommendations of the Geotech Report to use multiple smaller stormwater ponds rather than a centralized pond, Byron Solar's preliminary design anticipates 38 stormwater ponds. Dispersing stormwater ponds throughout the facility and away from karst features to the extent possible, minimizes the risk for a karst-related failure. The CSW Permit requires ponds to be located more than 1,000 feet upgradient or 100 feet downgradient away from active karst. The CSW Permit recommends, but does not require, a contingency plan for cases where karst features open up and impact a pond will be created. The Geotech Report's boring results will allow Byron to design runoff to disperse via vegetated drainways around the site, and ultimately infiltrate in BMPs constructed in stable zones away from karst.

Byron Solar has stated its intention to further investigation and evaluation of geology and karst as project design is finalized. Because the karst mapping indicated some level of karst risk for the three sinkholes, the Geotech Report recommended an exclusion zone for PV arrays be considered during design concepts. Generally, a minimum 150-foot radius buffer can be used from the edges around the potential karst features to reduce the risk of karst potential for the solar arrays. In areas where further investigation indicates that the size, extent or nature of the karst feature is not conducive to remediation, Byron Solar states it will move infrastructure out of the area surrounding the karst feature and preclude construction activity from a 100-150-foot buffer around the feature.

If Byron Solar determines through further investigation that remediation is possible or preferable, Byron Solar will:

- Close the feature using grouting, reverse graded filters, or an inverse aggregate graded filter. Selection of the preferred method will be specific to each feature.
- Grade the area around the remediated feature to prevent surface ponding and water infiltration to limit future subsidence of the feature. Other stormwater features, such as drain tile may be implemented as well.
- Incorporate the MPCA's stormwater best management practices for use in karst settings.[176]

The DSP (at Section 5.1) and DRP (at Section 6.4) proposes special conditions requiring the permittee to file a geotechnical investigation report prepared by a third-party geotechnical engineer or authorized representative. The report should include methodology, results, and conclusions drawn from the geotechnical investigation with recommendations on project design and construction. The special conditions also preclude construction activity or placement of project infrastructure within 150 feet of active karst features.

4.7.3 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

[176] MPCA. 2009. Minnesota Stormwater Manual: Structural BMP Use in Karst Settings. https://stormwater.pca.state.mn.us/index.php/Structural_BMP_use_in_karst_settings

facility will be covered with native perennial vegetation for the life of the project, soil health is likely to improve.

The soils deposited in the area are characteristic of glacial and post glacial activity and are listed in Table 18 and Table 19. The soils in the area of land control are generally fine-loamy and loamy soils. Soils at the solar facility are classified as predominantly low to moderate for erodibility. Topsoil in the project area may reach depts of up to 36 inches. Soils listed as predominantly hydric (Tripoli clay loam, Clyde silty clay loam, and the Coland-Spillville complex) are scattered throughout the Project location. Wetlands are associated with some of these areas, while other areas are tiled for drainage.[177] Approximately 96 percent of the solar facility is classified as prime farmland or prime farmland if drained. Impacts to prime farmland are discussed in Section 4.5.1

Table 18. Soil Types in Solar Facility Land Control Area

Soil Type	Acres	%	Soil Type	Acres	%
Readlyn silt loam, 1-3% slopes	437	24	Winneshiek silt loam, 6 – 12% slopes, moderately eroded	40	2.2
Kasson silt loam, 2- 6% slopes	368	20.4	Coland-Spillville complex, 0-2% slopes, flooded	55	0.7
Tripoli clay loam, 1-2%` slopes	254	14.3	Mantorville Loam 6-12% slopes, moderately eroded	11	0.6
Marquis silt loam, 1 – 3% slopes	231	12.9	Nasset-Winneshiek complex, 12-18% slopes, moderately eroded	8	0.5
Clyde-Floyd complex, 1 – 4 % slopes	178	9.9	Barremills silt loam drainageway, 1-5% slopes, occasionally flooded	3	0.2
Winneshiek silt loam, 2 – 6% slopes	106	5.9	Mantorville Loam 2-6% slopes	2	0.1
Clyde silty clay loam, 0 – 3% slopes	75	4.2	Bassett-Kasson complex, 6-12% slopes, eroded	1	0.1
Oran silty clay loam, 1 – 4% slopes	74	4.1			
			Total (rounded)	1795.2	100.00

Source: SSURGO

Table 19. Soils within Transmission Line Routes

Blue Route (53 acres)		Red Route (x acres)	
Soil Type	**%**	**Soil Type**	**%**
Readlyn silt loam, 1-3% slopes	23.9	Rockton loam, 1 to 6 percent slopes	17.4
Tama-Dinsmore complex, 2-3% slopes	16.5	Port Byron silt loam, 2-6 % slopes	13.0
Marquis silt loam, 1 – 3% slopes	15.3	Clyde silty clay loam, 0-3 % slope	8.4
Clyde-Floyd complex, 1 – 4 % slopes	11.7	Atkinson loam, 0-1 % slopes	8.0
Tripoli clay loam, 0-2%` slopes		Floyd silt loam, 1-4 % slopes	7.6
Garwin silty clay loam	6.7	Otter silt loam, channeled	4.6
Port Byron silt loam, 2-6% slopes	5.7	Racine silt loam, 1-6 % slopes	3.9
Joy-Ossian, 1-5% slopes, occasionally flooded	4.3	Kato silty clay loam, depressional	3.8

[177] Joint Application, pp. 104-105.

Port Byron silt loam, 6-12% slopes, moderately eroded	1.8	Rockton loam, 6 to 12 percent slopes	3.4
Port Byron silt loam, 0-2% slopes,	1.8	Joy silt loam, 1-4 % slopes	3.4
Joy silt loam, 1-4% slopes	1.8	Terril loam, sandy substratum, 1-6 % slopes	2.7
		Garwin silty clay loam	3.4
Total		Kasson silt loam, 1-4 % slopes	2.1
		Tripoli clay loam, 0-2 % slopes	1.9
		Racine silt loam, 6-12 % slopes	1.8
		Waucoma loam, 2-6 % slopes	1.4
			86.8

Source: SSURGO

POTENTIAL IMPACTS

The impact intensity level is expected to be low to moderate. Primary impacts to soils include compaction from construction equipment, soil profile mixing during grading and pole 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. Potentials impacts will be 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 would be covered with native perennial vegetation for the operating life of the project, soil health would likely improve over the operating life of the project.

Construction of the solar facility will disturb approximately 1,550 acres within the land control area. Of this, about 997 acres will be graded, which consists of cutting and filling earth in targeted areas to provide a level and stable base for the project substation, O&M building, access roads, and spot grading at select solar array and inverter skid locations. Significant impacts to topography, such as the creation of abrupt elevation changes or modifications to natural drainage patterns, are not expected. Most of the solar facility site's topography will remain within two feet of current elevations.

Topsoil depth varies throughout the site, but most of the solar facility site and land within the area of site control is characterized by Mollisols and Alfisols with topsoil depths of greater than 12 inches. Grading and excavating will separate the first 12 inches of topsoil, which will be stored on site and replaced when construction is completed. Approximately 35 miles of underground collector and communication lines will be installed in trenches or conduits at least 4 feet below the surface.[178] Impacts from the transmission line are primarily located at and near the location of the transmission structures. Some soil mixing may occur during the installation of the transmission structures.

As with any ground disturbance, there is potential for soil compaction and erosion. Heavy rainfall events during construction or prior to establishment of permanent vegetation, increase the risk that significant sedimentation and erosion could occur. Inadvertent disturbance of drain tile from construction activities could disrupt existing drainage.

[178] Joint Application, at pp. 36, 106, Appendix D (Draft AIMP), at pp. 6, 13, 18, **Appendix E**, response to Question 6

Soil cover and management at the solar facility will change from cultivated cropland to a mixture of and pervious areas with native groundcover plantings and approximately 233 acres of impervious surfaces.[179] Once permanent vegetation is properly established, stormwater management, as well as general soil health, might improve due to use of native plants. The location and amount of stored topsoil will be documented to facilitate re-spreading of topsoil after decommissioning. These benefits could extend beyond the life of the project if they are preserved through decommissioning practices, and if the site is returned to agricultural use. Soil cover along the transmission route will not change significantly, although approximately 0.2 acres of trees would be removed if the Red Route is selected.

Impacts to prime farmland are discussed in Section 4.5.1.

MITIGATION

Several sections of the DSP (**Appendix C**) and DRP (**Appendix D**) address soil-related impacts

- Section 4.3.9 of the DSP requires protection and segregation of topsoil;
- Section 4.3.10 of the DRP requires measures to minimize soil compaction;
- Because the project will disturb more than one acre, Byron Solar 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, Byron Solar will also develop a Stormwater Pollution Prevention Plan (SWPPP) that describes construction activity, temporary and permanent erosion and sediment controls, BMPs, permanent stormwater management that will be implemented during construction and through the life of the project. Section 4.3.11 of DSP (**Appendix C**) and Section 5.3.7 of the DRP (**Appendix D**) 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 4.3.17 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. Byron Solar has included a draft AIMP as Appendix D of its joint application.
- Section 4.3.18 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. While this has been required for solar site permits, it is also frequently included as a special condition in route permits issued by the Commission and is included as a special condition in Section 6.1 of the DRP. Byron Solar has included a draft VMP as Appendix E of its joint application.

4.7.4 Surface Water

The ROI for surface water resources is the land control area. The impact intensity level 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, of a small size, and localized. Impact can be mitigated.

[179] **Appendix E**, response to Question 8

The project is in the Zumbro River Watershed Basin.[180] Although there are several intermittent streams and drainage ditches in the area, there are no public waters in the solar facility site or the Blue Route. The Red Route crosses two public waters - Cascade Creek just south of U.S. Highway 14, and an unnamed creek between County Road 25 and 15th Street Southwest. Public waters are 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.[181]

Salem Creek, located approximately one-quarter mile south of the solar facility, is identified by MPCA as impaired for aquatic recreation and portions are impaired for aquatic life and invertebrate bioassessments. An unnamed stream located approximately one-half mile southeast of the solar facility is also identified as impaired for aquatic recreation. Both water bodies have Total Maximum Daily Load (TMDL) restrictions for fecal coliform.

Portions of five streams/waterways were delineated in the field delineation of the solar facility and Blue Route conducted in October 2020 and April 2021.[182] Waters within the Red Route have not been field delineated, but a GIS review indicates the Red Route crosses two watercourses.

Potential Impacts

The project is designed to avoid direct impacts to surface waters by avoiding placement of project components such as access roads, solar arrays, inverters, or transmission structures in surface waters.

Construction of the project creates a potential for indirect impacts if sediment or fugitive dust created by excavation, grading, vegetation removal, and construction traffic reaching 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.

Project design includes the installation of approximately 38 stormwater ponds to manage stormwater runoff to nearby surface areas.

Several sections of the DSP (**Appendix D**) and DRP (**Appendix E**) address potential impacts to surface waters:

- Section 4.3.11 of the DSP and Section 5.3.7 of the DRP 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. 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. Byron Solar will also develop a Stormwater Pollution Prevention Plan (SWPPP) that complies with MPCA rules and guidelines. The SWPPP describes

[180] MPCA, https://www.pca.state.mn.us/water/watersheds/zumbro-river
[181] Public waters are defined in Minnesota Statute 103G.005, subdivision 15
[182] Joint Application, at p. 111 and Appendix K.

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 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".
- Section 5.3.8 of the DRP requires several measures to minimize impact to surface waters including: requiring transmission structures to span watercourses where possible, assembly of transmission structures on upland areas before transporting to the site for installation, no staging or stringing set up areas within or adjacent to riparian areas, and requiring that soil excavated from the riparian areas be contained and not placed back into the riparian area.

In addition to the above-listed strategies, the Advisory Task Force recommended preparation of a hydrologic study for an area that extends beyond the solar facility site and transmission route.

4.7.5 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 wetland to be indirectly affected, direct impacts are not expected. These impacts will be short-term, of a small size, and localized. Impact 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.[183]

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 impacts 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 in turn affect wetland functionality.

In a wetland delineation survey performed in October 2020 and April 2021, 22.10 acres were delineated for the solar facility.[184] Because wetlands in the Red Route have not been field delineated, this report uses the National Wetland Inventory for Minnesota (NWI-MN) to allow for comparison between the routes (Table 20). The NWI-MN is a publicly available GIS database that provides information on the location and characteristics of wetlands in Minnesota. The inventory is a 2008 update of the USFWS National Wetlands Inventory that was completed for Minnesota in the 1980s. Wetlands listed on the NWI-MN may be inconsistent with local wetland conditions; however, the NWI-MN provides an accurate and readily available database of wetland resources within the Project area that can be used to compare wetlands at the solar facility and both routes.

[183] USEPA. 2022. *What is a Wetland* https://www.epa.gov/wetlands/what-wetland
[184] Joint Application, at p. 111 and Appendix K, Wetland Delineation Report.

Table 20. NWI-MN Wetlands[185]

Wetland Type	Acres			
	Solar Facility	Blue Route	Red Route	
		Route Width/ROW	Route Width	Anticipated ROW
Freshwater Emergent Wetland	26.0	0.7	10.0	2.7
Freshwater Forested Wetland	0.8	--	0.7	0.2
Freshwater Pond	0.3	--	--	--
Freshwater Shrub Wetland	0.7	--	3.9	1.8
Total	27.8	0.7	14.6	4.7

POTENTIAL IMPACTS

Although there are approximately 26 acres of wetland identified within the solar facility, he preliminary site layout for the solar facility avoids locating solar arrays and associated facilities in wetlands. There may be potential for temporary, short-term impacts to wetlands to occur during installation of the electrical collection lines and temporary access roads. Both routes cross wetland areas, approximately 0.7 acres in the Blue Route and 4.7 acres in the Red Route. The larges wetland crossing is approximately 670 feet, which allows for the wetland to be spanned given the anticipated spans of up to 974 feet.

MITIGATION

Portions of the DSP (**Appendix C**) and DRP (**Appendix D**) address impacts to wetlands:

- 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.
- Section 5.3.8 of the DRP requires several measures to minimize impact to wetlands including minimizing travel through wetlands by using the shortest route possible, requiring transmission structures to span wetlands to the extent possible, assembly of transmission structures on upland areas before transporting to the site for installation, no staging or stringing set up areas within or adjacent to wetlands, construction in wetland areas during frozen ground conditions where possible and use of mats in wetland areas if winter construction is not feasible. This condition also requires that soil excavated from the wetlands be contained and not placed back into the wetland area.

4.7.6 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 of the solar facility can be mitigated through development of a VMP. The transmission line will not result in significant impacts to vegetation.

[185] DNR. *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

Prior to European settlement vegetation in the project area was primarily bur oak savanna, with areas of tallgrass prairie and maple-basswood forest also present. Few remnants of pre-settlement vegetation remain.[186] 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. There is no mapped native prairie within the land control area.[187]

The National Land Cover Database provides "spatial reference and descriptive data for characteristics of the land surface" nationwide.[188] The land cover within the proposed solar facility site (Table 21, **Appendix B**) is dominated by cultivated agriculture, with scattered areas of pasture and developed areas around farmsteads.

Table 21. Land Cover – Solar Facility

Category	Acres	Percentage
Developed, Open Space	10.5	0.6%
Developed, Low Intensity	10.8	0.6%
Developed, Medium Intensity	2.7	0.2%
Deciduous Forest	2.0	0.1%
Herbacious	13.5	0.8%
Hay/Pasture	14.3	0.8%
Cultivated Crops	1741.0	97.0%

Agriculture also dominates the landcover for both route alternatives (Table 22),

Table 22: Land Cover - Routes

Category	Blue Route		Red Route			
	Route Width/ROW		Route Width		Anticipated ROW	
	Acres	%	Acres	%	Acres	%
Developed, Open Space	0.5	1.0%	4.6	1.9%	1.2	1.48%
Developed, Low Intensity	0.8	1.6%	6.1	2.5%	1.9	2.38%
Developed, Medium Intensity	0.9	1.9%	3.1	1.3%	0.8	1.06%
Deciduous Forest	0.0	0.0%	1.0	0.4%	0.2	0.31%
Herbaceous	0.0	0.0%	2.2	0.9%	0.5	0.58%
Hay/Pasture	0.8	1.6%	12.5	5.1%	3.0	3.77%
Cultivated Crops	45.7	93.9%	203.6	83.8%	69.0	86.72%
Woody Wetlands	0.0	0.0%	0.2	0.1%	0.0	0.0%
Emergent Herbaceous Wetlands	0.0	0.0%	9.4	3.9%	2.9	3.70%
Total	48.7	100%	242.8	100%	79.5	100%

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

[187] Joint Application, at p. 116.

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

Potential Impacts

Tall growing woody vegetation in the land control area at both the solar facility and the transmission ROW will be removed. Construction of the solar facility will eliminate vegetative cover and create impermeable surfaces at access roads, project substation, operation and maintenance building, and parking lot. 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 DNR will be used at the solar facility. Once established, vegetation would most likely be maintained by mowing, although grazing may also be used.

Both the Blue Route and the Red Route are located primarily on agricultural fields. The Blue Route does not contain significant areas of trees or woody vegetation. The Red Route would require removal of approximately two acres of trees in two areas west of the Dodge/Olmsted County line. Once construction is complete, Byron Solar will re-establish the ROW to pre-construction conditions.[189]

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

Mitigation

Several sections of the DSP (**Appendix C**) and DRP (**Appendix D**) address impacts to vegetation:

- Section 4.3.17 of the DSP requires the permittee to develop a vegetation management plan (VMP) in coordination with state agencies and to file the VMP prior to construction. While this has been required for solar site permits, it is also frequently included as a special condition in route permits issued by the Commission and is included as a special condition in Section 6.1 of the DRP. The applicant has prepared a draft VMP as Appendix E of the joint application 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.

[189] Joint Application, at p. 44

    - 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. Byron Solar has included a draft AIMP as Appendix D of its application.
- Section 4.3.15 of the DSP and Section 5.3.9 of the DRP 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.

4.7.7 Wildlife and Habitat

The ROI for non-avian wildlife and their habitats is the land control area, the ROI for birds is the local vicinity. Potential impacts may be positive or negative and are 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 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). of the Landscape types and vegetation communities vary throughout the local 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. These species include white-tailed deer, red fox, striped skunk, raccoon, Virginia opossum, coyote, garter snake, and a variety of insects including native bees, butterflies, and moths. Due to the lack of water resources in the project area and vicinity, waterfowl and shorebirds are not common in the area.[190]

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.

Non-Avian 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.

[190] Joint Application, at p. 117

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.[191] 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.[192] Predators can use fences to corner and kill prey species.[193]

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.[194]

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. Revegetating the site with pollinator friendly species will also benefit these species.

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".[195] 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 the danger is this appearance of water causing migrating birds to attempt to land, consequently incurring trauma and related predation.[196]

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. Although the propensity for electrocution is influenced by a combination of factors, transmission design is an important factor. The design factor of greatest importance is the "physical separation between energized and/or grounded structures, conductors, hardware, or equipment that can be bridged by birds to complete a circuit. Generally, electrocution can occur on structures with the following:

- Phase conductors separated by less than the wrist-to-wrist or head-to-toe distance of a bird;

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

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

[193] 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.

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

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

[196] 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

- Distance between grounded hardware (for example, grounded wires, metal braces) and any energized phase conductor that is less than wrist-to-wrist or head-to-foot distance of a bird."[197]

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

The incidence of birds colliding with transmission lines is also influenced by the number of horizontal planes in which the conductors are strung. Stringing the conductors in a single horizontal plane presents less of a barrier to birds crossing the transmission line ROW. A single horizontal plane, however, generally requires a wider structure (H-frame structure). Conversely, stringing the conductor wires in two or more planes creates a greater barrier to birds attempting to fly, not only across the lines, but over and potentially between them (monopole structure).

Habitat There are no DNR Wildlife Management Areas, Aquatic Management Areas, Sites of Biodiversity Significance, or Scientific and Natural Areas; or USFWS Waterfowl Production Areas within the local vicinity. The row crop habitat at the solar facility being converted 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 up to three times yearly, which might limit nesting opportunities, etc. Overall, the project does not contribute to significant habitat loss or degradation or create new habitat edge effects.

MITIGATION

Several sections of the DSP (**Appendix C**) 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.
- Section 5.2 is a special condition that requires use of wildlife-friendly erosion control.

Section 5.3.15 of the DRP (**Appendix D**) requires the permittee to coordinate with DNR on the placement of avian flight diverters. This section also requires the line to be designed using best

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

management practices for conductor spacing and shielding as codified in Avian Power Line Interaction Committee standards. Section 6.4 is a proposed special condition that requires use of wildlife-friendly erosion control.

Other potential mitigation measures include:

- Siting facilities away from wildlife movement corridors can avoid or minimize impacts to wildlife movement.
- Checking open trenches and removing any wildlife caught in trenches before backfilling mitigates impacts.
- Once permanent vegetation is established, restricting mowing from April 15 to August 15 will improve the potential for ground nesting habitat.

4.7.8 Rare and Unique Resources

The ROI for rare and unique resources is the local vicinity. The impact intensity level is anticipated to be minimal. Impacts could be both short and long term and could be positive (e.g., through introduction of habitat), or negative (e.g., by removing trees during breeding season). Impacts can be mitigated.

The Minnesota DNR classifies rare plant or animal communities across the state. These include Scientific and Natural Areas, High Conservation Value Forest, Minnesota Biological Survey (MBS) Native Plant Communities, and MBS Sites of Biodiversity Significance. No rare plant or animal communities have been identified within the project boundary.

The Division of Ecological and Water Resources within DNR manages the Natural Heritage Information System (NHIS), "provides information on Minnesota's rare plants, animals, native plant communities, and other rare features. The NHIS is continually updated as new information becomes available and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. Its purpose is to foster better understanding and conservation of these features."[198]

NHIS data includes federally endangered, threatened, or candidate plant species, and endangered or threatened animal species. The system also includes state endangered, threatened, or special concern species. The NHIS database a source of information, but not the sole source for identifying these resources, as some areas surveys have not been conducted extensively or recently making.

The EA does not map federal- or state-listed species found in the NHIS database, because DNR requires that public display of NHIS data either mask the identity or location of rare features due to the vulnerability of some species to exploitation. Moreover, the NHIS database masks the occurrence of rare species of by randomly incorporating their location into a larger polygon.

Northern Long Eared Bat

The Northern Long Eared Bat (NLEB) is a federally listed species and state listed species of concern. During the winter this species hibernates in caves and mines, and during the active season (approximately April-October) it roosts underneath bark or in cavities or crevices of both live and dead trees. The spread of white-nose syndrome across the eastern United States has become the major

[198] Department of Natural Resources (n.d.) *Natural Heritage Information System*, http://www.dnr.state.mn.us/nhnrp/nhis.html

threat to the species. Activities that might impact this species include, but are not limited to, any disturbance to hibernacula and destruction or degradation of habitat (including tree removal). No known hibernacula or maternity roost trees have been documented in Dodge or Olmsted counties and there are no documented species occurrences within or near the Project Area. While the Project Area is primarily agricultural lands with little forested habitat, the nearby landscape includes riparian corridors, indicating a moderate probability of NLEB occurrence within the Project Area.[199]

Rusty Patch Bumble Bee (Bombus affinis)

The rusty patch bumble bee is a federally-listed endangered species known to occur in Olmsted county.[200] Rusty patched bumble bees have been observed in a variety of habitats including prairies, woodlands, marshes, agricultural landscapes, parks and gardens. The species requires areas that provides nectar and pollen form a diverse array of flowers, undisturbed nesting sites in proximity to food source and overwintering sites for hibernating queens

Prairie Bush Clover (Lespedeza leptostachya)

Prairie Bush Clover is a federally and state listed threatened species endemic to tall grass prairies of the upper Mississippi River Valley. Remaining occurrences of the species are generally restricted to remnant prairies.[201] The primary threat to the species is habitat loss, land conversion, and encroachment of non-native and invasive species. There are no records of prairie bush clover or the required habitat within the project area and the probability of species occurrence within the Project Area is considered to be low due to the heavy agricultural use.[202]

Leedy's Roseroot (Rhodiola integrifolia ssp. Leedyi)

Leedy's roseroot is a federally listed threatened species known to occur in Olmsted County.[203]0 Other than the Minnesota population of Leedy's roseroot, the species is only found in a disjunct population in the state of New York. The Minnesota population are only found growing in crevices in maderate cliffs, which are characterized by constant presence of air cooled groundwater seepages on north facing dolomite cliffs. Leedy's roseroot habitat is always associated with karst topography and geology, because the air that cools the groundwater seepage, travels through underground air passages present in the karst.[204] The main threats to the Leedy's roseroot include development, cliff erosion, and contamination of seepage and groundwater. There are no records of Leedy's roseroot or the required habitat within the project area and the probability of the species occurring within the Project Area is considered low due to the relatively flat topography and heavy agricultural use.

Loggerhead Shrike (Lanius ludovicianus)

The Loggerhead shrike is a state-listed endangered species. Loggerhead shrike prefer large open prairie areas for hunting, and shrub thickets for nesting habitat. The loggerhead shrike's State threatened status was changed to endangered in 2013 by the DNR, this status change occurred after survey results showed a significant decline in the number of shrikes being observed in the State. Large,

---

[199] Joint Application, at p. 120

[200] USFWS. *Environmental Conservation Online System (ECOS)*.https://ecos.fws.gov/ecp/species/9383

[201] DNR, Rare Species Guide, https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=PDFAB27090 USFWS Website, Environmental Conservation Online System (ECOS). https://ecos.fws.gov/ecp/species/4458

[202] Joint Application, at pp. 121, 124

[203] USFWS Website, Environmental Conservation Online System (ECOS). https://ecos.fws.gov/ecp/species/285

[204] USFWS Website, Environmental Conservation Online System (ECOS). https://ecos.fws.gov/ecp/species/285)

open native prairie habitat in the State of Minnesota has declined significantly due to conversion to agricultural cropland. The species has been documented within one mile of the proposed solar facility.

Wood Turtle (Glyptemys insculpta)

The wood turtle is a state-listed threatened species. The wood turtle is largely aquatic, preferring small- to medium-sized, fast-moving rivers and streams with adjacent deciduous and coniferous forests. Wood turtles overwinter in rivers or streams, often sheltered areas in bank undercuts or near logjams, emerging and becoming active by late April. Hatchlings generally emerge from nests located in exposed sandbars, cutbanks, or other open well-drained areas in late August or September. A review of the NHIS database indicates a potential for the species along the southern border of the solar facility.[205]

POTENTIAL IMPACTS

Construction and operation of both solar facilities and transmission lines can impact rare and unique resources during construction and operation. Adverse impacts include the taking or displacement of individual plants or animals, invasive species introduction, habitat loss, reduced community size, and, for avian species, collision with conductors or electrocution.

Impacts to rare and unique resources are not necessarily adverse. In some cases, both solar sites and transmission line ROWs can be managed to provide habitat, for example, nesting platforms can be built on top of transmission structures for use by rare avian species and the introduction of native vegetation into a landscape otherwise dominated by cultivated row crops could create habitat for pollinators, such as the rusty patched bumble bee.

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

The preferred mitigation to avoid impacts to the Loggerhead Shrike is to avoid tree and shrub removal within suitable habitat during the April through July breeding season. If tree or shrub removal cannot be avoided during the breeding season, a qualified surveyor should inspect the trees/shrubs for active nests prior to removal. [206]

There are no known occurrences of prairie bush clover or leedy's roseroot in the project area. Construction activities will avoid Salem Creek and BMPs for soil erosion control and stormwater management will prevent runoff from impacting the creek that is a potential habitat for the wood turtle.

[205] Joint Application, Appendix C
[206] DNR Comment letter (eDocket ID: 20222-182833-01)

MITIGATION

Techniques for minimizing impacts to wildlife and vegetation also minimize impacts to rare species. Avoiding identified areas of species occurrence or preferred habitat is the preferred mitigation measure.

The DSP and DRP propose special conditions related to the NLEB and the Loggerhead Shrike.

- Section 5.3 of the DSP and Section 6.5 of the DRP require the permittee to comply with the USFWS guidance and requirements in effect regarding NLEB, including tree clearing restrictions if applicable.
- Section 5.4 of the DSP and Section 6.6 of the DRP require the permittee to avoid tree and shrub removal within suitable Loggerhead Shrike habitat during the April through July breeding season, and to coordinate with DNR if tree and shrub clearing will occur during the breeding season.to identify potentially suitable habitat and ensure that a qualified surveyor inspects the trees/shrubs for active nests prior to removal.

4.7.9 Climate Change

The project will help to shift energy production in Minnesota and the upper Midwest toward carbon-free sources. Construction emissions will have a short- term negligible increase in greenhouse gases that contribute to climate change. The project's design incorporates design 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.

Climate change refers to any significant change in measures of climate lasting for an extended period. 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 from the combustion of fossil fuels in construction equipment and vehicles.

Total GHG emissions for project construction are estimated to be approximately 5,080 tons of carbon dioxide (CO_2).[207] The project's construction emissions are an insignificant amount relative to Minnesota's overall emissions of approximately 161 million tons in 2018.[208]. Potential impacts due to construction GHG emissions are anticipated to be negligible.

Once operational, the project will generate minimal GHG emissions. Emissions that do occur would result from vehicle usage to and from the solar array and substation for maintenance and operation of the substation and switchyard. GHG emissions for project operation are estimated to be approximately 12 tons of CO_2 annually.[209]

[207] **Appendix E**, response to Question4.
[208] MPCA, *Greenhouse gas emissions data.* https://www.pca.state.mn.us/air/greenhouse-gas-emissions-data
[209] **Appendix E**, response to Question 4

In addition to GHG emissions from vehicles during operation, sulfur hexafluoride, a GHG, will be used at the substation. Small releases will occur as part of regular breaker operation and maintenance.[210] Potential impacts due to operational GHG emissions are anticipated to be negligible.

If electrical energy from the project displaces energy that would otherwise be generated by carbon-fueled power plants (e.g., coal, natural gas), the project could reduce GHG emissions by up to 307,563 metric tons of CO_2 annually.[211] Thus, compared to non-renewable energy generation, the project would be beneficial with respect to GHG emissions.

A warming climate is expected to cause increased flooding, storms, and heat wave events. These events, especially an increased number and intensity of storms, could increase risks to the project, e.g., storms and high winds could damage solar panels. 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 flooding. Flooding could damage the project's electrical collection system including inverters and collection wiring. Heat wave events could change demands on the electrical transmission and generation systems, especially as more indoor space is equipped with cooling systems. Because this is a solar project, it may improve the resiliency of the electrical transmission system by reducing the potential for peak overloads during heat wave events.

MITIGATION

Mitigation to reduce emissions during construction is discussed in the Air Quality section of this EA.

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.
- 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.

Byron Solar reports that it used a risk assessment tool to screen the site for the probability of extreme weather events such as hailstorms, flash flooding, wildfires, and tornados. The results from the screening informed the selection of the site, design and engineering of the facility, and equipment selection. Byron Solar has incorporated the following considerations into the project's design in order to minimize exposure to a warmer, wetter, and more energetic climate.

The PV foundations will be engineered to withstand sustained wind speeds of up to 110 miles per hour, with the ability to withstand higher gusts, and snow loading of up to 50 pounds per square foot. The highest recorded five-second wind speed in Rochester was 64 MPH in May of 1988.[212]

---

[210] **Appendix E**, response to Question 15c

[211] Joint Application, at pp. 3, 130. Applicant's calculations using the USEPA Greenhouse Gas Equivalencies Calculator

[212] DNR. *Minnesota Climate Summaries and Publications. Normals, Means, and Extremes for Major Airport Weather Stations – Rochester*. https://files.dnr.state.mn.us/natural_resources/climate/summaries_and_publications/2005_Annual_LCD_RST_page_3.pdf

Byron Solar states that it will incorporate local hydrology and topography into the site design. Depending upon the result of hydrology studies, the site design may require additions or improvements to the existing drain tile system to provide sufficient drainage.

PV panels are typically rated to withstand the National Weather Service's definition of severe hail (hailstones up to one inch in diameter and 50 mph winds), with some manufacturers providing even higher hail ratings. By re-orienting the trackers, panels can be stowed in a nearly vertical position, further limiting direct impacts from hail.

4.8 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 construction 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.
- Minor amounts of continued maintenance of tall-growing vegetation along the transmission line.

4.9 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.

4.10 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.

4.10.1 Displacement

Displacement can occur when residences or other buildings are located 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 from the site or ROW 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 site boundaries or ROWs to accommodate the proposed energy facility.

There are no residences, business, or structures such as barns or sheds located within the area of site control, and none will be displaced by the project. No mitigation is proposed.

4.10.2 Communications

Electronic interference from the proposed project is not anticipated. The project area is served by several AM and FM radio stations and more than 18 digital television channels. There are no radio, microwave, or television towers are located within the boundary of the solar facility. One cell phone tower associated with ALLTEL Corporation and AT& T Spectrum, LLC is located adjacent to the solar facility boundary. Cellular phone service in the service area is provided by national carriers Global Positioning System (GPS)

Electronic interference associated with communications 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 and Section 5.4.3 of the DRP require 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.

4.10.3 Implantable Medical Devices

Electromagnetic fields (EMF) 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.

4.10.4 Tourism

The project will have a negligible impact on tourism in Dodge and Olmsted counties. In 2020 the leisure and hospitality industry in Dodge County accounted for about $9.6 million in gross sales, and 358 private sector jobs; 2020 tourism generated approximately $384.6 million in gross sales and employed 7,685 in Olmsted County.[213] Tourist activities within the project area are largely related to the recreational activities discussed in Section 4.3.6, the Dodge County Fairgrounds, and Dodge County Speedway in nearby Kasson, and the healthcare services in nearby Rochester. Various sections of the DSP and DRP 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.

4.10.5 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.

4.10.6 Mining

There is one gravel pit and three rock quarries (two of which appear to be active) within one mile of the solar facility.[214] Through sale of lease of the land used for the solar facility, the current landowners choose energy production as the higher and greater economic use.

There are no gravel pits or rock quarries within the ROW of either transmission route.

Construction of the project will require the use of sand and aggregate for backfill and access roads. The demand for sand and gravel will be temporary and is not expected to require new or expanded sand or aggregate operations.

Impacts to mining will not occur and no mitigation is proposed.

4.10.7 Floodplain

Floodplains prevent flood damage by detaining debris, sediment, water, and ice. The Federal Emergency Management Agency (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.

[213] Explore Minnesota (n.d.) *Tourism and Minnesota's Economy*, retrieved from: https://mn.gov/tourism-industry/research/tourism-and-the-economy.jsp.

[214] Joint Application, at p. 96

According to FEMA, the flood risk index for the project area is relatively low to relatively moderate.[215] The solar facility site is outside of the 100-year Federal Emergency Management Agency (FEMA) flood zone.[216] Both transmission routes cross the 100-year flood plain associated with Cascade Creek.

The project will not significantly impact FEMA-mapped floodplains and no mitigation is proposed. While the solar facility is located completely outside of mapped FEMA flood zones, a handful of transmission structures along the Blue Route are potentially located within the 100 year floodplain. The presence of the transmission structures will not impact the function of the floodplain. Dodge County restricts structures within its Flood Overlay Zone. Inconsistencies with local land use controls are discussed in Section 4.3.3

4.11 Cumulative Potential Effects

Cumulative potential effects result from the incremental effects of a project in addition to other projects in the environmentally relevant area.

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.

4.11.1 Analysis Background

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

Cumulative potential effects are impacts to the environment that results from "the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects actually planned or for which a basis of expectation has been laid, regardless of what person undertakes the other projects or what jurisdictions have authority over the projects."[217]

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.

[215] FEMA, National Risk Index, https://hazards.fema.gov/nri/map.
[216] Joint Application, at p. 114
[217] Minn. R. 4410.0200, subp. 11a

Commerce staff contacted local governments to identify foreseeable projects. No relevant projects were found on the Environmental Quality Board's interactive project database. Foreseeable projects are identified in Table 23.

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.

Table 23. Current and Reasonably Foreseeable Future Projects

Project	Location	Anticipated Timeframe	Description
Dodge County Wind Project and associated	Dodge and Steele Counties, southwest of Dodge Center	2024?	200 MW wind generation project application submitted to Commission, project under review
Dodge County Wind 161 kV transmission line	Dodge and Mower Counties	2024	161 kV transmission line application submitted to Commission, under review
US Highway 14	Dodge Center to Owatonna	2022	Four land expansion
	Between Byron and Rochester	2022- 2023	Intersection improvements
	East of Highway 56 in Dodge Center to west of CR 5 in Byron	2024	Resurfacing
	Dodge Center and Kasson	2024	Reduced conflict intersection at CR 9 and installation of high-tension median barrier
CSAH 5	Between CSAH 25 and US Highway 14	2024	Reconstruction
Highway 57	CR 34 and 11th St NE	2022 - 2023	Improvements, including roundabout
	South Branch Middle Fork Zumbro Bridge to 9th Street in Mantorville	2024	Reconstruction
Quarry Sun Solar	Mantorville Township	2022	1 MW Community Solar Project

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

4.11.2 Human Settlement

Cumulative potential effects on human settlements are anticipated to be minimal to moderate. Some projects would have positive effects on human settlements by improving transportation and safety. Future projects will result in aesthetic impacts. As the anticipated transportation projects are largely improvements in existing roadways, aesthetic impacts are anticipated to be minimal. The Byron Solar

Project will also result in aesthetic impacts (Section 4.3.1). New wind turbines, solar facilities, and transmission lines introduce new visual elements into the landscape. Thus, aesthetic impacts will increase in the project area as a result of foreseeable projects. Construction the Byron Solar Project and the other identified projects 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.

4.11.3 Public Health and Safety

Cumulative potential effects on public health and safety are anticipated to be minimal to slightly positive. Impacts on public health and safety as a result of the Byron Solar Project are anticipated to be minimal (Section 4.4). Most of the projects foreseen in the project area are road and highway related. They are being undertaken to maintain and improve local roads to ensure their safe operation and the public's health and safety

4.11.4 Land-based Economies

Cumulative potential effects on land-based economies are anticipated to be minimal. Most of the projects in the foreseeable future are improvements to existing roadways the impact to current land use is expected to be negligable. Additional energy infrastructure will likely result in some removal of agricultural land from production, but overall impacts to agricultural land in the project area will be minimal.

4.11.5 Archaeological and Historical Resources

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

4.11.6 Natural Resources

Cumulative potential effects on the natural environment are anticipated to be minimal. Most of the foreseeable projects are in cultivated agricultural areas or along roadways. Impacts are limited along roadways by the use of existing infrastructure ROW. Wildlife might be inadvertently harmed or killed during construction. Long term and permanent impacts include a greater risk of bird electrocution or collision and bat fatalities due to increased wind turbines and transmission lines on the landscape. Potential impacts can be mitigated. The overall impact intensity level is expected to remain minimal.

4.11.7 Rare and Unique Resources

Cumulative potential effects on rare and unique natural resources are uncertain. There are few rare and unique species in the project area (Section 4.7.8). As the identified transportation projects are improvements along existing roadways, these areas generally do not provide habitat for rare and unique species, nor do they typically support rare communities.

5 System Alternatives

Chapter 5 evaluates alternatives to the project, including a no-build alternative. 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: demand side management; purchased power; facilities using a non-renewable energy source; upgrading existing facilities; and transmission rather than generation.[218]

The Commission determined that, for the purposes of the Certificate of Need, the proposed 345 kV transmission line is part of the generation facility as defined in Minnesota Statutes, Section 216B.2421, subd. 2(1), which defines "large energy facility" as “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;”

Because the transmission line fits under the definition of large energy facility, the Commission determined the line does not qualify as a Large High-Voltage Transmission Line as defined in Minnesota. Statutes, Section. 216B.2421, subdivision. 2(2). As a result, the Commission ordered that Byron Solar need not provide information on transmission alternatives required under portions of Minnesota Rule, Part 7849.0260.[219] Nonetheless, a high-level analysis of the alternatives identified in the scoping decision is provided below.

5.1 Need for the Project

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

The applicant proposes to construct the project to meet increasing commercial and industrial customer demand for renewable energy resources in Minnesota and neighboring states and to assist Minnesota meet its renewable energy objectives, which require that 25 percent of utility electric sales be generated by renewable energy technologies by the year 2025. 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.[220] Moreover, Minnesota utilities and cooperatives are responding to climate change with ambitious carbon reduction goals, for example, Xcel Energy’s goal to be carbon free by 2050 and SMMPA has announced plans for a reduction of 2005 carbon levels by 90 percent by 2030.[221]

---

[218] Public Utilities Commission (January 15, 2021) *Order Approving Notice Plan, Approving Exemption Requests, and Granting Variances*. eDocket ID: 20211-169865-01

[219] Minnesota Public Utilities Commission, January 15, 2021, Order Approving Notice Plan, Approving Exemption Requests and Granting Variances. eDocket ID: 20211-169865-01

[220] Minnesota Statute 216B.1691, at subdivisions 2(a) and 2(f).

[221] CN Application, at pp. 12-13

At the time this report was prepared, Byron Solar did not have a buyer for the power.

Comments filed by the Department of Commerce Division of Energy Resources generally support Byron Solar's analysis that there is a need for an additional 200 MW of renewable energy, and solar energy in particular, in Minnesota and in the region generally. [222]

5.2 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 200 MW solar energy generating system in a different location and a 200 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.

5.2.1 Solar Facility System Alternatives

A 200 MW solar energy generating system sited elsewhere in Minnesota would support the need for additional solar energy but address specific concerns with the project's proposed location that could not be addressed through mitigation. Such an alternative could be a single 200 MW solar facility or a combination of smaller distributed solar facilities.

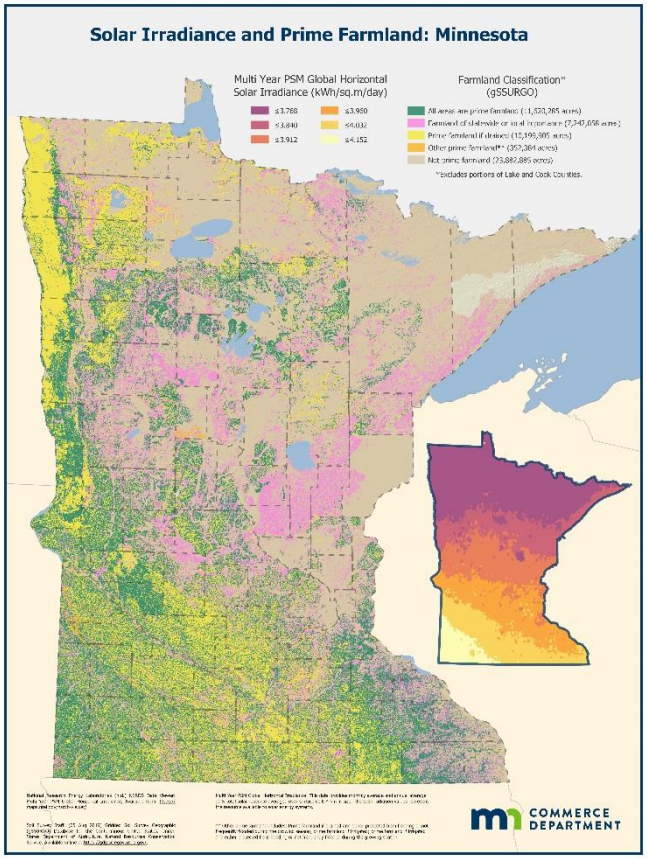
The U.S. Energy Information Administration projects the levelized total system cost for new ground-mounted single axis tracking solar PV generation resources entering service in 2027 to be $36.09 per megawatt hour (MWh) ($33.46/MWh with tax credit).[223] After a period of rapid decreases in solar generation 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.[224] This increase has been driven by state and federal policies, technology advances, and economics.

[222] Minnesota Department of Commerce, Division of Energy Resources, Comments and Recommendations. June 15, 2022, eDocket ID: 20226-186639-01

[223] 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

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

Figure 16. Solar Irradiance and Prime Farmland



A generic 200 MW solar is feasible and available. The Commission has permitted several solar farms in Minnesota. Although solar generation is moving outside of areas traditionally used to generate wind power, for example the North Star project is a 100 MW solar facility constructed in Chisago County. Solar irradiance in Minnesota is highest in southwest and south-central Minnesota in areas of the state that are primarily agricultural (Figure 16**).** The analysis that follows assumes that a generic 200 MW solar farm would likely be located in southern Minnesota in a row-crop agricultural setting, similar to the project. Eight? utility-scale solar energy generating systems have been permitted by the Commission.[225] The analysis for this alternative relies on data from these, and other, solar projects.

The types of impacts associated with a 200 MW solar facility 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.

5.2.1.1 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 pasture land as opposed to cultivated land, the potential for impacts may increase.

5.2.1.2 Human Settlement

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

[225] 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 Solar Project (Docket No. IP-7014/GS-19-620), Sherco Solar Project (Docket No. E-002/GS-21-191)

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, a railroad, and other wind and solar generation facilities. A generic 200 MW solar farm may or may not be located near existing infrastructure.

Construction of the project will require relocation of snowmobile trail 302. An alternative site could avoid impacts to recreation depending on recreation resources in the project area or could have greater impacts if located in an area with other recreation opportunities. An alternative constructed on, or adjacent to, non-compatible land uses or zoning would result in the same or greater impacts.

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

The proposed project will not disrupt local communities or businesses and does not disproportionately impact 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 amount of supplies and materials that can be purchased locally, the availability of local workers (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 and vegetation between effected 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.

5.2.1.3 Human Health and Safety

Because this system alternative is similar in type to the proposed project, potential impacts from electromagnetic fields ("EMF") and to implantable medical devices and worker safety are expected to be similar. These impacts might increase should an alternative be constructed near a sensitive receptor, such as a hospital or nursing home. 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.

5.2.1.4 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.

5.2.1.5 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.

Mining and forestry operations are not compatible with solar facilities. Solar projects are generally sited on open land that is not forested or mined. 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

Differences in air quality may occur if the project is located along unpaved roads. Without mitigation dry weather would increase levels of fugitive dust, negatively impacting air quality and indirectly impacting nearby surface waters. Increased water usage to control fugitive dust in the project location could occur during construction.

Depending upon the geology, an alternative location might be in an area with the same or lower potential impacts to groundwater and private wells. There are few wetlands and no surface waters within the land control area. 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.

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 closer proximity to DNR Wildlife Management Areas, Aquatic Management Areas, Sites of Biodiversity Significance, or Scientific and Natural Areas; or USFWS Waterfowl Production Areas impacts could be greater due to both the potential for greater numbers of wildlife in the area and the location being a heavily used wildlife movement corridor. 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.

Similar to the resources discussed above, impacts to vegetation are expected to be minimal. The soils within the project boundary range from well drained to poorly drained. Impacts to soil resources vary

by soil type. Therefore, impacts to soils at a different location could be greater or lower depending on soil type. Impacts to topography would be similar. Because of the location of the proposed project in a karst area with areas of shallow bedrock, a solar facility in another location would be expected to have the same or less impact to geology.

5.2.2 200 MW Wind Farm

A 200 MW large wind energy conversion system is an alternative renewable energy source. Such an alternative could be a single 200 MW wind farm or a combination of smaller dispersed wind farms.

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. 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. 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.

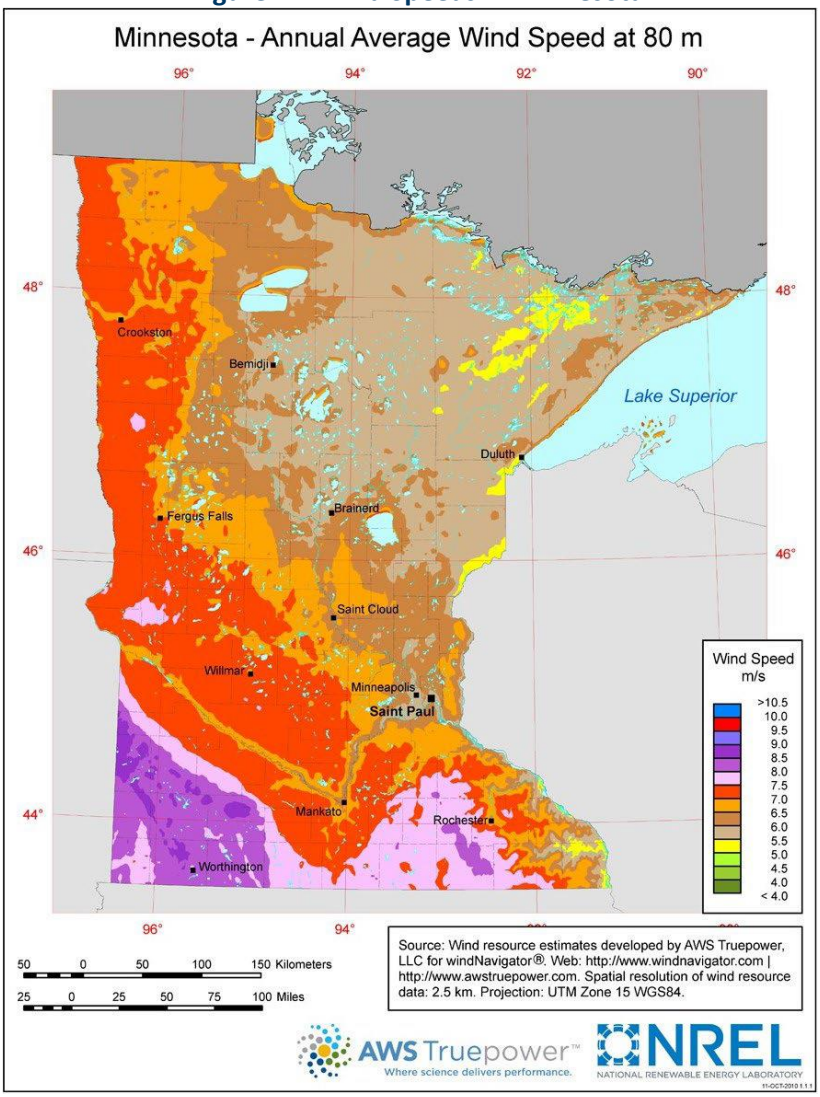
Multiple large wind energy conversion systems have been permitted by the Commission. The analysis for this alternative relies on data from these projects.

The types of impacts associated with a 200 MW wind farm constructed in another location (or multiple locations) 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 200 MW wind farm 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 17). This area of the state is primarily agricultural. Accordingly, a generic 200 MW wind farm would likely be located in southern Minnesota in an agricultural setting similar to the project.

Figure 17. 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 and nighttime lighting. If the wind farm was constructed in an area without wind generation on the landscape, it would be more noticeable. Topography, landscape features, and vegetation influence visual impacts. Night-time 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.

Turbines produce audible noise while operational. 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.

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.

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.

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 located 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 workers (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.[226] 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

[226] Department of Commerce (May 2018) *Environmental Report: Bitter Root Wind Project*, retrieved from: https://mn.gov/eera/web/file-list/2015/.

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.

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

A wind farm has greater potential to impact aviation, because of the vertical nature of wind turbines. Wind farms can negatively affect airport operations and air traffic. Potential impacts are mitigated by siting wind farms away from airports. Additionally, proposed turbine locations must be reviewed by the Federal Aviation Association ("FAA"), and appropriately lighted per FAA requirements. Additionally, permittees are required to notify local airports prior to construction.

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. 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.

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.

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 to 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 impacts 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.

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 require 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.

Depending upon the location, a wind farm may have equal or less impact geology and topography. If the wind farm were located in a similar area to the project, where there are areas of shallow (10 to 15 feet bedrock, effects would be similar to the project.

5.2.3 No-Build Alternative

Under the no-build alternative, the project would not be 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 $400,000 to $450,000 for Dodge County and approximately $100,000 to $125,000 for Canisteo Township.[227]

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. The no-build alternative means nothing is constructed. The analysis for this alternative considers potential impacts if the project is not constructed.

5.2.4 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.[228] Because solar farms 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 farms and wind farms. These pollutants include construction equipment exhaust and fugitive dust. Exhaust emissions from

[227] **Appendix E**, Response to Question 14

[228] University of Calgary. *Energy Education: Primary Pollutant*. (2018). https://energyeducation.ca/encyclopedia/Primary_pollutant.

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 farm 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."[229] Minor emissions of toxic air pollutants at solar facilitys 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."[230] 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.[231] The vast 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.

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

---

[229] U.S. Environmental Protection Agency. *What are Hazardous Air Pollutants?* (2022). https://www.epa.gov/haps/what-are-hazardous-air-pollutants.

[230] U.S. Environmental Protection Agency. *Ground-level Ozone Basics*. (2022). https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics#formation.

[231] 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.

both solar facilities and wind farms, such as circuit boards, contain hazardous materials commonly found in electronic devices.

Decommissioning of solar farms and wind farms will generate solid wastes. Certain electronic components in both solar farms 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."[232]

5.2.5 Transmission Line Alternatives

The transmission alternatives discussed here are those noted in the scoping decision for this EIS (**Appendix A**): the no-build alternative, transmission lines of a different size, and transmission lines with different endpoints. The discussion here assumes that the need for the project is to transport the power from the wind farm to the electrical grid.

NO BUILD ALTERNATIVE

Under the no build alternative, the transmission project would not be constructed. The no build alternative would not meet the need for the project. If a transmission line is not built the generation would have no outlet; the wind farm would not be financially viable and the project would not be built. There would be no direct human or environmental impacts as a result of this alternative.

TRANSMISSION LINE OF A DIFFERENT SIZE

In general, transmission lines with voltages greater than 345 kV, while technically feasible, are more than the need for the project. Although a 500 kV transmission line connects Manitoba with the transmission grid in northern Minnesota, there are no 500 kV transmission lines currently in use in southern Minnesota. Because there are no transmission facilities that could accommodate a transmission line of greater than 345 kV in southern Minnesota, a higher voltage transmission line is unfeasible for this project.

Consistent with the Commission's determination that Byron Solar need not provide information on transmission alternatives required under portions of Minnesota Rule, Part 7849.0260, Byron Solar did not analyze a transmission line with a lower voltage. Typically, however, lower voltage transmission lines are subject to greater line losses. The Draft Environmental Impact Statement for the Dodge County Wind Project looked at a lower voltage alternative to the proposed 345 kV transmission line. The EIS found that, although there are differences in the type and extent of impacts between the two voltages due to differences in structure heights (70 to 100 feet tall for a 161 kV transmission line), spans, (up to 700 feet for a 161 kV transmission line) and ROW widths (100-120 feet for a 161 kV transmission line), the human and environmental impacts of a 161 kV line would be similar to those of a 345 kV line.[233]

---

[232] 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).

[233] Minnesota Department of Commerce, *Dodge County Wind Project: Draft Environmental Impact Statement: The Human and Environmental Impacts of Constructing and Operating a 170 MW Wind Farm and*

Historically, the transfer of electricity between regions of the United States has been over high voltage alternating current (AC) transmission lines, which means that both the voltage and the current on these lines move in a wave-like pattern along the lines and are continually changing direction. Unlike an AC transmission line, the voltage and current on a direct current (DC) transmission line are not time varying, meaning they do not change direction as energy is transmitted. DC electricity is the constant, zero-frequency movement of electrons from an area of negative (-) charge to an area of positive (+) charge. DC transmission lines are typically used to deliver generation over a long distance (generally hundreds of miles) to a load center. The DC technology is not a feasible solution to deliver 200 MW of power from a solar to a nearby substation, such as the Byron Substation, located less than five miles from the generation source.

ALTERNATE ENDPOINTS

Byron Solar ultimately selected the Byron Substation as the point of interconnection because of the proximity to the solar facility. In selecting a site for the solar facility, Byron Solar has indicated it prioritized minimizing the distance between the generating facility and point of interconnect in order to make efficient use of existing infrastructure, minimize line loss, and minimize costs. Byron Solar states that A high voltage transmission line of more than 5 miles would strain the financial viability of a project of this size."[234]

Other nearby existing substations with a 345 kV interconnection capacity are the North Rochester Substation (approximately 12 miles northeast) and Pleasant Valley (approximately 16 miles south) would require a much longer transmission line.

Associated 345 kV Transmission Project, July 2019. eDocket ID: eDocket ID: 20197-154728-02 , at pp. 142-144

[234] Joint Application, at p. 19

6 Sources

Unless otherwise noted, all links were valid as of September 16, 2022.

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

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

California Department of Toxic Substance Control (2022). Photovoltaic (PV) Modules (Including Solar Panels) Universal Waste Management – Frequently Asked Questions. https://dtsc.ca.gov/solar-panel-faqs/#easy-faq-348310

Canisteo Township. (2012). *Canisteo Township Zoning Ordinance No. III* http://nebula.wsimg.com/ec9c8c94b41c849acc5ba6ee2367048e?AccessKeyId=6EE0A5039D19E4433884&disposition=0&alloworigin=1

Chalmers, James (2019) *High Voltage Transmission Lines and Residential Property Values in New England PowerPoint Presentation*, https://www.nhmunicipal.org/sites/default/files/uploads/Annual_Conference/2019/Sessions/Wednesday/market_effects_of_utility_rows_presentation-1045am.pdf

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

Dodge County.

- *Dodge County Zoning Ordinance*. (n.d.) https://www.co.dodge.mn.us/departments/land_use.php
- *Comprehensive Plan, Dodge County, Minnesota*. (2019) https://cms4files.revize.com/dodgecountymn/EnvironmentalServices/Final%20Adopted%20Comprehensive%20Plan%209-10-19.pdf

Explore Minnesota. *Tourism and Minnesota's Economy*. (n.d.) https://mn.gov/tourism-industry/research/tourism-and-the-economy.jsp.

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

Federal Emergency Management Agency, National Risk Index, https://hazards.fema.gov/nri/map.

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

Flowers, George; Cleveland, Tommy. *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

Forge Solar. PV Planning and Glare Analysis. https://www.forgesolar.com/help/#intro

Franco, Lucas. *Catching the Wind 2.0: An Update on Changing Employment Practices in Minnesota's Wind Energy Industry.* (2019). https://d3ciwvs59ifrt8.cloudfront.net/19d28156-d283-4f19-aa25-a3a81dcfffdf/94a68b0d-c092-4d05-9abc-b452e02aba21.pdf.

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

IEEE Standards Association. *2017 – National Electrical Safety Code Brochure*. (2017). https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/nesc_2017_brochure.pdf

Kalmar Township. *Kalmar Township, Olmsted County, Minnesota Zoning Ordinance.* (2018) https://kalmartownship.org/vertical/sites/%7B635CF471-CBED-41DA-A029-A7AC2AE42286%7D/uploads/Kalmar_Update_2016_FINAL.pdf

McGarr, Patricia L. et al. (November 21, 2021), https://www.linncountyiowa.gov/DocumentCenter/View/18016/Real-Estate-Adjacent-Property-Value-Impact-Report-PDF?bidId=

Michigan Agricultural Electric Council. *Stray Voltage: Questions and Answers*. (2008). retrieved from: http://maec.msu.edu/Stray%20Voltage%20Brochure%202008.pdf

Minnesota House Research, *Property Tax 101: Property Tax Variation by Property Type*. (2022) https://www.house.leg.state.mn.us/hrd/pubs/ss/ssptvart.pdf .

Minnesota Department of Commerce.

- Dodge County Wind Project: Draft Environmental Impact Statement: The Human and Environmental Impacts of Constructing and Operating a 170 MW Wind Farm and Associated 345 kV Transmission Project. (2019). eDocket ID: eDocket ID: 20197-154728-02 ,
- *Environmental Report: Bitter Root Wind Project*. (2018),: https://mn.gov/eera/web/file-list/2015/
- *Minnesota Solar Fact Sheet*. (2022). https://mn.gov/commerce-stat/pdfs/solar-fact-sheet-2022.pdf
- *Potential Human and Environmental Impacts of the Freeborn Wind Transmission Line Project.* (2018): https://mn.gov/eera/web/project-file?legacyPath=/opt/documents/34748/1%20Text%20Figures%20Tables.pdf
- *Rights-of-way and Easements for Energy Facility Construction and Operation*, https://apps.commerce.state.mn.us/eera/web/project-file/12227 .

Minnesota Department of Commerce, Minnesota Department of Agriculture. 2020. *Solar Energy Production and Prime Farmland: Guidance for Evaluating Prudent and Feasible Alternatives*. https://apps.commerce.state.mn.us/eera/web/doc/13929

Minnesota Department of Economic Employment and Development,

- Economic Development Region 10: 2021 Regional Profile. https://mn.gov/deed/assets/2021_EDR10RP_MS_tcm1045-133258.pdf ,
- 2021 County Profile for Dodge County https://mn.gov/deed/assets/080122_dodge_tcm1045-407635.pdf
- 2021County Profile for Olmsted County https://mn.gov/deed/assets/080122_olmsted_tcm1045-407643.pdf

Minnesota Department of Health

- *Minnesota Well Index*. (n.d.) https://www.health.state.mn.us/communities/environment/water/mwi/index.html
- Source Water Protection Web Map Viewer, https://www.health.state.mn.us/communities/environment/water/swp/mapviewer.html

Minnesota Department of Natural Resources

- *Ecological Classification System: Ecological Land Classification Hierarchy*. (n.d.) https://www.dnr.state.mn.us/ecs/index.html
- *Minnesota Climate Summaries and Publications.* ***Normals, Means, and Extremes for Major Airport Weather Stations – Rochester***. https://files.dnr.state.mn.us/natural_resources/climate/summaries_and_publications/2005_Annual_LCD_RST_page_3.pdf
- *Minnesota Regions Prone to Surface Karst Feature Development* (2016). http://files.dnr.state.mn.us/waters/groundwater_section/mapping/gw/gw01_report.pdf
- *Natural Heritage Information System*. (n.d.) http://www.dnr.state.mn.us/nhnrp/nhis.html
- Rare Species Guide, https://www.dnr.state.mn.us/rsg/index.html
- *Requirements for Projects Involving Public Waters Work Permits*. (n.d.) http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/requirements.html.
- *Utility Crossing License.* https://www.dnr.state.mn.us/permits/utility_crossing/index.html
- *Wildlife-friendly Erosion Control*. (2013). http://files.dnr.state.mn.us/eco/nongame/wildlife-friendly-erosion-control.pdf.

Minnesota Department of Revenue. (2021). Solar Energy Production Tax 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.

Minnesota Department of Transportation (n.d.)

- *Land Management*. (2022). https://www.dot.state.mn.us/utility/forms.html.
- *Utility Accommodation on Trunk Highway Right of Way: Policy OP002.* (2017). http://www.dot.state.mn.us/policy/operations/op002.html.

Minnesota Environmental Quality Board. *Environmental Review Projects Interactive Map.* https://www.eqb.state.mn.us/content/env-rev-projects-interactive-map

Minnesota Pollution Control Agency. (n.d.)

- *The Air We Breathe: The State of Minnesota's Air* Quality (2017), https://www.pca.state.mn.us/sites/default/files/lraq-1sy17.pdf,.
- *Annual AQI Days by Reporting Region*, https://public.tableau.com/app/profile/mpca.data.services/viz/MinnesotaAirQualityIndex_0/AQIExternal
- *Clean Water Act Section 401 Water Quality Certifications*. (n.d.) https://www.pca.state.mn.us/water/clean-water-act-section-401-water-quality-certifications.
- *Construction Stormwater*. (2022). https://www.pca.state.mn.us/business-with-us/construction-stormwater
- *Greenhouse gas emissions data*, https://www.pca.state.mn.us/air/greenhouse-gas-emissions-data
- *A Guide to Noise Control in Minnesota*. (2015). https://www.pca.state.mn.us/sites/default/files/p-gen6-01.pdf

- *Minnesota Stormwater Manual*. (2022). https://www.pca.state.mn.us/water/minnesotas-stormwater-manual.
- *Minnesota Stormwater Manual: Structural BMP Use in Karst Settings*. (2022). https://stormwater.pca.state.mn.us/index.php/Structural_BMP_use_in_karst_settings
- *Toxics and Pollution Prevention Evaluation Report.* (2018). https://www.pca.state.mn.us/sites/default/files/lrp-p2s-2sy17.pdf
- Watershed Information: Zumbro River. https://www.pca.state.mn.us/water/watersheds/zumbro-river

Minnesota Public Utilities Commission, Electric Service Area Map. https://minnesota.maps.arcgis.com/apps/webappviewer/index.html?id=95ae13000e0b4d53a793423df1176514/

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
- *Electric and Magnetic Fields.* (2018). http://www.niehs.nih.gov/health/topics/agents/emf/index.cfm.

National Cancer Institute (May 27, 2016) *Magnetic Field Exposure and Cancer*. (2016). http://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/magnetic-fields-fact-sheet

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

North Dakota State University Agricultural Engineering Department. *Extension Publication #108: Stray Voltage* (1986)

Olmsted County, Olmsted County General Land Use Plan. (2014). https://www.olmstedcounty.gov/sites/default/files/2020-10/Olmsted%20County%20Land%20Use%20Plan.pdf

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

Salem Township, *Salem Township Zoning Ordinance.* (2014). http://salemmn.org/main/?page_id=321

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

Township Cooperative Planning Association https://tcpamn.org/

United States Energy Information Administration,
- *Electric Power Monthly*, June 2022, Table 6.07b, Capacity Factor for Utility Scale Generators Primarily Using Non-Fossil Fuels. (2022)., https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_6_07_b
- *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

- *Solar Explained: Photovoltaics and Electricity*. (2022). https://www.eia.gov/energyexplained/solar/photovoltaics-and-electricity.php

United States. Environmental Protection Agency (

- *National Ambient Air Quality Standards (NAAQS) Table*. (2016).: https://www.epa.gov/criteria-air-pollutants/naaqs-table.
- *Ozone Pollution*. (2020). https://www.epa.gov/ozone-pollution.
- *What is a Wetland.* (2022). https://www.epa.gov/wetlands/what-wetland
- *Environmental Justice*. (2022). https://www.epa.gov/environmentaljustice .
- *Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analysis*. (1998).Guidance for Incorporating Environmental Justice Concern in EPA's NEPA Compliance Analyses (pdf), .
- *EJ Screen: Environmental Screening and Mapping Tool*. (2022).https://www.epa.gov/ejscreen.
- *What are Hazardous Air Pollutants?* (2022). https://www.epa.gov/haps/what-are-hazardous-air-pollutants.
- *Ground-level Ozone Basics*. (2022): https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics#formation.
- *Section 404 Permit Program*. (2022). http://www.epa.gov/cwa-404/section-404-permit-program.

United States Federal Aviation Administration, *Airport Data and Information Portal* https://adip.faa.gov/agis/public/#/public ,

United States Fish and Wildlife Service

- Environmental Conservation Online System (ECOS). https://ecos.fws.gov/ecp/
- 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.

United States Census, Explore Census Data, https://data.census.gov/cedsci/

United States Department of Agriculture,

- 2017 Census of Agriculture, County Profile: Dodge County, Minnesota https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Minnesota/cp27039.pdf
- 2017 Census of Agriculture, County Profile: Olmsted County, Minnesota https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Minnesota/cp27109.pdf

United States 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

University of Calgary. *Energy Education: Primary Pollutant*. (2018). https://energyeducation.ca/encyclopedia/Primary_pollutant.

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

Wisconsin Public Service Corporation (2011) Answers to Your Stray Voltage Questions: Backed by Research, (2011). https://www.wisconsinpublicservice.com/partners/agriculture/stray-voltage/pdf/stray-voltage.pdf

World Health Organization

- *Extremely Low Frequency Fields*. (2007). https://www.who.int/publications/i/item/9789241572385
- *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

Geospatial Sources:

Minnesota Board of Water and Soil Resources. *State Funded Conservation Easements (RIM Reserve)*. Available from https://gisdata.mn.gov/.

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/.
- *MNDNR Native Plant Communities*. Available from https://gisdata.mn.gov/.

Minnesota Department of Transportation. *Roads, Minnesota, 2012*. Available from https://gisdata.mn.gov/.

Minnesota State Geospatial Information Office.

- City, Township, and Unorganized Territory (CTU) Boundaries, Minnesota, May 29, 2014. Available from https://gisdata.mn.gov/
- Impaired Streams. January 22, 2016. Available from https://gisdata.mn.gov/

U.S. Fish and Wildlife Service. *Wetlands and Deepwater Habitats of the United States*. Available from http://www.fws.gov/wetlands/Data/State-Downloads.html.

U.S. Geological Survey, *NLCD 2019 Land Cover Conterminous United States*. Available from https://www.mrlc.gov/data