Environmental Assessment: Regal Solar Project

Human and Environmental Impacts of Constructing and Operating this 100 MW Solar Energy Generating System and Associated Facilities

November 2020

PUC Docket No. IP7003/CN-19-223

PUC Docket No. IP7003/GS-19-395

OAH Docket No. 71-2500-36480

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Sources

Much of the information used to prepare this environmental assessment comes from the certificate of need and site permit applications and addendums. Additional sources include new information provided by the applicant, as well as information from relevant federal and state environmental review documents for similar projects. Spatial data was used. Information was gathered from multiple site visits. Unless otherwise noted url addresses were current as of October 31, 2020.

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 (19-223 or 19-395), 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).

Additional Information

Scan QR code to view project webpage.

Scan QR code to view project map.

Coronavirus Pandemic

The descriptions and analyses provided herein do not account for uncertainties associated with the coronavirus pandemic. Impacts from the pandemic are anticipated to be primarily socioeconomic in nature, but impacts could occur to other resources.

Acronyms and Abbreviations

AC	alternating current
ALJ	administrative law judge
applicant	Regal Solar, LLC
BWSR	Board of Water and Soil Resources
commerce	Department of Commerce
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
EA	environmental assessment
ECE	East Central Energy
EERA	Energy Environmental Review and Analysis
ELF-EMF	extremely low frequency electromagnetic fields
EMF	electromagnetic fields
ER	environmental report
GRE	Great River Energy
kV	kilovolt
MBS	Minnesota Biological Survey
MDA	Department of Agriculture
MP	Minnesota Power
MW	megawatt
/MWh	per megawatt hour
Minn. R.	Minnesota Rule
Minn. Stat.	Minnesota Statute
mG	milligauss
MnDOT	Department of Transportation
MPCA	Pollution Control Agency
NAC	noise area classification
NHIS	Natural Heritage Information System
NLCD	National Land Cover Database
project	Regal Solar Project
PV	photovoltaic
RES	renewable energy standard
ROI	region of influence
sample permit	sample solar site permit
SCADA	supervisory control and data acquisition
SES	solar energy standard
SGCN	Species in Greatest Conservation Need
SHPO	State Historic Preservation Office
SSURGO	Soil Survey Geographic Database
Two Rivers	Two Rivers Campground and Tubing
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 a 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).

collection line means an approximately 2.8-mile above-ground double-circuit three-phase 34.5 kV distribution line proposed by the applicant to connect the solar array to the project substation.

collection line corridor means the approximately 84-acre review area for the collection line, project substation, Minnesota Power switching station, and gen-tie transmission line.

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.

gen-tie transmission line means an approximately 700-foot above-ground 115 kV transmission line proposed by the applicant to connect the project substation to the switching station.

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

land control area means the approximately 802-acre review area for the solar array.

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.

solar farm means ground-mounted photovoltaic equipment capable of operation at 5,000 kilowatts or more connected directly to the electrical grid.

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.

Summary

Regal Solar, LLC ("applicant"), an affiliate of National Grid Renewables, must obtain a certificate of need and site permit from the Public Utilities Commission ("commission") before it can construct the proposed Regal Solar Project ("project"). The project would interconnect to the electrical grid at a new switching station to be constructed and operated by Minnesota Power.

The applicant filed separate certificate of need and site permit applications on July 22, 2019. Based on comments received, the commission required updated and corrected applications. Per commission order, these revised applications were deemed substantially complete upon their submittal on September 6, 2019. On May 8, 2020, at the request of the applicant, the permitting process was suspended to revise the project's interconnection point with the electrical grid. The applicant filed an addendum to its site permit and certificate of need applications on August 4, 2020, and August 12, 2020, respectively.

What is this document?

This document is an environmental assessment. The commission will use the information in this document to inform their decisions about issuing 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") was responsible for preparing this document as part of the environmental review process. Scoping was the first step in the process. It provided opportunities to provide comments on the content of this environmental assessment ("EA") and suggest alternatives to mitigate potential impacts.

Where do I get more information?

For additional information contact commission or commerce staff.

If you would like more information or if you have questions, please contact commerce staff: Andrew Levi (andrew.levi@state.mn.us or (651) 539-1840) or the commission public advisor: Charley Bruce (publicadvisor.puc@state.mn.us or (651) 201-2251).

Additional documents and information, including the revised certificate of need and site permit applications, can be found on eDockets: https://www.edockets.state.mn.us/EFiling/search.jsp by searching "19" for year either "223" (certificate of need) or "395" (site permit) for number. Information is also available on the commerce webpage: https://mn.gov/eera/web/project/13656/.

What is the applicant proposing to construct?

A 100-megawatt solar energy generating system and associated facilities.

The project's primary components include photovoltaic panels affixed to linear ground-mounted single-axis tracking systems, 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, access roads, laydown areas, weather stations, and an operation and maintenance facility. The project would interconnect to the

electrical grid at a new switching station through a new 115 kV overhead gen-tie transmission expected to be 700 feet long.

What is the project's purpose?

To increase solar generating capacity in Minnesota.

The applicant indicates the project "would install . . . solar generating capacity in Minnesota that can contribute to satisfying utilities' and consumers' demands for renewable energy, and potentially meet utility renewable requirements or individual sustainability goals, depending on the ultimate power purchaser." The applicant has not secured a power purchase agreement at this time.

Where is the project located?

The project is located entirely within Langola Township in Benton County, Minnesota.

Located directly west of U.S. Highway 10, approximately 230 feet west of Rice and one and one-half miles southeast of Royalton, the project is entirely within Langola Township in Benton County on approximately 800 acres of land that is currently center pivot irrigated farmland.

What permits are needed?

A certificate of need and site permit from the commission are required. Also, various federal, state, and local permits might be required.

The project requires a certificate of need 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 substation and gen-tie line are associated facilities and, as a result, will be permitted as part of the project. Therefore, they are analyzed in this EA.

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

What potential impacts were identified?

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

A potential impact is the anticipated change to an existing condition caused either directly or indirectly by the 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.

Some impacts can be avoided or minimized; some might be unavoidable but can be minimized; others might be unavoidable and unable to be minimized, but can be compensated for or corrected. Collectively, this is referred to as mitigation.

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 permit decision. Potential impacts are anticipated to be negligible to airports, displacement, electronic interference, emergency services, floodplains, forestry, geology, implantable medical devices, stray voltage, topography, and wetlands.

Human Settlement

Large energy projects can impact human settlement. Impacts might be short-term, for example, increased local expenditures during construction, or long-term, for example, changes to viewshed.

Aesthetics The impact intensity level is expected to be minimal to moderate for those with low viewer sensitivity, for example, passing motorists along U.S. Highway 10. For those with high viewer sensitivity, for example, neighboring landowners or recreationalists, 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. Impacts will be greater if the above-ground electrical collection system is used. Potential impacts are unavoidable, but can be mitigated in part.

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 or land use in such a way as to impact the underlying culture of the area. Tension 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 minimal. Potential impacts to zoning are anticipated to be long-term and localized. Constructing the project will change land use from agricultural to industrial for at least 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 Specific impacts are associated with construction and operation. The impact intensity level during construction is anticipated to range from negligible to significant depending on the activity. Potential impacts are anticipated to be intermittent and short-term. These localized impacts will affect unique resources (residences, campground), 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. On whole, impacts in the local vicinity are anticipated to be minimal and dissipate at distance. Impacts to specific properties could be moderate to significant. Long-term impacts might or might not occur. Potential impacts can be minimized.

Recreation During construction the impact intensity level is anticipated to be moderate to significant. Potential impacts will be intermittent and occur over the short-term. These localized impacts will affect a unique resource. Impacts can be minimized or avoided. Operational impacts will be long-term, unavoidable, and subjective to the individual.

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 might occur for individuals. Impacts from operation will be long-term and significant. Adverse impacts are not anticipated.

Human Health and Safety

Large energy projects have potential to impact human health and safety.

Electronic and Magnetic Fields The impact intensity level is anticipated to be negligible, and are not expected to negatively affect human health. Impacts will be long-term and localized, but can be minimized.

Worker and Public Safety The impact intensity level is minimal. Potential impacts would be short-and long-term, and can be minimized. Worker safety issues are primarily associated with construction. Public safety concerns would be most associated with unauthorized entry to the project.

Public Services

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.

Roads and Highways Potential impacts 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. Impacts are unavoidable, but can be minimized.

Utilities The impact intensity level is anticipated to be minimal. Impacts should be limited to a single electrical outage. Potential impacts can be minimized.

Land-based Economies

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

Agriculture The impact intensity level is anticipated to be minimal. Potential impacts are localized and unavoidable, but can be minimized. Minimizing impacts requires special mitigation. The site permit could require the applicant to work with the landowner to ensure agreement concerning continued access along the existing farm road.

Mining The impact intensity level is anticipated to be negligible. Should the location of the collection line shift to the north side of the road additional mitigation is proposed.

Tourism The impact intensity level is anticipated to be minimal to moderate during construction. Impacts will be localized and affect a unique resource. Impacts will be unavoidable, but minimal during operation. Potential impacts can be mitigated.

Archeological and Historic Resources

The impact intensity level is anticipated to be negligible to minimal. Impacts, should they occur, will be localized and affect a unique resource. Impacts can be mitigated through prudent routing of the project's collection line.

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

Air Quality The impact intensity level is anticipated to be minimal. Intermittent localized impacts will occur during construction. Once operational, the solar array will not generate criteria pollutants or carbon dioxide. Impacts related to operation of the collection line are anticipated to be long-term, localized, and negligible. Impacts are unavoidable and do not affect a unique resource. Impacts can be minimized.

Groundwater The impact intensity level is anticipated to be minimal. Localized impacts, should they occur, would be intermittent, but have the potential to occur over the long-term. Impacts can be mitigated.

Rare and Unique Resources The impact intensity level is anticipated to be minimal. Impacts could be positive or negative, short- and long-term. Impacts can be mitigated.

Soils The impact intensity level is expected to be minimal. Potentials impacts will both positive and negative, and short- and long-term. Isolated moderate to significant negative impacts associated with high rainfall events could occur. Impacts to soils are greatest with the below-ground electrical collection system. Impacts can be mitigated.

Surface Water 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.

Vegetation Within the land control area, the impact intensity level is anticipated to be long-term and positive. Minimal negative impacts would occur along the collection line. Additional mitigation is proposed.

Wildlife and Habitat Potential impacts are positive or negative, and are species dependent. Long-term, minimal positive impacts to birds, 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. Potential impacts can be mitigated in part. The impact intensity level is expected to be minimal.

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 certificate of need and issue a site 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 speak, ask questions, and submit comments about the project. After the public comment period is over, the ALJ will provide a written report to the commission summarizing the public hearing and comment period, and any spoken or written comments received. The ALJ will also provide the commission with proposed findings and a recommendation whether to issue a certificate of need and site permit.

The commission then reviews the record and decides whether to grant a certificate of need and issue a site permit. If the commission issues a certificate and site permit for the project it may identify measures to mitigate potential impacts. The commission is expected to make a decision by spring 2021.

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Chapter 1: Introduction

The Commerce Department ("commerce") prepared this environmental assessment ("EA") for the proposed Regal Solar Project ("project")—a 100 megawatt ("MW")[1] solar energy generating system and associated facilities to be located in Benton County, Minnesota (**Figure 1**). The project is proposed by Regal Solar, LLC, ("applicant") a wholly owned subsidiary of National Grid Renewables.[2]

The EA contains an overview of the resources affected by the project, and discusses potential human and environmental impacts[3] and mitigation measures. It also studies alternatives to the project itself. An EA is an information document. It is intended to facilitate informed decisions by the Public Utilities Commission ("commission"), 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 insuring that electric energy needs are met and fulfilled in an orderly and timely fashion".[4]

What is the state of Minnesota's role?

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

In order to build the project, the applicant needs two approvals—a certificate of need and site permit—from the commission. In addition, the project might require additional approvals from other federal and state agencies and local governments, for example, a License to Cross from the Department of Natural Resources ("DNR"). A site permit supersedes local zoning, building, and land use rules.[5] 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".[6]

The applicant applied to the commission for a certificate of need[7] and a site permit[8] for the project in summer 2019. The applicant revised these applications in fall 2019.[9,10] On May 8, 2020, at the request of the applicant, the permitting process was suspended so that the electrical interconnection location could be revised. On August 4, 2020, the applicant filed an addendum to its site permit application.[11] On August 12, 2020, the applicant revised its certificate of need application.[12]

With these applications, the commission has before it two distinct 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, where is it best located[13] and what conditions should be placed on the site permit?

To ensure a fair and robust airing of the issues, the Minnesota Legislature set out a process for the commission to follow when considering certificate of need and site permit applications.[14] 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 certificate of need and site permit applications.

How is this document organized?

The EA addresses the matters identified in the revised scoping decision.

This EA is based on the applicant's certificate of need and site permit applications (as revised and amended) and public scoping comments. It addresses the matters identified in the December 5, 2019, scoping decision[15] and the October 2, 2020, revised scoping decision[16] (Appendix A). The EA is organized as follows:

Chapter 1 briefly describes Minnesota's role; discusses how this EA is organized; and provides an overview of the project.

Chapter 2 summarizes the regulatory framework, including the certificate of need and site permit processes, the environmental review process, and the other approvals that might be required for the project.

Chapter 3 describes the project—its design, construction, operation, and decommissioning.

Chapter 4 discusses the feasibility, availability, and potential impacts of system alternatives.

Chapter 5 describes the environmental setting; details potential human and environmental impacts; and identifies measures to mitigate adverse impacts. It summarizes the cumulative potential effects of the project and other projects, and lists unavoidable impacts and irreversible and irretrievable commitments of resources.

Chapter 6 applies the siting factors the commission must consider to the project.

What does the applicant propose to construct?

A 100 MW solar energy generating system, collection line, gen-tie line, and associated facilities.

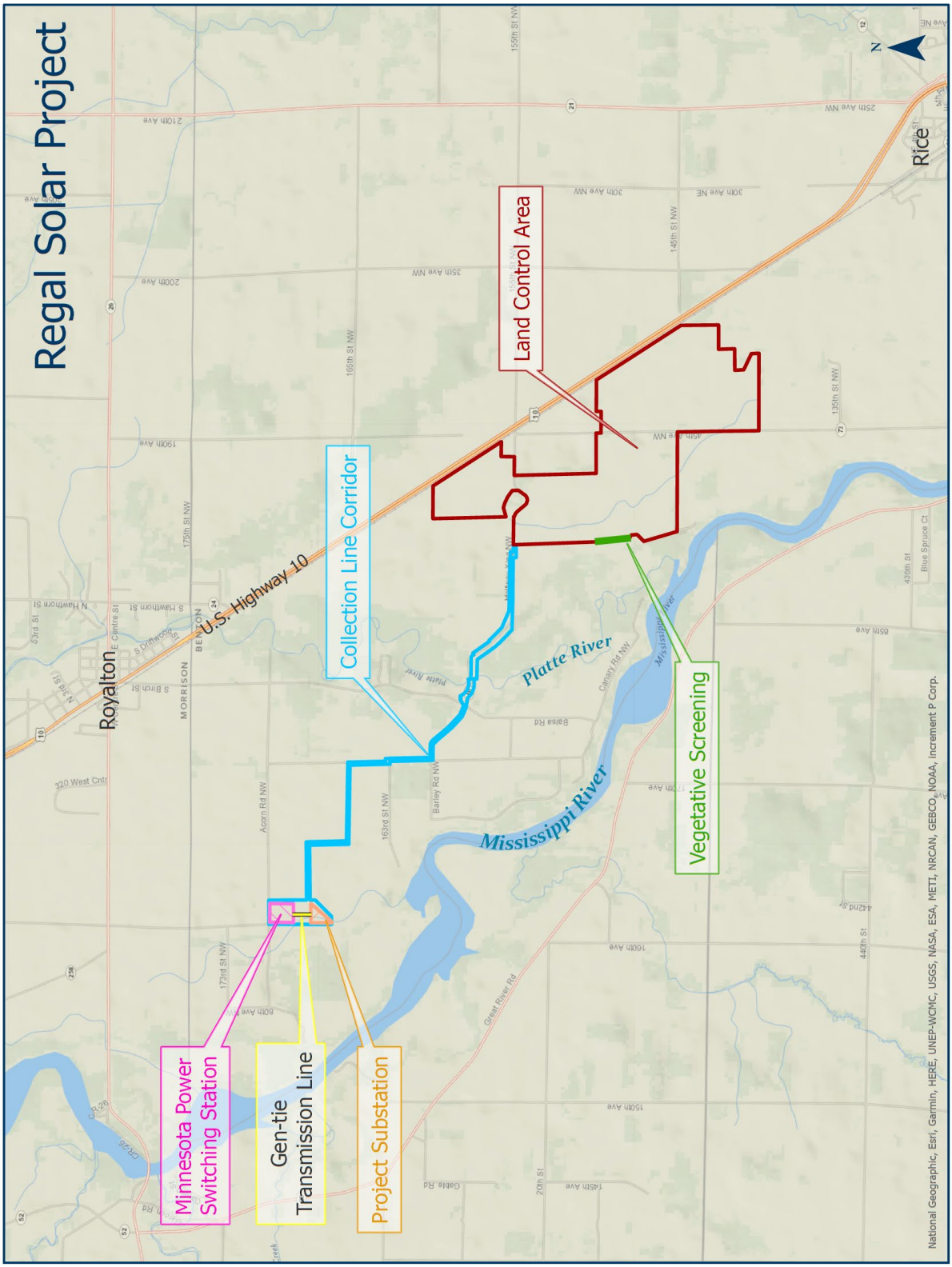
The project's primary components include photovoltaic ("PV") panels affixed to linear ground-mounted single-axis tracking systems, inverters and transformers housed in electrical cabinets, electrical collection system, project substation, and supervisory control and data acquisition ("SCADA") systems and metering equipment.[17] It also requires fencing, access roads, laydown areas, weather stations, and an operation and maintenance facility.[18] The project would interconnect to the electrical grid at a new, yet-to-be-built Minnesota Power-owned switching station to be located approximately three and three-tenths miles northwest of the land control area at the southeast corner of Acorn Road NW and 75th Avenue NW.[19] The solar array will connect to the project substation through an above-ground double-circuit three-phase 34.5 kilovolt ("kV") collection line.[20] The project substation would interconnect with the switching station through a 115 kV gen-tie transmission line approximately 700 feet long.[21]

What is the project's purpose?

To increase solar generating capacity in Minnesota.

The applicant indicates the project "would install . . . solar generating capacity in Minnesota that can contribute to satisfying utilities' and consumers' demands for renewable energy, and potentially meet utility renewable requirements or individual sustainability goals, depending on the ultimate power purchaser."[22] The applicant has not secured a power purchase agreement at this time.[23]

Figure 1 Project Location



Notes

[1] *See generally* Minnesota Statute 216E.021 (the applicant submitted a solar size determination form for the project).

[2] Regal Solar, LLC (October 16, 2020) *Request to Update Service List*, eDockets No. 202010-167425-01 (the applicant was originally owned by Geronimo Energy, LLC, which was rebranded as National Grid Renewables on October 15, 2020).

[3] In this document, the terms "effect" and "impact" are synonymous and could be beneficial or detrimental.

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

[5] Minn. Stat. 216E.10, subd. 1.

[6] Minn. Stat. 216E.03, subd. 7.

[7] Regal Solar, LLC (July 26, 2019) *Regal Certificate of Need Application*, eDockets Nos. 20197-154554-01, 20197-154554-02, and 20197-154554-03 (TRADE SECRET).

[8] Regal Solar, LLC (July 26, 2019) *Regal Site Permit Application*, eDockets Nos. 20197-154555-01, 20197-154555-02, 20197-154555-03, 20197-154555-04, 20197-154555-05, 20197-154555-06, 20197-154555-07, 20197-154555-08, 20197-154555-09, 20197-154555-10, and 20197-154557-01.

[9] Regal Solar, LLC (September 6, 2019) *Revised Regal Certificate of Need Application*, eDockets Nos. 20199-155713-01, 20199-155713-02, and 20199-155713-03 (TRADE SECRET) (hereinafter "Revised Certificate of Need Application").

[10] Regal Solar, LLC (September 6, 2019) *Revised Regal Site Permit Application*, eDockets Nos. 20199-155714-01, 20199-155714-02, 20199-155714-03, 20199-155714-04, 20199-155714-05, 20199-155714-06, 20199-155714-07, 20199-155714-08, 20199-155714-09, 20199-155715-01, 20199-155715-02, 20199-155715-03 (hereinafter "Revised Site Permit Application").

[11] Regal Solar, LLC (August 4, 2020) *Regal Site Permit Addendum*, eDockets Nos. 20208-165585-01, 20208-165585-02, 20208-165585-03, 20208-165585-04, 20208-165585-05, 20208-165585-06, 20208-165585-07, 20208-165585-08, 20208-165585-09, 20208-165586-01 (Trade Secret), 20208-165586-02, 20208-165586-03, 20208-165586-04, 20208-165586-05 (hereinafter "Addendum").

[12] Regal Solar, LLC (August 12, 2020) *Revised Certificate of Need Application*, eDockets Nos. 20208-165819-01, 20208-165819-02, 20208-165819-03, 20208-165819-04 (Trade Secret), 20208-165819-05, 20208-165819-06, 20208-165819-07.

[13] If the commission grants a site permit, it chooses which of the studied locations is most appropriate. In this matter only one location is studied.

[14] *See generally* Minn. Stat. 216B and 216E.

[15] Department of Commerce (December 4, 2019) *Environmental Assessment Scoping Decision*, eDockets Nos. 201912-158059-01 and 201912-158060-01 (hereinafter "Scoping Decision").

[16] Department of Commerce (October 2, 2020) *Environmental Assessment Revised Scoping Decision*, eDockets Nos. 202010-167024-01 and 202010-167025-01 (hereinafter "Revised Scoping Decision").

[17] Revised Application, pages 10-20.

[18] *Ibid*.

[19] Addendum, pages 1, 2.

[20] *Id*., page 2.

[21] *Ibid*.

[22] Revised Site Permit Application, page 3.

[23] *Id*., page 1.

Chapter 2: Regulatory Framework

Chapter 2 discusses the two approvals required from the commission—a certificate of need and site permit. It describes the environmental review process, and lists the factors the commission must consider 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.

What commission approvals are required?

A certificate of need and site permit are required, because the project meets several thresholds defined in Minnesota Statute.

The project requires a certificate of need because it meets the definition of *large energy facility*,[1] which means any electric power generating plant—including one powered by solar energy—with a capacity of 50 MW or more.[2]

The project requires a site permit from the commission because it meets the definition of *large electric power generating plant*,[3] which means any electric power generating equipment designed for or capable of operation at a capacity of 50 MW or more.[4]

A new gen-tie transmission line will interconnect the project to the electrical grid at a new switching station.[5] This gen-tie line will be less than 1,500 feet in length; therefore, its construction does not require a separate commission route permit.[6] The project substation and gen-tie line are associated facilities as defined by Minnesota Rule 7850.1000, subpart 3, and, as a result, will be permitted as part of the project. Therefore, they are analyzed in this EA.

Minnesota Power will construct and operate the switching station.[7] While not permitted as part of this project, the switching station is nevertheless analyzed in this EA as it is an associated facility to the project.[8]

What permitting steps have occurred to date?

The commission accepted the revised certificate of need and site permit applications as complete. A public information and scoping meeting was held in the project area.

Applicants must provide the commission with a written notice of their intent to file a site permit under the alternative process.[9] The applicant provided notice on June 11, 2019.[10] On July 22, 2019, the applicant filed separate certificate of need and site permit applications. The commission met to consider these applications at its September 5, 2019, agenda meeting, and decided that updated and corrected applications were required.[11] The applicant submitted revised applications on September 6, 2019.[12] Per the commission's October 11, 2019, written order, these applications were deemed substantially complete upon their submittal.[13] 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 porject.[14] Commission staff provided a *Sample Solar Site Permit* ("sample permit") on October 17, 2019.[15]

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 certificate of need and site permit. This analysis is called environmental review. **Figure 2** outlines the permitting process as it has unfolded for this project. (Read from left to right; shaded steps are complete; "*****" means public comment opportunity and "**#**" means public meeting opportunity.)

Figure 2 Simplified Process Summary

Certificate of Need

Applications for a certificate of need require preparation of an environmental report ("ER").[16] An ER contains "information on the human and environmental impacts of the [project] associated with the size, type, and timing of the project, system configurations, and voltage".[17] It also contains information on system alternatives to the project, as well as mitigation measures.

Site Permit

Minnesota law provides the commission with two processes to review site permit applications. These are the full permitting process[18] and the alternative permitting process.[19] The full process includes preparing an environmental impact statement and holding a contested-case hearing. The alternative process, which applies to solar projects,[20] requires an EA instead of the more detailed environmental impact statement and a public hearing instead of the more formal contested-case hearing.[21,22]

An EA contains an overview of the resources affected by the project, and discusses potential human and environmental impacts and mitigation measures.[23] It also contains information on alternative sites should alternative sites be studied in the EA.

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 certificate of need and site permit; therefore, these applications are being processed jointly using Minnesota Rule 7829.1200 and Minnesota Rule 7850.2800 to 7850.3900.[24]

Commerce staff prepared an EA in lieu of an ER, which means the analysis of issues typically reviewed for a site permit in an EA and system alternatives otherwise studied in an ER were combined into a single document. This is the only state environmental review document required for the project.[25]

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 includes a public meeting and comment period that provide opportunities for interested persons to help develop the scope (or contents) of the EA.[26] On October 28, 2019, commission and commerce staff issued a joint *Notice of Public Information and Environmental Assessment Scoping Meeting* and associated public comment period.[27] Notice was sent to those individuals on the project contact list and to potentially affected landowners.[28] The applicant published notice in the *Benton County News* on October 29, 2019.[29] Additionally, notice was available on the Energy Environmental Review and Analysis ("EERA") webpage.[30]

Commission and commerce staff jointly held the public information and scoping meeting as noticed. The purpose of the meeting was to provide information and answer questions about the project and permitting process, and gather input regarding potential impacts and mitigative measures that should be studied in the EA. The meeting also provided an opportunity to solicit potential site or system alternatives. Multiple handouts were provided, including presentation slides, process summary, and comment form.[31] A court reporter was present to document verbal statements.[32]

Seven people (including four neighboring landowners) attended the public meeting. Commission, commerce, and applicant representatives gave verbal presentations. Individuals asked questions about the project, and provided verbal comments. No site or system alternatives were recommended for study.

A public comment period, ending December 2, 2019, 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 one state agency. Site or system alternatives were not recommended.

Scoping Comments Received

Scoping comments are compiled and available to view or download.

Staff received a variety of comments about the project.[33] Representatives from the Benton County Board and the Langola Township Board of Supervisors expressed support for the project. No individuals spoke specifically against the project.

Concerns included, but were not limited to, impacts resulting from construction and operation of the project to: aesthetics, agriculture (including access along an existing farm road), electrical interference,

human health (specifically electric and magnetic fields), noise, noxious weed control, property values, recreation, screening along county roads, stray voltage, and wildlife and their habitats (with emphasis on deer movement). Concerns about project decommissioning were raised.

The Department of Transportation ("MnDOT") requested the EA address relevant permits or authorizations from road and rail authorities. "[A]ny associated electrical collection systems that run along a trunk highway right of way would need to permitted [sic] through a municipal, cooperative or investor owned electric service provider. MnDOT allows private parties to place connecting lines across trunk highway rights of way, but does not allow private parties to place such facilities longitudinally along trunk highways."[34] Additionally, MnDOT requested the applicant coordinate material delivery that might affect MnDOT right-of-way with the agency.

Scoping Decision

The scoping decision identified the issues studied in this EA.

After considering public comments and recommendations by staff, the assistant commissioner of commerce issued a scoping decision on December 4, 2019 (Appendix A). The scoping decision identified the issues to be evaluated in this EA. Staff provided notice of the scoping decision to those persons on the service list and project mailing list, and posted the notice to the EERA website.[35]

Revised Scoping Decision

The scoping decision was revised to reflect new project information.

The applicant revised its project on August 4, 2020. The project substation and electrical collection system are no longer located within the land control area, and the project no longer interconnects to the electrical grid at the existing Platte River Substation. The project's interconnection location is now a new switching station to be located approximately three and three-tenths miles northwest of the land control area at the southeast corner of Acorn Road NW and 75th Avenue NW.

On August 25, 2020, commission and commerce staff jointly issued a *Notice of Comment Period on Amended Certificate of Need and Site Permit Applications and the Scope of the Environmental Assessment*.[36] The notice requested comments to help address the following questions.

- What new or additional potential human and environmental impacts of the proposed project should be considered in scope of the Environmental Assessment (EA)?
- What are possible methods to minimize, mitigate, or avoid the potential impacts?
- Are there any items missing or mischaracterized in either of the amended applications, issues that need further development, or any review process related issues that need further consideration?

No public comments were received. Comments were received from DNR and the Board of Soil and Water Resources. DNR provided comments concerning decommissioning and repowering, oak wilt, erosion control, wildlife, state listed species, Minnesota Biological Survey Sites of Biodiversity Significance, and pollinator habitat.[37] The DNR included several attachments to their comments. The Board of Soil and Water Resources provided comments about pollinator habitat.[38] The applicant responded to these comments in their reply comments.[39]

After considering agency comments and recommendations by staff, the deputy commissioner of commerce issued a revised scoping decision on October 2, 2020 (Appendix A).[40] The revised scoping

decision incorporates substantial project changes that significantly affect the project's environmental effects. It also adjusted the schedule associated with development of the EA. Staff provided notice of the revised scoping decision to those persons on the service list and project mailing list, and posted the notice to the EERA website.[41]

Public Hearing

A public hearing will be held in the project area; you can provide comments at the hearing.

Minnesota Rule 7850.3800, subpart 1, requires the commission hold a public hearing and open a public comment period once the EA is complete and available. The hearing will be presided over by an ALJ. You will have the opportunity to speak at the hearing, ask questions, and submit comments. Commerce staff will respond to your questions and comments about the EA at the public hearing, but staff is not required to revise or supplement the document.[42]

Comments received during the hearing and the associated public comment period become part of the project record. The ALJ will provide a written report to the commission summarizing the public hearing and comment period, and any spoken or written comments received. The ALJ will also provide the commission with proposed findings and a recommendation whether to issue a certificate of need and site permit.

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 certificate of need and site permit.

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

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

Certificate of Need

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

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 certificate of need (with or without conditions). The certificate of need decision determines the type and size of the project, but does not determine its location.

Site Permit

If the commission determines the project 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".[43]

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

Are other permits or approvals required?

Yes, other permits and approvals might be required for the project.

A certificate of need and site 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.[44] Table 1 lists potential downstream permits that might be required, several of which are discussed below.

Federal

The U.S. Army Corps of Engineers ("USACE") "regulates the discharge of dredged or fill material into waters of the United States, including wetlands".[45] 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[46] 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.

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.[47] Projects affecting the course, current, or cross-section of lakes, wetlands, and streams that are public waters may require a *Public Waters Work Permit*.[48] 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 Pollution Control Agency ("MPCA"). This permit is issued to "construction site owners and their operators to prevent stormwater pollution during and after construction."[49] 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 farms. This amount can be applied as a credit towards the total amount of stormwater treatment needed for a project.[50]

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."[51] 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.[52] Coordination would be required to construct access roads or driveways from trunk highways.[53] 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.[54]

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

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

Local

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

Commission 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.

Public Lands Coordination would be required to occupy county or township lands such as forest lands, park lands, watershed districts, and other properties owned by these entities.

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.

Zoning Coordination may be required to meet certain zoning requirements.

Table 1 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
	Section 10 – Rivers and Harbor Act	Protects water quality by controlling crossings of navigable waters
U.S. Fish and Wildlife Service	Threatened and Endangered Species Consultation	Consultation to mitigate impacts to federally-listed species
Tribal		
American Indian Tribes	National Historic Preservation Act Section 106 Coordination	Coordination to prevent impacts to traditional cultural properties
State		
Department of Natural Resources	License to Cross Public Lands and Waters	License to 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	To balance competing management objectives
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 Transportation	Utility Permit	Controls utilities being placed along highway rights-of-way
	Driveway Access	Controls access to driveways along highways
	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	Coordination with BWSR and local governments to ensure conservation of wetlands
Local		
Benton County	Utility Permit	Needed to construct or maintain electrical lines along or across county highway right-of-way
	Land Use Permit	Needed to remove pine plantations and shelter belts
	Shoreland Alteration Permit	May be needed for work in shoreland district
Local Governments	Road Crossing, Driveway, Oversize or Overweight, and Land Permits	Ensures proper use of local roads and lands

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.[56] 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 electric supply . . . lines".[57] 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,[58] which define the reliability requirements for planning and operating the electrical transmission grid in North America.[59]

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.
- Any system alternative not specifically identified in the scoping decision.
- The way landowners are compensated for use or sale of their land.

Notes

1 Minnesota Statute 216B.243, subdivision 2.

2 Minn. Stat. 216B.2421, subd. 2(1).

3 Minn. Stat. 216E.03, subd. 1.

4 Minn. Stat. 216E.01, subd. 4.

5 Addendum, page 2 (overall length of the gen-tie transmission line currently estimated at 700 feet).

6 Minn. Stat. 216E.01, subd. 4 ("high voltage transmission lines" must be capable of operation of 100 kilovolts or more and be greater than 1,500 feet in length).

7 Addendum, page 2.

8 See Minnesota Rule 7850.1000, subpart 3 (defining associated facility as "equipment and other physical structures that are necessary to the operation" of the project).

9 Minn. R. 7850.2800, subp. 2.

10 Regal Solar, LLC (June 6, 2019) *Notice of Application to File a Site Permit Application*, eDockets No. 20196-153498-01; Regal Solar, LLC (July 8, 2019) *Corrected Cover Letter Notice of Application to File a Site Permit Application*, eDockets No. 20197-154228-01 (clarifying the project is not a distributed project).

11 Public Utilities Commission (October 11, 2019) *Order Accepting Applications as Substantially Complete Pending Additional Information and Directing Use of Informal Process*, eDockets No. 201910-156514-01 (hereinafter "October Written Order").

12 *Supra* Chapter 1, notes 9, 10.

13 October Written Order, page 6.

14 *Ibid*., page 6; *see also* Department of Commerce (August 9, 2019) *EERA Completeness Review*, eDockets No. 20198-155060-01 (as part of a summary proceeding the administrative law judge provides findings of fact, conclusions of law, and recommendations regarding the applications).

15 Public Utilities Commission (October 17, 2019) *Sample Solar Site Permit*, eDockets No. 201910-156706-01 (hereinafter "Appendix C").

16 Minnesota Rule 7849.1200.

17 Minn. R. 7849.1500.

18 Minn. Stat. 216E.03; Minn. R. 7850.1700-2700.

19 Minn. Stat. 216E.04; Minn. R. 7850.2800-3900.

20 Minn. Stat. 216E.04, subd. 2(8).

21 Minn. Stat. 216E.04, subd. 5; Minn. R. 7850.3700, subp. 1.

22 Applicants are free to elect the alternative process if their project qualifies for it.

23 Minn. Stat. 216E.04, subd. 5; Minn. R. 7850.3700, subp. 4.

24 October Written Order, page 6.

25 Minn. R. 7849.1900, subp. 1; Mnn. R. 7859.3700, subp. 8.

26 Minn. R. 7850.3700, subp. 2.

27 Public Utilities Commission (October 28, 2019) *Notice of Public Information and Environmental Assessment Scoping Meeting*, eDockets No. 201910-156937-02.

28 Public Utilities Commission (October 28, 2019) *Certificate of Service and Service Lists*, eDockets No. 201910-156937-04.

29 Public Utilities Commission (November 18, 2019) *Affidavit of Publication Public Information and Environmental Assessment Scoping Meeting*, eDockets No. 201911-157657-02.

30 Department of Commerce (n.d.) *Project Docket: Regal Solar Project*, Available at: https://mn.gov/eera/web/project/13656/.

31 Department of Commerce (November 15, 2019) *Meeting Handouts*, eDockets No. 201911-157568-01.

32 Department of Commerce (December 3, 2019) *Environmental Assessment Scoping Comments Received*, eDockets No. 201912-157991-01 (hereinafter "Public Comments").

[33] *Ibid*.

[34] Department of Transportation (December 2, 2019) *Comments*, eDockets No. 201912-157944-01.

[35] Department of Commerce (December 5, 2019) *Scoping Notice*, eDockets No. 20192-158068-01.

[36] Public Utilities Commission and Department of Commerce (August 25, 2020) *Notice of Comment Period on Amended Certificate of Need and Site Permit Applications and the Scope of the Environmental Assessment*, eDockets No. 20208-166143-01.

[37] Department of Natural Resources (September 14, 2020) Comments, eDockets Nos. 20209-166562-01, 20209-166562-02, 20209-166562-03, 20209-166562-04.

[38] Board of Soil and Water Resources (September 15, 2020) Comments, eDockets No. 20209-166622-01.

[39] Regal Solar, LLC (September 22, 2020) *Reply Comments*, eDockets No. 20209-166769-01.

[40] Revised Scoping Decision, *supra* Chapter 1 note 16.

[41] Department of Commerce (October 8, 2020) *Notice of Revised Scoping Decision*, eDockets No. 202010-167159-01.

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

[43] Minn. Stat. 216E.03, subd. 7(a).

[44] 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").

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

[46] 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).

[47] Minn. Stat. 84.415.

[48] Minnesota Department of Natural Resources (n.d.) *Requirements for Projects Involving Public Waters Work Permits*, retrieved from: http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/requirements.html.

[49] Minnesota Pollution Control Agency (November 19, 2015) *Stormwater Program for Construction Activity*, retrieved from: http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/construction-stormwater/index.html.

[50] Minnesota Pollution Control Agency (January 22, 2020) *Minnesota Stormwater Manual*, retrieved from: https://www.pca.state.mn.us/water/minnesotas-stormwater-manual.

[51] Minnesota Pollution Control Agency (n.d.) *Clean Water Act Section 401 Water Quality Certifications*, retrieved from: https://www.pca.state.mn.us/water/clean-water-act-section-401-water-quality-certifications.

[52] Minn. R. 8810.3300, subp. 1.

[53] Minnesota Department of Transportation (n.d.) *Land Management*, retrieved from: https://www.dot.state.mn.us/utility/forms.html.

[54] Minnesota Department of Transportation (n.d.) *MnDOT Policies*, retrieved from: http://www.dot.state.mn.us/policy/operations/op002.html.

[55] Minn. R. 8420.0100, subp. 2.

[56] *See* Minn. Stat. 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); *see also* Appendix C, Section 4.5.1 (requiring compliance with NESC standards).

[57] 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.

[58] Appendix C, Section 4.5.1.

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

Chapter 3: Proposed Solar Farm

This chapter describes the project and how it would be constructed. Unless otherwise noted, the source of information for this chapter is the revised site permit application and addendum. Supplemental information was also provided by the applicant. Staff supplemental information inquiries and the applicant's responses are provided in Appendix B.

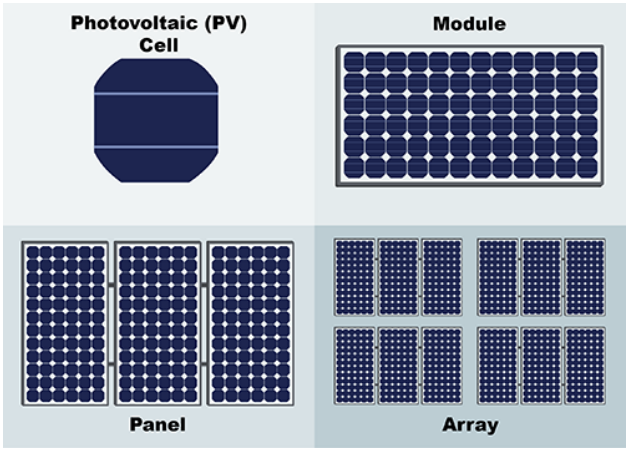
How do solar farms generate electricity?

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.

PV cells are commonly made of crystalline silicon wafers. Because silicon is typically a poor conductor of electricity, a process called *doping* introduces a small amount of other material to convert silicon from an insulator to a semiconductor.[1] These additives create either a negative n-type silicon or positive p-type silicon.[2] When fused together they make a single, two-layer wafer with relative negative and positive charges front to back. In the middle is the p-n junction. At a molecular level, the n-type layer has an extra electron compared to the p-type layer. Said differently, when compared to the n-type layer, the p-type layer has a hole in its structure.

To complete the PV cell, front and rear electrical contacts are connected to an external load. An anti-reflective coating and backsheet are applied to the front and back of the cell, respectively. Multiple PV cells can be combined into modules to generate greater quantities of electricity. Modules are encased in glass, and sealed within an aluminum frame. Modules can be further combined into panels that are arranged in electrically connected blocks throughout a solar farm. Taken together, the panels are referred to as a solar array. Figure 3 depicts this progression.[3]

Figure 3 PV Cell, Module, Panel, and Array



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) strike a PV cell some is absorbed, which excites electrons within the cell. The extra electrons from the n-type layer very quickly fill the holes in the p-type layer. This happens first at the p-n junction, which creates electrical resistance between layers. The extra electrons in the n-type layer then fill the holes in the p-type layer by traveling though the electrical contacts because there is less resistance. This results in a continuous flow of electrons, or, a continuous flow of electric current as depicted in Figure 4.[4]

Solar farms can be configured as fixed or tracking systems. Permanently mounted in a stationary position, fixed systems are aligned to gather the greatest level of solar radiation over the course of the year. Tracking systems increase efficiencies by orientating the PV panels towards the sun. Single-axis systems track the sun from east to west throughout the day. Dual-axis systems track the sun both east to west throughout the day and north to south throughout the year.

PV cells 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 one location. Figure 5 generally depicts this process.[5] (Note that it does not show a project substation, which, for this project, would step up the voltage again to 115 kV to interconnect with the electrical grid.)

Figure 4 Inside a PV Cell

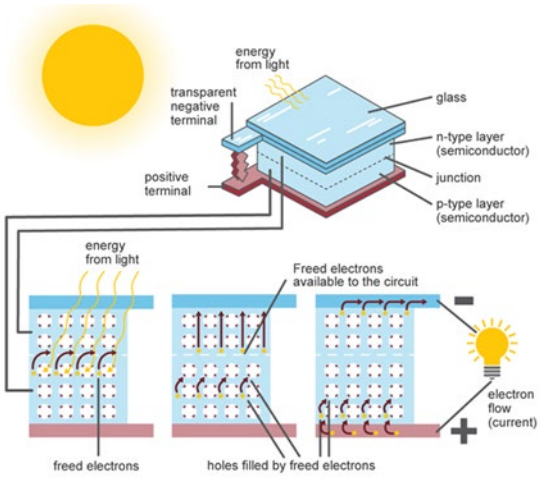
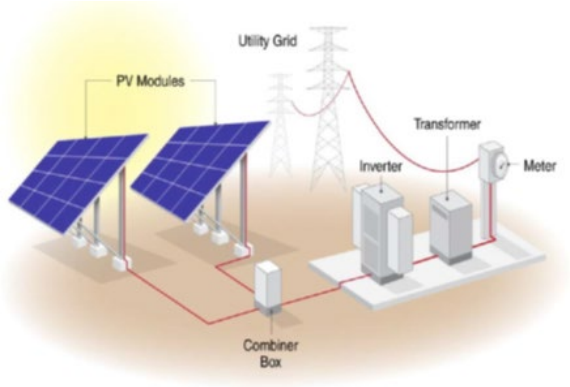


Figure 5 Generic Solar Farm Drawing



Where is the project proposed to be located?

The project is entirely within Langola Township in Benton County, Minnesota.

Table 2 summarizes the project location. Located directly west of U.S. Highway 10, approximately 230 feet west of Rice and one and one-half miles southeast of Royalton, the project is entirely within Langola Township.

Table 2 Project Location

Township	Range	Section	Political Township	County
38	32	12, 13	Langola	Benton
38	31	18, 19	Langola	Benton
38	32	3, 10-13	Langola	Benton

The solar array would be located on approximately 700 acres of center pivot irrigated farmland. The applicant holds a purchase option with a single landowner for this portion of the project. The collection line, project substation, and switching station are also located within Langola Township. The applicant intends to secure easements for the collection line and purchase the underlying land for the project

substation and switching station. The applicant will sell Minnesota Power the land needed for the switching station.

How is the project designed?

The project will convert solar energy into electricity, and deliver it to the electrical grid.

Primary components include PV panels affixed to linear ground-mounted single-axis tracking systems, inverters and transformers housed in electrical cabinets, electrical collection system, project substation, and SCADA systems and metering equipment. The project also requires fencing, access roads, laydown areas, weather stations, and an operation and maintenance facility. It would interconnect to the electrical grid at a new switching station through a new 115 kV overhead gen-tie transmission line approximately 700 feet long.

PV Array

The most visible component of the project will be the PV panels. The applicant has not selected a specific panel type at this time; however, panel size is estimated to be between four to seven feet long by two to four feet wide. The panels will be one to two inches thick. Panels are designed to withstand extreme weather, including hail.

The project will use a single-axis tracking system oriented north to south. The PV panels will be supported on aluminum frames mounted to galvanized steel i-beam posts. There would be approximately 52,000 of these posts. A motor will rotate the tracking systems, and, as a result, the panels, will rotate from east to west throughout the day. Depending on type, the PV panels might reach 20 feet tall at their steepest angle (approximately 45 degrees) during the morning and evening hours. The applicant anticipates that, on average, the PV panels will be 15 feet tall. For visual reference, center pivot irrigation systems, for corn, are usually 14 to 18 feet in total height, with the sprinkler drop heads between seven and nine feet tall.[6]

Inverters, Transformers, and SCADA Systems

Inverter skids centralized within PV panel blocks will house inverters, transformers, and SCADA equipment. These metal skids will be approximately 10 feet wide by 25 feet long and 12 feet tall. From a distance, they will appear similar to a half-sized semi-trailer box (full length semi-trailer boxes are usually eight feet wide by 48 to 53 feet long and eight feet tall).[7] The skids will be placed on concrete or pier foundations along access roads. The applicant proposes to use 40 inverter skids for the project; however, they indicate that one inverter would be required for every two to three MW of electricity. Therefore, based on this estimate, up to 50 skids might be needed.

Electrical Collection System

An electrical collection system will collect DC electricity generated by a panel block and funnel it to an inverter skid where it will be converted to AC electricity. The collection system then directs the AC electricity to an above ground collection line, which routes the electricity to the project substation. This happens across the array. The applicant indicates the electrical collection system will be installed above or below ground, or be a hybrid. Road crossings within the land control area will be above or below ground.[8] Below-ground crossings are expected to utilize a conventional guided bore—a steerable, trenchless crossing method. A pit at the entry and exit points provides access to the borehole.

Collection Line An above ground AC collection line, beginning at the northwest corner of the land control area, will interconnect the solar arrays with the project substation to be located approximately three miles northwest of the arrays. "The design includes 51 poles typically spaced approximately 300 feet apart that will carry two circuits with six conductors ...."[9] "Based on preliminary design, pole spacing ranges from 156-862 feet to span various environmental features or roads."[10] Structures will be approximately 60 feet tall. The collection line will be about two and eight-tenths miles long. A 26-foot right-of-way (13 feet on either side of the collection line) will be maintained.

Above-ground System DC collection cables will be located underneath each panel row on steel arms attached to foundation posts. The electrical cables will be supported by a steel cable. These hanging brackets would connect panel blocks to a common collection point where the electrical cables will be routed below-ground to an inverter skid. The AC power will then be routed above-ground on distribution-type poles to the start of the collection line. These poles would be made of wood, approximately 18 inches in diameter, be up to 30 feet tall, and be spaced approximately 200 feet apart. Crossing existing distribution lines would require taller structures (up to 60 feet). Approximately 198 distribution poles would be needed within the solar array.

Below-ground System For each panel block, DC collection cables will be routed below-ground to an inverter skid. The AC power will then be routed below-ground to a riser pole at the start of the collection line.

Hybrid System Similar to the above-ground system, electrical cables will be located underneath each panel row on steel arms attached to the foundation posts and supported by a steel cable. These hanging brackets would connect panel blocks to a common collection point where the electrical cables will be routed below-ground to an inverter skid. The AC power will then be routed below-ground to a riser pole at the start of the collection line.

Associated Facilities

The following facilities will be permitted as part of the project: project substation, gen-tie transmission line, access roads, weather stations, operation and maintenance building, security features, and temporary facilities. An associated switching station will be constructed by Minnesota Power, but not permitted as part of the project.

Project Substation The project generates AC electricity at 34.5 kV, but would connect to the electrical transmission grid at 115 kV. Therefore, a project substation with a 34.5/115 kV step-up transformer will be constructed. The substation will have metering and switching gear. The footprint—150 feet by 150 feet—will be graveled and fenced.

Switching Station A switching station will be constructed, owned, and operated by Minnesota Power. "The switching station will contain station service transformers and a 3-ring breaker bus. The voltage will be 115 kV."[11] The footprint—650 feet by 350 feet—will be graveled and fenced.

Gen-tie Transmission Line In order to connect the project substation with the switching station, the applicant will construct a 115 kV overhead high voltage transmission line. This transmission line will be approximately 700 feet long. Structures are expected to be 70 feet tall and contained with the footprint of the project substation and switching station.

Access Roads Approximately 12.5 miles of 16-foot wide graveled access roads will be constructed. Within the solar array, these roads will lead to the inverter skids. They will also be constructed around the project perimeter to reduce the chance of fire reaching the solar array. An access road will be also constructed to provide access to the project substation for maintenance activities.

There are four access points from existing county roads (two along Halfway Crossing Road and two along 45th Avenue NW). These entrances will have locked gates. Upgrades to public roads will be required, which could include general improvements, additional aggregate, and driveway changes. The applicant would be responsible to pay for these upgrades.

Construction crews will use the space between panel rows to access the project once foundations posts are driven. These temporary access corridors will not be staked or augmented with additional materials; therefore, they are not considered access roads. These corridors will be easily identified as a function of the construction process as foundation posts would be installed first.

Security The entire project area will be fenced to prevent public access to electrical equipment, which could cause injury. The solar array will be enclosed by an agricultural style woven fence. As proposed, the fence will be six feet tall and topped with three to four strands of smooth wire angled at 45 degrees. In total, the fence will be about 7 feet tall. The project substation will be enclosed in a chain-link fence topped with barbed wire. Security cameras and down-lit lighting will be installed at select locations.

Weather Stations Up to two weather stations might be constructed. These stations will be mounted on 20-foot wood poles, and be located within the developed area of the project.

Operation and Maintenance Building An operation and maintenance building will be centrally located in the land control area. It will be approximately 60 feet long by 40 feet wide and constructed of metal. It will look like a pole barn. The operation and maintenance building will house a SCADA cabinet, spare panels and parts, hydraulic oil and fuel, and safety equipment. A 500 square-foot parking lot will also be constructed.

Temporary Facilities Five temporary laydown areas totaling approximately eight and one-half acres will be used for parking and receiving, storing, and staging equipment and materials during construction. Laydown areas might house temporary onsite construction trailers.

How would the project be constructed?

The applicant must obtain a site permit prior to constructing the project. Construction is expected to take approximately one year.

Construction cannot not begin until the applicant obtains necessary approvals. All activities must comply with permit conditions. The applicant is "hopeful" that construction can begin second quarter 2021 with commercial operation expected by the end of 2021.[12] Table 3 provides an anticipated construction schedule, which might change due to permit timing and conditions, weather, and available workforce and materials.

The applicant anticipates an average of 100 workers on-site during construction. This includes laborers, supervisory personnel, support personnel, and construction management personnel. During peak construction periods up to 150 workers might be employed on-site. The applicant plans for construction activities to occur between 7 a.m. and 5 p.m., Monday through Saturday. In some cases,

construction activities might occur outside these times. In situations where activities such as testing or commissioning need to be performed outside of daylight, temporary lighting for these activities will be provided by mobile light plant trailers.

Construction equipment such as scrapers, dozers, dump trucks, watering trucks, motor graders, vibratory compactors and pile drivers, pickup trucks, skid steer loaders, medium duty cranes, all-terrain forklifts, concrete truck and boom truck, high reach bucket truck, auger or drill rigs, and backhoes will be used during construction.

A project-specific safety plan will be developed and implemented. The plan will outline safety rules and procedures required on-site. All personnel will be required to complete safety orientation and training. Weekly safety meetings will occur. At the start of work each day, crews will perform field level hazard assessments (safety meetings) to review hazards associated with work to be completed that day.

Land Acquisition

The applicant has a purchase option for the land control area and is negotiating a purchase option for the project substation and switching station locations. If a site permit is issued for the project, the applicant will purchase the necessary land from landowners, but sell the land needed for the switching station to Minnesota Power. The applicant has signed easements for the collection line corridor.

Construction Process: Solar Array

The revised site permit application and addendum discuss construction and operation of the project. The applicant will begin preparing the project location for construction after necessary permits are obtained. Once access to the site is established, construction will begin with initial site preparation work, including utility locates. Agricultural wells will be flagged and fenced to avoid impacts. Depending on timing, residual row-crop debris might be cleared. A fencing company will be contracted to construct perimeter fencing—wooden posts will be augured or directly embedded.

Some grading will occur to provide a more level workspace and maintain soil stability in areas with greater than five percent slope. This type of grading is generally referred to as cut and fill. Higher areas would be excavated (cut) and the material used to raise (fill) the surface of nearby lower areas. The applicant estimates that approximately 230 acres will require grading. Topsoil will be stripped and segregated from subsoil. Permanent access roads will be constructed, along with drainage ditches. Laydown areas will be established. Previously stripped topsoil will be re-spread throughout the project boundary.

Once site preparation is complete, the solar array will be constructed in blocks. Multiple blocks might be constructed simultaneously. The size of the blocks is dependent on inverter specifications. Foundation posts will be driven using a track-driven hydraulic ram and operated by two workers. Each post will take between 30 seconds and two minutes to install, depending on soil conditions.[13] Racking will be bolted on top of the foundation posts to which solar panels are fastened. Solar panels, along with electrical connections, terminations and grounding, and cable management systems, will be installed by multiple crews using hand tools. Installation crews will proceed in serpentine fashion along temporary access roads in a pre-established route.

The inverter skids will be placed on poured concrete slabs or pier foundations. Concrete foundations require a backhoe to dig out major foundation components. An auger drill machine would be used to drill pier foundations. Inverter skids would be constructed off-site and shipped from the manufacturer.

Table 3 Construction Timeline for Individual Tasks

Task*	Duration**	Predecessor	Timeframe
Site preparation	20	Start of Construction	June – July
Laydown areas/job site trailers	04	Start of Construction	June – July
Fencing	10	Site Preparation	July
Access roads	10	Site Preparation	July
Posts and foundations	30	Site Preparation	July – August
Electrical collection system	30	Site Preparation	July - September
Tracking	30	Site Preparation	August
Wiring and cabling	45	Tracking, Panel Installation	Aug. – Sept.
Panels	60+	Tracking Installation	Sept. – Nov.
Major electrical equipment	30	Site Preparation	Sept. – Nov.
Project substation	30	Site Preparation	Sept. – Nov.
Transmission line	05	Project Substation	October
Operations building/parking lot	30	Project Substation	Oct. – Nov.
Restoration	10	Major Electrical	Oct. – Nov.
Testing	10	Major Electrical	November
Commissioning	10	Testing	December

* Tasks are not necessarily in chronological order.
** Estimated number of days; not necessarily consecutive days.

Electrical collection cables will connect the solar panel blocks to inverters and transformers, and ultimately, to the project substation. These cables will be installed in an above-ground, below-ground, or hybrid system. Above-ground electrical cables will be supported by steel cabling and strung under the panels on steel arms attached to the foundation posts. Below-ground cables would be trenched or ploughed into place at a depth of at least four feet. During excavation topsoil and subsoil will be removed and stockpiled separately. Once cables are laid in the trench, the trench will be backfilled with subsoil followed by topsoil.

Substation construction begins with site clearing. Topsoil will be removed to a pre-established location for long-term storage. Ground disturbance will be limited to the substation footprint. Poured concrete or drilled foundations will be installed. A station service transformer will be installed along with batteries and battery chargers to power the switchyard control system. Above- and below-ground conduits from this equipment will run to a control enclosure that will house the protection, control, and automation relay panels. Crushed rock will cover the substation footprint; fencing and down-lit lighting will be installed around the substation. The switching station would be constructed in the same fashion.

The project operation and maintenance building and associated parking lot will be constructed using standard building practices.

Throughout construction, inspection and testing will occur for each component of the solar array, as well as for associated communication, meteorological, electrical collection, and SCADA systems.

Construction Process: 34.5 kV Collection Line

Before ground disturbance occurs, surveyors will mark the anticipated alignment and right-of-way boundary. Construction begins by removing trees and other vegetation from the right-of-way that will interfere with safe construction and operation of the collection line. The applicant would coordinate with Benton County for any tree removal. 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.[14]

Structures are generally installed at existing grade; locations with more than 10 percent slope will be graded and leveled. Crews will install erosion control where needed. Access will be from existing roads or farm field access roads. Prior to structure installation, the alignment might again be surveyed and marked to guarantee proper placement of structures.

Poles will be staged in laydown areas. They will be delivered to the pole location, and placed within the collection line corridor until the pole is set. Most structures will be directly embedded, unless concrete foundations are required by soil conditions. Direct embedment usually involves auguring a hole up to three feet across and 15 feet deep. The hole is partially filled with crushed rock, and the structure placed on the rock base. The hole is backfilled with crushed rock and subsoil. Excess topsoil is spread and leveled near the structure or removed. Concrete pier foundations will be used for dead-end structures or if soil conditions require. A foundation hole is drilled. Steel reinforcing bars and anchor bolts are installed. Concrete is poured—usually to one-foot above grade. After the foundation is set structures are bolted to it. Excess subsoil is removed, excess topsoil is treated similarly to above.

Hardware is usually attached to structures prior to being raised. Once structures are installed conductors are strung along the line. Puller-tensioner sites are locations where specialized equipment pulls in and tensions the conductor. This will involve a boom truck at each pole location and a small construction vehicle, for example, a skidsteer, pulling the conductor. “At the Platte River crossing, the stringing vehicle [skidsteer] would use the bridge along Halfway Crossing NW to cross the River and avoid impacts to the waterbody. Use of Halfway Crossing NW would be coordinated through Benton County and all appropriate safety measures in place, such as lane closures and signage.”[15]

Portions of existing distribution lines will be buried by the local utility. Generally, trenching or a vibratory plow is used to bury distribution lines within the road right-of-way after necessary permits are acquired, and a single, short (minutes to hours) outage might occur. Crossing the Platte River will be by horizontal directional drill. Relocating the distribution line is anticipated to take about one month. Relocation and burial of this distribution line are analyzed as part of the project.

Restoration and Cleanup

Areas disturbed during construction that do not contain permanent facilities will be restored. Permanent erosion control methods will be implemented. The solar array will be seeded with native seed mixes developed in coordination with DNR. A cover crop will be planted with the seed mixes to stabilize the soil and prevent erosion during the time it takes for the seed mix to establish. The collection line corridor will be allowed to revegetate and, as necessary, will be seeded with a MnDOT

approved roadside seed mix. Trees will not be allowed to grow in a way that would interfere with the safe operation of the collection line.

Vegetative screening will be located at one location near a residence. It is anticipated to be a combination of evergreens and leafy shrubs. The type of plants used will be guided, in part, by landowner preference. Screening will be installed using youth-stage plants—shrubs installed at about two feet and evergreens three to four feet. At maturity, shrubs will measure approximately eight feet tall and evergreens 12 to 15 feet tall. Vegetative screening will be maintained by a professional landscape service throughout the life of the project, and will be replaced if it fails to establish.

Collection points and dumpsters for construction debris and trash will be located in laydown areas and at designated locations close to work locations. Dumpster service will be locally sourced. To the extent practicable, recyclable materials will be sorted and recycled at a local facility. The fence line will be inspected and cleared of trash and debris daily. Contaminated or otherwise hazardous materials would be disposed of in accordance with applicable laws and regulations. "[The applicant] or its contractor will contact each property owner after construction is completed to identify and address any damage that may have occurred as a result of the construction of the [p]roject."[16]

How would the project be operated and maintained?

The project will be maintained by the applicant, an affiliate, or contractor. All maintenance activities will be performed by qualified personnel.

The expected service life of the project is 25 to 40 years. As a standalone facility, the expected service life of the collection line, substation, and gen-tie line would normally be longer; however, these facilities are associated with the project, so their expected service life is the same. A site permit for a solar farm lasts 30 years.

The project will be maintained and operated by the applicant, an affiliate, or contractor.[17] Table 4 lists the anticipated frequency of the operations and maintenance tasks. All maintenance activities will be performed by qualified personnel. Solar farms can be remotely operated through real-time SCADA equipment for most functions. The applicant anticipates a permanent staff of four to five full-time positions. This includes one plant manager. Local staff will conduct scheduled inspections and routine maintenance. Additional staff or contractors might be needed to perform specialized repairs, or to assist with snow plowing and vegetation management.

The frequency of inspections could ultimately vary. However, at this time the applicant anticipates the solar array will be inspected yearly and the project substation, the collection line will be inspected monthly, and the gen-tie transmission line every six months. These facilities will be maintained in accordance with code requirements and manufacturers' recommendations. Other tasks include road and vegetation maintenance, fence and gate inspections, lighting system checks, and snow removal. Animal presence will not be routinely monitored.

What would happen at the end of the project's useful life?

The permittee will apply to the commission to renew the site permit, or decommission the project. A draft decommissioning plan is provided in Appendix D.

The applicant indicates that at the end of the project's useful life steps will be taken to continue operation of the project (this would include the commission approving an amendment to the site

permit or a new site permit altogether) or the project will be decommissioned. This determination will be influenced by a variety of factors, such as "energy market conditions, regulations, anticipated equipment lifetime, highest and best use of the underlying property, and ongoing operations costs".[18]

Table 4 Operations and Maintenance

PV Field	Electric Boards
PV panel visual check	Case visual check
Wirings and junction boxes visual check	Fuses check
PV strings measurement of the insulation	Surge arresters check
PV strings and string boxes faults	Torque check
PV panels washing	DC voltage and current check
Vegetation management	Grounding check
Inverters	**Support Structures**
Case visual inspection	Visual check
Air intake and filters inspection	Random panel torque check
Conversion stop for lack of voltage	**Anticipated frequency is yearly for ALL TASKS, except:** • **Panels washed as needed.** • **Vegetation management (mowing) up to three times yearly.**
AC voltage and current check	
Conversion efficiency inspection	
Datalogger memory download	
Fuses check	
Grounding check	
Torque check	

Should the project be decommissioned, it would take at least one year. The project would be restored to an agricultural use, in accordance with the *Agricultural Impact Mitigation Plan*,[19] and involve the following:

- Removal of all equipment to a depth of four feet, except for the operations and maintenance facility, which might be useful for other purposes.
- Repurposing, salvaging, recycling, or properly disposing of the solar energy generation equipment (including PV panels).
- Removal of below-ground electrical cables to a depth of four feet.
- Removal of access roads; however, if the land is sold to a new owner, access roads desired by the new landowner would be retained.
- Repurposing or removing the collection line.
- Removing the project substation, unless left for future use at the request of Minnesota Power.
- Restoring the land control area by grading, adding, or re-spreading topsoil, and reseeding.

The applicant indicates that all decommissioning activities, especially grading and soil disturbance, would be kept to the minimum necessary to not negatively impact soil benefits achieved over the life of the project.

How much would the project cost?

The project is expected to cost approximately $146 million.

Table 5 provides cost estimates. These are engineering estimates, and are anticipated to reflect actual costs within 10 percent. Installation of above-ground and hybrid collection systems would cost less; however, at one percent or less, this amount is insignificant. The below-ground collection system would reduce mowing costs by approximately 10 percent. This reduced cost is not reflected in Table 5, and is insignificant.

The applicant has not chosen PV panels, inverters, or transformers for the project. PV panels are anticipated to cost $0.32 to $0.38 per watt DC ($32 million to $38 million total); inverters $0.03 to $0.045 per watt AC ($3 million to $4.5 million total); and transformers approximately $0.04 per watt DC ($4 million total).

Table 5 Estimated Project Costs

Project Component	Baseline Cost (millions)	Above-ground Collection System‡	Below-ground Collection System‡	Hybrid Collection System‡
Design, procurement, and construction	$118.6	~ 1% decrease	Baseline	~ 0.5% decrease
Development expense*	$28.2	No change	No change	No change
Interconnection	$15.2	No change	No change	No change
Financing**	$2.7	No change	No change	No change
Total	**$164.7 million +/- 10 percent**	**All options within 10 percent engineering estimate.**		

* Includes development payments to the landowner, land purchase, costs associated with developing the project such as title clearing, design, environmental and engineering surveys, and permit applications. Additionally, development costs include property tax payments during construction and construction management.
** Includes legal/transactional fees associated with financing, tax equity commitment fees, upfront construction and construction commitment fees, construction interest and the upfront fee for the operating letter of credit required by financing parties.
‡ Includes above-ground collection line.

Notes

[1] Reference* (n.d.) *Does Silicon Conduct Electricity?*, retrieved from: https://www.reference.com/science/silicon-conduct-electricity-25f69f8a8928d811.

[2] Clean Energy Reviews (August 20, 2018) *Solar Panel Construction*, retrieved from: https://www.cleanenergyreviews.info/blog/solar-panel-components-construction.

[3] Florida Solar Energy Center (2014) *Cells, Modules, and Arrays*, retrieved from: http://www.fsec.ucf.edu/en/consumer/solar_electricity/basics/cells_modules_arrays.htm.

[4] U.S. Energy Information Administration (October 7, 2019) *Solar Explained: Photovoltaics and Electricity*, retrieved from: https://www.eia.gov/energyexplained/solar/photovoltaics-and-electricity.php.

[5] National Renewable Energy Laboratory (September 2016) *Facility-Scale Solar Photovoltaic Guidebook*, retrieved from: https://www.nrel.gov/docs/fy16osti/67122.pdf.

[6] Grand Irrigation (February 28, 2020) *Personal Communication*.

[7] International Used Truck Centers (n.d.) *Semi Truck Trailer Sizes*, retrieved from: https://www.internationalusedtrucks.com/driver-tips/semi-truck-trailer-sizes/.

[8] Department of Commerce (December 3, 2019) *Environmental Assessment Scoping Comments Received*, eDockets No. 201912-157991-01, page 60 (applicant stating that road crossings "are going to directly bored underground. Yeah, road crossings will be underground"); *but see* Regal Solar, LLC (February 14, 2020) *Supplemental Information Inquiry #3*, Appendix B (applicant stating a preference "to keep the option open for using overhead lines at the two road crossings").

[9] Addendum, page 10.

[10] *Ibid*.

[11] Addendum, page 12.

[12] *Id*., page 4.

[13] There are approximately 52,000 foundation posts. Should each post take two minutes to install, a single hydraulic ram will run for approximately 1,733 hours or 72 days. Staff does not expect the worst-case scenario.

[14] Appendix C, page 7 (Section 4.3.7 states "the permittee shall disturb or clear vegetation on the site only to the extent necessary to assure suitable access for construction, and for safe operation and maintenance of the project").

[15] Addendum, page 15.

[16] *Id*., page 16.

[17] The switching station will be operated and maintained by Minnesota Power.

[18] Department of Commerce (September 24, 2015) *North Star Solar Project Environmental Assessment*, retrieved from: https://mn.gov/eera/web/file-list/4480/.

[19] Revised Site Permit Application, Appendix C.

Chapter 4: Alternatives to the Project

The applicant proposes to construct the project to increase solar generating capacity in Minnesota that can contribute to meeting demands for renewable energy. As described in Chapter 2, the commission must determine if the project is needed or if another project is more appropriate for Minnesota, such as a project of a different type or size.

This chapter evaluates alternatives to the project, including a no-build alternative. This 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 certificate of need filing requirements concerning alternatives to the project that otherwise must be discussed under Minnesota Rule 7849.1500. The commission authorized these exemptions.[1] As a result, the following system alternatives are not studied: demand side management;[2] purchased power;[3] facilities using a non-renewable energy source;[4] upgrading existing facilities;[5] and transmission rather than generation.[6]

Need for the Project

The project could contribute to satisfying utility and consumer demands for renewable energy.

The applicant proposes to construct the project to "contribute to satisfying utilities' and consumers' demands for renewable energy, and potentially meet utility renewable requirements or individual sustainability goals, depending on the ultimate power purchaser."[7] While constructed in Minnesota, the electricity generated could ultimately be sold to utilities and companies in neighboring states. North and South Dakota have voluntary 10 percent from renewable standards; Wisconsin requires 12.89 percent from renewables; and Michigan requires 15 percent from renewables by 2021.[8] Minnesota's renewable standards are discussed in more detail below.

Solar Energy Standard

In 2013, the Minnesota Legislature established the Solar Energy Standard ("SES") requiring 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.[9] Three utilities are subject to the SES—Minnesota Power, Ottertail Power Company, and Xcel Energy—and are required to submit annual reports detailing compliance efforts. These efforts are summarized in *Minnesota Renewable Energy Standard: Utility Compliance* prepared by the Division of Energy Resources within commerce.[10]

It is estimated that Otter Tail Power Company requires 30 MW of solar capacity to meet 2020 SES requirements. The company continues to evaluate solar projects. Minnesota Power requires 30 MW of solar capacity to meet 2020 SES requirements. The company plans to purchase energy from a 10 MW solar project scheduled to come online in 2020. Xcel Energy requires 226 MW of solar capacity to meet 2020 SES requirements. The company has 273 MW of community solar gardens in the design and construction process. Xcel Energy included a target of 3,000 MW of additional solar generation by 2030 in its *Upper Midwest Integrated Resource Plan: 2020-2034*.[11]

Renewable Energy Standard

In 2007, the Minnesota Legislature established a Renewable Energy Standard ("RES") requiring electric utilities to "generate or procure" sufficient electrical generation to meet standard percentages. These standards require that 25 percent of total electric sales to retail customers in Minnesota be generated by renewable energy by 2025. Utilities are required to submit annual reports detailing compliance efforts, which are also summarized in *Minnesota Renewable Energy Standard: Utility Compliance*.

The current RES requires Xcel Energy to obtain 25 percent of its Minnesota retail sales from renewables, and all other utilities subject to RES requirements to obtain 17 percent of their Minnesota retail sales from renewables. All utilities subject to the Minnesota RES have demonstrated compliance with 2017 RES requirements.

As part of their reporting, utilities were asked to provide the year through which it can maintain RES compliance with its current renewable portfolio. All utilities, with the exception of one, have sufficient renewable resources to meet compliance beyond 2019. On average, utilities can comply with the RES through 2031 (median=2030; mode=2025). The largest utilities in Minnesota—Xcel Energy, Minnesota Power, Great River Energy ("GRE"), and Ottertail Power Company—can comply with the RES through 2040, 2053, 2039, and 2034, respectively.

System Alternatives

The project is one way to satisfy utility and consumer demands for renewable energy. Other ways include a solar farm 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 100 MW solar energy generating system in a different location and a 100 MW large wind energy conversion system. A no-build alternative is also studied. The analysis in this EA attempts to describe differences between the project and these system alternatives.

100 MW Solar Farm

A 100 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 100 MW solar farm or a combination of smaller distributed solar farms. In all likelihood, this system alternative would need to be constructed in an agricultural area due to land requirements; therefore, the analysis that follows makes this assumption.

Three solar energy generating systems have been permitted by the commission.[12] The analysis for this alternative relies on data from these, and other, solar projects.

100 MW Wind Farm

A 100 MW large wind energy conversion system is an alternative renewable energy source. Such an alternative could be a single 100 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.

Wind farms generally take up a large land area (thousands of acres) in which a developer has obtained wind rights. Turbine are sited in discrete locations that avoid impeding air flow between the other turbines. A large land area is necessary because of internal and external setbacks required to assure wind efficiencies, and to protect wind rights and nearby receptors (residences). Like solar farms, 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 farms—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.

No-Build Alternative

The no-build alternative means nothing is constructed. The analysis for this alternative considers potential benefits and drawbacks of what may occur if the project is not constructed.

Potential Impacts and Mitigation of System Alternatives

How are potential impacts associated with the project different from those associated with the studied system alternatives?

Note: Potential impacts are difficult to assess for generic projects because the environmental setting is unknown. There are differences between locations that would influence or change potential impacts, perhaps significantly. The discussion that follows speaks in general terms regarding changes to potential impacts based on location to the extent possible.

Associated facilities, such as, substations and transmission lines, would be required to "transmit the electricity to customers"[13] by interconnecting the project to the electrical grid. The types of facilities are similar for both solar farms and wind farms. An electrical collection system is required to funnel electricity generated by the panels or turbines to a project substation. From there, the electricity is delivered to the electrical grid via a direct tap to an existing transmission line or by way of a new or existing substation. The size and length of these facilities would vary depending on the location of the project and electrical interconnect thereby 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. Below-ground facilities mitigate these impacts, but cause greater impacts to soils.

100 MW Solar Farm

The types of impacts associated with a 100 MW solar farm constructed in another location (or multiple locations) would be similar to those of the project. For example, a solar farm 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. For most resource elements, a different location would likely increase potential for negative effects.

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 negative effects would increase.

Human Settlement

Potential aesthetic and noise impacts are highly dependent on the number of neighboring receptors and their distance from the system alternative. Since there are three residences adjacent to the project, an alternative with more than three receptors would likely have a greater level of impact. The project is located next to U.S. Highway 10. While these viewers will have low sensitivity to the project, a system alternative constructed away from a major highway would have less visual exposure, and, as a result, less potential for aesthetic impact. Topography, landscape features, and vegetation influence noise related effects. System alternatives with landforms or dense vegetation between it and the receptor would be anticipated to lessen these impacts.

The project could change neighboring landowners' the sense of place. Differing views regarding an 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 wind turbines. Some individuals or communities might accept solar generation more than others. Tension between the project and cultural values has not occurred to date; a solar farm in a different location could be viewed differently.

Potential impacts to recreation are most associated with Two Rivers Campground and Tubing ("Two Rivers"). A system alternative not adjacent to a campground or other recreational opportunities would reduce potential impacts. An alternative that is constructed on, or adjacent to, non-compatible land uses or zoning would result in greater impacts.

Because this system alternative is a similar type of project potential impacts from stray voltage and electronic interference would be expected to be similar.

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 location is used that does not meet these same characteristics. The project would be required to pay production taxes. While positive, its impact is dependent on the operating budgets of local unit of governments. 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.

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, should the system alternative do so, impacts from displacement would be greater.

Human Health and Safety

Because this system alternative is a similar type of 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 reroutes could be more prevalent during construction.

Public Services

Solar farms do not impact airport operations; therefore, effects would be similar regardless of location. Potential impacts to local utilities depend upon the utilities present. Similar to the project, service interruptions are likely to occur, 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. Potential impacts to roads and highways would be similar, except that, in this instance, the project is adjacent to U.S. Highway 10 resulting in short trips on local roads. Should a system alternative be constructed far from major roadways, impacts to local roads would be greater.

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 project is not located on lands designated as prime farmland or farmland of statewide importance. Therefore, a system alternative located on these lands would have greater impacts.

Mining and forestry operations are precluded at solar farms. Should these resources exists, a system alternative could have great levels of impact; however, these types of impacts are usually mitigated though land lease/purchase agreements.

Potential impacts to tourism would be expected to be less for a system alternative given the project's proximity to Two Rivers campground.

Natural Resources

Differences to air quality would occur if the project was located along unpaved roads. Without mitigation dry weather would result in increased levels of fugitive dust, negatively affecting air quality and indirectly impacting nearby surface waters. Increased water usage to control fugitive dust in the project location might occur.

The project is an area of high sensitivity to pollution of near-surface materials. An alternative location might be in an area of lower sensitivity, limiting potential impact to groundwater. There are few wetlands and no surface waters within the land control area, given that solar farms generally avoid these areas, impacts would likely be similar in a different location. The project is not proposed to be

constructed in a floodplain. A system alternative proposed in a floodplain would result in a greater potential for impacts.

Because this analysis assumes this 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.

Again, assuming the system alternative is constructed on farmland, impacts to vegetation would be similar. Should a below-ground electrical collection system be used, the project would not clear woody vegetation, increasing the likelihood that impacts to vegetation would be greater in a different location. The predominance of excessively drained soils at the land control area might mitigate impacts from both sedimentation and compaction. Therefore, impacts at a different location might be greater, should the soils be more susceptible to these effects. Because this system alternative is a similar type of project potential impacts to geology and topography would be similar except in areas of very shallow (10 to 15 feet) or exposed bedrock.

100 MW Wind Farm

The types of impacts associated with a 100 MW wind farm constructed in another location (or multiple locations) would, in general, be similar to those of the project. For example, a wind farm would produce renewable energy, and, as result would not emit criteria pollutants. However, there are differences between solar and wind generation, for example, tower height and rotor swept zone, that influence or change potential impacts.

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 farm. 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 not adjacent to a campground or other recreational opportunities would reduce potential impacts. Wind farms could preclude future land use or zoning.

Because wind farms are electrically grounded, impacts from stray voltage would be similar. Electronic interference would be similar to 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.[14] If the wind farm was constructed in an area without wind generation on the landscape there could be more noticeable 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.

Human Health and Safety

Potential impacts from EMF and to implantable medical devices would be similar. Like the project, all equipment is electrically grounded. When operating, wind turbines generate EMF from mechanical components located within the nacelle. Minimum setback distances (1,000 feet) minimize potential impacts to local 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. Similar to 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. 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

Potential impacts to air quality would be similar. Wind farms are typical developed across a larger area, because turbines must be spaced across the landscape to minimize wake loss effects resulting in lost energy production. The larger project area results in use and travel on more gravel roads. As a result, material delivery and construction could result in increased levels of fugitive dust, negatively affecting air quality and indirectly impacting nearby surface waters. Increased water usage to control fugitive dust in the project location might occur.

Wind 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.

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 turbines and associated facilities are rarely located in floodplains.

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 number 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. 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 farm requires about six to eight acres.

Wind farms would similarly impact geology and topography unless the system alternative was constructed in an area of shallow (10 to 15 feet) or exposed bedrock.

Impacts of Power Plants

Minnesota Rule 7849.1500, subpart 2, requires that specific impacts from large electric power generating plant be discussed in the environmental document.[15] Subpart 2 focusses, generally, on air and water quality, aesthetics, noise, and hazardous waste.

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.[16] Because solar farms and wind farms do not burn fuel, they do not emit the above-mentioned pollutants. Temporary impacts during construction and operation are similar, and include short-term air emissions from exhaust and fugitive dust. Exhaust emissions from construction equipment and vehicles traveling to and from the facility will occur during construction. Fugitive dust occurs from earth moving activities and vehicle travel on unpaved roads. These impacts are influenced heavily by weather conditions and the specific construction activity occurring. Once construction is complete, exhaust and dust emissions related to vehicular traffic would be 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."[17] Minor emissions of toxic air pollutants at solar farms 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."[18] Solar farms 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 Appropriate 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.[19] (The vast majority of this water is returned to the source.) Solar farms 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 farm and wind farm construction generates solid waste, such as scrap wood and metal, plastics, and cardboard. Petroleum products would be present on-site, including engine and hydraulic oil, lubricants, grease, cleaning solvents, and fuel. Operation is not expected to generate significant qualities of solid and hazardous wastes—but more so for wind farms. Small quantities of petroleum products would be kept onsite for routine maintenance activities. Certain electronic components in both solar farms and wind farms, such as circuit boards, contain hazardous materials commonly found in electronic devices.

"In Minnesota, solar panels discarded by commercial entities 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. If hazardous waste, they must be properly disposed of in a special facility or recycled if recyclers are available."[20]

No-Build Alternative

The analysis of a no-build alternative involves a discussion of the environmental impacts of continuing the status quo. For example, with a proposed highway project, the no-build alternative would discuss the impacts associated with traffic increases along existing roads and highways, and for development to occur along existing arteries. In this instance, if the commission determines that the need for additional solar generation is not clearly established, no certificate of need will be issued and nothing new will be constructed. Whatever impacts would occur from the project will not occur. The applicant indicates they will continue to pursue other solar projects within Minnesota.

If the project is not constructed, the potential human and environmental impacts discussed in the following chapter would not occur. If the project is not built, economic opportunities in the project area would be lost, and one less option would be available to meet SES and RES objectives, and possibly replacement electricity could be generated from a non-renewable energy source.

Loss of Economic Benefits If the project is not built, economic opportunities would be lost. The landowner would lose the income associated with selling property to the applicant. Local governments would lose energy production tax revenues estimated to be $192,000 annually (see Socioeconomics, page 61). The applicant has committed to advertising construction and operation jobs locally, and, as feasible, purchasing goods and services locally. If the project is not constructed, these potential opportunities and their associated income would be lost. The applicant has also committed to contribute $20,000 annually between the Royalton and Sauk Rapids-Rice school districts.

Solar Energy and Renewable Energy Standards Minnesota is committed to meeting SES and RES objectives. While there are solar and wind resources in other parts of the state that could replace the project; these resources are finite. If the project is not built, it would reduce the available options to meet these objectives.

Availability and Feasibility of System Alternatives

Are these system alternatives feasible and available, and, if so, can they meet the stated need for the project?

This section discusses whether system alternatives can be engineered, designed, and constructed; and if alternatives are readily obtainable at the appropriate scale.

Associated facilities, such as, substations and transmission lines, would be required to "transmit the electricity to customers"[21] by interconnecting the project to the electrical grid. These facilities are similar for both solar farms and wind farms. An electrical collection system is required to funnel electricity generated by the panels or turbines to a project substation. From there, the electricity is delivered to the electrical grid via a direct tap to an existing transmission line or by way of a new or existing substation. The size and length of these facilities would vary depending on the location of the project and electrical interconnect thereby making potential impacts difficult to quantify. Constructing these facilities is feasible. Existing facilities are available; however, constraints exist.

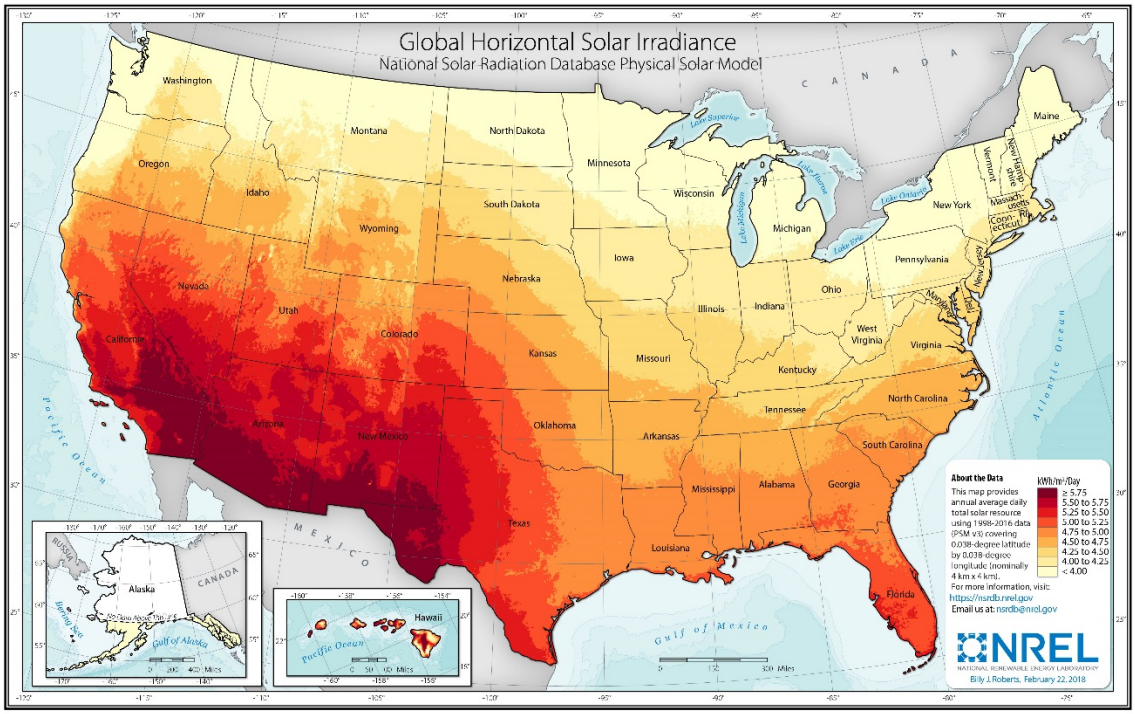
100 MW Solar Farm

A generic solar farm is both feasible and available; however, a location with adequate space and access to transmission interconnection is important for the project to be viable.

In the past, access to the electrical grid has constrained wind energy development in Minnesota. This same constraint will likely affect solar energy development. Additionally, Minnesota Rule 7850.4400 states that no large electric power generating plant site (including a solar energy generating system) can include more than one-half acres of prime farmland per MW of net generating capacity. This "prime farmland exclusion" can be waived if "no feasible and prudent alternative" is available or if the commission varies its rules. To date, one utility scale solar project has been sited on prime farmland.[22]

The greater the solar irradiance, which is a measure of both direct and scattered solar radiation, the greater potential exists for solar generation. The greatest concentration of solar irradiance in Minnesota is concentrated in the southwest. Minnesota has a similar solar resource as other Great Lakes states, such as Wisconsin, Michigan, Pennsylvania, and New York (**Figure 6**). Nationally, Minnesota's solar resource would rank somewhere in the bottom half, making solar energy less efficient and more expensive than more southern states.

Figure 6 Global Horizontal Solar Irradiance: United States

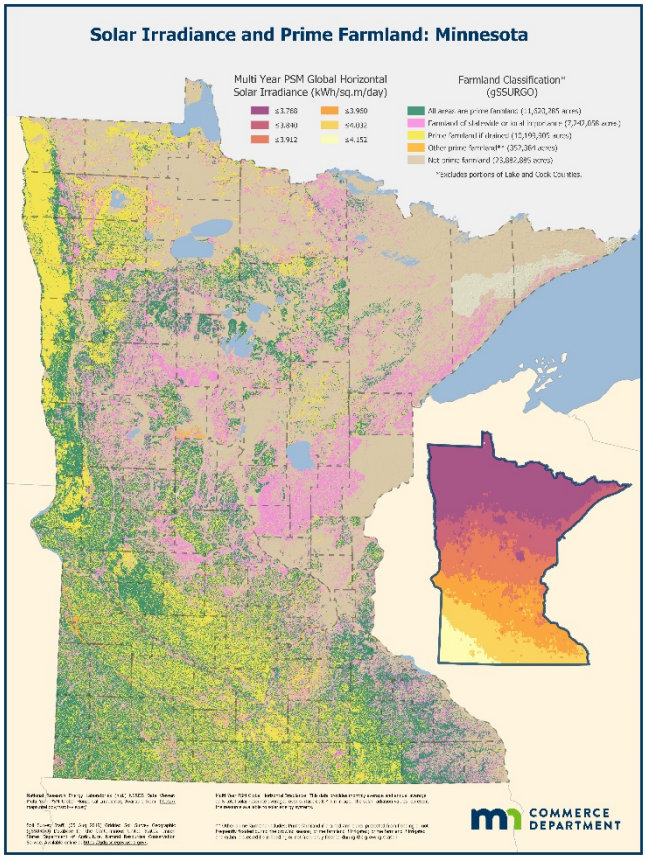


Minnesota is largely agricultural in the south, with lower population densities. Combined, these characteristics—relatively high solar irradiance (for Minnesota) and large areas of available land—could foster the growth of solar energy generation. Southern Minnesota contains high amounts of prime farmland, requiring compliance with the prime farmland exclusion (**Figure 7**). Solar generation also needs to compete with already established wind generation in that part of the state. Solar generation has moved outside of areas traditionally used to generate wind power, for example, the North Star project is a 100 MW solar farm constructed in Chisago County.

The U.S. Energy Information Administration projects the levelized total system cost for new generation resources entering service in 2023 to be $48.8 per megawatt hour ("/MWh") ($37.6/MWh with tax credit) for solar PV. Onshore wind continues to be more favorable than solar despite recent decreases in solar generation costs.

Over the past 20 years, generation of electricity in Minnesota has shifted from a reliance on coal and nuclear power to a more diverse mix that includes an increasing amount of renewable generation. Solar generation has increased approximately 2,650 percent since 2015 to 882 MW of installed solar capacity (2018 preliminary data),[23] which accounts for about 2 percent of Minnesota's electrical generation. This increase has been driven by state and federal policies, technology advances, and economics.

Figure 7 Solar Irradiance and Prime farmland



100 MW Wind Farm

A 100 MW wind farm is both feasible and available; however, access to transmission interconnection is important for the project to be viable.

Wind resources generally refers to wind availability and wind speeds, which determine the productivity of wind turbines. The Great Plains states, including Minnesota, Iowa, and North and South Dakota, have higher-than-average wind speeds compared to other areas of the country, making wind energy more efficient and inexpensive.

These states also tend to be largely agricultural with lower population densities. Combined, these characteristics—relatively high wind speeds and large areas of available land—have fostered the growth of wind energy generation. However, these characteristics also mean that wind energy is often located far from load centers, requiring transmission lines to transport electricity to populated areas. Electrical energy produced by wind generation is among the lowest-cost energy available to consumers in the United States. The levelized cost of wind generation in 2023 is expected to be $36.6/MWh with tax credit —less in Minnesota.[24] This makes wind generation the cheapest generation technology.

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). Wind generation has increased approximately threefold in the past 10 years to 3,509 MW of installed wind

capacity (2016). This increase has been driven by state and federal policies, favorable wind resources, technology improvements, and economics.

No-Build Alternative

The no-build alternative is not one that requires any analysis regarding its feasibility or availability. If the project were not undertaken, satisfying utilities' and consumers' demands for solar generating capacity would need to be met elsewhere.

Notes

[1] Public Utilities Commission (May 13, 2019) *Order Regarding Exemption from Certain Certificate of Need Application Content Requirements*, eDockets No. 20195-152889-01.

[2] Department of Commerce (April 4, 2019) *Comments*, eDockets No. 20194-151713-01, page 6 (the applicant "is not a regulated utility, has no retail customers, and plans to sell the project's output into the wholesale market. For these reasons, and the fact that the project is a renewable energy project, conservation programs could not serve as an alternative to the project").

[3] *Id.*, page 4 (the applicant "is proposing to produce power to sell to utilities in the market, and thus is in the business of selling rather than purchasing power").

[4] *Id.*, page 5 ("since the intent of the project is to provide renewable energy to sell to the market, examination of non-renewable alternatives would be irrelevant").

[5] *Id.*, pages 4, 5 (the applicant "is not a vertically integrated regulated utility and therefore has no existing facilities in Minnesota for which efficiency could be improved to mitigate the need for the project").

[6] *Id.*, page 7 ("transmission facilities are not true alternatives to the [p]roject as the purpose of the [p]roject is to increase the available supply of renewable energy").

[7] Revised Site Permit Application, page 3.

[8] Xcel Energy (July 1, 2019) *Upper Midwest Integrated Resource Plan 2020-2034*, retrieved from: https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/The-Resource-Plan-No-Appendices.pdf, page 59.

[9] Excluding retail sales to customers that are iron mining extraction and processing facilities, or paper mills and wood products manufacturers from the retail sales calculation. The statute further requires that at least 10 percent of the 1.5 percent SES goal be met by solar energy from facilities with a nameplate capacity of 20 kW or less.

[10] Department of Commerce (January 15, 2019) Minnesota Renewable Energy Standard: Utility Compliance, retrieved from: https://www.leg.state.mn.us/docs/2019/mandated/190330.pdf; *see also* Department of Commerce (November 2018) *Minnesota Renewable Energy Update*, retrieved from: https://mn.gov/commerce-stat/pdfs/2017-renewable-energy-update.pdf.

[11] Xcel Energy (July 1, 2019), page 2.

[12] 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).

[13] Minn. R. 7849.1500, subpart 2(F).

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

[15] Minnesota Rule 7849.1500, subpart 2, requires certain potential impacts be addressed. This subsection addresses subparts 2(A) (air pollutants); 2(B) (hazardous air pollutants); 2(D) (ozone); 2(F) (associated facilities); 2(G) (water use); 2(H) (wastewater); and 2(I) (solid and hazardous waste). Subparts 2(C) (aesthetics) and 2(J) (noise) are discussed in the Potential Impacts and Mitigation section of this chapter beginning on page 29. Subpart 2(E) (fuel sources) is not discussed because questions of fuel source availability, fuel requirements, and fuel transportation do not apply to projects using the sun and wind.

[16] University of Calgary (September 3, 2018) *Energy Education: Primary Pollutant*, retrieved from: https://energyeducation.ca/encyclopedia/Primary_pollutant.

[17] U.S. Environmental Protection Agency (February 9, 2017) *What are Hazardous Air Pollutants?*, retrieved from: https://www.epa.gov/haps/what-are-hazardous-air-pollutants.

[18] U.S. Environmental Protection Agency (October 31, 2018) *Ground-level Ozone Basics*, retrieved from: https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics#formation.

[19] U.S. Geological Survey (n.d.) *Total Water Use*, retrieved from: https://www.usgs.gov/mission-areas/water-resources/science/total-water-use?qt-science_center_objects=0#qt-science_center_objects.

[20] Pollution Control Agency (April 2018) *2017 Toxics and Pollution Prevention Evaluation Report*, retrieved from: 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*, retrieved from: 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).

[21] Minn. R. 7849.1500, subpart 2(F).

[22] Marshall Solar Project (Docket No. IP6941/GS-14-1052).

[23] https://mn.gov/commerce-stat/pdfs/solar-fact-sheet.pdf

[24] Current pricing for wind generation in Minnesota is cheaper than the national weighted average of $37/MWh. In a 2017 competitive bidding process for additional electrical generation, one of the applicants, Xcel Energy, received 30 bids for wind projects with a levelized cost of energy less than $22/MWh.

Chapter 5: Potential Impacts and Mitigation Measures

Chapter 5 describes the environmental setting, affected resources, and potential impacts. It also discusses ways to mitigate potential impacts.

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.

Potential Impacts and Mitigation

In order to provide appropriate context, 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 highly beneficial to highly 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.

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 (for the solar array); collection line corridor (for the collection line); local vicinity (1,600 feet from the land control area and collection line corridor); project area (one-mile from the land control area and collection line corridor); and Benton County. Impacts to resources may extend beyond these distances, but are expected to diminish quickly. ROIs vary between resources, and can change across projects. Table 6 summarizes the ROIs used in this EA. As necessary, the EA discusses potential impacts and mitigation measures beyond the identified ROI to provide appropriate context, for example, number of acres of prime farmland in a county. Also, direct impacts within the ROI might cause indirect impacts outside the ROI.

Environmental Setting

The existing environment is rural open space. Agricultural row crop fields are common, but wooded areas exist throughout the project area. Built features are numerous and include residences and buildings, paved and gravel roads, railroad, communications tower, power lines, and substations. The project is between the cities of Rice and Royalton along U.S. Highway 10.

The DNR and U.S. Forest Service developed the *Ecological Classification System* for ecological mapping and landscape classification in Minnesota. These classifications "identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features."[1] The project is in the Anoka Sand Plain subsection.

Table 6 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/ Collection Line Corridor
	Aesthetics, Noise, Property Values, Recreation	Local Vicinity
	Cultural Values	Project Area
	Socioeconomics	Benton County
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/ Collection Line Corridor
Land-based Economies	Agriculture, Forestry, Mining	Land Control Area/ Collection Line Corridor
	Tourism	Project Area
Archaeological and Historic Resources	—	Project Area
Natural Environment	Geology, Soils, Vegetation, Water Resources, Wetlands, Wildlife (except birds), Wildlife Habitat	Land Control Area/ Collection Line Corridor
	Wildlife (birds)	Local Vicinity
	Rare and Unique Resources	Project Area
	Air Quality	Benton County

Prior to European settlement, oak barrens and openings dominated this droughty upland with brushland covering large areas of the sandplain. "Upland prairie formed a narrow band along the Mississippi River, as did areas of floodplain forest." Historically, fire and drought greatly impacted vegetation. During severe periods of drought, vegetation cover was greatly reduced on portions of the sand plain, resulting in wind erosion and sand dune movement.

Today, the subsection is primarily farmland, although some small oak barrens and openings still exist. Farmland is often irrigated near the Mississippi River. Urban expansion is accelerating into the subsection along the U.S. Highway 10 corridor, especially near St. Cloud, Elk River, and the Twin Cities metropolitan area. Significant urban expansion has not reached the project area.

Project Setting

The topography in the project area is level to gently rolling characteristic of a broad sandy lake plain. The Mississippi River constitutes the western project boundary. U.S. Highway 10 and the Burlington Northern Santa Fe railroad the eastern boundary. Elevations in the local vicinity range from 1,020 feet to 1,070 feet above sea level.[2] Lower elevations are associated with river bottoms, abruptly ascending 40 feet to the solar array.

The National Land Cover Database ("NLCD") provides "spatial reference and descriptive data for characteristics of the land surface" nationwide.[3] Land cover types within the land control area are approximately 67 percent cultivated crops and six percent pasture. About 13 percent is deciduous forest. Developed space, for example, homesteads and roads, accounts for approximately five percent. Wetlands account for three percent of cover types. Within the collection line corridor, about 54 percent cultivated crops and 18 percent pasture. Developed space accounts for another 18 percent.

NLCD is based on a 30 meter resolution meaning cover types are grouped into 30 x 30 meter blocks. This provides an accurate depiction of land cover types at a landscape scale. However, smaller cover types may be classified the same as larger, surrounding cover types. Therefore, when reviewing projects at a localized scale, NLCD may not accurately depict all parcels.

The existing environment is rural open space. Agricultural row crop fields with center-pivot irrigation and trees rows for wind breaks are common, but wooded areas, especially associated with waterbodies, exist throughout the project area. Built features are numerous and include residences and outbuildings, agricultural buildings, U.S. Highway 10, other paved and gravel roads, railroad, communications tower, power lines, and substations. The land control area is approximately equal distance from the cities of Rice and Royalton, but closer to Rice.

An existing 115 kV transmission line—the Langola Tap Line—travels from the existing Langola and Platte River Substations to the project's new electrical connection location along the St. Cloud to Little Falls 115 kV transmission line.[4] These substations are adjacent to the land control area near U.S. Highway 10. Staff inquired if the applicant considered either collocation with or underbuilding along the existing 115 kV Langola Tap Line to the proposed switching station instead of the collection line corridor (**Appendix B** – Information Inquiry No. 7). The applicant considered but rejected this option.

The applicant indicates that underbuilding along the existing tap line is not feasible because the existing poles are not capable of holding the existing 115kV line in addition to a double-circuit three-phase 34.5 kV collection line. Further, the applicant states that GRE, the Langola Tap Line owner, did not present underbuilding as an option. The applicant indicates that collocating a new 115 kV transmission line or double-circuit three-phase 34.5 kV collection line adjacent to the existing Langola Tap Line 115kV line is not feasible or practicable. "For example, a new 115 kV line would require a route permit [from the commission] and the [p]roject's anticipated timeline needed to satisfy the Federal Investment Tax Credit requirements would not allow the time needed to [apply for and receive] a route permit."[5] The applicant indicated that an additional "overhead power line would result in a considerable expansion of the existing corridor into agricultural fields, which would significantly disrupt existing irrigation

infrastructure."[6] "It would also involve considerable tree clearing where the line crosses the Platte River just west of Highway 10."[7]

The collection line corridor follows road rights-of-way and existing field lines and parcel lines. It crosses the Platte River at an existing roadway crossing. A distribution line also crosses the river at this location.

Resource Topics Receiving Abbreviated Analysis

Select resource topics received abbreviated study because they were deemed to be of minor importance to the commission's site permit decision; impact intensity levels are negligible.

The following resource topics are commonly considered as part of environmental review, but were determined insignificant to the commission's decision in this docket. This determination was based on information provided by the applicant, field visits, scoping comments received, environmental analysis, and staff experience with similar projects. Additional information regarding these topics is provided in the revised site permit application.

Airports

According to navigational charts[8] and GIS desktop review[9] the closest airports to the project are private airstrips. The Fussy Airstrip is about three and one-half miles to the west and the Britz Airstrip is approximately seven and one-half miles to the northeast. The closest paved runway is 10.5 miles to the north in Little Falls. The project will not impact airports. The FFA made a *Determination of No Hazard to Air Navigation*.[10] Impacts will not occur; mitigation is not proposed.

Displacement

Displacement is the forced removal of residences or buildings.[11] It will not occur.

Electronic Interference

Electrical interference associated with electrical infrastructure is related with a phenomenon known as corona. Corona results from small electrical discharges along the surface of a conductor that ionize surrounding air molecules. The amount of corona created is directly associated with the size of the conductor. Collection lines might be strung over existing roads. Impacts are not expected, because anticipated electric fields are below levels expected to produce significant levels of corona.[12] Section 4.3.14 of the sample permit requires permittees 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". Additional mitigation is not proposed.

Emergency Services

Police and fire services are provided by Benton County, Rice, and Royalton. The nearest ambulance service is in Little Falls. Rice is the closest municipality to the project. During construction localized traffic delays could interrupt or delay emergency vehicles. These impacts, should they occur, would be intermittent, temporary, and short-term. Notifying emergency responders of traffic interruptions can mitigate impacts to emergency response. Road mitigations can indirectly mitigate impacts to emergency services. Long-term impacts are not anticipated. No additional mitigation is proposed.

Floodplain

The solar array is within an area of minimal flood hazard—above the 500-year flood level[13]—as determined by the Federal Emergency Management Agency.[14] The elevation of the Mississippi and Platte Rivers are approximately 1,022 feet above sea level in the immediate vicinity of the solar arrays, which are at elevations approximately 1,060 feet and greater.[15]

The collection line crosses the 100-year floodway (Zone AE) and floodway areas associated with the Platte River. Zone AE is considered a base flood, which is a "flood that has a [one percent] chance of being equaled or exceeded in any given year".[16] "The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the [one percent] annual chance flood can be carried without substantial increases in flood heights."[17] The applicant proposes to avoid the floodplain by using a 556-foot span in this location.

Impacts to floodplains would not occur. Mitigation is not proposed.

Forestry

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

Geology and Topography

The topography is generally flat to gently rolling, with abrupt elevation changes associated with river bottoms. Elevations range from approximately 1,028 to 1,080 feet above sea level across the project area.[18] The elevation of the bedrock surface in this area varies from 876 to 975 feet above sea level.[19,20] Bedrock outcroppings do not occur in the local vicinity.[21] Cut and fill grading activities will occur at the solar arrays, but is not expected at the collection line. The project will neither significantly change the underlying topography nor impact bedrock. The applicant indicates that areas disturbed during construction will be "repaired and restored to pre-construction contours and characteristics to the extent practicable" allowing the project's land surface to "blend with the natural terrain".[22] Additional mitigation is not proposed.

Implantable Medical Devices

EMF might interfere with implantable electromechanical medical devices, such as pacemakers, defibrillators, neurostimulators, and insulin pumps. Magnetic interference is only observed at strengths greater than those generated by the project.[23] Electronic interference must be at levels above 5.0 kilovolts per meter ("kV/m") to interfere with modern, bipolar pacemaker behavior.[24] The highest levels of EMF are associated within the fenced portion of the project directly underneath the 115 kV gen-tie line where levels are expected to be 1.48 kV/m. EMF levels are expected to be about 0.82 kV/m directly underneath the collection line. 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 4.3.19 of the sample permit requires permittees to provide educational materials about the project to adjacent landowners. Additional mitigation is not proposed.

Stray Voltage

There are two types of stray voltage: induced voltage and neutral-to-earth voltage. Induced voltage is associated with an electric field extending from a transmission line to nearby conductive objects. Neutral-to-earth voltage is a type of stray voltage that can occur where distribution lines enter structures causing extraneous voltage to appear on metal surfaces in buildings, barns, and other structures. The project will not result in the construction of large transmission lines; interconnect to businesses, farms, or residences; or change local electrical service. Impacts are not expected. Mitigation is not proposed.

Wetlands

The *National Wetlands Inventory* is a publicly available resource maintained by the U.S. Fish and Wildlife Service ("USFWS") that provides "detailed information on the abundance, characteristics, and distribution of wetlands" in the United States.[25] Review of this dataset shows one quarter-acre wetland fully within the land control area. This wetland is farmed during years of normal precipitation.[26] The collection line will cross wetlands associated primarily with the Platte River. The applicant conducted a wetland delineation survey within the collection line corridor in June 2020. "There are five wetlands totaling 1.5 acres within the collection line corridor."[27]

New impacts to wetlands are not expected. The applicant designed the collection line to avoid pole placement in delineated wetlands. Additionally, the applicant indicates that "poles are situated such that access to and workspace around each structure will also avoid impacts".[28] The CSW Permit issued by MPCA addresses short- and long-term impacts to wetlands, for example, it "requires that construction maintain at least 50 feet of existing buffer at all wetlands [and if] maintaining the buffer is not feasible, redundant (double) downgradient sediment controls will be required to keep sediment away from the wetlands during construction." Section 4.3.5 of the sample permit addresses impacts to wetlands and other water resources. No additional mitigation is proposed.

Human Settlement

Solar farms can impact human settlement. Impacts might be short-term, for example, increased local expenditures during construction, or long-term, for example, changes to viewshed.

Aesthetics

The impact intensity level is expected to be minimal to moderate for those with low viewer sensitivity, for example, passing motorists along U.S. Highway 10. For those with high viewer sensitivity, for example, neighboring landowners or recreationalists, 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. Impacts will be greater if the above-ground electrical collection system is used. 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. Generally, a harmonious viewshed is considered by many to be more aesthetically pleasing.

Viewer sensitivity is an individual's interest or concern for the quality of a viewshed and varies depending upon the activity viewers are engaged in, their values and expectations related to the viewshed, and their level of concern for potential changes to the viewshed. High viewer sensitivity is generally associated with individuals engaged in recreational activities; traveling to scenic sites for pleasure and to or from recreational, protected, natural, cultural, or historic areas; or experiencing viewsheds from resorts, road-side pull-outs, or residences. Residents have a higher sensitivity to potential aesthetic impacts than temporary observers. Low viewer sensitivity is generally associated with individuals working or passing through an area.

Viewer exposure refers to variables associated with observing a viewshed, and can include the number of viewers, frequency and duration of views, and view location. 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.

Potential Impacts

The ROI for aesthetics is the local vicinity. The impact intensity level is expected to be minimal to moderate for those with low viewer sensitivity, for example, passing motorists along U.S. Highway 10. For those with high viewer sensitivity, for example, neighboring landowners or recreationalists, the anticipated impact intensity level is anticipated to be moderate to significant. Impacts will be short- and long-term, and localized. Impacts are unavoidable, but can be mitigated in part.

The solar array is in an area of high viewer exposure; however, many viewers will have low viewer sensitivity as they would be passing motorists along U.S. Highway 10. Viewers with high sensitivity include neighboring landowners, individuals traveling to recreation sites, Two Rivers campground guests, other recreationalists, and area residents using local roads. The panels will face east to west, meaning viewers from Two Rivers campground will see a side profile; neighboring landowners and motorists on local roads, including U.S. Highway 10, will see a full profile.

The project will result in visible landscape changes. Based on preliminary design, approximately 670 acres of row crop fields will be converted to an industrial facility. This conversion will last at least 30 years. The PV array, inverter skid sheds, perimeter fencing, and, depending on type, electrical collection system will have the greatest impact to the viewshed. PV panels are constructed of dark, light-absorbing material and covered with an anti-reflective coating to limit reflection. Because of this, glare and reflection are expected to be minor.

Because of their relatively low profile, the array will not be visible from great distances. When PV panels are at their maximum tilt of 45 degrees (tilted east in the morning and west in the afternoon) the panels might reach up to 20 feet in height. The applicant anticipates that, on average, the PV panels will be 15 feet tall. For reference, center pivot irrigation systems, for corn, 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.

Should an above-ground electrical collection system be used, collection poles will be 30 feet tall within the array and up to 60 feet tall at road crossings. Poles will be visible from a further distance, though

not significantly farther. When compared to the below-ground or hybrid collection system, the above-ground system would create significantly greater aesthetic impacts within the solar array by adding approximately 198 distribution type poles within the land control area.[29]

The collection line corridor will replace approximately one and six-tenths miles of shelter belt vegetation with distribution line. A new substation will be constructed introducing an industrial built structure into agricultural space, as well as a new lit feature to the landscape. Along Barley Road a shelter belt will be removed and distribution line will run on both sides of the road significantly changing the viewshed for a single residence (**Figure 8**). An overhead transmission lines approximately 700 feet long and 80 to 90 feet tall would run from the project substation to the switching station. This line will be similar in size to the Little Falls to St. Cloud 115 kV line in this location.

Lights will be installed on temporary service poles to provide lighting during the construction phase of the project. Once operational, lighting will be switch activated, meaning it will usually be off, but will be motion activated to deter intrusion. All lighting will be down lit. Security lighting at entrances will be pole mounted at about 10 feet in height. Inverter skids will also have down lit lights at each skid. Because these lights are down lit and will generally be in the off position, potential impacts will be long-term, but intermittent and minor.

Figure 8 Barley Road

Note that trees to the west of the road (left) will be removed.

Most negative aesthetic impacts will be experienced by neighboring landowners and individuals using adjacent local roads. Impacts associated with the collection line are likely to be more associated with removal of trees as opposed to the collection line itself. There are sixteen residences/farmsteads within the local vicinity, and five local roads. Two Rivers campground is located adjacent to the project. Visual impacts to recreational activities are discussed on page 60.

Mitigation

The primary strategy for minimizing aesthetic impacts is choosing a site where solar facilities are consistent with the existing landscape, not immediately adjacent to homes and shielded from view by terrain or existing vegetation. Site-specific landscaping plans identify ways to minimize visual impacts to adjacent land uses. Techniques often employed include vegetation screening, berms, or fencing. Adverse impacts can be further mitigated by ensuring that damage to natural landscapes during construction is minimized.

Screening at residences is the most effective means to soften visual impacts. PV panels will nonetheless still be visible, especially during winter months. The applicant indicates that youth stage deciduous and coniferous plantings will be used. Visual screening could be more effective if, in select lines of sight,

more mature plants are used. This would increase the initial height of visual screening. Additionally, vegetative screening could be planted as soon as possible, as opposed to the restoration phase of construction. Use of the below-ground or hybrid electrical collection system would further mitigate visual impacts.

To minimize impacts along Barley Road, the applicant could be required to route the collection line along the east side of the road, within the existing utility corridor, and enter into an agreement with East Central Energy ("ECE") to bury the existing distribution line at this location. Currently, the applicant does not have a voluntary easement to route the collection line on the east side of the road.

Shelter belts could be replanted with low growing shrub vegetation.

Section 4.3.7 of the sample permit requires permittees to "consider input pertaining to visual impacts from landowners and land management agencies". Specific mitigation at the Platte River crossing is discussed on page 83. No additional mitigation is proposed.

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 or land use in such a way as to impact the underlying culture of the area. Tension between cultural values related to renewable energy and rural character has the potential to create tradeoffs that cannot be addressed in the site permit.

Cultural values can be described as shared community beliefs or attitudes that define what is collectively important to the group. These values provide a framework for individual 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, which weakens shared beliefs and attitudes weakening a community's shared sense of self.

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 erodes the rural feeling that is part of a residents' sense of place.

Cultural values can be informed, in part, by ethnic heritage. Residents of Benton County self-reported having primarily European ancestry, with German, Polish, and Norwegian being most common (over half of the total population).[30] Cultural values are also informed by work and leisure pursuits, for example, farming and fishing, as well as land use, such as agricultural cropland. Community events seem to be tied to geographic features, seasonal/municipal events, and national holidays.[31]

Potential Impacts

The ROI for cultural values is the project area. The project contributes to the growth of renewable energy, and is likely to strengthen and reinforce this value in the area should it currently exist. Should it not currently exist, it might foster this value. At the same time, the development of the project will change the character of the area possibly eroding residents' sense of place. The tension between homegrown energy and rural character creates real tradeoffs; however, this currently does not appear to be occurring.

While negative impacts will occur to specific resource elements, for example, aesthetics, the construction and operation of the project is not anticipated to impact or alter the work and leisure pursuits of residents in the project area or land use in such a way as to impact the underlying culture of the area.

Mitigation

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

Land Use and Zoning

The impact intensity level is anticipated to be minimal. Potential impacts to zoning are anticipated to be long-term and localized. Constructing the project will change land use from agricultural to industrial for at least 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 use of land by humans, such as residential, commercial or agricultural uses, and often refers to zoning. Zoning is a regulatory tool used by local governments (cities, counties, and some townships) to promote or restrict certain land uses within specific geographic areas. Solar farms may impede current and future land use.

A site permit from the commission supersedes local zoning, building, or land use rules.[32] 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."[33]

The project is located within Benton County's Agricultural District.[34] As stated in the Benton County Development Code, the district "is intended for those areas of Benton County where it is desirable, because of the high quality of soils and highly productive capacity of the land, to preserve, promote, maintain and enhance the use of land for agricultural purposes."[35] Section 9.20.3 of the development code lists solar energy systems as a permitted accessory use.[36] An accessory use is "a use which is incidental to, and customarily incident to the principal use."[37]

Section 9.20.3 sets criteria that solar energy systems, as a permitted accessory use, must meet. These include number, height, and setback requirements, as well as compliance with applicable codes, rules, and regulations. The project, while not subject to these requirements, nonetheless meets height (maximum 25 feet) and setback (125 feet)[38] requirements. It would also comply with state electrical codes, and applicable rules and regulations.

The collection line travels through Shoreland District, which is defined by Benton County as "land being located within 1,000 feet of the ordinary high water level of a lake or within 300 feet of a river or stream or the landward side of a flood plain on such river".[39] "A Shoreland Alteration Permit may be required if an area within the shoreland is being filled, graded or vegetation altered."[40]

The Benton County Board of Commissioners and the Langola Township Board of Supervisors provided letters of support for the project.[41] The applicant is purchasing or leasing property from willing sellers/lessee.

Potential Impacts

The ROI for land use and zoning is the land control area and collection line corridor. Constructing the project will change land use from agricultural to industrial for at least 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. The project is not expected to interfere with Benton County zoning ordinances.

Mitigation

If permitted, beginning in year fifteen of the project's operational life the permittee will either "create a reserve fund, enter into a surety bond agreement, create an escrow account, or provide another form of security that will ultimately fund decommissioning and site restoration costs . . . to the extent that the salvage value does not cover decommissioning costs".[42] "The exact amount to be allocated for decommissioning will be determined by a third-party study in year fourteen that will assess the difference between estimated decommissioning costs and the salvage value."[43] This should ensure that the land control area and collection line corridor can be restored at the end of the project's useful life.

Landscaping can minimize visual impacts to adjacent land uses. Specific landscaping techniques are suggested to minimize aesthetic impacts on page 53. Section 4.3.5 of the sample permit addresses impacts to shorelands; however, shorelands are not expected to be significantly impacted by the project. Additional mitigation is not proposed.

Noise

Specific impacts are associated with construction and operation. The impact intensity level during construction is anticipated to range from negligible to significant depending on the activity. Potential impacts are anticipated to be intermittent and short-term. These localized impacts will affect unique resources (residences, campground), 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.[44] 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.[45] 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 9** provides decibel levels for common indoor and outdoor activities.[46]

Noise standards in Minnesota are based on *noise area classifications* ("NAC"), which correspond to the location of the listener, referred to as a receptor. These classifications are not necessarily synonymous with zoning classifications. NACs are assigned to areas based on the type of land use activity occurring at that location. 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 time period. L_{10} may be exceeded 10 percent of the time, or six minutes per hour, while L_{50} may be exceeded 50 percent of the time, or 30 minutes per hour. Standards vary between daytime and nighttime hours. There is no limit to the maximum loudness of a noise.[47] **Table 7** provides current Minnesota noise standards.

The project is in a rural area. "Quiet daytime noise levels in rural areas with no significant noise sources might be in the 30 to 40 dBA range."[48] Noise levels increase sporadically with passing vehicle traffic; high winds; or use of farm equipment, all-terrain vehicles, or snowmobiles. The primary noise receptors within the local vicinity are residences, farmsteads, and Two Rivers campground. These receptors are assigned to NAC 1.

Table 7 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

Potential Impacts

The ROI for noise is the local vicinity. Specific impacts are associated with both construction and operation; however, impacts are primarily associated with construction. The applicant indicates that construction will generally occur between 7 a.m. and 5 p.m. Monday through Saturday.[49] As a result, during construction, MPCA daytime noise standards would most often apply.

Construction The impact intensity level is anticipated to range from negligible to significant depending on activity. Impacts are unavoidable, but can be mitigated.

Intermittent construction noise will occur and is dependent upon activity. Major noise producing activities related to the solar arrays are associated with clearing and grading, material delivery, and driving foundation posts. (Driving foundation posts, while intermittent during the construction process will be constant throughout the day when the activity is taking place.) Trenching or setting utility structures and stringing conductors for the electrical collection system might also be sources of noise. Major noise producing activities related to the collection line are associated with clearing and grading, material delivery, auguring foundation holes, setting structures, and stringing conductors.

Figure 9 Comparative Noise Levels

Noise from heavy equipment and increased vehicle traffic will be intermittent and occur during daytime hours. Noise associated with heavy equipment can range between 80 and 90 dBA at full power 50 feet

from the source.[50] Heavy equipment generally runs at full power up to 50 percent of the time.[51] Point source sounds decrease six decibels at each doubling of distance;[52] a 90 dBA sound at 50 feet is perceived as a 72 dBA sound at 400 feet and a 60 dBA sound at 1,600 feet. Using additional equipment at the same location, for example, two graders instead of one, doubles the sound energy, and increases sound by three decibels.[53]

The applicant indicates that driving foundation posts will be the loudest construction activity (101 dBA at 50 feet).[54] Installation will take "between 30 seconds to two minutes depending on the soil conditions" and will take up to eight weeks to complete.[55] This activity would exceed state L_{10} noise standards to a distance of 3,200 feet from the source because a 101 dBA sound at 50 feet is perceived as a 65 dBA at 3,200 feet. (The above point source noise estimation does not include any sound mitigation from obstructions, terrain, vegetation, etc.)

Construction noise might exceed state noise standards at select times and locations, for example, when driving foundation posts near local residences and Two Rivers campground. Any exceedance of noise standards would be short-term and confined to daytime hours. An exceedance of state noise standards need not occur for an impact to occur. For example, "[s]ome intermittent noises such as horns [and] back-up beeps, etc. can be disruptive, particularly when they occur in the evening or early morning hours. These types of noises rarely violate state noise standard because they are too short in duration to affect monitoring results for L_{10} and L_{50} standards."[56]

Operation The impact intensity level is anticipated to be negligible. The primary source of noise 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's preliminary design meets the nighttime L_{50} dBA noise standard.[57] Noise from routine maintenance activities is anticipated to be negligible to minimal. Noise from the electrical collection system, collection line, 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 4.3.6 of the sample permit requires that "construction and maintenance activities shall be limited to daytime working hours to the extent practicable to ensure nighttime noise level standards will not be exceeded". During operation, permittees are required to adhere to noise standards at all times and all appropriate locations. No additional mitigation is proposed.

Property Values

Impacts to property values within the local vicinity could occur; however, changes to a specific property's value are difficult to determine. On whole, impacts in the local vicinity are anticipated to be minimal and dissipate at distance. Impacts to specific properties could be moderate to significant. Long-term impacts might or might not occur. Potential impacts can be minimized.

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 farm becomes one of many interacting factors that could affect a specific property's value.

Electrical generating 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 expected to be negligible. Visual impacts will occur, but because the project lacks the height of smokestacks (and their plumes) or wind turbines, impacts would be limited in geographic scope.

A review of the literature did not identify peer-reviewed journal articles specifically aimed at quantifying impacts to property values based solely on proximity to utility-scale PV solar farms. However, comparably sized PV solar farms exist in Minnesota, and limited sales information is available. The 100 MW North Star Solar project is located in Chisago County. It 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.[58] This means that house sale price exceeded assessed value near the solar farm at a rate comparable to the general real estate market in the area.

Potential Impacts

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. Widespread negative impacts to property values are not anticipated. Impacts, if they occur, are expected to decay over time. Property value impacts tend to fall off rapidly over distance; therefore, potential impacts are anticipated to be localized. On whole, impacts in the local vicinity are anticipated to be minimal and dissipate at distance. Impacts to specific properties could be moderate to significant. Long-term impacts might or might not occur.

The local vicinity is impacted by power lines and substations, and a communications tower, railroad, and major highway. The impact to property values from these existing facilities is unknown.

Mitigation

Impacts to property values can be mitigated by reducing aesthetic impacts, perceived health risks, 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.

Recreation

During construction the impact intensity level is anticipated to be moderate to significant. Potential impacts will be intermittent and occur over the short-term. These localized impacts will affect a unique resource. Impacts can be minimized or avoided. Operational impacts will be long-term, unavoidable, and subjective to the individual.

"Benton County, because of its location in relation to large population centers such as St. Paul-Minneapolis, Duluth, and St. Cloud, has opportunities to attract visitors for various forms of outdoor recreation."[59] Recreational opportunities in the project area include biking, boating, fishing, camping, swimming, snowmobiling, and nature viewing associated primarily with snowmobile trails, the

Mississippi and Platte Rivers, and Two Rivers campground—a privately owned, seasonally operated, campground with 221 campsites, lodge, pool, mini golf, boat access, and tube rentals.[60]

The project is within 500 feet of the Mississippi River State Water Trail.[61] "A water trail is a stretch of river or lake that is mapped and managed especially for canoeing, kayaking, boating, and camping. There are 35 Minnesota state water trails featuring public water accesses, campsites, rest areas, and over 4,500 miles of paddling."[62] Two Rivers campground is called out on the water trail map.

The Great River Road National Scenic Byway follows the banks of the Mississippi River for 3,000 miles from its headwaters to the Gulf of Mexico.[63] The Great River Road follows County Road 1 on the west bank of the Mississippi River in the local vicinity of the project.[64]

Potential Impacts

The ROI for recreation is the local vicinity. During construction the impact intensity level is anticipated to be moderate to significant. Potential impacts will be intermittent and occur over the short-term. These localized impacts will affect a unique resource. Impacts can be minimized or avoided. Operational impacts will be long-term and subjective to the individual.

Significant noise impacts during construction are anticipated. Operational noise will be negligible, and not affect recreationalists. Potential noise impacts are discussed on page 57. Fugitive dust associated with construction might indirectly impact recreationalists or natural areas. Potential air impacts are discussed on page 74. New built features will be introduced to the landscape, and construction equipment and vehicle traffic will affect aesthetics. Potential aesthetic impacts are discussed on page 53. While impacts will occur, they are not expected to physically obstruct recreational activities.

There are no DNR classified lands, such as State Forests, State Parks, State Trails, Aquatic Management Areas, Wildlife Management Areas, or Scientific and Natural Areas; federal parks, forests, or refuges; or county parks within the local vicinity of the project. The Mississippi State Water Trail and the Great River Road are within the local vicinity. The project is not expected to be visible; however, noise related impacts might occur during project construction.

The Two Rivers campground is immediately adjacent to the project along 145 Street NW. During construction, visitors will drive through a construction area on their way to the campground. Once operational, visitors will drive through an industrial area. As a result, the look and feel of the campground might change. This impact would be subjective to the individual. The project is not expected to create significant visual impacts the campground due to existing vegetation and the seasonal nature of the campground. See **Figure 10** and **Figure 11** (exiting campground to the east; note screening on both sides of the road).

Recreationalists float the Platte River. Two Rivers campground provides a shuttle service to a location upstream of the Halfway Crossing Road bridge. Floaters will cross underneath the collection line at the bridge. Impacts are negligible given the existence of an existing distribution line at this location.

An existing snowmobile trail bisects the land control area. This trail is a major east-west connector and is associated with one of three Mississippi River crossings between Little Falls and Sartell. It would need to be rerouted as a result of the project. The applicant has discussed the trail with the local snowmobile club, and indicates "it is likely the trail [as travelling east to west] would be rerouted to follow the railroad right-of-way for an additional 1,900 feet to get beyond the proposed fence . . . before turning

south through agricultural fields."[65] Impacts are anticipated to be negligible, given that snowmobile trails travel through a variety of landscapes, and often follow built infrastructure. In the local vicinity the trail follows U.S. Highway 10; therefore, the project would be consistent with use expectations.

Given the land control area and collection line corridor would be located on previously private land, impacts to public hunting will not occur. However, the project could potentially affect hunting on neighboring private land to the extent that it might constrain shooting direction or alter historical wildlife habitat or movement, that is, upland bird habitat or deer movement.

Figure 10 Two Rivers Campground

Mitigation

The project will not impact public lands. The applicant is committed to keeping existing vegetative screening intact along 145 Street NW near Two Rivers campground.[66] The applicant is also committed to further discussions with the local snowmobile club to address a reroute of the existing trail.[67] Should a permit be issued for the project, the permittee could be required to document these discussions prior to constructing the project.

Figure 11 Two Rivers Campground Exit

Given that Two Rivers campground is seasonally operated, limiting project construction near the campground to the winter months would mitigate all construction related impacts. Alternatively, daily or yearly time restrictions to certain construction activities within 1,600 feet of the campground could be implemented to minimize noise impacts. For example, normal working hours could be delayed (moved later in the morning) or avoided entirely (holiday weekends).

Various sections of the sample permit indirectly address impacts to recreation, such as noise, aesthetics, soils, etc. Specific mitigation at the Platte River crossing is discussed on page 83. No additional mitigation is proposed.

Socioeconomics

The impact intensity level is positive. Effects associated with construction will, overall, be short-term and minimal. Significant positive effects might occur for individuals. Impacts from operation will be long-term and significant. Adverse impacts are not anticipated.

The project is located in a rural area of Benton County, immediately north of Rice in Langola Township. It is located away from population centers, and is located entirely within agricultural zoned areas.

Table 8 provides information about total population and household income, and percentage of minority population and individuals below the poverty level. In Langola Township the median household income is higher and the percentage of individuals living below the poverty level is lower than Minnesota as a whole. Minority groups make up a smaller percentage of the total population than Minnesota as a whole.

Table 8 Population and Economic Profile

Location	Total Population	Percent Minority Population‡	Median Household Income	Percent Below Poverty Level
Minnesota	5,490,726	16.3	$ 65,699	10.5
Benton County	39,360	6.3	$ 53,574	14.1
Langola Township	1,070	5.8	$ 70,417	2.8
Rice	1,575	3.7	$ 72,375	6.0
Royalton	1,206	1.7	$ 50,052	20.2

* Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

‡ Minority population includes all persons excluding those who self-identified as white.

Benton, Sherburne, Stearns, and Wright Counties make up Economic Development Region 7W as defined by the Department of Employment and Economic Development. "Region 7W added . . . 12,066 workers from 2010 to 2018. There were about 7,250 unemployed workers in 2018, down from a high of more than 19,000 unemployed workers during the Great Recession in 2009."[68]

"Although the regional labor force and economy continue to grow, the rate of labor force growth is slowing down considerably…. Increasingly tight labor markets and a growing scarcity of workers is now recognized as one of the most significant barriers to future economic growth in Region7W,"[69] and will have a substantial impact on the regional economy.[70]

Unemployment rates in the region are consistently similar to state levels (Figure 12).[71] "According to recent Job Vacancy Survey results, there were 9,760 [job] openings reported by employers compared to 6,373 unemployed jobseekers in the region."[72]

Potential Impacts

The ROI for socioeconomics is Benton County. The impact intensity level is anticipated to be positive. Potential impacts associated with construction will be positive, but minimal and short-term. Significant positive effects might occur for individuals. Impacts from operation will be long-term, positive, and significant. The project will not disrupt local communities or businesses, and does not disproportionately impact low-income or minority populations. Adverse impacts are not anticipated.

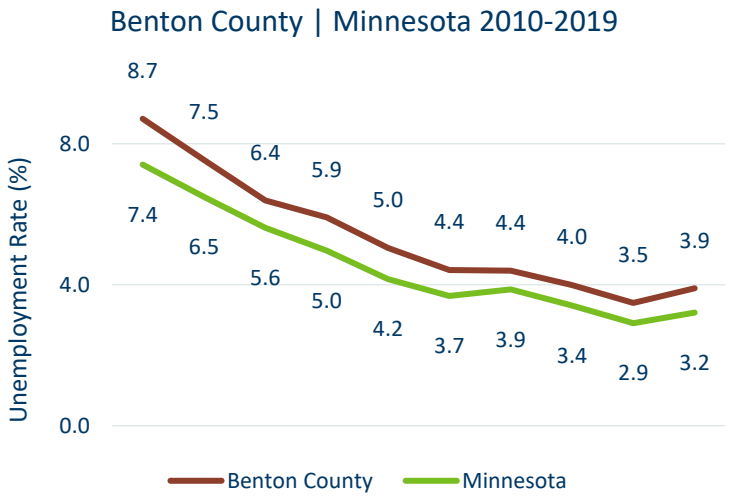
Positive economic impacts include increased expenditures, for example, food and fuel, at local businesses during construction. The applicant indicates that some materials might be purchased locally depending on availability, terms and conditions, etc. The applicant anticipates an average of 100 workers at the site during construction. During peak construction periods up to 150 workers might be employed. The applicant has committed to posting jobs locally. 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."[73] From the U.S. Bureau of Labor Statistics:

> *The majority of the occupations [related to the project] are not specific to the solar industry—they exist in other industries as well. Although many of these occupations require special skills unique to solar power, skills can be acquired in other industries in most cases. For many positions, experience in other industries is desired by employers in the solar power industry. For example, solar photovoltaic installers need to have specialized knowledge and training, but many installers have previous experience as roofers, electricians, or construction workers.*[74]

Because experience requirements "vary widely" it is difficult to predict how many jobs might or might not be local jobs.

Figure 12 Benton County Unemployment Rate



The applicant 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—personal property consisting of solar energy generating systems is exempt meaning the value of the generation equipment is not included in the calculation.[75] Instead of paying personal property tax on the generation equipment, Minnesota adopted a production tax of $1.20/MWh paid 80 percent to counties and 20 percent to the cities and townships.[76] Based on the project's estimated annual electricity production of 160,000 MWh, the project would generate approximately $192,000 in tax revenue to local governments each year and approximately $5.75 million over the life of the permit.[77]

Mitigation

Socioeconomic impacts are anticipated to be positive. Section 8.5 of the sample permit requires quarterly reports concerning efforts to hire Minnesota workers. Section 9 addresses project decommission, specifically requiring the permittee to file a decommissioning plan with the commission prior to operation; establishing the permittee as the responsible party for carrying out decommissioning tasks, and sets out minimum standards for restoration and timelines; and addresses abandoned solar installations. No additional mitigation is proposed.

Human Health and Safety

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

Electronic and Magnetic Fields

The impact intensity level is anticipated to be negligible, and are not expected to negatively affect human health. Impacts will be long-term and localized, but can be minimized.

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

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

Current moving through a conductor creates a magnetic field that surrounds and extends from the wire. Using the same analogy, current is equivalent to the amount of water moving through the pipe. The strength of a magnetic field produced is associated with the current moving through the power line and is measured in milliGauss (mG). Similar to 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.

"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…."[78] Table 9 provides examples of electric and magnetic fields associated with common household items.

Health Studies In the late-1970s, epidemiological studies indicated a weak association between childhood leukemia and ELF-EMF levels.[79] "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."[80]

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."[81] "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."[82] "Overall there is no evidence that exposure to ELF magnetic fields alone causes tumors. The evidence that ELF magnetic field exposure can enhance tumor development in combination with carcinogens is inadequate."[83]

In 2002, 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. 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.[84]

Table 9 Electric and Magnetic Field Strength of Common Household Items

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

Regulations and Guidelines Currently, there are no federal regulations regarding allowable ELF-EMF produced by power lines in the United States; however, state governments have developed state-specific regulations. For example, Florida limits electric fields to 2.0 kV/m and magnetic fields to 150 mG at the edge of the right-of-way for 161 kV transmission lines.[85] Additionally, international organizations have adopted standards for exposure to electric and magnetic fields.

The commission limits the maximum electric field under high voltage transmission lines in Minnesota to 8.0 kV/m.[86] It has not adopted a standard for magnetic fields.

Potential Impacts

The ROI for EMF is the land control area and collection line corridor. 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.

EMF calculations are provided in Table 10. Electric field values are less than the commission standard of 8.0 kv/m. EMF from adjacent or underground lines would be cumulative, but were not included in the calculations. There should be little to no change from existing, ambient EMF outside the land control area. The nearest home is approximately 900 feet from the anticipated location of the project substation, and approximately 675 from the gen-tie transmission line. This same home would be about

500 feet from an above-ground collection line, should that type of electrical collection system be used. No change from existing EMF levels is anticipated at this, or any other, residence.

Table 10 EMF Table

Distance/Field Type	Gen-tie Line (115 kV)				Collection Line (34.5 kV)			
Feet from Line (ft)	0	50	100	150	0	50	100	150
Electric Field (kV/m)	1.48	0.40	0.10	0.03	0.82	0.20	0.05	0.01
Magnetic Field (mG)	90	23	6	1.5	90	26	7	2

Mitigation

No health impacts from EMF are anticipated; however, the commission has adopted a prudent avoidance approach when routing high voltage transmission lines. If warranted, the Commission considers, and may require, mitigation strategies to minimize EMF exposure levels. Consistent with this, 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. Again, while no impacts to human health are anticipated, burying the electrical collection system would nonetheless be consistent with this prudent avoidance approach. No additional mitigation is proposed.

Worker and Public Safety

The impact intensity level is minimal. Potential impacts would be short-and long-term, and can be minimized. Worker safety issues are primarily associated with construction. Public safety concerns would be most associated with unauthorized entry to the project.

A project specific *Environmental Health and Safety* plan will "establish and maintain" appropriate rules and procedures to ensure safety. All construction personnel will receive safety orientation and training. At the start of work each day, crews will meet to review hazards associated with work to be completed that day. Weekly safety meetings will be held on-site.[87]

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

Fencing will deter public access, and signage will provide appropriate public warnings. An *Operations and Emergency Action Plan* will be developed with local first responders to outline "emergency procedures for evacuation, fire response, extreme weather, injury, and criminal behavior".[88]

In Minnesota, solar panels discarded by commercial entities 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. If hazardous waste, they must be properly disposed of in a special facility or recycled if recyclers are available.[89]

Potential Impacts

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

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. A review of *What's in My Neighborhood*, maintained by MPCA, indicates that potentially contaminated sites do not occur within the land control area.[90]

During operation there are occupational risks similar to those associated with construction, but to a much lesser degree. Public risks would result from unauthorized entry into the facility. PV panels contain hazardous materials, as a result proper disposal of panels at the end of their useful life is necessary to ensure that leaching of the materials, especially lead, does not reach the environment.

Mitigation

Construction is bound by federal and state Occupational Safety and Health Administration requirements for worker safety,[91] and must comply with local, state, and federal regulations regarding installation of the facilities. 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. *Environmental Health and Safety* and *Operations and Emergency Action* plans will be developed and implemented. A decommissioning plan addresses PV panel end of life issues.

Section 4.3.19 of the sample permit addresses public safety, including landowner educational materials, appropriate signs and gates, etc. Section 8.10 requires permittees file an emergency response plan with the commission prior to operation. Section 8.11 requires disclosure of extraordinary events, such as fires, etc. No additional mitigation is proposed.

Public Services

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.

Roads and Highways

Potential impacts 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. Impacts are unavoidable, but can be minimized.

U.S. Highway 10 borders the land control area to the east; 45th Avenue NW (County Road 73) bisects the land control area north to south; and Halfway Crossing Road (County Road 40) bisects the land control area east to west. Access to the collection line and substation continues west along Halfway Crossing Road, then continues along small local roads to the north and west. Current Annual Average Daily Traffic volumes are 23,100 (1,900 heavy commercial)[92]; 980; and 270 vehicle trips per day for these roads, respectively.[93] Traffic on 45th Avenue NW is estimated to be 1,400 vehicle trips per day, but this number is not yet official.[94]

The U.S. Department of Transportation classifies roadways based on function. "Each function class is based on the type of service the road provides to the motoring public, and the designation is used for data and planning purposes."[95] Roads in the local vicinity are categorized as follows: U.S. Highway 10 – Principal Arterial; 45th Avenue NW – Major Collector; Halfway Crossing Road, Barley Road,

65 Avenue NW, Acorn Road – Local. Collector roads connect local roads to arterial roads, which link, as directly as possible, principal urbanized areas.[96]

There are five access points to the project: two each on Halfway Crossing Road and 45th Avenue NW and one at Acorn Road.[97]

Potential Impacts

The ROI for roads and highways is the project area. The impact intensity level will be minimal. Potential impacts associated with construction are anticipated to be short-term, intermittent, and localized. Major delivery access to the project will be from the public road network via U.S. Highway 10. Besides driveway approaches at access points, upgrades or changes to existing roads necessary to construct the project are only needed at the project substation. The applicant may upgrade an existing 1,400-foot two-track dirt road from dirt to gravel in coordination with the landowner "to enhance the reliability and usability of this road to better suit the access needs of the Project and landowner accessing the agricultural field".[98]

During construction temporary traffic delays associated with material delivery, worker transportation, and slow-moving construction equipment might occur. Up to 150 workers might be on site during peak construction. This, coupled with material deliveries, might result in congestion, which is expected to be noticeable to neighboring landowners. Lane closures would be necessary to string the collection line conductor at the Platte River crossing. These would be temporary in nature. Roads could potentially be damaged during construction from increased heavy commercial traffic.[99]

No impacts to roads are anticipated during the operation; negligible traffic increases would occur for maintenance.

Mitigation

Section 4.3.12 of the sample permit addresses roads. Permittees are required 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. Additionally, 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 could be required to repair any damaged roads to preconstruction conditions.

Utilities

The impact intensity level is anticipated to be minimal. Impacts should be limited to a single electrical outage. Potential impacts can be minimized.

Utilities within the project area are typical of rural areas across central Minnesota. The project area is not serviced by city water supply or sanitary sewer. Distribution lines exist throughout the local vicinity.

Pipelines Staff reviewed the Federal Pipeline and Hazardous Materials Safety Administration developed the Pipeline Information Management Mapping Application (publicly available version) for hazardous liquid and gas transmission pipelines, liquefied natural gas plants, and breakout tank data. These facilities are not present in the project area. A distribution natural gas pipeline exists along the north side of Halfway Crossing Road.

Fiber Optic Buried fiber optic cable is present along Halfway Crossing Road.

Distribution Line The collection line is proposed to be collocated with an existing ECE distribution line for a portion of its length. It also follows existing road right-of-way with the ECE line on different sides of the road.

Potential Impacts

The ROI for utilities is the project area. The impact intensity level is anticipated to be minimal. Impacts will be limited to a single electrical outage. Potential impacts can be minimized.

The applicant and ECE have entered into an agreement that will require, at the applicant's expense, ECE to bury its collection line from the land control area to the intersection of Halfway Crossing Road and Balsa Road. Short outages might occur. Customers might experience a 15- to 30-minute outage when the distribution line is disconnected and temporary service is established.[100] "The timing and duration of any service interruptions would be determined and communicated by Minnesota Power and ECE [and] potential outages associated with the Minnesota Power 115 kV line are anticipated to be approximately one hour or less."[101]

Mitigation

Potential impacts can be avoided by marking underground utilities prior to construction and avoiding these areas during construction. The location of underground utilities can be identified using the Gopher State One Call system during engineering surveys. 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.

Electrical outages can be minimized by using the minimum number necessary and informing customers of the outage well in advance. Additionally, necessary transmission outages should be coordinated through Midcontinent Independent System Operators.

Section 4.3.4 of the sample permit requires permittees to minimize disruptions to public utilities. No long-term impacts to utilities will occur. Additional mitigation is not proposed.

Land-based Economies

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

Agriculture

The impact intensity level is anticipated to be minimal. Potential impacts are localized and unavoidable, but can be minimized. Minimizing impacts requires special mitigation. The site permit could require the applicant to work with the landowner to ensure agreement concerning continued access along an existing farm road.

Farming occurs throughout Benton County. The following summary is based on information from the Census of Agriculture, which is conducted by the U.S. Department of Agriculture ("USDA"). The agricultural census is a complete count of farms and ranches and the people who operate them, including small plots with at least $1,000 in annual sales.[102] In 2012 there were 958 individual farms using 188,735 acres of farmland in Benton County—an increase in number and acres from 2007. The value of products sold, both crop sales and livestock sales, increased, on average, 41 percent per farm to $174,845. Average farm size decreased slightly. Cropland is the dominant agricultural land use. Farmers in Benton County raise a variety of commodities. The top crop items, in acres, include corn for grain and soybeans for beans. The top livestock inventory item is broiler chickens.

NCLD data suggests that 97 percent of the land control area and 72 percent of the collection line corridor is agricultural land (pasture/hay and cultivated crops).

Prime Farmland Although much of the land in Benton County has historically been used for agriculture, there are differences in the quality and suitability of land for agricultural production. Approximately 146,615 acres (~ 56 percent) in Benton County are considered prime farmland or farmland of statewide importance.[103] Federal regulation at 7 C.F.R. 657.5(a)(1) defines prime farmland, in part, as:

> Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding.

Although prime farmland characteristics are the same nationwide, certain soils that do not meet these specific characteristics are nevertheless important at a statewide level. Farmland of statewide importance is land, in addition to prime and unique farmlands, that is of statewide importance to produce food, feed, fiber, forage, and oil seed crops.[104]

Criteria for defining and delineating farmland of statewide importance are determined by the appropriate state agency or agencies. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some soils might produce as high a yield as prime farmlands if conditions are favorable. In some states, additional farmlands of statewide importance may include tracts of land that have been designated for agriculture by state law.[105]

The Soil Survey Geographic Database ("SSURGO")[106] contains soil information collected by the USDA National Cooperative Soil Survey. There are no soils classified as prime farmland or farmland of statewide importance within the land control area. About two percent of soils within the collection line corridor are considered prime farmland.

Farmland does not need to be categorized as prime farmland or farmland of statewide importance to be productive. The land control area is "highly productive land [especially] with all the [center pivot irrigation equipment]".[107]

Potential Impacts

The ROI for agriculture is the land control area and collection line corridor. The impact intensity level is anticipated to be minimal. Potential impacts are localized and unavoidable, but can be minimized.

Rural farmland areas, with large parcels of relatively flat, open land, tend to be attractive locations for developers seeking to site ground-mounted PV projects, which require six to eight acres of land to generate one MW of electricity. The project will result in up to 735 acres of farmland being removed from agricultural production for at least the life of the project. This change in land use would take productive farmland out of production, but would result in a negligible loss of farmland in Benton County (less than 0.005 percent of 188,735 acres of land in farms).[108] The applicant indicates that the land could be returned to agricultural production after the project is decommissioned.

The collection line was designed to locate poles where they would not interfere with agricultural activities, including center pivot irrigation. The project substation is in an agricultural field corner outside of the center-pivot irrigation area.[109]

Minnesota Rule 7850.4400 states that no large electric power generating plant site (including a solar energy generating system) can include more than one-half acres of prime farmland per MW of net generating capacity. This prime farmland exclusion can be waived if "no feasible and prudent alternative" is available or if the commission varies its rules. No areas of prime farmland or farmland of statewide importance are within the land control area. The collection line corridor crosses about two acres of prime farmland. The project does not exceed the one-half acres of prime farmland per MW of net generating capacity threshold test; therefore, the applicant is not required to define feasible and prudent alternatives to the proposed project to meet the requirements of Minnesota Rule 7850.4400.

A farm road abuts the southwest portion of the project. This road, while difficult to see on satellite imagery, is immediately adjacent to the tree line as it travels north by northwest from 145 Street NW. The driveway appears to be located, in large part, within the land control area. The property owner asked the applicant to be "thoughtful about that shared access we have"[110] in that location. It appears the road provides a southerly access point to both the farmstead and agricultural fields production. The applicant indicated that it would "check into . . . whether there's easements or . . . continuing to allow that access."[111] Should access be restricted it would negatively affect agricultural production.

Mitigation

Farming revenues lost will be offset by land purchase. Landowner agreements are outside the scope of this EA. The applicant developed and is committed to an *Agricultural Mitigation Plan*[112] that details methods to minimize soil compaction, preserve topsoil, and establish and maintain appropriate vegetation to ensure the project is designed, constructed, operated and ultimately restored in a manner that would allow the land to be returned to agricultural use.

The applicant committed to "gather additional information about the existence of drain tile from landowners and other data sources, possibly including, but not limited to, infrared aerial photographs. In the event that damage occurs to drain tile or private ditches as a result of construction activities or operation of the [project, the applicant] will repair any damages."[113] The applicant also commits to assuring that restoration is conducted in a manner that allows "land surfaces to drain properly, blend with the natural terrain, re-vegetate, and avoid erosion."[114]

The site permit could require the applicant to work with the landowner to ensure agreement concerning continued access along the existing farm road. This is consistent with commitments made by the applicant to "continue to allow the neighbor to use the driveway and will pursue options with the neighbor to address their concerns on an ongoing basis, including granting a license or easement agreement to the neighbor over the existing driveway".[115]

Section 4.3.18 of the sample permit requires permittees fairly restore or compensate landowners for damages to crops, fences, drain tile, etc. during construction. Other sections address impacts to soils, such as erosion, compaction, etc. No additional mitigation is proposed.

Mining

The impact intensity level is anticipated to be negligible. Should the location of the collection line shift to the north side of the road additional mitigation is proposed.

Mining activities do not currently occur at the land control area. There are no identified aggregate resources within the land control area.[116] The land control area has "non-significant potential for sand and gravel resources" and "limited potential for crushed stone resources."[117] The applicant will purchase the underlying land; therefore, even if mining resources were available, the new landowner chooses energy production as the higher and greater economic use. The collection line corridor passes near an active gravel pit.

Potential Impacts

The ROI for mining is the land control area and collection line corridor. The proposed alignment is on the other side of Halfway Crossing Road in this location. Impacts are not anticipated.

Mitigation

Mitigation is not proposed, except that if the collection line is routed on the north side of Halfway Crossing Road in this location, the applicant should work with the gravel pit operator to ensure the collection line is high enough at the driveway crossing to avoid potential impacts to the ingress and egress of equipment.

Tourism

The impact intensity level is anticipated to be minimal to moderate during construction. Impacts will be localized and affect a unique resource. Impacts will be unavoidable, but minimal during operation. Potential impacts can be mitigated.

In 2019 the leisure and hospitality industry in Benton County accounted for about $50 million in gross sales, and 1,217 private sector jobs.[118] Tourist activities within project area are primarily associated with the recreational activities discussed on page 59. These activities are primarily associated with the Two Rivers campground, the Mississippi and Platte Rivers, the Great River Road, and the local snowmobile trails. Electrical infrastructure can impact tourism if they affect visitor experiences at tourism sites, primarily through aesthetic or noise impacts, or degrade natural or human-made resources that provide tourist-type activities.

Potential Impacts

The ROI for mining is the project area. The impact intensity level is anticipated to be minimal to moderate during construction. Impacts will be localized and affect a unique resource. Impacts will be unavoidable, but minimal during operation.

Tourism in the project area is associated with the recreational activities previously described. Construction noise related impacts would be short-term and intermittent, and range from negligible to significant. Operational noise is expected to be below ambient noise levels. Aesthetic impacts would be subjective to the individual.

The project will not preclude future tourist activities. Some recreationalists might not prefer to recreate near an industrial type facility, thereby limiting visitor use. Such preferences would be highly dependent on the individual user, and are not anticipated to be a common enough feeling to impact tourism in the project area.

Mitigation

Impacts to tourism can be mitigated by selecting locations that avoid natural and human-made resources utilized for tourist-type activities. Potential impacts to tourism can also be mitigated by reducing noise and aesthetic impacts, as well as impacts to natural landscapes. Long-term impacts can be mitigated through appropriate screening. Mitigation specific to the Two Rivers campground was recommended on page 61. Various sections of the sample permit 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.

Archeological and Historic Resources

The impact intensity level is anticipated to be negligible to minimal. Impacts, should they occur, will be localized and affect a unique resource. Impacts can be mitigated through prudent 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.[119] Historic resources are sites, buildings, structures, or other antiquities of state or national significance.[120]

Potential Impacts

Area M Consulting conducted two Phase I Archaeological Reconnaissance Surveys for the project. The consultant recommended that construction of the solar array could "proceed as planned with no negative impacts to cultural resources".[121] SHPO reviewed the survey report and concluded that "there are no properties listed in the National or State Registers of Historic Places, and no known or suspected archaeological properties in the area that will be affected by this project."[122] The land control area is within actively cultivated farmland. Impacts are not expected.

Area M Consulting also recommended that the collection line could be constructed with no negative impacts to cultural resources. Staff reviewed the non-public version of the Phase I Archaeological Reconnaissance Surveys for the collection line. Impacts are not expected because the site was likely destroyed. The Phase I Survey indicated that, "previously-recorded site 21BN0003 falls within the survey corridor [. . .] it is unlikely [this site] has subsurface integrity or substantial research value; the site has likely been destroyed through agriculture and erosion".[123]

Mitigation

Prudent siting and routing can avoid impacts to archaeological and historic resources. This is the preferred mitigation. The applicant designed the collection line to span 21BN0003 50 feet on either side. The applicant also intends to install temporary fencing to demarcate a 50-foot buffer area within

the collection line corridor during construction to protect the site from construction traffic.[124] Section 4.3.13 of the sample permit addresses archeological resources.[125] If previously unidentified archaeological sites are found during construction, the applicant would be required to stop construction and contact SHPO to determine how best to proceed.[126] Ground disturbing activity will stop and local law enforcement will be notified should human remains be discovered.[127] Because impacts to archeological and historic resources are not anticipated, additional mitigation is not proposed.

Natural Resources

Solar farms impact the natural environment. Impacts are dependent upon many factors, such as how the project is designed, constructed, maintained, and decommissioned. Other factors, for example, the environmental setting, influence potential impacts. Impacts can and do vary significantly both within, and across, projects.

Air Quality

The impact intensity level is anticipated to be minimal. Intermittent localized impacts will occur during construction. Once operational, the solar array will not generate criteria pollutants or carbon dioxide. Impacts related to operation of the collection line are anticipated to be long-term, localized, and negligible. 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."[128] "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."[129] According to the MnRiskS model developed by MPCA, cancer and non-cancer health risks from air pollutants released by permitted and non-permitted sources near the project are low.[130]

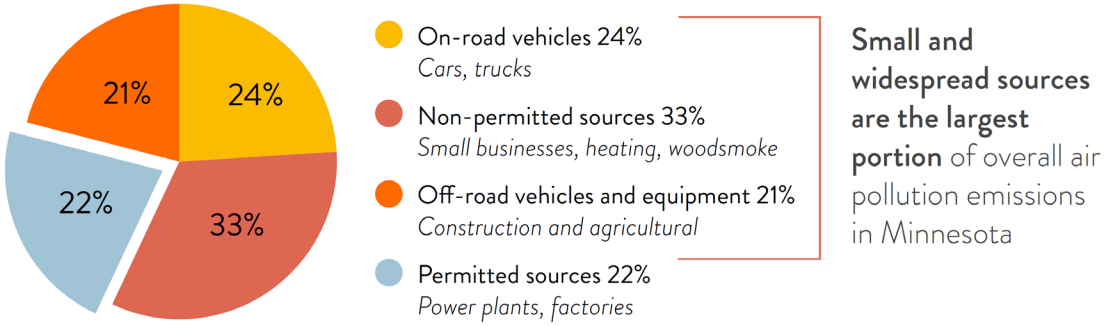
Potential Impacts

The ROI for air quality is Benton County. During construction, minimal intermittent air emissions are expected. 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, the solar array would not 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.[131] The project will generate fugitive dust from travel on unpaved roads, grading, and excavation. "The impact of a fugitive dust source on air pollution depends on the quantity and drift potential of the dust particles injected into the atmosphere. In addition to large dust particles that settle out near the source (often creating a local nuisance problem), considerable amounts of fine particles also are emitted and dispersed over much greater distances from the source."[132]

Figure 13 Air Pollution Sources by Type



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.[133] 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.[134] The national ozone standard is 0.070 ppm over a 3-year average of the annual fourth-highest daily maximum eight-hour average concentration.[135] 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. 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.

"Control techniques for fugitive dust sources generally involve watering [or] chemical stabilization…. Watering, the most common and, generally, least expensive method, provides only temporary dust control. The use of chemicals to treat exposed surfaces provides longer dust suppression, but may be costly, have adverse effects on plant and animal life, or contaminate the treated material."[136] 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* list best management practices, that while directly related to soils and vegetation, will help to mitigate against fugitive dust emissions. Several sections of the sample permit indirectly mitigate impacts to air quality, including sections related to soils, vegetation removal, restoration, and pollution and hazardous wastes.

Groundwater

The impact intensity level is anticipated to be minimal. Localized impacts, should they occur, would be intermittent, but have the potential to occur over the long-term. Impacts can be mitigated.

The project is within the Central Groundwater Province, where "sand aquifers in generally thick sandy and clayey glacial drift [overlay] Precambrain and Cretaceous bedrock."[137] "Glacial sediments are thick,

sand and gravel aquifers are common, and the deeper fractured bedrock is rarely used as an aquifer."[138] General availability of groundwater in the province is good and moderate in surficial sands and buried sands, respectively.[139]

According to the *Pollution Sensitivity of Near-Surface Materials* the land control area is in an area of high sensitivity.[140] The sensitivity to pollution of near-surface materials is an estimate of the time it takes for water to travel through the unsaturated zone to reach the water table, which for the purposes of the model was is assumed to be 10 feet below the land surface.[141] A rating was applied across the state, defining the vertical travel time of water to reach a depth of 10 feet. Water travels through an area of high sensitivity to a depth of 10 feet in less than 170 hours, whereas it takes water 430 to 1,600 hours to reach that same depth in areas rated as low.[142]

Wellhead protection areas exist "to prevent contamination of public drinking water supplies by identifying water supply recharge areas and implementing management practices for potential pollution sources found within those areas."[143] There are no wellhead protection areas within the land control area. The *Rice Wellhead Protection Area* is the nearest to the project, one mile to the southeast.

"The *Minnesota Well Index* provides basic information about location, depth, geology, construction and static water level, for many wells and borings drilled in Minnesota. It by no means contains information for all the wells and borings and the absence of information about a well on a property does not mean there are not wells on that property."[144] Private wells exist throughout the local vicinity. Two verified drinking water wells are located near the land control area. Well No. 530064 is 50 feet west of the project, and is 100 feet deep. Well No. 827727 is 125 feet from the land control area near Halfway Crossing Road. It is 144 feet deep. Irrigation wells are present in the land control area. No wells are within the collection line corridor.

Potential Impacts

The ROI for groundwater is the land control area and collection line corridor. The impact intensity level is anticipated to be minimal. Localized impacts, should they occur, would be intermittent, but have the potential to occur over the long-term. Impacts can be mitigated.

Potential impacts to groundwater can occur directly or indirectly. Direct impacts are generally associated with construction, for example, driving galvanized steel i-beam post foundations could penetrate shallow water tables. There would be approximately 52,000 of these posts, which will be driven to a depth of approximately eight to 14 feet deep. Although there is potential that subsurface activity might disturb shallow groundwater resources, the disturbance area would be well above well-depth used for potable water in the local vicinity.

Collection line structures will be embedded directly into the ground. Some of these structures might come into direct contact with groundwater. Wood preservatives might reach groundwater from direct contact or from the soil through runoff and leaching. Generally, leaching is greatest in the first year.[145] 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.[146]

Impacts to surface waters can lead to indirect impacts to groundwater. Surface water impacts are not anticipated.

Mitigation

Section 4.3.3 of the sample permit requires permittees to "implement erosion prevention and sediment control practices recommended by the [MPCA]" and to "obtain a [CSW Permit]". MPCA has indicated that soil testing to "ensure existing soil infiltration rates do not exceed 8.3 inches per hour" will be required as part the application for a CSW Permit.[147] Impacts to groundwater can also be minimized by mitigating impacts to surface waters and soils. Additional mitigation is not proposed.

Rare and Unique Resources

The impact intensity level is anticipated to be minimal. Impacts could be positive or negative, short- and long-term. Impacts can be mitigated.

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. Several MBS Sites of Biodiversity Significance occur within the project area. These sites—Brockway 1, East Langola 7, and West Langola 1, 2, 4, and 10—have a biodiversity rank of *below*. Sites ranked *below* "lack occurrences of rare species and natural features or do not meet MBS standards for outstanding, high, or moderate rank. These sites [might] include areas of conservation value at the local level, such as habitat for native plants and animals, corridors for animal movement, buffers surrounding higher-quality natural areas, areas with high potential for restoration of native habitat, or open space."[148]

The Division of Ecological and Water Resources within DNR manages the Natural Heritage Information System ("NHIS"), which "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."[149]

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.

Staff reviewed the NHIS and the USFWS Information for Planning and Consultation databases. The Loggerhead Shrike is a state endangered species. Northern long-eared bats are a state species of special concern, and a federal threatened species. The EA does not map rare features 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.

Loggerhead Shrikes, "a state-listed bird species of special concern, have been documented in the project area,"[150] and are distributed throughout most of the continental United States and the southern portions of Alberta, Saskatchewan, and Manitoba. "The Loggerhead Shrike population in Minnesota has fallen sharply, and the species is currently very rare or absent throughout much of its former range." "Loggerhead Shrikes live in areas of upland grasslands and sometimes in agricultural areas where short grass vegetation and perching sites such as hedgerows, shrubs, and small trees are found. They [might] occur in both native and non-native grasslands…." Habitat loss is partly responsible for this species' decline, including changes to farming practices that involve larger fields and fewer trees, as well as environmental contamination via reduced food supply and ingestion of contaminated prey.[151]

Lark Sparrows, a state-listed species of concern, have been documented in the collection line corridor.[152] "In Minnesota, Lark Sparrows typically occur in dry grasslands with a specific set of components and characteristics: short and/or sparse grasses (usually native) in areas of sand or gravel soils, with at least some bare ground and widely-scattered or patchy trees."[153] "The vast majority of Minnesota's oak savanna and dry prairie habitat for Lark Sparrows has already been lost. The few high quality remnants of these habitats are at risk due to development pressures, sand and gravel mining, increases in woody vegetation, invasive species, and other factors." "Habitat for the lark sparrow may be present in the forested corridor along the Platte River within the collection line corridor."[154]

Cerulean Warblers, a state-listed species of special concern have been documented in the project area.[155] "The cerulean warbler requires large tracts of deciduous forest with mature to old-growth trees and a structurally diverse canopy. Minimum forest tract size estimates vary widely and by region, but there is general agreement that the cerulean warbler needs large unfragmented tracts."[156] "Cerulean warblers in central Minnesota typically occur in upland oak, maple, and/or basswood dominated forests, usually in tracts with numerous wooded potholes or wet meadow openings within the forest."[157] "On the breeding grounds, loss and fragmentation of mature deciduous forest, especially along stream valleys, is the most serious threat facing the cerulean warbler."[158] "Habitat for the cerulean warbler may be present within a mile of the collection line corridor associated with the large tracts of forested corridor along the Mississippi River."[159]

Northern long-eared bats, a state-listed species of special concern, can be found throughout Minnesota. During 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 threat to the species. Activities that might impact this species include, but are not limited to, wind farm operation, any disturbance to hibernacula, and destruction or degradation of habitat (including tree removal). The NHIS database does not contain any known occurrence of Northern long-eared bat roosts or hibernacula within Benton County, although there is record of the species in Morrison and Stearns Counties.[160] Note that species occurrence maps, in this instance, are based on a species being found anywhere in the county.[161]

Blunt Sedge, a state-listed vascular plant species of special concern "is an uncommon inhabitant of sandy prairies. Intact native prairies of any kind have become quite rare in the state, and the dry sandy prairies inhabited by [blunt sedge] are among the rarest. Only a few such prairies in central and northwestern Minnesota are known to support this species. Even in prairies where [blunt sedge] is found, its population numbers are often precariously low."[162] Native plant communities do not exist within the collection line corridor; however, the blunt sedge is documented within the collection line corridor.[163]

Drummond's Campion, a state-listed vascular plant species of special concern. "Habitats in Minnesota seem to be dry, sandy soil and direct sunlight. But the species only occurs where these conditions are present in relatively high-quality native plant communities of dry prairies and dry savannas. It apparently does not occur on roadsides, agricultural land, gravel pits, or other habitats that have been created incidental to human activities."[164] Native plant communities do not exist within the collection line corridor; however, the blunt sedge is documented within the collection line corridor.[165]

Potential Impacts

The ROI for rare and unique species is the project area. Rare plant and animal communities do not exist in the land control area. Tree clearing would occur. Northern long-eared bats use the project area. The bats may roost in the trees within the collection line corridor or fly through the collection corridor to forage in larger forested areas near the Mississippi River. "Tree-nesting birds such as the [Loggerhead Shrike might] be affected during tree clearing if nests with eggs or chicks are present in the trees that are cleared."[166] Land cover conversion from row crops to native grasses would likely result in more foraging habitat for rare animal species resulting in positive impacts.

Mitigation

Any tree removal should avoid the active season for the Northern long-eared bat (April 1-September 30).[167] Ensuring construction and operation are consistent with USFWS guidance would minimize impacts to this species. The applicant committed to implementing mitigation techniques focused on loggerhead shrikes as recommended by DNR in their October 11, 2018, Natural Heritage Review letter, such as avoiding tree and shrub removal within suitable habitat during breeding season, and reporting any Loggerhead Shrike sightings to the agency.[168] Because Blunt Sedge and Drummond's Campion are documented nearby, DNR recommends restricting soil disturbance along the Platte River to previously disturbed area near the road right-of-way or contacting the agency for further coordination.[169] Techniques for minimizing impacts to wildlife and vegetation also minimize impacts to rare species. No additional mitigation is proposed.

Soils

The impact intensity level is expected to be minimal. Potentials impacts will both positive and negative, and short- and long-term. Isolated moderate to significant negative impacts associated with high rainfall events could occur. Impacts to soils are greatest with the below-ground electrical collection system. Impacts can be mitigated.

Soils types within the land control area are listed in Table 11. None of these soils are considered prime farmland. Most are within the *Hubbard* series. This "series consists of very deep, excessively and well drained soils that formed in sandy glacial outwash or sandy alluvial sediments".[170] These soils are "excessively drained to well drained", and, during normal years, a saturated zone can occur between three to six feet in April to June. These soils are generally cultivated, and many areas are irrigated. *Isan* series soils are "very deep, poorly and very poorly drained".[171] *Sandberg* series soils are "very deep, excessively drained soils".[172]

Table 11 Soil Types within Land Control Area

Soil Type	Acres	Percent
Hubbard loamy sand, 0 to 2 % slopes	463	58
Hubbard loamy sand, 1 to 6 % slopes	309	38
Hubbard loamy sand, 2 to 12 % slopes	26	3
Isan-Isan, frequently ponded, complex, 0 to 2 % slopes	4	< 1
Sandberg loamy coarse sand, 6 to 30 % slopes	2	< 1

Most soils crossed by the collection line corridor are Hubbard loamy sands of various slopes. These soils are not prime farmland. A small portion of the collection line corridor (approximately two acres) crosses

Elkriver fine sandy loam with zero to two percent slopes which is rarely flooded. These soils are considered prime farmland.

Potential Impacts

The ROI for soils is the land control area and collection line corridor. The impact intensity level is expected to be minimal. Potentials impacts will both positive and negative, and short- and long-term. Isolated moderate to significant negative impacts associated with high rainfall events could occur. Impacts to soils are greatest with the below-ground electrical collection system.

Construction will disturb approximately 700 acres within the land control area.[173] Of this, about 230 acres will be graded, which consists of cutting and filling earth in targeted areas to provide a level and stable base for equipment. Graded locations "will have topsoil and organic matter stripped and segregated from the subsoil".[174] As with any ground disturbance, the potential exists for soil compaction and erosion. Should high rainfall events occur during construction or prior to establishment of permanent vegetation, significant sedimentation might occur.

Soil cover and management will change from cultivated cropland to a mixture of impervious surfaces, for example, PV panels, access roads, project substation, etc., underlain and surrounded by native groundcover plantings. Once permanent vegetation is properly established, stormwater management, as well as general soil health, might improve due to use of native plants. These benefits could extend beyond the life of the project if these benefits are preserved through decommissioning practices, and if the land control area is returned to agricultural use.

The type of electrical collection system used would affect soils differently. In all systems, some trenching will be required to bury electrical cables. Impacts are most substantial with the below-ground system, and decrease with the hybrid system. The above-ground system involves significantly less soil disturbance.

Soil compaction and rutting will occur from movement of construction vehicles along the collection line. Installing structures requires removing and handling soils, which, along with vegetation clearing and minor grading, will expose soils to wind and water erosion. Topsoil could be lost to improper handling or erosion. The collection line corridor will remove approximately one and six-tenths miles of shelter belts, which could result in greater levels of erosion in select areas.

Impacts to prime farmland are discussed on page 71.

Mitigation

The use of best management practices can protect topsoil and minimize the potential for soil erosion. The applicant has committed to temporary and permanent topsoil stabilization measures in accordance with the project's CSW Permit; restoring disturbed areas to pre-construction conditions to the extent practicable; minimizing erosion by implementing environmental control measures, such as, temporary and permanent seeding, mulching, filter strips, erosion blankets, and sod stabilization.[175] The predominance of excessively drained soils at the land control area might mitigate impacts from both sedimentation and compaction.

Sections 4.3.1, 4.3.2, 4.3.3, and 4.3.8 of the sample permit address soil related impacts: 4.3.1 requires protection and segregation of topsoil; 4.3.2 requires measures to minimize soil compaction; and 4.3.3

requires the permittee to "implement erosion prevention and sediment control practices recommended by the [MPCA]" and to "obtain a [CSW Permit]." A CSW Permit requires both temporary and permanent stormwater controls. Section 4.3.3 also requires implementation of reasonable erosion and sediment control measures, contours graded to provide for proper drainage, and all disturbed areas be returned to pre-construction conditions. Section 4.3.8 requires that "site restoration and management" practices enhance "soil water retention and reduces storm water runoff and erosion".

The applicant developed and is committed to an *Agricultural Mitigation Plan* that details methods to minimize soil compaction, preserve topsoil, and establish and maintain appropriate vegetation to ensure the project is designed, constructed, operated and ultimately restored in a manner that would preserve soils to allow for the land to be returned to agricultural use. The *Vegetation Management Plan* lists best management practices, that while directly related to vegetation, will stabilize soils.

Surface Water

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.

The project is within the Mississippi River – Sartell watershed, which is part of the Upper Mississippi River Basin. The collection line corridor crosses the Platte River. The Platte River drains 432 square miles[176] from Eskrine Lake (near Mill Lacs Lake) to the Mississippi River. The Platte River is an impaired water; however, the portion potentially impacted the project was delisted in 2004.[177]

Public Waters

Certain waters in Minnesota are classified as public waters under Minnesota Statute 103G.005. 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 use of the water, meaning lake, watercourse, or wetland. Utilities are required to obtain a license to cross state lands and waters.[178] Projects affecting the course, current, or cross-section of lakes, wetlands, and streams that are public waters may require a Public Waters Work Permit.[179]

The Mississippi River is west of the project. From its nearest point, it is approximately 500 feet from the land control area through vegetative cover. The Mississippi River is classified as a restricted water and, therefore, additional construction stormwater best management practices are required "for those areas of the project draining to a discharge point . . . within one mile of [a restricted] water."[180] These additional requirements are "described in the CSW Permit parts 23.9, 23.10, and 23.11."[181]

Potential Impacts

The ROI for surface waters is the land control area and collection line corridor. The project will not directly impact surface waters. The applicant proposes to span the Platte River, and the ECE distribution line will be buried using horizontal directional drill techniques to avoid impacting the river. Indirect impacts during construction include sediment or fugitive dust created by excavation, grading, vegetation removal, and construction traffic reaching nearby surface waters.

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.

Certain "hydro-mulch products may contain small synthetic (plastic) fibers to aid in its matrix strength. These loose fibers could potentially re-suspend and make their way into public waters. [DNR requests the applicant] review mulch products and . . . not allow any materials with synthetic (plastic) fiber additives in areas that drain to public waters."[182]

Section 4.3.3 of the sample site permit requires "reasonable measures to minimize erosion and sedimentation during construction" such as use of perimeter sediment controls and controlling vehicle tracking. Section 4.3.3 also requires the permittee to "implement erosion prevention and sediment control practices recommended by the [MPCA]" and to "obtain a [CSW Permit]." Depending on total impervious surface associated with the project, the CSW Permit will address mitigation for operational stormwater impacts. No additional mitigation is proposed.

Vegetation

Within the land control area, the impact intensity level is anticipated to be long-term and positive. Minimal negative impacts would occur along the collection line. Additional mitigation is proposed.

Prior to European settlement, oak barrens and openings dominated this droughty upland with brushland covering large areas of the sandplain. Upland prairie formed a narrow band along the Mississippi River, as did areas of floodplain forest. Native vegetation consisted of "big bluestem, little bluestem, indiangrass, switchgrass and other grasses of the tall grass prairie with scattered bur oak trees and beaked or American hazelnut."[183] Today, the land control area is dominated by cultivated crops established and maintained by humans. Several areas with trees, likely windbreak remnants, exist within the land control area.

Non-native invasive species are likely limited due to weed management associated with agriculture. MDA administers the *Minnesota Noxious Weed Law*. Noxious weeds are defined as an annual, biennial, or perennial plants designated to be injurious to the environment, public health, public roads, crops, livestock, or other property. The purpose of the law is to protect residents of Minnesota from the injurious effects of these weeds.[184] MDA lists four categories of noxious weeds with differing levels of eradication, control, reporting, transport, sales, and propagation requirements. There are 14 weeds on the eradicate list and nine on the control list.[185] There are 15 restricted weeds.[186] None of the weeds on these lists are to be transported, propagated, or sold in the state.

Potential Impacts

The ROI for vegetation is the land control area and collection line corridor. Construction of the project will eliminate vegetative cover at access roads, project substation, operation and maintenance building, and parking lot. In the land control area agricultural row crop fields 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. Once established, vegetation would most likely be maintained by mowing.

The collection line corridor will result in the removal of approximately one and sixth-tenths miles of shelter belt. Additionally, the existing ECE distribution line crosses the Platte river to the north of Halfway Crossing Road. The collection line is proposed to cross to the south. This will result in a new corridor being cleared over the river (**Figure 14**).

Figure 14 Platte River Crossing

North South

Construction activities could introduce invasive species. "The first three years of vegetation management are a concerted effort to remove invasive vegetation from the site while also helping the planted native vegetation establish."[187] Use of the above-ground electrical collection system would require small amounts of tree clearing. There no mapped native prairie within the land control area. The land control area is adjacent to a railroad right-of-way prairie remnant that was ranked fair in 1998. The project would not impact this remnant.

Mitigation

The applicant prepared and is committed to a *Vegetation Management Plan* to guide site preparation, installation of prescribed seed mixes, management of invasive species and noxious weeds, and control of erosion/sedimentation. The applicant developed and is committed to an *Agricultural Mitigation Plan* that details methods to minimize soil compaction, preserve topsoil, and establish and maintain appropriate vegetation to ensure the project is designed, constructed, operated and ultimately restored in a manner that would preserve soils to allow for the land to be returned to agricultural use.

Section 4.3.7 of the sample permit requires that vegetation clearing be limited to only the extent necessary for construction access and safe operation and maintenance of the project. Section 4.3.8 requires that site restoration and management practices provide for native perennial vegetation. Section 4.3.9 discusses pesticide use. Section 4.3.10 requires permittees to employ best management practices to avoid the potential introduction and spread of invasive species on lands disturbed by project construction. Section 4.3.11 requires permittees to take all reasonable precautions against the spread of noxious weeds during all phases of construction.

Given the importance of a vegetation management plan, BWSR and DNR recommended the following language be incorporated as Section 4.3.8.1 Site Planning Management.[188]

- Management objectives addressing short term (year 0-3, seeding and establishment) and long term (year 4 through the life of the permit) objectives.
- A description of planned restoration and vegetation activities, including how the site will be prepared, timing of activities, and 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 objectives.
- A description of management tools used to maintain vegetation (e.g. mowing, spot spraying, hand removal, fire, grazing, etc.), including timing/frequency of maintenance activity.
- Identify responsible party for site restoration, monitoring, and long-term vegetation management of the site (e.g. consultant, contractor, site manager, etc.).
- Identification, monitoring and management of noxious weeds and invasive species (native and non-native) on site.

Moreover, BSWR and DNR recommend the Vegetation Management Plan be revised in coordination with BWSR, DNR, and commerce.[189] The vegetation management plan and documentation of the coordination efforts between the permittee and the coordinating agencies shall be filed at least 14 days prior to the preconstruction meeting.

Use of the above-ground collection system would require tree removal; use of the below-ground or hybrid collection system would avoid tree clearing within the land control area.

> Oak savanna plant communities have been documented in the project area, and it is possible that oaks will be present in areas where tree removal and branch trimming are necessary. Within the project area, oak trees are most susceptible to oak wilt infection from April 1 through July 15. [. . .] Tree trimming and removal should be avoided during this timeframe unless all cuts and wounds on oaks are painted within 10 minutes with a water-soluble paint or shellac. The outer three growth rings and bark should be totally covered with paint.[190]

To minimize impacts at the Platte River crossing, the applicant could be required to cross the Platte River to the north along the existing distribution line corridor.[191] Currently, the applicant indicates it is not possible to acquire an easement to route the collection line on the north side of the Halfway Crossing Road. Shelter belts could be replanted with low growing shrub vegetation. No additional mitigation is proposed.

Wildlife and Habitat

Potential impacts are positive or negative, and are species dependent. Long-term, minimal positive impacts to birds, 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. Potential impacts can be mitigated in part. The impact intensity level is expected to be minimal.

Landscape types and vegetation communities vary throughout the local vicinity; however, the majority is disturbed open land habitat dominated by agricultural row crops. Fencerows and woodlots, as well as small grassland pockets, provide habitat for terrestrial and avian wildlife. The Mississippi and Platte River areas “provide important habitat for wildlife in this area [such as] habitat for birds, both during the migration and nesting seasons”.[192]

Wildlife utilizing the land control area are common species associated with disturbed habitats, and are accustom to human activities occurring in the area, for example, agricultural activities and road traffic. Mammals, reptiles, amphibians, and insects are present. These species include white-tailed deer, red fox, striped skunk, wild turkey, ringnecked pheasant, sandhill crane, passerines, rodents, gartersnake,

gopher snake, and insects.[193] The area is used by ducks, geese, and, in recent years, trumpeter swans.[194] Central Minnesota has some of the highest deer densities in the state. Based on the proximity to river bottom habitat, species that use the river might move through and forage in the land control area. These species include river otter, beaver, muskrat, and waterfowl.[195] Fish species are likely not present in the land control area given the lack of open water.

"Minnesota defines Species in Greatest Conservation Need ("SGCN") as native animals, nongame and game, whose populations are rare, declining, or vulnerable to decline and are below levels desirable to ensure their long-term health and stability. Also included are species for which Minnesota has a stewardship responsibility."[196] The Wildlife Action Network is "mapped terrestrial and aquatic habitats, buffers, and connectors that represent a diversity of quality habitat . . . representing viable or persistent populations and 'richness hotspots' of SGCN".[197] The Mississippi and Platte Rivers are mapped features in the Wildlife Action Network. These features receive a rank of medium to medium-high in the local vicinity of the project.[198]

Table 12 "provides information on the factors influencing the vulnerability or decline of SGCN that are known or predicted to occur in the subsection".[199] Habitat loss and degradation are the greatest factors influencing the Anoka Sandplain Subsection.

Open land habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Woodland habitat consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wetland habitat wildlife consists of open, marshy, or swampy shallow water areas.[200] The land control area consists of open land habitat; however, wood land and wetland habitats exist within the local vicinity. The Mississippi River corridor is a major migration corridor for a variety of birds.

Potential Impacts

The ROI for wildlife and wildlife habitat is the land control area and collection line corridor. The ROI for birds is the local vicinity. The impact intensity level is expected to be minimal. Impacts could be positive or negative, and depend on species type. Potential impacts will be short- and long-term and can be mitigated.

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

The single largest impact to wildlife associated with the project is fencing. Studies estimate that one ungulate per year becomes entangled for every two and one-half miles of fence.[201] Deer can jump many fences, "but smooth or barbed-wire can snag animals and tangle legs, especially if wires are loose and spaced too closely together" (Figure 15).[202] Predators can use fences to corner and kill prey species.[203] 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".[204] Other low flying birds such as grouse and owls are also vulnerable to fence collisions.

DNR indicates that any fence greater than six feet will restrict wildlife movement; however, there is no way to predict exactly how it would change. Any fence that successfully excludes deer would, as a

result, funnel deer along roads that bisect or follow the periphery of the project increasing risk of deer mortality—as well as increased risk of human injury—associated with deer vehicle collisions.[205] 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.[206]

Table 12 Species Problem Analysis

Problem	% of SGCN for which this is a problem*
Habitat Loss in MN	82
Habitat Degradation in MN	87
Habitat Loss/Degradation Outside MN	31
Invasive Species and Competition	26
Pollution	36
Social Tolerance/Persecution/Exploitation	24
Disease	3
Food Source Limitations	2
Other	12

* The inverse of the percentages for each problem does not necessarily represent the percentage of SGCN for which the factor is not a problem, but instead might indicate that there is not sufficient information available to determine the level of influence the problem has on SGCN.

Risks to birds have been identified near PV solar farms.[207] PV panels are "movable and generally directed upward, reflecting the sky". "[A] large expanse of reflective, blue panels may be reminiscent of a large body of water." Preliminary findings, 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.

Should an above-ground electrical collection system be used, birds might collide with or be electrocuted by conductors and equipment, either of which could result in death. Collisions are more likely for large-bodied birds with long wing spans, such as swans, geese, and ducks; however, any size species could collide with a conductor. Electrocution is also more common in large bodied birds, but, again, any species can be electrocuted. Because of their smaller size, electrocution risk is greater on distribution lines.[208] Should the below-ground electrical collection system be used, wildlife might become trapped in trenches.

Reduced pesticide use, as compared to agricultural production, should benefit insects, including pollinators, and smaller wildlife such as rodents, birds, insects, and reptiles. These same species might benefit from increased cover and foraging habitat. DNR indicates that other impacts—positive or negative—to wildlife will occur, but there is no way to predict what they will be and their intensity level.[209]

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 being converted is not crucial to wildlife populations. The land control area is likely used as a travel corridor or, occasionally, as a food source (for example, standing corn).[210] 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. The collection line corridor will remove approximately one and six-tenths miles of shelter belts. These areas provide habitat for small birds and mammals. Shelter belts also provide a travel corridor for wildlife passing through the area. Overall, the project does not contribute to significant habitat loss or degradation, or create new habitat edge effects.

Figure 15 Fence Entanglement

Mitigation

Siting facilities away from wildlife movement corridors can avoid or minimize impacts to wildlife movement. Avoiding use of plastic erosion-control materials where possible and using biodegradable materials (typically made from natural fibers) instead can minimize the impact to wildlife. The site permit could include the use of natural fiber materials as a standard condition or as a special condition for facilities where there is greatest concern.

Fencing "The 'friendliest' fences for wildlife are very visible and allow animals to easily jump over or slip under the wires or rails."[211] This type of fence would not preclude human entry—an indicated purpose of the security fence. Therefore, to maintain a human barrier, but minimize impacts to wildlife, especially deer, the site permit could require that an eight-foot fence be used with the wire brought tight to the ground. "The fence can be completely built from woven wire or a combination of a bottom section of woven wire and top strands of smooth wire."[212] This type of barrier or exclusion fence should be set back sufficiently to encourage wildlife (primarily deer) to follow the fence line around the project away from roads, instead of pushing them into the roadway.[213]

The site permit could require that visibility markers be placed at appropriate locations on perimeter fencing.

> High visibility helps wildlife negotiate fences. Visibility is especially important in grasslands and near creeks and wetlands to protect low-flying birds, such as grouse, owls, and waterfowl. For big game, increased visibility helps animals judge their jumps…. Using a vinyl coated high-tensile wire for the top

> wire, or covering [it] with PVC pipe, flagging, or tape helps wildlife see fences and dramatically reduces wildlife damage to fences of all heights.[214]

Should wildlife, such as deer, enter the fenced area they would need an escape. The site permit could require that wildlife ramps be constructed "at corners where an accidentally trapped animal is more likely to find an escape" (Figure 16) (Note the jump platform is lower than the fence, ensuring that it does not appear as a landing pad from the exterior).[215]

Trenching Should the below-ground collection system be used, checking open trenches for wildlife and removing wildlife before backfilling mitigates impacts.

Erosion Control "Due to entanglement issues with small animals, [DNR requests] use of erosion control blankets to 'bionetting' or 'natural netting' types; and, specifically not products containing plastic mesh netting or other plastic components. These erosion control blankets are Category 3N or 4N in the MnDOT 2018 Standard Specification book (Specification 3885)."[216]

Habitat Once permanent vegetation is established, restricting mowing from April 15 to August 15 would improve the potential for ground nesting habitat. Shelter belts could be replanted with low growing shrub vegetation. This would replace marginal wildlife habitat and travel corridors removed for the project.

BWSR and DNR, in coordination with EERA, proposed language modifying Section 4.3.8 of the sample permit.[217] Agency staff recommend use of best management practices established by BWSR and DNR. Staff further recommends the vegetation management plan be prepared in coordination with BWSR, DNR, and commerce. The vegetation management plan and documentation of the coordination efforts between the permittee and the coordinating agencies shall be filed at least 14 days prior to the preconstruction meeting. Permittees are encouraged to meet the standards for Minnesota's Habitat Friendly Solar Program by submitting project plans, seed mixes, a completed project planning assessment form, and any other applicable documentation used to meet the standard to BWSR.

Power Lines DNR recommends that new power lines constructed as part of the solar array "be placed below ground" to minimize bird-strike collisions.[218] Impacts to avian species can also be minimized by diverting bird flights away from power lines through the use of bird diverters placed on shield wires. Diverters are placed on the top shield wire because of the natural tendency for birds to avoid obstacles in flight by increasing altitude. Bird diverters can be used over open water and wetland areas, or near natural openings and funnels within forested areas near habitats used by avian species, especially waterfowl species. DNR recommends bird diverters at the Platte River crossing. DNR also recommended bird diverters at the northwest end of the collection near the West Langola 4 and West Langola 10 Minnesota Biological Survey sites of biodiversity significance.

Impacts to avian species caused by electrocution can be mitigated by use of best management practices for conductor spacing and shielding. These practices are codified in Avian Power Line Interaction Committee standards. Avian protection is a common commission route permit condition. Should an above-ground electrical collection system be used, the site permit could include similar language to mitigate avian impacts.[219]

Figure 16 Wildlife Jump

Section 8.12 of the sample permit requires permittees to report "any wildlife injuries and fatalities" to the commission on a quarterly basis. Section 4.3.8 requires use of "site restoration and management practices that provide for native perennial vegetation and foraging habitat beneficial to gamebirds, songbirds, and pollinators". No additional mitigation is proposed.

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 as long as the construction period, and include:

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

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

- Visual impacts of the project.
- Cultural impacts due to a change in the sense of place for local residents.

- Loss of land for agricultural purposes.
- Injury or death of birds that collide with or are electrocuted by conductors.
- Injury or death of birds that collide with PV panels
- Injury or death of birds and mammals from fencing.
- Potential decrease to property values.
- Minor amounts of continued maintenance of tall-growing vegetation along the collection line corridor.

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.

Cumulative Potential Effects

Cumulative potential effects result from the incremental effects of a project in addition to other projects in the environmentally relevant area. Impacts will be "cumulative" with the Minnesota Power Switching Station.

Minnesota Rule 4410.0200, subpart 11a, defines "cumulative potential effects," in part, as the "effect on the environment that results from the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects ... regardless of what person undertakes the other projects or what jurisdictions have authority over the project."

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

EERA staff determined what projects are "reasonably likely to occur."[220] In this instance, Minnesota Power will construct and operate a switching station in the environmentally relevant area. The following subsection analyses the cumulative potential effects of the project and the switching station where potential effects coincide.

Analysis Assumptions

The following assumptions regarding the construction and normal operation of the Royal Solar Farm were used for the purposes of this cumulative potential effects analysis:

- The switching station will be constructed, maintained, and operated in a similar manner as this project's project substation.

- The switching station will not be decommissioned and removed at the end of the project's useful life.

Analysis Background

The ROI for cumulative potential effects varies across elements and is consistent with the ROI identified in Potential Impacts and Mitigation. 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 might or might not change the impact intensity level assigned to the resource or element.

The following graphics are used to illustrate the potential for cumulative potential effects:

▲ Cumulative potential effects are anticipated.

▼ Cumulative potential effects are NOT anticipated.

◆ Cumulative potential effects are uncertain.

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 Potential Impacts and Mitigation. The source of information regarding the switching station is the addendum.

Human Settlement

This section describes cumulative potential effects to human settlement. **Table 13** illustrates the potential for cumulative effects.

Aesthetics The ROI for aesthetics is the local vicinity. There are three residences within the local vicinity of the switching station. During construction increased vehicle traffic and construction activities will occur. An additional industrial feature will be added to the landscape. This feature will be lit at night. Impacts to the travelling public are not anticipated. Potential impacts are unavoidable, but can be mitigated in part. The overall impact intensity level is anticipated to remain moderate to significant for those with high viewer sensitivity, for example, neighboring landowners.

Land Use The ROI for land use is the collection line corridor. Agricultural lands may or may not be taken out of production. Land use will be permanently converted to an industrial type use. The overall impact intensity level will remain minimal.

Noise The ROI for noise is the local vicinity. Heavy truck traffic along established haul routes will generate noise during materials delivery. Construction noise related to the switching station is typical of a construction site. The switching station is not anticipated to cause noise impacts once in operation. Impacts can be mitigated. The overall impact intensity level will not change.

Property Values The ROI for property values is the local vicinity. Residences within the local vicinity might see both the project substation and the switching station within their viewsheds. Short-term cumulative effects will occur. Staff is uncertain if long-term impacts will occur. It is unlikely that impacts

will be permanent. Impacts can be mitigated. The overall impact intensity level is anticipated to remain minimal and dissipate at distance. Impacts to specific properties could be moderate to significant.

Table 13 Potential for Cumulative Effects: Human Settlement

Element/Resource	Region of Influence*	Potential for Cumulative Effects		
		Short-term	Long-term	Permanent
Aesthetics	Local Vicinity	▲	▲	▲
Cultural Values	Project Area	▼	▼	▼
Displacement	Collection Line Corridor	▼	▼	▼
Electrical Interference	Collection Line Corridor	▼	▼	▼
Land Use	Collection Line Corridor	▲	▲	▲
Noise	Local Vicinity	▲	▼	▼
Property Values	Local Vicinity	▲	◆	▼
Recreation	Local Vicinity	▼	▼	▼
Socioeconomics	Benton County	▲	▲	▲

Socioeconomics The ROI for socioeconomics is Benton County. Construction of the switching station 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. Adverse impacts will not occur.

Public Health and Safety

This section describes cumulative potential effects to public health and safety. **Table 14** illustrates the potential for cumulative effects.

Table 14 Potential for Cumulative Effects: Public Health and Safety

Element/Resource	Region of Influence*	Potential for Cumulative Effects		
		Short-term	Long-term	Permanent
EMF	Collection Line Corridor	▲	▲	▲
Electrical Interference	Collection Line Corridor	▼	▼	▼
Stray Voltage	Collection Line Corridor	▼	▼	▼
Medical Devices	Collection Line Corridor	▼	▼	▼
Public Safety	Collection Line Corridor	▼	▼	▼
Worker Safety	Collection Line Corridor	▲	▲	▲

Electromagnetic Fields The ROI for EMF is the collection line corridor. The switching station will add to background EMF levels. Impacts are anticipated to be negligible. Impacts can be mitigated. The overall impact intensity level is anticipated to remain minimal.

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

Public Services

This section describes cumulative potential effects to public services. **Table 15** illustrates the potential for cumulative effects.

Table 15 Potential for Cumulative Effects: Public Services

Element/Resource	Region of Influence*	Potential for Cumulative Effects		
		Short-term	Long-term	Permanent
Airports	Project Area	▼	▼	▼
Emergency Services	Project Area	▼	▼	▼
Roads	Project Area	▲	▼	▼
Utilities	Project Area	▲	▼	▼

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

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

Land-based Economies

This section describes cumulative potential effects to land-based economies. **Table 16** illustrates the potential for cumulative effects.

Table 16 Potential for Cumulative Effects: Land-based Economies

Element/Resource	Region of Influence*	Potential for Cumulative Effects		
		Short-term	Long-term	Permanent
Agriculture	Collection Line Corridor	▲	▲	▲
Forestry	Collection Line Corridor	▼	▼	▼
Mining	Collection Line Corridor	▼	▼	▼
Tourism	Project Area	▼	▼	▼

Agricultural lands may be taken out of production or become less productive if the switching station interferes with center-pivot irrigation. Impacts to the total amount of agricultural land in Benton County are negligible. Farming revenues lost will be offset by land purchase. Landowner agreements are outside the scope of this EA. Potential impacts can be mitigated. The overall impact intensity level will remain minimal.

Archaeological and Historical Resources

This section describes cumulative potential effects to archaeological and historic resources. **Table 17** illustrates the potential for cumulative effects.

Table 17 Potential for Cumulative Effects: Archaeological and Historic Resources

Element/Resource	Region of Influence*	Potential for Cumulative Effects		
		Short-term	Long-term	Permanent
Archaeological	Project Area	◆	◆	◆
Historic	Project Area	◆	◆	◆

The ROI for archaeological and historic resources is the project area. Because this element focusses on unidentified resources cumulative potential effects are unknown. The overall impact intensity level is expected to remain negligible. While unlikely, the switching station could impact previously unidentified archaeological and historical resources during construction. If previously unidentified archaeological sites are found during construction, the applicant would be required to stop construction and contact SHPO to determine how best to proceed. Ground disturbing activity will stop and local law enforcement will be notified should human remains be discovered.

Natural Resources

This section describes cumulative potential effects to natural resources. **Table 18** illustrates the potential for cumulative effects.

Table 18 Potential for Cumulative Effects: Natural Resources

Element/Resource	Region of Influence*	Potential for Cumulative Effects		
		Short-term	Long-term	Permanent
Air Quality	Benton County	▲	▲	▲
Geology/Topography	Collection Line Corridor	▼	▼	▼
Groundwater	Collection Line Corridor	▼	▼	▼
Rare Resources	Project Area	▼	▼	▼
Soils	Collection Line Corridor	▲	▲	▲
Surface Water	Collection Line Corridor	▼	▼	▼
Vegetation	Collection Line Corridor	▼	▼	▼
Wetlands	Collection Line Corridor	▼	▼	▼
Wildlife and Habitat	Collection Line Corridor	▲	▼	▼
Wildlife (birds)	Local Vicinity	▲	▲	▲

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

Soils The ROI is the collection line corridor. Soils within the footprint of the switching station will be permanently compacted. Soils around the switching station may experience compaction and rutting from movement of construction vehicles. The overall impact intensity level is expected to remain minimal.

Wildlife The ROI for wildlife is the collection line corridor. The ROI for birds is the local vicinity. Wildlife might be inadvertently harmed or killed during construction. Long term and permanent impacts include a greater risk of bird electrocution or collision due to increased electrical equipment on the landscape. Potential impacts can be mitigated. The overall impact intensity level is expected to remain minimal.

Notes

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[6] *Ibid*.

[7] *Ibid*.

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[21] Minnesota Geological Survey (2010) *C-23 Geologic Atlas of Benton County, Minnesota [Part A], Plate 1—Data-Base*, retrieved from: https://conservancy.umn.edu/handle/11299/93866.

[22] Revised Site Permit Application, page 51; *see also* Appendix C, page 5 (requiring that contours "be graded as required so that all surfaces . . . blend with the natural terrain").

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[41] Revised Site Permit Application, Appendix A.

[42] Revised Site Permit Application, page 30.

[43] *Ibid*.

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[89] *Supra* Chapter 3, note 20.

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[107] Public Comments, page 53.

[108] U.S. Department of Agriculture (2012) 2012 Census of Agriculture: Benton County, MN, retrieved from: https://www.nass.usda.gov/Publications/AgCensus/2012/Online_Resources/County_Profiles/Minnesota/index.php.

[109] Addendum, page 29.

[110] Public Comments, page 39.

[111] Public Comments, page 40; *see also* Appendix B, Supplemental Information Inquiry #4 (the applicant "has provided" information concerning the location of the farm road "to the neighbor but has been unable to discuss directly with the neighbor").

[112] Revised Site Permit Application, Appendix F.

[113] Revised Site Permit Application, page 52.

[114] *Id*., page 51.

[115] Appendix B, Supplemental Information Inquiry #4.

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[119] *See* Minn. Stat. 138.31, subd. 14.

[120] *See* Minn. Stat. 138.51.

[121] Revised Site Permit Application, Appendix D, page 15

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[177] Minnesota Pollution Control Agency (n.d.) *Impaired Waters Viewer: Draft 2020*, retrieved from: https://www.pca.state.mn.us/water/impaired-waters-viewer-iwav.

[178] Minn. Stat. 84.415.

[179] Minnesota Department of Natural Resources (n.d.) *Requirements for Projects Involving Public Waters Work Permits*, retrieved from: http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/requirements.html.

[180] Pollution Control Agency (August 1, 2018) *Permit Number: MN R 100001*, retrieved from: https://www.pca.state.mn.us/sites/default/files/wq-strm2-80a.pdf.

[181] Pollution Control Agency (August 13, 2019) *Comments: Regal Solar Project*, eDockets No. 20198-155308-01.

[182] *Supra* Chapter 2, note 37.

[183] *Supra* note 170.

[184] Minnesota Department of Agriculture (2018) *2018 Noxious Weed List*, retrieved from: https://www.mda.state.mn.us/sites/default/files/inline-files/noxiousweeds2018_0.pdf.

[185] *Ibid*.

[186] *Ibid*.

[187] Revised Site Permit Application Appendix C, Vegetation Management Plan, page 2.

[188] *Supra* Chapter 2, notes 37, 38.

[189] *Ibid*.

[190] *Supra* Chapter 2, note 37.

[191] Appendix B, Supplemental Information Inquiry No. 7 (The Applicant indicates it is not possible to route the collection line on the north side of the bridge due to the existence of a "gap" parcel with no clear owner; therefore, an easement could not be obtained on the north side of the road in this location.)

[192] Department of Natural Resources (October 12, 2018) *Letter to Geronimo Energy*, Revised Site Permit Application Appendix A.

[193] Revised Site Permit Application, page 64.

[194] Department of Natural Resources (January 3, 2020) *Personal Communication with Beau Liddell, Area Wildlife Biologist*.

[195] *Ibid*.

[196] Department of Natural Resources (2016) *Minnesota's Wildlife Action Plan 2015 – 2025*, retrieved from: https://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/mnwap/wildlife-action-plan-2015-2025.pdf, page 15.

[197] Department of Natural Resources (April 13, 2016) *The Wildlife Action Network developed for the 2015-2025 MN Wildlife Action Plan*, retrieved from: https://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/mnwap/mndnr_wildlife_action_network_description.pdf.

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[199] Department of Natural Resources (January 2006) *Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife*, retrieved from: https://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/profiles/anoka_sand_plain.pdf.

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

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

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

[206] Department of Natural Resources (2013) *Wildlife-friendly Erosion Control*, retrieved from: http://files.dnr.state.mn.us/eco/nongame/wildlife-friendly-erosion-control.pdf.

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

[208] Avian Power Line Interaction Committee, Edison Electric Institute, and California Energy Commission (2006) *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*, retrieved from: https://www.nrc.gov/docs/ML1224/ML12243A391.pdf, page 56.

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

[210] *Ibid*.

[211] Colorado Division of Wildlife (December 2009), page 6.

[212] Arizona Game and Fish (2011), page 20.

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

[214] Colorado Division of Wildlife (December 2009), page 6.

[215] *Id*., page 29.

[216] *Supra* Chapter 2, note 37.

[217] *Supra* note 188.

[218] Department of Natural Resources (October 12, 2018) *Letter to Geronimo Energy*, Revised Site Permit Application Appendix A.

[219] *E.g.*, Public Utilities Commission (December 19, 2018) *Order Approving Route Permit*, eDockets No. 201812-148593-01, page 10.

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

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Chapter 6: Application of Siting Factors

The analysis that follows applies the information available in the revised site permit application and this EA to the factors the commission must consider when making a site permit decision. Generally, EERA staff reviews these factors to help establish the relative merits of a proposed project against alternative power plant sites or transmission line routes studied in the environmental document. In this matter only one site was studied; therefore, the concept of relative merits is not applicable. However, because multiple electrical collection systems are proposed within the land control area the concept of relative merits applies to these systems.

The Minnesota Legislature directed the commission to select sites for large electric power generating plants that minimize adverse human and environmental impacts while insuring continuing electric power system reliability and integrity.[1] The site must be compatible with environmental preservation and the efficient use of resources while also insuring electric energy needs are met and fulfilled in an orderly and timely fashion.[2]

Minnesota Statute 216E.03, subdivision 7(b) identifies 12 considerations that guide commission decisions when designating a site for a large electric power generating plant.[3] These considerations are further clarified and expanded by Minnesota Rule 7850.4100, which identifies 14 factors the commission must consider when making a permit decision. These factors are listed on page 10.

Some factors are described in just a few words, for example, effects on archaeological and historic resources. 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) were discussed in the previous chapter. Factor H (use of existing rights-of-way) and Factor J (use of existing infrastructure rights-of-way) apply solely to high voltage transmission lines. Factor G (application of design options) and Factor L (costs dependent on design) do not apply as the design of the proposed project is the only design under consideration. Should the applicant receive a generation interconnection agreement from the Midcontinent Independent System Operator, Factor K (electrical reliability) will be met. 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

Analysis

This analysis applies the siting factors to the project, and discusses the relative merits of the different electrical collection systems.

Graphics (described on the previous page) are used to illustrate distinct impacts associated with construction and operation. A discussion highlighting differences follows.

Table 19 Application of Siting Factors/Relative Merits of Collection System

	Application of Siting Factors		Relative Merits of Electrical Collection System		
Factor A: Human Settlement					
Element	**Construction**	**Operation**	**Above-ground**	**Hybrid**	**Below-ground**
Aesthetics	○	○	⊘	●	●
Displacement	●	●	●	●	●
Cultural Values	●	●	●	●	●
Electric Interference	●	●	○	●	●
Floodplains	●	●	●	●	●
Land Use and Zoning	●	●	●	●	●
Noise	⊘	●	●	●	●
Property Values*	○	●	○	●	●
Recreation	⊘	●	○	●	●
Socioeconomics	●	●	●	●	●
Factor A: Public Services					
Element	**Construction**	**Operation**	**Above-ground**	**Hybrid**	**Below-ground**
Airports	●	●	●	●	●
Roads and Highways	○	●	●	●	●
Utilities	●	●	●	●	●
Factor B: Public Safety					
Element	**Construction**	**Operation**	**Above-ground**	**Hybrid**	**Below-ground**
EMF	●	●	●	●	●
Emergency Services	●	●	●	●	●
Medical Devices	●	●	●	●	●
Public Safety	●	●	●	●	●
Stray Voltage	●	●	●	●	●
Worker Safety	●	●	●	●	●

* On whole, impacts in the local vicinity are anticipated to be minimal and dissipate at distance.

	Application of Siting Factors		Relative Merits of Electrical Collection System		
Factor C: Land-based Economies					
Element	**Construction**	**Operation**	**Above-ground**	**Hybrid**	**Below-ground**
Agriculture	○	○	●	●	●
Forestry	●	●	●	●	●
Mining	●	●	●	●	●
Tourism	○	●	●	●	●
Factor D: Archaeological and Historic Resources					
Element	**Construction**	**Operation**	**Above-ground**	**Hybrid**	**Below-ground**
Archeological	●	●	●	●	●
Historic	●	●	●	●	●
Factor E: Natural Resources					
Element	**Construction**	**Operation**	**Above-ground**	**Hybrid**	**Below-ground**
Air Quality	●	●	●	●	●
Geology	●	●	●	●	●
Groundwater	●	●	●	●	●
Soils	●	●	●	●	⊘
Surface Water	●	●	●	●	●
Topography	●	●	●	●	●
Vegetation	●	●	●	●	●
Wetlands	●	●	●	●	●
Wildlife	●	○	○	●	●
Wildlife Habitat	●	●	●	●	●
Factor F: Rare and Unique Resources					
Element	**Construction**	**Operation**	**Above-ground**	**Hybrid**	**Below-ground**
Fauna	●	●	●	●	●
Flora	●	●	●	●	●
Factor I: Use of Existing Generating Plants					
Element	**Construction**	**Operation**	**Above-ground**	**Hybrid**	**Below-ground**
Existing Plants	⊘	⊘	N/A	N/A	N/A

Discussion

The following discussion highlights potential impacts to factor elements that are anticipated to be moderate to significant, as well as siting factors that are less consistent, consistent in part, or not consistent. It also discusses the relative merits of the different electrical collection systems.

Siting Factors

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

Potential impacts to aesthetics are expected to be minimal to moderate for those with low viewer sensitivity, for example, passing motorists along U.S. Highway 10. For those with high viewer sensitivity, for example, neighboring landowners or recreationalists, 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. Impacts will be greater if the above-ground electrical collection system is used. Potential impacts are unavoidable, but can be mitigated in part.

Specific noise impacts are associated with construction and operation. The impact intensity level during construction is anticipated to range from negligible to significant depending on the activity. Potential impacts are anticipated to be intermittent and short-term. These localized impacts will affect unique resources (residences, Two Rivers campground), and might exceed state noise standards. Impacts are unavoidable, but can be minimized. Operational impacts are anticipated to be negligible.

Impacts to property values within the local vicinity could occur; however, changes to a specific property's value are difficult to determine. On whole, impacts in the local vicinity are anticipated to be minimal and dissipate at distance. Impacts to specific properties could be moderate to significant. Long-term impacts might or might not occur. Potential impacts can be minimized.

During construction potential impacts to recreation anticipated to be moderate to significant. Potential impacts will be intermittent and occur over the short-term. These localized impacts will affect a unique resource (campground). Impacts can be minimized or avoided. Operational impacts will be long-term, unavoidable, and subjective to the individual.

Potential impacts to roads and highways are 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. Impacts are unavoidable, but can be minimized.

Factor C Land Based Economies

The impact intensity level to agriculture is anticipated to be minimal. Potential impacts are localized and unavoidable, but can be minimized. Minimizing impacts requires special mitigation. The site permit could require the applicant to work with the landowner to ensure agreement concerning continued access along the existing farm road.

Potential impacts to tourism are anticipated to be minimal to moderate during construction. Impacts will be localized and affect a unique resource. Impacts will be unavoidable, but minimal during operation. Potential impacts can be mitigated.

Factor E Natural Resources

Potential impacts to wildlife will be positive or negative, and are species dependent. Long-term, minimal positive impacts to birds, 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. Potential impacts can be mitigated in part. The impact intensity level is expected to be minimal.

Factor I Power Plants

The project is not constructed at an existing power plant site; therefore, it is not consistent.

Relative Merits of Electrical Collection System

The following discusses the relative merits of the different electrical collection systems. Regardless of system used, an above-ground collection line will connect the solar array to the project substation.

Factor A Human Settlement

The above-ground electrical collection system would create significantly greater aesthetic impacts by adding approximately 198 distribution type poles within the site location. These direct aesthetic impacts could cause increased negative indirect impacts to property values and recreation. While not expected to be significant, the potential exists for increased electrical interference at overhead road crossings making the above-ground system less consistent than the below-ground system.

Factor E Natural Resources

The above-ground electrical collection system could cause greater negative impacts to wildlife through increased potential for bird collisions and electrocution. Trenching the below-ground system would impact soils to a greater extent.

Notes

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

[2] *Ibid*.

[3] Minn. Stat. 216E.03, subd. 7(e) requires the commission "to make specific findings that it has considered locating a route for a high-voltage transmission line on an existing high-voltage route and the use of parallel existing highway right-of-way and, to the extent those are not used for the route, the commission must state the reasons". A route permit will not be issued for this project; therefore, this factor is not relevant. However, the proposed gen-tie transmission line is proposed to be located parallel to existing high-voltage transmission line route, although not adjacent to it. The collection line corridor would follow existing road rights-of-way for most of its length.