COMMERCE DEPARTMENT

Environmental Report
Walleye Wind Project

Docket No. IP-7026/CN-20-269

March 2021

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ABSTRACT

Walleye Wind, LLC (Walleye Wind) is proposing to build an up to 109.2 megawatt wind farm in Rock County in southwest Minnesota (Project). Walleye Wind must obtain two approvals from the Minnesota Public Utilities Commission (Commission) to the build and operate the project: a certificate of need (CN) and a site permit.

An environmental report (ER) must be prepared as part of the CN review process. Minnesota Department of Commerce, Energy Environmental Review and Analysis staff has prepared this environmental report. The report analyzes the human and environment impacts of the Project as well as alternatives to the Project. It will be used by the Commission in making a decision on the certificate of need application.

A public hearing is anticipated to occur May 4, 2021. Due to the current COVID-19 pandemic, public hearings will be held via remote-access (replacing the standard in-person hearings) as directed by the Governor's Executive Order 20-78. Notice of the hearing will be issued separately. An administrative law judge (ALJ) from the Minnesota Office of Administrative Hearings will preside over the hearings. The ALJ will make recommendations to the Commission regarding the project. Commission decisions on a certificate of need and site permit are expected in late summer or early autumn 2021.

Additional materials related to this project and its permitting proceedings are available on the Department's website: https://mn.gov/eera/web/project/13893/ and on the State of Minnesota's eDockets system: https://www.edockets.state.mn.us/EFiling/search.jsp (enter the year "20" and the number "269" for the CN or year "20" and the number "384" for the site permit).

Persons interested in receiving future notices about this project can place their names on the project mailing list by contacting docketing.puc@state.mn.us or (651) 201-2246 and providing the docket number (20-269 or 20-384), their name, email address, and mailing address. Please indicate how you would like to receive notices – by email or U.S. mail.

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

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ACRONYM/TERM	DEFINITION
AADT	average annual daily traffic
ADLS	aircraft detection lighting system
ALJ	administrative law judge
BMP	best management practice
Commission	Minnesota Public Utilities Commission
CN	certificate of need
CR	County Road
CSAH	County State Aid Highway
dBA	A-weighted decibels
DEED	Minnesota Department of Economic Development
distribution	relatively low-voltage lines that deliver electricity to a retail customer's home or business
DNR	Minnesota Department of Natural Resources
ECS	Ecological Classification System
EERA	Minnesota Department of Commerce, Energy Environmental Review and Analysis
EMF	electromagnetic field
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
GE	General Electric
GPS	global positioning system
HAP	hazardous air pollutant
interconnection	location of project connection to the power grid
kV	kilovolt
kW	kilowatt
kWh	kilowatt-hour
LIDS	Light Intensity Dimming Solution
LNTE	low-noise trailing edge
LWECS	large wind energy conversion system

ACRONYM/TERM	DEFINITION
MBS	Minnesota Biological Survey
MDH	Minnesota Department of Health
MET	meteorological tower
micrositing	the process in which the wind resources, potential environmentally sensitive areas, soil conditions, and other site factors, as identified by local, state and federal agencies, are evaluated to locate wind turbines and associated facilities
MISO	Midcontinent Independent Transmission System Operator, Inc.
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MW	megawatt
MWh	megawatt-hour
NAC	noise area classification
NESC	National Electric Safety Code
NHIS	Natural Heritage Information System
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRO	Noise Reducing Operation
NSP	Northern States Power, a subsidiary of Xcel Energy
NTIA	National Telecommunications and Information Administration
NWI	National Wetlands Inventory
O&M	operation and maintenance
PM	particulate matter
ppm	parts per million
Project	Walleye Wind Project
PV	Photovoltaic
PWI	Public Waters Inventory
RD	rotor diameter; diameter of the rotor from the tip of a single blade to the tip of the opposite blade
SCADA	supervisory control and data acquisition

ACRONYM/TERM	DEFINITION
SHPO	Minnesota State Historic Preservation Office
SWPPP	stormwater pollution prevention plan
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
Walleye Wind	Walleye Wind, LLC
WCA	Wetland Conservation Act
WMA	wildlife management area
WPA	waterfowl protection area

SUMMARY

This environmental report (ER) has been prepared for the Walleye Wind Project, a proposed 109.2 megawatt (MW) wind farm in Rock County, Minnesota. It evaluates the potential human and environmental impacts of the Project and three alternatives to the Project – a no build alternative, a generic 109.2 MW wind farm sited elsewhere in Minnesota, and a109.2 MW solar farm. This ER will be used by the Minnesota Public Utilities Commission in deciding whether to issue a certificate of need for the Project.

No Build Alternative

Impacts that would result from the no build alternative include: (1) a possible reduction in the state's ability to meet its renewable energy objectives; (2) the loss of economic benefits to the project area; and (3) the potential negative impacts resulting from replacing the renewably generated electrical energy with energy generated from a non-renewable source.

Economic benefits that would be lost include temporary and permanent jobs, an increase in the counties' tax base, and a loss of lease payments to Project participants. Impacts associated with electrical generation using non-renewable resources include health impacts due to air emissions, impacts to water resources associated with heat rejection, and climate change impacts. The burning of carbon-based fuels results in greenhouse gas emissions that exacerbate climate change. Climate change impacts include significant impacts to public health, food production, and biodiversity.

Walleye Wind Project, Generic 109.2 MW Wind Farm, and 109.2 MW Solar Farm

Because they are all renewable technologies, these three alternatives have similar potential human and environmental impacts. They have minimal impacts on air and water resources; they generate minimal wastes. Accordingly, they have minimal impacts on human health and the environment. With proper siting, impacts to vegetation and to threatened and endangered species can also be minimized.

However, there are differences in potential impacts among the alternatives. Wind farms have potentially greater impacts on human settlements due to aesthetic impacts, shadow flicker, and noise impacts. Due to their size, wind turbines can be seen from a distance. They change the viewshed and impact the aesthetics of the landscape. Because of their height, wind turbines must have proper lighting or marking to allow for safe air navigation. The lighted turbines can be seen from a distance and can impact a relatively dark night sky. In contrast, the infrastructure at solar farms is much shorter and their aesthetic impacts are limited to a smaller viewshed. Additionally, solar farms do not require safety lighting.

Wind farms produce shadow flicker; solar farms do not. Shadow flicker can impact human settlements near wind farms. Both wind and solar farms must meet Minnesota state noise standards. However, of the two noise sources, wind farms produce relatively greater sound levels and thus have a greater potential for noise impacts, even when these impacts are within state standards.

The Project and a generic 109.2 MW wind farm will have relatively greater impacts on wildlife than a solar farm, particularly impacts to birds and bats. Bird fatalities for wind farms range from 0 to 6

fatalities per MW per year; bat fatalities range from 1 to 26 fatalities per MW per year. Bird and bat impacts for the Project are anticipated to be similar to impacts for a 109.2 MW wind farm sited elsewhere in Minnesota. Solar farm impacts on birds and bats are minimal.

A solar farm will have relatively greater impacts on land use and agriculture than a wind farm. Solar farms require 7 to 10 acres of land per MW, compared to less than one acre per MW for a wind farm. From a land use perspective wind farms projects are relatively more compatible with agricultural production. Wind farms can interfere with aerial application of agricultural products.

1 Introduction

On July 9, 2020, Walleye Wind, LLC (Walleye Wind) filed certificate of need[1] (CN) and site permit[2] applications with the Minnesota Public Utilities Commission (Commission) for the Walleye Wind Project (Project). On November 4, 2020, Walleye Wind filed amended certificate of need[3] and site permit[4] applications. The Project proposed by Walleye Wind is an up to 109.2 megawatt[5] (MW) Large Wind Energy Conversion System (LWECS or wind farm) on a site of approximately 31,000 acres in Rock County, Minnesota. Walleye Wind is a wholly owned subsidiary of NextEra Energy Resources, LLC, based in Juno Beach, Florida.

1.1 Project Overview

Walleye Wind proposes to construct up to 40 wind turbines and associated facilities including underground electric collector lines, a new collector substation, and operations and maintenance facility, a new 161 kV generation tie line of approximately 500 feet connecting the Project's substation to the electric grid, one permanent meteorological tower, and gravel access roads. The proposed site, shown in **Figure 1**, is approximately 49 square miles (31,000 acres) located in Rock County (Beaver Creek, Luverne, Martin, and Springwater townships).[6]

The Project will produce up to 109.2 MW and will use 36 General Electric (GE) 2.82 MW wind turbines and four GE 2.3 MW turbines. The Project will interconnect to the electric transmission grid at the existing Rock County Substation owned by Northern States Power Company (NSP), a subsidiary of Xcel Energy. Walleye Wind anticipates commencing construction of the Project during the third quarter of 2021, with an anticipated commercial operation date of December 31, 2021.[7]

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[1] Walleye Wind, *Application for a Certificate of Need*, July 9, 2020. eDocket ID: 20207-164773-01, 20207-164773-02

[2] Walleye Wind, *Application for a Large Wind Energy Conversion System Site Permit*. July 9, 2020. eDocket ID: 20207-164776-01,-02, -03,- 04, -05, -06, -07, 08, -09, 20207-164777-01, -02, -03, -04, -05, -06 (trade secret), -07, -08, -09, -10 (trade secret), 20207-164778-01, -02, -03 (trade secret), -04 (trade secret), -05

[3] Walleye Wind, *Amended Certificate of Need Application*, November 4, 2020. eDocket ID: 202011-168044-01, 202011-168044-02, 202011-168044-03

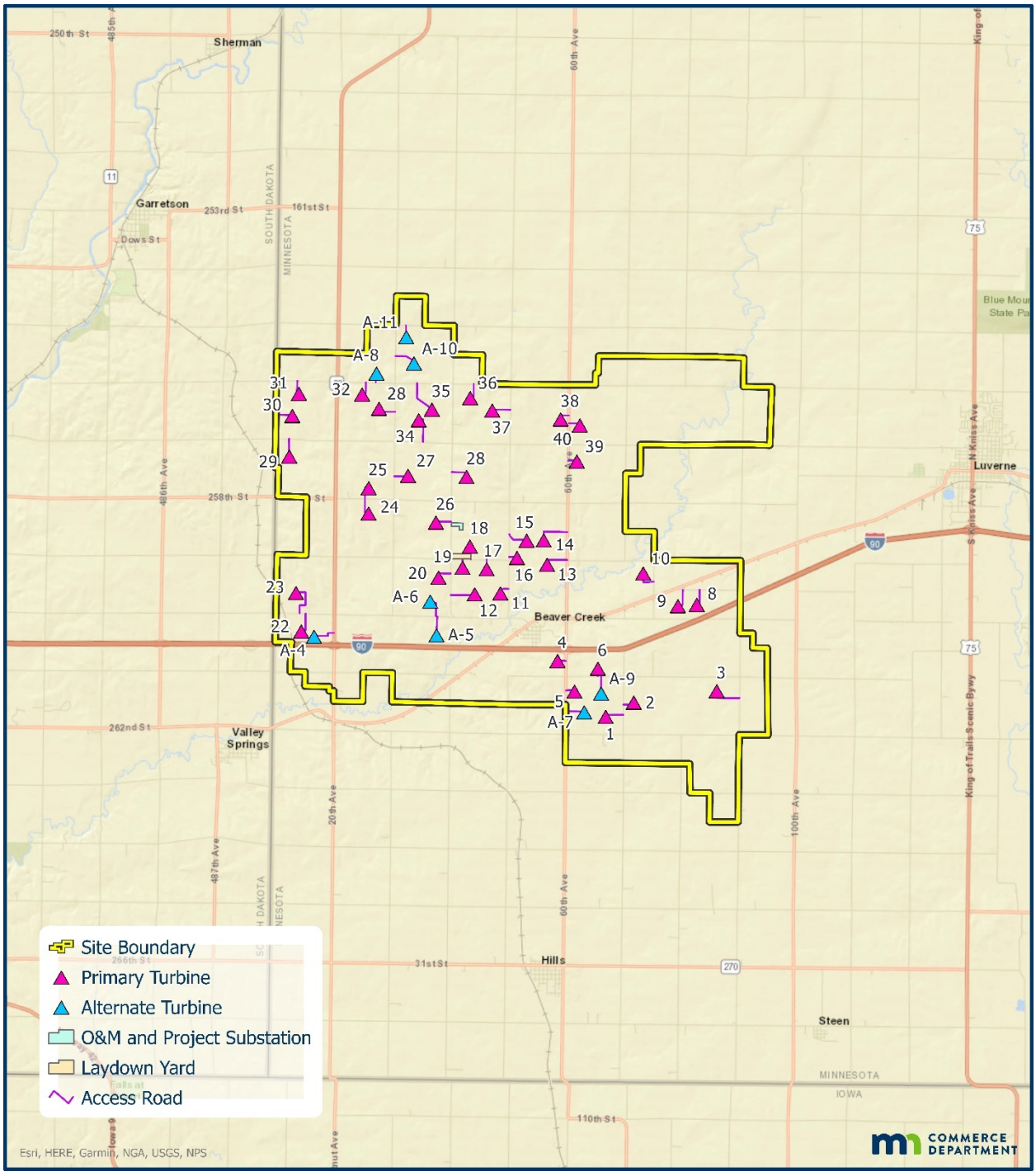
[4] Walleye Wind, *Amended Site Permit Application*, November 4, 2020. eDocket ID: 202011-168046-01 , -02, -03, -04, -05, -06

[5] The Project was originally proposed as a 111.5 MW LWECS. The Amended CN and Site Permit Applications describe the Project as a 109.2 MW Project. Walleye Wind's response to EERA Data Request 3 requests a site permit for a 109.7 MW project (**Appendix E**).

[6] Amended Site Permit Application, at p. 6

[7] Amended Site Permit Application., at p. 139

Figure 1. Walleye Wind Project



The Perch Wind Project (also referred to as MinWind III and MinWind IV) is a locally permitted 11.5 MW project comprised of seven 1.65 MW NEC MICON turbines in the central portion of the site (**Appendix C,** Map 1). The Perch Wind Project began operating in 2004 and was acquired by Walleye Wind in 2019. The turbines are no longer operating and Walleye Wind will decommission the turbines in 2021.[8]

The Project's output will be sold to the Minnesota Municipal Power Agency (MMPA) under a 30-year power purchase agreement. The Project's output will help MMPA (representing 12 municipal utilities and approximately 74,000 customers) to meet and exceed its Renewable Energy Standard.[9]

1.2 State of Minnesota's Role

In order to build the Project, Walleye Wind must obtain two approvals from the Commission – a CN and a site permit. In addition to these approvals from the Commission, the Project also requires approvals (e.g., permits, licenses) from other state agencies and federal agencies with permitting authority for specific resources (e.g., the waters of Minnesota). Commission site and route permits supersede and preempt all zoning, building, and land-use regulations promulgated by local units of government.

Walleye Wind has applied to the Commission for a CN and a site permit. With these applications, the Commission has before it two distinct considerations: (1) whether the proposed project is needed, or whether some other project would 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, and (2) if the project is needed, where is it best located and what conditions are necessary to ensure environmental preservation, sustainable development, and the efficient use of resources.

To help the Commission with its decision-making and to ensure a fair and robust airing of the issues, the state of Minnesota has set out a process for the Commission to follow in making its decisions. This process includes: (1) development of a draft site permit, (2) development of an environmental report (ER), and (3) a public hearing before an administrative law judge (ALJ).

The goal of the draft site permit is to describe the ways in which the potential impacts of the Project will be mitigated. The goal of the ER is to describe the potential human and environmental impacts of the Project and alternatives to the Project. The goal of the hearing is to advocate, question, and debate what decisions the Commission should make about the Project. The entire record developed in this process—the draft site permit, the ER, and the report from the ALJ, including all public input and testimony—is considered by the Commission when it makes its decisions on an applicant's CN and site permit applications.

[8] Amended Site Permit Application, at p. 39

[9] Amended CN Application, at p. 7

1.3 Organization and Content of This Document

This ER is organized into eight sections:

Section 1: Introduction
Section 2: Regulatory Framework
Section 3: Description of the Proposed Project
Section 4: Description of Project Alternatives
Section 5: No Build Alternative
Section 6: Human and Environmental Impacts
Section 7: Feasibility and Availability of Alternatives
Section 8: References

1.4 Sources of Information

Information for this report has been gathered from multiple sources that are cited throughout the report. The primary source documents are the CN and site permit applications submitted by Walleye Wind. Applicable information from reports issued by the Minnesota Environmental Quality Board and Minnesota Department of Commerce has also been included in this report.

2 Regulatory Framework

The Walleye Wind Project requires two approvals from the Commission – a certificate of need (CN) and a site permit. The Project will also require approvals from other state and federal agencies with permitting authority for actions related to the Project.

2.1 Certificate of Need

Construction of a large energy facility in Minnesota requires a CN from the Commission. Walleye Wind submitted a CN application to the Commission on July 12, 2019, and an amended application on August 9, 2019. On November 12, 2019, the Commission issued an order accepting the application as substantially complete and authorizing an informal review process (i.e., notice and comment).

Certificate of Need Criteria

The Commission must determine whether the proposed project is needed or if another project would be more appropriate for the state of Minnesota. Minnesota Rules, part 7849.0120 provides the criteria that the Commission must use in determining whether to grant a CN:

- The probable result of denial would be an adverse effect on 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.
- A more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record.
- 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.
- 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 that an applicant has met these criteria, a CN is granted. The Commission's CN decision determines the type of project, the size of the project, and its timing. The Commission could place conditions on the granting of a CN.

The CN decision does not determine the locations of wind turbines or conditions on their operation; these determinations are made in the site permit for the project.

2.2 Site Permit

A site permit from the Commission is required to construct a large wind energy conversion system (LWECS), which is any combination of wind turbines and associated facilities with the capacity to generate five MW or more of electricity. The Minnesota Wind Siting Act is found at Minnesota

Statutes Chapter 216F. The rules to implement the permitting requirements are in Minnesota Rule 7854.

Site Permit Criteria

In making a siting decision for the wind farm, the Commission considers factors prescribed in statute and rule. Minnesota Statutes, section 216E.03, identifies considerations that the Commission must consider when siting wind farms, including potential impacts on human and natural resources. The Commission also must determine that a project is compatible with environmental preservation, sustainable development, and the efficient use of resources.

2.3 Environmental Review

The Minnesota Environmental Policy Act requires that governmental units consider the human and environmental impacts of a project prior to approving the construction and operation of the project. For the Walleye Wind Project, this consideration takes two forms – (1) a site permit application and comment period and (2) an environmental report (ER).

Site Permit Application

For the Commission's site permit decision, the site permit application constitutes environmental review of the project. The application discusses the potential human and environmental impacts of the project and mitigation measures. These impacts can occur during construction and operation of the project. Public comments on the application result in the Commission's development and issuance of a draft site permit for the project.

Department of Commerce, Energy Environmental Review and Analysis (EERA) staff solicited public comments on the site permit application through a public meeting and comment period (discussed further, below). Based on these comments and on EERA recommendations, the Commission issued a draft site permit for the Project on March 24, 2021.[10]

Environmental Report

An ER is intended to facilitate informed decision-making by the Commission and other entities with regulatory authority over a proposed project. An ER describes and analyzes the potential human and environmental impacts of a project and alternatives to the project. It does not advocate or state a preference for a specific alternative.

Scoping is the first step in the development of the ER for the project. The scoping process has two primary purposes: (1) to gather public input as to the impacts, mitigation measures, and alternatives to study in the ER, and (2) to focus the ER on those impacts, mitigation measures, and alternatives that will aid in the Commission's decisions on the CN.

[10] Commission. *Order Issuing Draft Site Permit and Requesting ALJ Report*. March 24, 2021. eDocket ID: 20213-172143-01

EERA staff gathered input on the scope of the ER through a public meeting and an associated comment period. Commission and EERA staff held a joint public information and ER scoping meeting on January 5, 2021. Due to the current COVID-19 pandemic, the meeting was conducted remotely. Approximately 120 individual lines were connected to the audio portion of the meeting and 19 people made comments at the meeting.[11] EERA staff received 21 written comments by the end of the scoping period on January 26, 2021.[12] Comments were received from members of the public and state agencies, including the Minnesota Department of Natural Resources (DNR), the Minnesota Department of Transportation (MnDOT), and the Minnesota Pollution Control Agency (MPCA).

Based on public comments and applicable rules, the Department of Commerce issued the scoping decision for the ER on February 5, 2021 (Appendix A). The scoping decision identifies the human and environmental impacts to be analyzed for the Project and alternatives to the Project. Based on the scoping decision, EERA staff has prepared this ER. The ER will be entered into the record for these proceedings so that it can be used by the Commission in making decisions about the CN for the Project.

2.4 Public Hearing

After the Commission issues a draft site permit for the Project and after issuance of the ER, a public hearing will be held. The hearing will be presided over by an ALJ from the Office of Administrative Hearings. At the hearing, citizens, agencies, and governmental bodies will have an opportunity to submit comments, present evidence, and ask questions. The ALJ will submit a report to the Commission with findings of facts, conclusions of law, and recommendations regarding the site permit for the Project.

2.5 Commission Decision

After considering the entire record, the Commission will determine whether to grant a CN for the Project. The Commission may place conditions on the granting of a CN.

If a CN is granted, the Commission will also determine the conditions appropriate for the Project's site permit. Site permits include conditions specifying construction and operating standards; they also include mitigation plans and Project-specific mitigation measures. At the time this report was prepared, decisions by the Commission on the CN and site permit applications are anticipated in late summer or early fall 2021.

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[11] *Summary of Public Comments Received at January 5, 2021, Public Information and Scoping Meeting*. January 22, 2021. eDocket ID: 20211-170142-02

[12] Compiled Public Scoping Comments, February 1, 2021, eDocket ID: 20212-170594-02; Other public scoping comments eDocket ID: 20211-169535-01, 202012-169227-01, Minnesota Department of Natural Resources Scoping Comments, January 26, 2021, eDocket ID: 20211-170291-01, 20211-170293-01 ; MnDOT Scoping Comments, January 26, 20211, eDocket ID 20211-170313-01; MPCA Scoping Comments, January 25, 2021, eDocket ID: 20211-170252-01.

2.6 Other Permits and Approvals

A site permit from the Commission is the only permit required for the siting of the Project. Commission-issued site permits supersede local planning and zoning and bind state agencies; thus, state agencies are required to participate in the Commission's permitting process to aid the Commission's decision-making and to indicate sites that are not permittable.

However, various federal, tribal, state, and local approvals may be required for activities related to the construction and operation of the Project. All permits subsequent to the Commission's issuance of a site permit and necessary for the Project (commonly referred to as "downstream permits") must be obtained by a permittee. The information in this ER may be used by downstream permitting agencies in their evaluation of impacts to resources. Table 1 lists permits and approvals that could be required for the Project, depending on the final design.

Table 1. Potential Permits

Regulatory Authority	Permit/Approval	Applicability to the Project
FEDERAL		
Federal Aviation Administration	Part 7460 Review	Review of structures taller than 200 feet and determination of no hazard; review of final turbine locations and heights.
Federal Communications Commission	Non-Federally Licensed Microwave Study	Study to avoid interference with point-to-point microwave communications.
	NTIA Communication Study	Study to avoid interference with telecommunications.
U.S. Army Corps of Engineers	Clean Water Act Section 404 Coordination	As required to protect water quality through authorized discharges of dredged and fill material to waters of the Unite States.
U.S. Fish and Wildlife Service	Informal Coordination under Section 7 of the Endangered Species Act	Coordination to establish conservation measures for endangered species.
U.S. Department of Agriculture	Informal Consultation for Affected Properties in Conservation, Easement, or Reserve Programs	As required where project impacts specific conservations or reserve land management programs.
STATE		
Minnesota Public Utilities Commission	Certificate of Need	Required approval of the project.
	Site Permit for LWECS	Required for siting of the project consistent with state policies.
Minnesota Department of Labor and Industry	Electrical Plan Review, Permits, and Inspections	Review and inspections as required for project electrical infrastructure.

Regulatory Authority	Permit/Approval	Applicability to the Project
Minnesota State Historic Preservation Office (SHPO)	Informal Cultural Resources Consultation	Consultation with SHPO regarding archaeological, historic, and cultural resources that could be present in the project area. Development of any necessary cultural resource plans for the project.
Minnesota Pollution Control Agency (MPCA)	National Pollutant Discharge Elimination System/State Disposal System Permit (NPDES/SDS) – Construction Stormwater Permit	Required to minimize impacts to waters due to construction of the project. Required for construction disturbances of more than one acre or if project is part of a common plan of development.
	License for a Very Small Quantity Generator of Hazardous Waste	Required if hazardous waste handling exceeds regulatory limits.
	Spill Prevention Control and Countermeasure Plan	Plan required if project oil storage exceeds regulatory limits. In coordination with U.S. Environmental Protection Agency Region 5
	Aboveground Storage Tank Notification Form	Required for storage tanks that meet size and content regulatory requirements.
	Clean Water Act Section 401 Water Quality Certification	As required, with Section 404 approval, to prevent impairment of waters in the project area.
Minnesota Department of Health	Environmental Bore Hole Approval	Required for boreholes where used for subsurface geotechnical studies.
	Plumbing Plan Review	As required for O&M building.
	Water Well Permit	As required for O&M building.
Minnesota Department of Natural Resources	Informal Coordination Regarding Endangered Species	Coordination to establish conservation measures for state species that are threatened, endangered, or of special concern.
	Coordination on Avian and Bat Protection Plan	Coordination to ensure measures that minimize impacts to avian and bat species.
	General Permit for Water Appropriations, Dewatering	As required for water use and dewatering.
	Public Waters Work Permit and/or License to Cross Public Lands and Waters	As required for crossings of public waters and lands by the project.
Minnesota Department of Transportation	Oversize/Overweight Permit for State Highways	Required for transport of oversize/overweight project components to project site.

Regulatory Authority	Permit/Approval	Applicability to the Project
	Access Driveway Permits for MnDOT Roads	Required when a change in access is necessary to a MnDOT right-of-way or property.
	Tall Structure Permit	As required for approval of tall structures.
	Utility Access Permit	Required for access to utilities in MnDOT rights-of-way or properties.
Minnesota Office of the State Archeologist	Coordination for archeological resources and sites	Coordination to minimize impact to archaeological resources.
LOCAL		
Rock County (O&M and laydown only)	Conditional Use Permit	As required by local regulation.
	Land Use Permit	As required by local regulation.
	Roadway Access Permit	As required by local regulation to ensure proper use of local roads.
	Drainage Permit	As required by local regulation.
	Working in Right-of-Way Permit	As required by local regulation.
	Overweight/Over-Dimension Permit	As required by local regulation to ensure proper transport of project components on local roads.
	Utility Permit	As required by local regulation.
	Floodplain permit or Shoreland District Permitting	As required by local regulation
	Wetland Conservation Act Approvals	As required to minimize impacts to wetlands in the project area.
Townships (Beaver Creek, Springwater, Luverne, Martin)	Right-of-way permits, crossing permits, road access permits, and driveway permits for access roads and electrical collection system.	As required by local regulation.
OTHER		
Tribal Historic Offices	Coordination	Coordination to minimize impact to resources important to American Indian Tribes.
Midcontinent Independent Transmission System Operator	Generator Interconnection Agreement	Required for interconnection approval.

3 Proposed Project

Walleye Wind proposes to construct, own, and operate a 109.2 MW wind farm to be located within an area of approximately 49 square miles (31,000 acres) (the site) in Beaver Creek, Luverne, Martin, and Springwater townships in Rock County, Minnesota. As proposed, the Walleye Wind Project would consist of up to 40 turbines and associated facilities including underground electric collector lines, a new collector substation, and operations and maintenance facility, one permanent meteorological tower, and gravel access roads.[13]

3.1 Project Description

Walleye Wind proposes to install a combination of up to 40 turbines using a combination of three S-class General Electric (GE) models: [14]

- GE 2.82 MW turbine (28 primary sites, 4 alternate sites): 114-meter (m) (374 ft) hub height, 127.2 m (417 ft) rotor diameter (RD), total height (ground to tip of fully extended blade) of 178.1 m (584.3 ft)
- GE 2.82 MW turbine (8 primary sites): 89 m (292 ft) hub height, 127.2 m (417 ft) RD, total height of 152.1 m (499 ft)
- 4 GE 2.32 MW turbine (4 primary sites and 1 alternate site): 80 m (263 ft) hub height, 116.5 m (382 ft) RD, total height of 138.3 m (453.7 ft)

Walleye Wind has identified both primary and alternate turbine locations. Alternate turbine allow for flexibility in the event development or constructability issues are encountered. Although the nameplate capacity of the 36 2.82 MW turbines and four 2.32 turbines is110.8 MW, Walleye Wind anticipates operating several turbines under Noise Reduced Operation (NRO), which would reduce the Project output.[15]

3.2 Project Location

The Project site is located on approximately 31,095 acres (49 square miles) of predominantly cultivated land west of the city of Luverne in Rock County, Minnesota (**Figure 1**). The site straddles Interstate 90 and is generally bounded on the western by the South Dakota border. The site is located within Martin, Luverne, Beaver Creek, and Springwater townships in Rock County **(Table 2**).

[13] Site Permit Application, at p. 6

[14] Walleye Wind, *Informational Filing*, January 29, 2021. eDocket ID: 20211-170488-02 .

[15] Response to Data Request 3, **Appendix E**

Table 2. Walleye Wind Location[16]

County Name	Township Name	Township	Range	Sections
Rock	Martin	101N	46W	1-3, 12
Rock	Luverne	102N	45W	6, 30-31
Rock	Beaver Creek	102N	46W	1-11, 14-36
Rock	Beaver Creek	102N	47W	1-2, 11-14, 23-26, 35-36
Rock	Springwater	103N	46W	30-32, 34-36
Rock	Springwater	103N	47W	35-36

As of March 19, 2021, Walleye Wind has secured wind rights for approximately 14,448 acres of private land within the 31,000-acre site, or approximately 92 percent of the land required for the wind farm.[17] Walleye intends to commence construction in the third quarter of 2021, and commence commercial operation of the Project by the end of December 2021.[18]

The site is located in a rural area of southwestern Minnesota. Land use within the site is primarily agricultural row crops and pastureland typical of the region. Approximately 27,000 acres (87 percent) of the landcover within the site is cultivated crops, with an additional 1,800 acres (six percent) classified as hay/pasture/herbaceous land cover.[19]

A proposed layout for the Project is shown on in the maps in Appendix C. The proposed layout shows 40 primary turbine locations and five (5) alternate turbine locations. Table 3 summarizes the Commission's General Permit Standards[20] and provides a comparison with those adopted by Rock County for wind facilities of less than five (5) MW. As proposed, the Project layout incorporates the wind energy conversion facility siting criteria outlined in the Commission's General Wind Permit Standards.

[16] *Amended Site Permit Application*, at Table 1, p. 6.

[17] Response to Data Request 6, Appendix E.

[18] *Amended Site Permit Application*, at p. 139

[19] Amended *Site Permit Application*, at Table 37, p.95

[20] Commission. *Order Establishing General Permit Standards*. January 11, 2008. eDocket ID: 4897855

Table 3. Wind Project Setback Comparison

Resource	Commission	Rock County[21]
Non-participating/ Participating Property Lines	3 RD on non-prevailing wind axis and 5 RD on prevailing wind axis from non-participating property lines	3 RD on east-west axis and 5 RD on north-south axis.
Residential Dwellings	500 feet and sufficient distance to meet state noise standard.	1000 feet and/or sufficient distance to meet state noise standards, whichever is greater.
Meteorological Towers	250 feet from the edge of road right-of-way and boundaries of developer's site control, or consistent with county ordinances, whichever is more restrictive.	1.1 times the total height. Minimum 250 feet from dwellings, roads, and land for which the permittee does not have legal control.
Other Structures	None specified.	1.1 times the total height.
Public Roads	250 feet (76 meters)	1.1 times the total height.
Recreational Trails	250 feet (76 meters)	1.1 times the total height.
Public Lands	Generally, not permitted on public lands. Wind Access buffer applies.	For public conservation lands managed as grassland: 3 RD on east-west axis and 5 RD on north-south axis.
Wetland, Streams and Ditches	No turbines, towers or associated facilities allowed. Electric collector and feeder lines may cross or placed subject to DNR, FWS, and/or USACOE permits.	3 RD on east-west axis and 5 RD on north-south axis.
Internal Turbine Spacing	3 RD on non-prevailing wind axis and 5 RD on prevailing wind axis from non-participating property lines, up to 20 percent of the turbines can be spaced more closely.	3 RD on east-west axis and 5 RD on north-south axis.

[21] *Rock County Zoning Ordinance*, https://go.boarddocs.com/mn/rcmn/Board.nsf/files/B4QJLX4BB554/$file/FINAL%202018%20Zoning%20Ordinance%20w%20Table%20of%20Contents%20180917.pdf , see *Renewable Energy Ordinance* at pp. 104-122, specifically *Subdivision 8, Setbacks for Wind Turbines*

Resource	Commission	Rock County[21]
Native Prairies	Turbines and associated facilities shall not be placed in native prairies, unless approved in the native prairie protection plan	None specified.
Sand & Gravel Operations	Turbines and associated facilities shall not be placed in active sand and gravel operations, unless negotiated with landowner.	None specified.
Aviation	Turbines and associated facilities shall not be located so as to create an obstruction to navigable airspace of public and private airports.	None specified.

Rock County regulates wind energy conversion systems under five (5) MW under Section 27 of the Rock County Zoning Ordinance.[22] As shown in Table 3, the Rock County Zoning Ordinance is largely consistent with the standards identified in the Commission's General Wind Permit Standards, but there are differences in three areas:

- Roads: Commission-issued permits require a setback of 250 feet from public roads, while the county requires a setback of 1.1 times the tower height (base of turbine to tip of highest point of the turbine, typically the rotor tip when fully extended). For the proposed Project, 1.1 times the total height would result in a setback of between 499 and 642 feet depending upon the turbine model.
- Wind Access Buffer: Commission-issued permits require a setback of five (5) rotor diameters (RD) on the prevailing wind access and three (3) RD on the non-prevailing wind directions from land where the Permittee does not hold wind rights. Rock County setback requirements are similar, but specify that the 5 RD setback applies to the north-south access, and the 3 RD setback applies to the east-west access.
- Internal spacing: Commission-issued permits generally require a setback of 5 RD on the prevailing wind access and 3 RD on the non-prevailing wind access between turbines within the Project. The general permit standards explicitly provide for up to 20 percent of the towers to be sited more closely, but encourage that the Permittee to minimize the need to site the turbine towers closer. Rock County require a setback of 3 RD on east-west axis and 5 RD on north-south axis; there is no explicit provision for variances to this requirement.

[22] *Rock County Zoning Ordinance*, https://go.boarddocs.com/mn/rcmn/Board.nsf/files/B4QJLX4BB554/$file/FINAL%202018%20Zoning%20Ordinance%20w%20Table%20of%20Contents%20180917.pdf , see *Renewable Energy Ordinance* at pp. 104-122, specifically *Subdivision 8, Setbacks for Wind Turbines*.

In its letter of July 6, 2020, the Rock County Board of Commissioners clarified that it is not the county's intent for the *Renewable Energy Ordinance* to be applied to projects permitted by the Commission and therefore does not believe the setbacks outlined in the Renewable Energy Ordinance are applicable to the Walleye Wind Project.[23]

3.3 Project Components

Each tower will be secured by a concrete foundation that varies in design depending on soil conditions. A control panel inside the base of each turbine tower houses communication and electronic circuitry. The GE turbines have a design life of 20 years. Each turbine is equipped with a wind speed and direction sensor that communicates with the turbine's control system to signal when sufficient winds are present for operation. Turbines feature variable-speed control and independent blade pitch to ensure aerodynamic efficiency.

Each turbine will be grounded and shielded to protect against lightning. The grounding system installed during foundation work will be designed for local soil conditions and in accordance with local utility or code requirements. Lightning receptors are placed in each rotor blade and in the turbine tower. The electrical components are also protected.

The turbines have active yaw and pitch regulation and asynchronous generators. The turbines use a bedplate drivetrain design, where all nacelle components are joined on common structures to improve durability.

The rotor consists of three blades mounted to a rotor hub. The hub is attached to the nacelle, which houses the gearbox, generator, brake, cooling system, and other electrical and mechanical systems. Hub heights of 89 or 114 meters (GE 2.82 MW turbines) or 80 meters (GE 2.32 MW turbines), and the rotor diameters of 127.2 meters (GE 2.82 MW turbines) or 116.5 meters (GE 2.32 MW turbines), and a rotor speed of 7.4 to 15.7 rotations per minute.[24] A smooth tubular steel tower supports the nacelle and rotor. All modern turbine models contain emergency and backup power systems to allow shutdown of the turbine if power to the grid is lost.

The portion of the foundation that is above ground is roughly 16 feet wide at the base of the tower. The turbine towers, on which the nacelle is mounted, consist of three or four sections welded together at the factory by automatically controlled power welding machines. Welds are and ultrasonically inspected during manufacturing per American National Standards Institute specifications. All surfaces are coated for protection against corrosion in a non-glare white, off-white, or light gray color. Access to the turbine is through a lockable steel door at the base of the tower.

The wind turbines' freestanding tubular towers will be connected to the foundation through a base plate and anchor bolts. Although geotechnical surveys, turbine tower load specifications, and cost considerations will dictate final design parameters of the foundations, Walleye Wind anticipates that

[23] Rock County Board of Commissioners. Letter to Mike Weich. July 6, 2020. Walleye Wind Site Permit Application, *Appendix A: Agency Correspondence*, at pp. 77-78. eDocket ID: 20207-164777-01

[24] *Amended Site Permit Application*, Table 3, at pp. 14-16

the concrete foundation will extend approximately 12 feet below grade and 68 feet in diameter. Although the actual soil displacement may vary somewhat based on turbine size and soil conditions at each turbine site, Walleye Wind's preliminary design anticipates a displacement of approximately 2,500 cubic yards of soil and require approximately 400 cubic yards of concrete.[25]

All turbines will use Low Noise Trailing Edge serrations along approximately 20 to 30 percent of the trailing edge of the outboard blade to reduce operating noise.[26] The turbine specifications are provided in Table 4.

Table 4. Wind Turbine Specifications[27]

Feature	GE 2.82 MW/114 m	GE2.82/ 89 m	GE 2.32 MW/ 80 m
Nameplate Capacity	2.82 MW	2.82 MW	2.32 MW
Hub Height	114 m (374 ft)	89 m (292 ft)	80 m (263 ft)
Rotor Swept Area	12,704 m^2 (136,745 ft^2)	12,704 m^2 (136,745 ft^2)	10,660 m^2 (114,743 ft^2)
Total Height (ground to fully extended blade tip)	178.1 m (584 ft)	152.1 m (499 ft)	138.3 m (454 ft)
Rotor Diameter	127.2 m (417 ft)	127.2 m (417 ft)	116.5 m (382 ft)
Cut in Wind Speed	3 m/s (10 ft/s)		
Cut Out Wind Speed			
600-second interval	30 m/s (98 ft/s)		32 m/s (305 ft/s)
30- second interval	35 m/s (145 ft/s)		37 m/s (305 ft/s)
3 second interval	39 m/s (305 ft/s)		41 m/s (305 ft/s)
Rotor Speed	7.4-15.7 RPM		
Tip Speed	85.1 – 89.1 m/s (279-292 f/s)		81.7-85.4 m/s (268.0-280.18 ft/s)
Sound at Turbine	Lw = 108.5 A-Weighted Decibels (dBA) with LNTE		Lw = 106 A-Weighted Decibels (dBA) with LNTE
Power Regulation	Blade pitch controls power. Controls included for ZVRT and enhanced reactive power (0.9 power factor)		

In addition to the turbines, the project will also include a new Project substation, and operations and Maintenance (O&M) facility, a permanent meteorological tower to measure climatic data for predicting and optimizing the Project's operation, aircraft detection lighting system (ADLS) or Lighting Intensity Dimming System (LIDS) equipment to minimize the impacts of turbine lighting, gravel access roads, and underground electric collector lines (Table 5). The 34.5 kV collection lines from the wind

[25] *Amended Site Permit Application*, at p. 137
[26] *Amended Site Permit Application*, at p., 14
[27] *Amended Site Permit Application*, at Table 3

turbines will be aggregated at the Walleye Wind Substation and stepped up to 161 kV for connection to the utility transmission grid at NSP's Rock County Substation.[28]

Table 5. Additional Facilities

Facility Type	Description
Access roads to turbines and laydown areas	• Approximately 12 miles of permanent low-profile gravel access roads connecting each turbine to a public road. The access roads will be all-weather gravel construction and will be approximately 16 feet wide once the wind farm is operational. • Temporary roads will be approximately 40 to 45 feet wide to facilitate turbine construction
Step-up transformers	• Power from each turbine is stepped up from 690 volts to the collector system voltage of 34.5 kV by means of a step-up transformer, mounted on the pad outside the turbine tower.
34.5 kV collector and feeder lines	• Collector and feeder lines are installed in underground trenches, with a depth of 36 to 48 inches • Approximately 37 miles of collector trenches, within which approximately 111 miles of collector lines will be buried.
Walleye Wind Substation and Intertie	• New Walleye Wind substation located on a 10-acre site the east side of 40th Avenue, approximately two miles northwest of the city of Beaver Creek in Beaver Creek Township. The permanent footprint of the developed substation of approximately 20,000 square feet. • Expansion of NSP's Rock County Substation to accommodate the intertie. • The collector lines coming into the Walleye Wind Substation will combine the electrical output of the wind turbines into two 34.5kV circuits and will be stepped up to the 161 kV transmission voltage and then connected to the grid at the Rock County Substation via a new 500-foot generation tie line.
Operation and Maintenance (O&M) Facility	• The O&M building is planned to be located adjacent to the proposed Project substation along 40th Avenue within the same 10-acre parcel. • The 3,500 square foot O&M building will be constructed within a fenced area of approximately one acre that also contains surface parking, and storage.
Meteorological Towers	• One permanent 114-meter (374 ft) free-standing monopole meteorological tower. • Constructed to meet FAA requirements. • Construction area of 400x400 feet with permanently affected area of less than 0.1 acres.
Construction Staging and Turbine Laydown Areas	• 18-acre turbine laydown and construction staging area for turbine components during construction, parking, and equipment deliveries • Depending upon local availability and dispatchability, a temporary concrete batch plant may be installed at the laydown during construction

[28] *Amended* Site *Permit Application*, at pp. 18-20

Site Control and Data Acquisition (SCADA) system	• Each turbine is equipped with SCADA controller hardware, software and database storage capability to remotely monitor the conditions of the wind farm and alert technicians to any irregularities with the wind turbines, electrical system, or other Project components.
ADLS or LIDS	• Up to 0.2 acres would be developed for installation of ADLS or LIDS tower.

3.4 Project Cost and Schedule

The installed capital costs for the proposed wind farm are estimated to be approximately $150 million, including development, design, permitting, and construction of the facilities. Ongoing operations and maintenance costs are estimated to be approximately $1.75 million in year one, and approximately $1.9 million annually over the life of the Project.[29]

Depending on interconnection process completion, permitting, and other development activities the Project is expected to achieve commercial operation in December 2021.[30]

3.5 Project Decommissioning

Information in this section is adapted from Section 11 of the *Amended Site Permit Application* and the *Decommissioning Plan* prepared by Walleye Wind (included in Appendix D of this document). Walleye Wind will decommission the existing Perch Wind Project (MinWind III and MinWind IV) in a similar manner to the decommissioning described for the Project.

The anticipated lifespan of the Project is 30 years. Once it determines the Project is at the end of its useful life, Walleye Wind will notify affected landowners and local governments of the anticipated decommissioning activities and prepare an updated SWPPP incorporating plans for anticipated disturbances for the construction of temporary facilities and removal of project components.

At the end of the Project's useful life Walleye Wind will disconnect the Project from the grid by tripping the 161 kV breaker at the Walleye Wind Substation, opening the 161 kV circuit, and removing the 161 kV intertie to NSP's Rock County Substation. The Rock County Substation is expected to remain in operation as a NSP substation.

The decommissioning of the wind farm will look similar to construction, but in reverse order. A crane will be used to remove hub and blades from the nacelle and placed on the ground. Once on the ground, a crew and small crane will remove the blades from the hub. Disassembled, blades will be placed into a carrying frame and loaded onto a truck for removal from the site. The hub will also be loaded onto a truck for removal.

After removal of the rotor, the crane will remove the nacelle and then take down the tower section by section. Pad mounted transformers will be disconnected and removed from the site. The concrete

[29] *Amended Site Permit* Application, at p. 139
[30] *Amended Site Permit* Application, at p. 139

pads will be crushed and hauled offsite. Turbine foundations will be removed to a depth of four feet and removed from the site.

A crane will be used to dismantle MET towers from the top down and will be loaded onto trucks to be removed from the site.

Unless a landowner informs Walleye Wind otherwise, access road, will be removed and the land will be restored.

Underground collection lines buried above four feet below the surface will be removed. Underground collection buried greater than four feet below the surface will be abandoned in place unless requested by the landowner or other entity. In certain cases, landowners may wish to abandon underground collector lines in place when located above four feet below the surface to minimize impacts to the environment. Site permits issued by the Commission require that any agreement between landowners and Walleye Wind to leave underground cables in place at a lesser depth or no removal must recorded with the county and show the location of all remaining infrastructure. If the cables are to be removed, a trench will be opened the cables pulled out, cut into manageable lengths and removed from the site.

After dismantling the Project, Walleye Wind, or its contractor, will remove components having salvage value. Generally, turbines, transformers, electrical components, towers, and transmission poles are refurbished and resold or are recycled for scrap. Decommissioning of the existing turbines will include removal and transport of generators and towers offsite to disposal facilities and/or sale of towers and generators. Unless expressly requested by the landowner, non-salvageable material will be broken down for transport, removed from the site, and disposed at an authorized site in accordance with applicable regulations

Walleye Wind estimates the total decommissioning costs for the Project to be approximately $6.8 million. With an estimated salvage value of $3.2 million, the net decommissioning cost is estimated to be approximately $3.6 million. Walleye Wind plans to establish a decommissioning bond with Rock County to ensure that funds are available to the county if Walleye Wind fails in its obligation to properly decommission the Project. Walleye Wind reports that townships have agreed to allow Rock County to hold financial obligations and agreements.

4 Project Alternatives

Under Minnesota Rule 7849.1200, the Commission must consider alternatives to the proposed Project. In addition to evaluating alternatives and their impacts, a no build option must also be evaluated. This section provides a discussion of alternate power sources to the Project.

If approved by the Commission, the Project will provide wind-generated electricity through a 30-year power purchase agreement with MMPA.[31] Production is intended to help MMPA in meeting, and exceeding, its renewable energy objectives under Minnesota Statute 216B.1691. Typically, alternatives to the Project would include generation facilities of all types, including plants that use coal, natural gas, fuel oil, or similar non-renewable fuels, as well as transmission facilities (to import energy) in lieu of generation. However, because the Project is intended to meet renewable energy objectives, wind farm alternatives examined in this ER are limited to technologies that support renewable energy objectives under Minnesota Statute 216B.1691, subd. 1. These alternatives will include:

- a generic 109.2 MW wind generation project sited elsewhere in Minnesota,
- a 109.2 MW solar farm, and

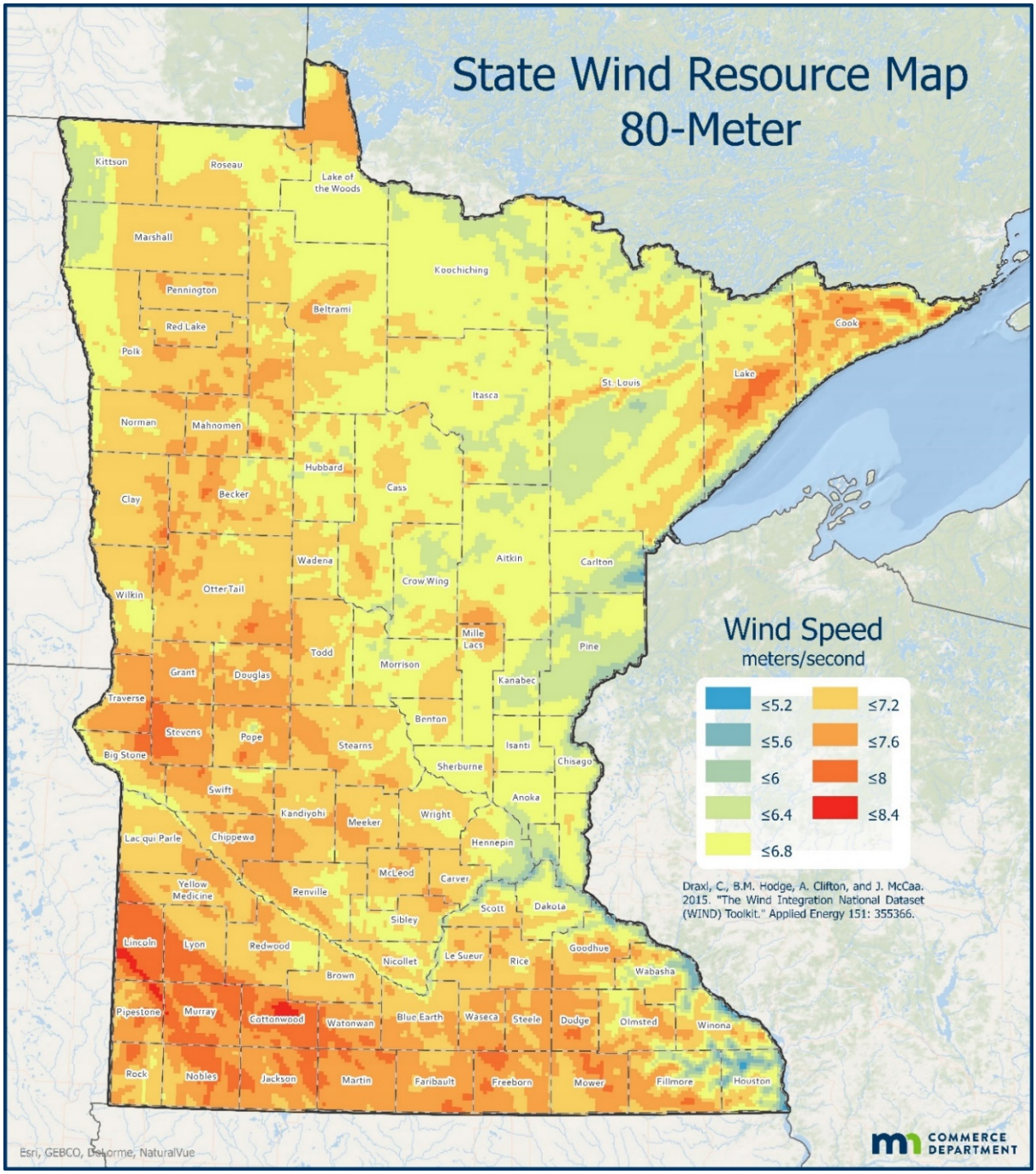
In addition to the renewable generation alternatives discussed in this section, a "no-build" alternative is discussed in Section 5.

4.1 109.2 MW Wind Farm

An alternative to the proposed wind farm that would utilize an eligible renewable energy resource is a wind farm sited elsewhere in Minnesota. Such a project could be an approximately 109.2 MW Project or a combination of smaller dispersed projects. The analysis in this ER will attempt to describe differences in the impacts associated with a generic 109.2 MW wind farm sited in Minnesota and the proposed Project. While possible to site a wind elsewhere in in Minnesota, there are areas in the state that have better wind resources than others as shown in Figure 2.

[31] *Amended Certificate of Need Application*, at p. 7.

Figure 2. Minnesota Wind Resources



4.2 109.2 MW Solar Farm

Another alternative renewable energy source to the Project is a solar farm that generates a similar amount of electricity as the Project. The term solar farm is used to describe a large-scale photovoltaic (PV) system that can supply power to the electricity grid. Solar farms are different from most rooftop and other decentralized solar power applications as they supply power at the utility scale rather than

supplying local users. This solar farm alternative could be a single 109.2 MW project or a combination of smaller dispersed solar projects that together, generate a total of 109.2 MW. This ER will attempt to describe differences in the impacts associated with a single 109.2 MW solar farm and the Project. Information for making comparisons between a solar farm and the Project has been primarily drawn from the North Star solar farm. The North Star Project is a 100 MW solar farm located in east central Minnesota (Chisago County) that underwent environmental review and permitting in Minnesota in 2015.

A solar facility such as the North Star Solar Project is comprised of PV modules mounted on linear axis tracking systems and centralized inverters. In addition to the modules grouped into arrays, the facility also includes electrical cables and conduit, electrical cabinets, step-up transformers, SCADA systems and metering equipment, an O&M area, and roads providing access to the equipment. A perimeter fence surrounds the facility. The operation and maintenance facility for the North Star Solar Project includes a flat gravel/grass area for parking and receiving and a building of approximately 3,000 to 5,000 square feet housing equipment used to operate and maintain the solar facility.[32]

Although smaller solar facilities, such as community solar gardens are located throughout Minnesota. Large wind farms tend to be located in areas with higher solar resources. As shown in **Figure 3**, the highest solar resources in Minnesota are located in the southwestern part of the state.

[32] Minnesota Department of Commerce. *North Star Solar Project, Environmental Assessment*. September, 2015. https://mn.gov/eera/web/file-list/4480/ (Hereinafter *North Star Solar Project EA*)

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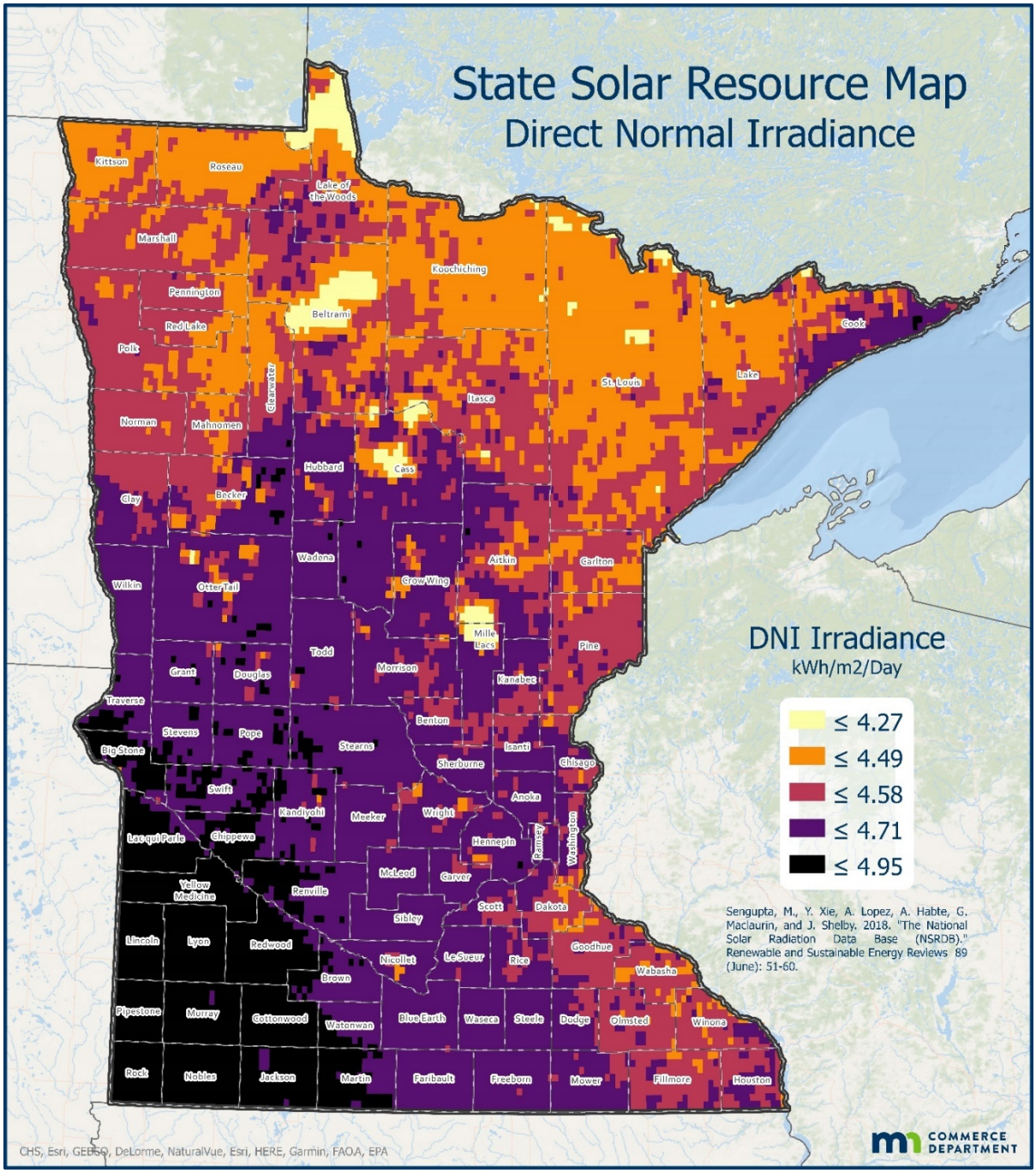
Figure 3. Minnesota Solar Resource



5 No Build Alternative

The no build alternative assumes no Project is constructed. The analysis for this alternative considers the potential benefits and drawbacks of not constructing the Project.

The no build alternative analyzes the impacts of the status quo. For example, with a proposed roadway project, the no build alternative assesses the impacts associated with not improving the roadway. This includes potential traffic increases on nearby roads and highways, increased maintenance costs, and longer travel times.

For the Project, the primary impacts of the no build alternative are: (1) reducing the state's ability to meet its renewable energy objectives, (2) the loss of economic benefits in the project area, and (3) the possible negative impact of providing replacement electricity from a non-renewable energy source.

The potential impacts of the no build alternative are discussed below.

5.1 Renewable Energy Objectives

Under Minnesota Statute 216B.1691, Minnesota has committed to a renewable energy objective of generating 25 percent of its electricity from eligible renewable sources by the year 2025.

5.2 Loss of Economic Benefits

If the Project is not built, there would be a loss of economic benefits in the project area. Landowners would lose lease payments over the operational life of the Project. Local governments would lose wind energy production tax revenues. The Project will pay a Wind Energy Production Tax to the local units of government of $1.20 per megawatt-hour (MWh) of electricity produced. This would result in approximately $518,000 in annual Wind Energy Production Tax revenues collected by Rock County.[33]

If the Project is not constructed, there would be a loss of revenue to local businesses. The proposed wind farm is expected to generate approximately 150 to 185 temporary construction jobs and four (4) permanent operation and maintenance jobs.[34] These employment opportunities and associated income would be lost if the Project is not built. If the Project is not constructed, local labor would not be employed in the construction or operation of the Project, although to some degree this loss would be offset by other employment opportunities. The location of these opportunities is unknown.

5.3 Replacement with a Non-Renewable Resource

The projected average annual output from the Project is approximately 432,000 megawatt-hours (MWh).[35] Though the impacts associated with non-renewable sources vary, it is possible to estimate, as an example, the impact of replacing the Project's projected production of approximately 432,000

[33] *Amended Site Permit Application*, at pp. 80-81.
[34] *Amended Site Permit Application*, at pp. 80-81
[35] *Amended Site Permit Application*, at p. 139.

MWh/year with natural gas or, less likely, coal energy. However, since no non-renewable proposals are being considered in this case, that comparative analysis is not pursued in this review.

Benefits

Benefits of not building the Project include avoidance of potential human and environmental impacts associated with the Project.

6 Human and Environmental Impacts

The Project and the project alternatives have the potential for human and environmental impacts, which are discussed below, along with possible mitigation strategies.

6.1 Air Quality

Electric generation facilities may emit air pollutants during construction and operation. This ER examines air emissions as required by Minnesota Rule 7849.1500, subp. 2.

6.1.1 Criteria Pollutants

Minnesota Rule 7849.1500 requires examination of emissions of the following pollutants: sulfur dioxide (SO_2), nitrogen oxides (NO_x), mercury (Hg), and particulate matter (PM). These common pollutants (other than mercury) are known as criteria pollutants.[36] Another criteria pollutant, carbon dioxide (CO_2) is discussed in Section 6.1.3 (Greenhouse Gases).

Walleye Wind Project

The proposed wind farm would not emit criteria pollutants during operation. Impacts from construction would be short-term and temporary. Impacts would include dust due travel on unpaved roads, grading and excavation.

Fugitive dust is considered particulate matter under air quality regulations. The concentrations of fugitive dust that is fine particulate matter (P.M. less than 2.5 microns or PM2.5) is generally small, or approximately 3 percent to 10 percent of total particulate matter. Since fine particulate matter has the potential to travel further into the lungs, it is of greater concern than larger particle size ranges.

Dust and emissions associated with the construction of the Project would be similar to large scale outdoor construction activities such as road work and residential developments. Short-term air quality impacts from fugitive dust may result from travel on unpaved roads, some grading at the site and excavation required for trenching for electrical and communications cables, foundations, the Project substation, and the O&M building.

Once construction is completed, dust emissions would be significantly reduced, and are not likely to impact air quality.

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm would not emit criteria pollutants during operation and would have short-term and localized air quality impacts from dust related to construction activities similar to those of the Project.

[36]United States Environmental Protection Agency (EPA). *Criteria Air Pollutants*. https://www.epa.gov/criteria-air-pollutants

109.2 MW Solar Farm

As with the Project, a solar farm would not emit criteria pollutants during operation. Temporary air quality impacts from dust related to travel on unpaved roads and construction activity would occur during the construction phase of the solar farm project. Once operational, the Project would not generate criteria pollutants.

Mitigation

Dust from construction activity can be controlled using standard construction practices such as watering of exposed surfaces, covering of disturbed areas, and reduced speed limits on site.

6.1.2 Hazardous Air Pollutants and Volatile Organic Compounds

Electric generation facilities have the potential to emit air pollutants during construction and operation. Minnesota Rule 7849.1500 requires this ER to examine emissions of hazardous air pollutants (HAP) and volatile organic compounds (VOC). These classes of pollutants are known or suspected of causing cancer and other serious health effects.[37]

Walleye Wind Project

The wind farm would emit minimal HAPs or VOCs during operation. Petroleum-based fluids used in the operation of wind turbines, such as gear box oil, hydraulic fluid and gear grease, have a low vapor pressure and any release of VOCs would be minimal.

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm would have HAP and VOC emissions similar to the Project, as the generic 109.2 MW wind farm would utilize the petroleum-based fluids during wind turbine operation.

109.2 MW Solar Farm

As with wind farm, minor emissions of toxic air pollutants would occur from vehicle and equipment use and from any minor solvent and coating use associated with maintenance of equipment and upkeep of buildings.

Mitigation

Other than standard best management practices (BMPs) for the handling and storage of the small quantities of hazardous materials, no additional mitigation measures are recommended.

6.1.3 Greenhouse Gases

The accumulation of greenhouse gases in the atmosphere and associated warming of the planet is leading to a variety of adverse human and environmental impacts – including more severe droughts

[37] EPA. *Hazardous Air Pollutants*, https://www.epa.gov/haps

and floods, more heat related illnesses, and a decrease in food security. Though a variety of gases contribute to the greenhouse effect, the most prominent greenhouse gas is carbon dioxide.[38]

Walleye Wind Project

Greenhouse gas emissions related to the Project will be largely related to vehicle emissions during the construction of the Project. The magnitude of the construction emissions is influenced heavily by weather conditions and the specific construction activity occurring. Exhaust emissions from primarily diesel equipment would vary according to the phase of construction but would be minimal and temporary.

Once operational, vehicles used during regular operations and maintenance activities (including periodic natural resource monitoring) will generate minimal greenhouse gases. It is anticipated that Project's total greenhouse gas emissions would decline over time as both the usage of vehicles declines following the more intense construction phase, and as the national vehicle fleet shifts away from internal combustion engines and towards electric vehicles over the 30-year operating life of the Project.

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm built during the same general timeframe would have greenhouse gas emissions similar to the Project. As with the Project, greenhouse gas emissions would be heaviest during the construction period and decrease over the operating life of the Project.

109.2 MW Solar Farm

As with wind farm, minor emissions of greenhouse gases would occur primarily from vehicle emissions during from construction phase of the Project, with minor emissions from vehicles required during the operations and maintenance phase of the solar farm.

Mitigation

Emissions from construction vehicles can be minimized by limiting construction equipment idling to the extent practical when not in use; and following equipment manufacturer-recommended operations and good combustion practices, including not tampering engines to increase horsepower and using ultra-low sulfur diesel.

6.1.4 Ozone

Large electric power generating facilities, such as coal, natural gas, and biomass facilities, have the potential to produce reactive gases, which can lead to ground-level ozone formation. Ozone and nitrous oxide are reactive compounds that contribute to smog and can have adverse impacts on human respiratory systems.[39] Accordingly, these compounds are regulated and have permissible

[38] Minnesota Environmental Quality Board, *Minnesota and Climate Change: Our Tomorrow Starts Today*. https://www.eqb.state.mn.us/sites/default/files/documents/EQB%20Climate%20Change%20Communications.pdf

[39] EPA. *Criteria Air Pollutants*. https://www.epa.gov/criteria-air-pollutants

concentration limits. Minnesota Rule 7009.0800 sets state's ozone limit at 0.08 parts per million (ppm). The federal ozone limit is 0.07 ppm.[40] Minnesota Rule 7849.1500, subpart 2 requires that anticipated ozone formation be addressed. Ozone can cause human health risks and can also damage crops, trees and other vegetation.[41]

Walleye Wind Farm

The wind farm would not produce ozone or ozone precursors at the operating wind turbines. Ozone production can occur adjacent to transmission lines under specific conditions. The human and environmental impact will be minimal and no mitigation related to ozone formation is proposed.

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm would not produce ozone or ozone precursors at the operating wind turbines. The generic 109.2 MW wind farm would have minimal or no impacts related to ozone formation, similar to the Project. Any transmission line associated with the wind farm, whether new or existing, would generate small amounts of ozone and nitrous oxide.

109.2 MW Solar Farm

A 109.2 MW solar farm would not produce ozone or ozone precursors at the operating of the PV panels. As with wind farm, the ozone production associated with a 109.2 MW solar farm would depend on the use of associated transmission lines to deliver power to the grid. The generic 109.2 MW solar farm would have minimal or no impacts related to ozone formation, similar to the Project. Ground level ozone formation and associated impacts are anticipated to be minimal.

Mitigation

Since neither wind farm nor solar farms produce ozone or ozone precursors there will be minimal or no human or environmental impacts, and thus no mitigation related to ozone formation.

6.2 Water Resources

Different generation options have different water usage and effects on the water quality and water resources.

6.2.1 Water Appropriations

Large electric power generating facilities may require water for operations. This section discusses potential water appropriation impacts from such facilities.

Walleye Wind Project

An O&M facility will be constructed within the site to serve as a center for the wind farm's ongoing O&M activities. The footprint of the facility is anticipated to be approximately one (1) acre and will

[40] EPA. *2015 National Ambient Air Quality Standards (NAAQA) for Ozone*.https://www.epa.gov/ozone-pollution/2015-national-ambient-air-quality-standards-naaqs-ozone
[41] EPA. *Ozone Pollution.* https://www.epa.gov/ozone-pollution

include an access road, parking lot and O&M building. The 3,500 square foot O&M building and will provide office space for maintenance personnel, house the SCADA monitoring equipment, provide a shop and storage area for spare parts and vehicles.[42]

The O&M facility will require the installation of a well for potable water and the design and installation of an Individual Sewer Treatment System (septic system). The amount of water used for these facilities is anticipated to be approximately 100 gallons per day.[43]

Geotechnical data, turbine loads, and cost considerations will dictate the final design of the foundation at each turbine location. The concrete turbine foundations will require up to approximately 2,500 cubic yards of excavation and up to 400 cubic yards of concrete depending on final design.[44] A temporary concrete batch plant, if deemed necessary, for construction of turbine foundations may require a water appropriations permit from the DNR.

Generic 109.2 MW Wind Farm

Water appropriations for a generic 109.2 MW wind farm would be similar to the Project, depending on the need for an on-site concrete batch plant and proximity to existing water supplies.

109.2 MW Solar Farm

A solar facility such as the North Star Solar Project is comprised of PV modules mounted on linear axis tracking systems and centralized inverters. In addition to the modules grouped into arrays, the facility also includes electrical cables and conduit, electrical cabinets, step-up transformers, SCADA systems and metering equipment, an operations and maintenance (O&M) area, and roads providing access to the equipment. A perimeter fence surrounds the facility.

The operation and maintenance facility for the North Star Solar Project includes a flat gravel/grass area for parking and receiving and a building of approximately 3,000 to 5,000 square feet housing equipment used to operate and maintain the solar facility.

The minimal need for concrete in the construction of solar farms does not typically warrant a batch plant. Subsurface work (cables, conduit, grading, and trenching) is conducted above water table levels, negating the need for dewatering; however, should dewatering become necessary a solar farm project would require the comparable regulatory review and permitting as for the wind farm. Given that utility-scale solar farms are sited in rural areas, it is anticipated that domestic water and sewer services would be provided by on-site infrastructure (i.e., private well and septic), which would require similar regulatory review and permitting as for the wind farm.

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[42] *Amended Site Permit Application*, at p 19.

[43] Response to Data Request 2, **Appendix E**

[44] *Amended Site Permit Application*., at p 137.

Mitigation

There would be minimal or no human or environmental impacts concerning water appropriations for these projects, outside of BMPs and standard conditions contained in the DNR permit. No additional mitigation is required.

A water appropriations permit may also be required if temporary dewatering activities are needed during construction.[45] The determination of need for the water appropriations permit for construction dewatering activities will be determined by the contractor during construction depending on site conditions.

If temporary dewatering is required during construction activities, discharge of dewatering fluid will be conducted under the National Pollutant Discharge Elimination System (NPDES) permit program and addressed by the Project's Storm Water Pollution Prevention Plan (SWPPP), as required.

6.2.2 Wastewater

Large electric generation facilities have the potential to generate significant amounts of wastewater. This section discusses potential impacts from wastewater generation.

Walleye Wind Project

The wind farm's O&M facility would generate household amounts of wastewater. Walleye Wind plans to build an on-site septic system to serve the O&M facility.[46]The potential impacts of this wastewater and septic system are anticipated to be minimal and no additional mitigation beyond that required by the Rock County permit for the Individual Sewage Treatment System is anticipated.

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm would have wastewater impacts similar to the Project.

109.2 MW Solar Farm

Similar to a wind farm, a solar farm would likely require a private well and septic system at the O&M building to provide sanitary services and water for maintenance, like the North Star Solar Farm.[47]

Given the rural nature of most large solar farms, it is anticipated that domestic sewer services would be provided by a private well and septic system. Wells and septic system installations require state and local permits.

Mitigation

There would be minimal or no human or environmental impacts concerning waste water from these projects; outside of BMPs and standard conditions contained in the Individual Sewage Treatment System permits, no additional mitigation is required.

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[45] Amended Site Permit Application., at Table 53, p 143

[46] Response to Data Request 2, **Appendix E**

[47] North Star Solar Project EA, P. 40.

6.2.3 Groundwater

Ground water in Minnesota is largely a function of local geologic conditions that determine the type and properties of aquifers. The Minnesota DNR divides the state into six ground water provinces based on bedrock and glacial geology.[48] Most groundwater originates from rain and melting snow and ice that infiltrate into the ground; it is the source of water for springs and wells. It is relied on as a source for drinking water, irrigation, and industrial use. Groundwater can be sourced from shallow surficial aquifers or from deeper confined aquifers. Activities that reduce the quantity of available water or introduce contaminants into these aquifers can affect groundwater resources and the people and industries that rely on them.

This section assesses the potential for construction and operation of the Project to affect the quantity of available water or to introduce pollutants that would degrade the quality of groundwater resources.

Walleye Wind Project

Bedrock in this region is made up of Mesozoic Paleoproterozoic stone. The bedrock underlaying the northern portion of the site is Sioux Quartzite, while bedrocks in the southern portion of the site are comprised of undifferentiated sandstone, mudstone, shale, marlstone, siltstone, and minor lignite. Depth to bedrock varies widely – between 2 to 300 feet.[49]

Rock County is part of groundwater province 5 (Western groundwater province). Aquifers in this province occur locally under unconsolidated sand and gravel sediments. Major unconfined aquifers in Rock County are associated with the Rock River and with Beaver Creek (which crosses the southern portion of the site).[50] In the area of the Project, water supplies for domestic, agricultural and municipal uses are primarily obtained from sand and gravel aquifers within the glacial deposits.[51]

According to the Minnesota Department of Health (MDH) County Well Index online database, wells are interspersed throughout the site. Well depths within the project area vary widely ranging between 33 feet to 725 feet deep, with most being more than 100 feet in depth.[52]

Impacts to groundwater resources from construction and operation of the Project are anticipated to be minimal. Water supply needs during Project operation are anticipated to be limited to the O&M facility requirements, which will be satisfied via a private well. As previously noted, the temporary concrete batch plant may need a water well to provide water for concrete production during the construction phase of the Project.

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[48] DNR. *Minnesota Groundwater Provinces* 2021.
https://files.dnr.state.mn.us/waters/groundwater_section/provinces/2021-provinces.pdf

[49] *Amended Site Permit*, at p. 87

[50] *Amended Site Permit*, at p. 87

[51] Lindgren, Richard J. 1997. Hydrogeology and Ground-Water Quality of Confined Aquifers in Buried Valleys in Rock County, Minnesota and Minnehaha County, South Dakota.1997. U.S. Geological Survey.
https://pubs.usgs.gov/wri/1997/4029/report.pdf

[52] *Amended Site Permit Application*, at p. 87

Generic 109.2 MW Wind Farm

Impacts to groundwater from a generic 109.2 MW wind farm might be comparable to the Project, depending on site location and geological material underlying the generic project's site. The potential for groundwater contamination resulting from construction may be higher in areas with karst geology.

109.2 MW Solar Farm

The infrastructure at the North Star Project, including the direct-embedded piers supporting the PV tracking installations, foundations for inverters and the O&M facility, and embedded transmission poles were installed at a depth above the average depth to groundwater of 15-40 feet.[53] No impacts to geologic and groundwater resources were anticipated as a result of construction or operation of the North Star Project.

With the shallow subsurface depth requirements for infrastructure at solar farms it is unlikely these type of projects situated elsewhere in Minnesota would pose a general threat to groundwater quality; however, with certain site specific subsurface conditions (karst or high water table) the risk may increase.

Mitigation

Large scale excavation at wind farms is limited to the turbine pads and the O&M facility (including well and septic) and are temporary. Groundwater resources are not expected to be impacted from these activities. Site permits issued by the Commission require turbines to be located at least 1,000 feet from homes, where most residential wells are located, Individual wind turbine locations should not impact the use of existing water wells. During "down-stream" permitting, measures would be taken to identify any nearby wells prior to construction of turbine foundations. Permitting agencies such as the DNR, MPCA, and MDH determine appropriate actions to protect local groundwater resources.

Groundwater use for both wind farms and solar farms is anticipated to be minimal, and supply and drawdown impacts will be further addressed, if necessary, in appropriations permits.

6.2.4 Surface Water

Potential impacts to surface waters from electric generation projects are largely related to construction activities. During operation, in the cases where hazardous materials (i.e., fuel, lubricants, hydraulic oil, etc.) may be stored onsite, these supplies need to be properly stored to prevent potential impacts to surface waters from releases.

Walleye Wind Project

The site is located within the Rock and Lower Big Sioux watersheds of the Missouri River Basin.[54] There are many small watercourses and wetlands within these drainage basins, including named and unnamed creeks (**Appendix C,** Map 4).

[53] North Star Solar Project EA, P. 61.

[54] *Amended Site Permit Application*, at p 88

Some watercourses and water bodies within the site are designated as public waters and are listed in the public waters inventory (PWI) by the State of Minnesota. Public waters are designated as such to indicate lakes, wetlands, and watercourses over which DNR has regulatory jurisdiction. Public waters are identified on PWI maps and are designated as public waters under DNR's Public Waters Permit Program (Minnesota Statute 103G.005, Subdivision 15).

Some of the watercourses within the site are subject to protection buffer requirements under the Minnesota Statute 103F.48 (the Buffer Law). Minnesota's Buffer Law requires perennial vegetative buffers of up to 50 feet along lakes, rivers, and streams and buffers of 16.5 feet (5 meters) along ditches. Table 6 lists the public waters in the site and the distance of the protective buffer. All eight (8) of the PWI streams within the site have designated 50-foot (15 meter) protection buffer requirements according to the Minnesota Buffer Law.[55]

Table 6 Public Waters Inventory

PWI Feature Name	PWI Type	Protection Buffer (feet)	Length within Project Area (miles)
Mud Creek	Public Water Watercourse	50.0	2.35
Beaver Creek	Public Water Watercourse	50.0	13.64
Unnamed Stream	Public Water Watercourse	50.0	2.02
Unnamed Stream	Public Water Watercourse	50.0	0.65
Unnamed Stream	Public Water Watercourse	50.0	1.03
Unnamed Stream	Public Water Watercourse	50.0	4.47
Springwater Creek	Public Water Watercourse	50.0	9.38
Unnamed Stream	Public Water Watercourse	50.0	0.02
Total Length			33.56

The Clean Water Act (Section 303(d)) requires each state to list streams and lakes that are not meeting their designated uses (i.e., impaired) because of excess pollutants. Two recorded waterbodies within the site, Beaver Creek and Mud Creek are listed as impaired by the MPCA for failure to one or more of the water quality standards or bioassessment standards for macroinvertebrates and fish.[56]

There are no DNR designated wildlife lakes within the site, nor have any outstanding resource value waters or trout streams been identified within the site.

Floodplains are areas susceptible to flooding. Although floodplains are most commonly located adjacent to rivers, streams, and lakes, the normally dry areas adjacent to wetlands, small ponds, or other low areas that cannot drain as quickly as the rain falls may also serve as floodplains. Federal

[55] *Amended Site Permit Application*, at p 89

[56] *Amended Site Permit Application*, at p. 89, see also Minnesota MPCA Minnesota's Impaired Waters List, https://www.pca.state.mn.us/water/minnesotas-impaired-waters-list

Emergency Management Agency (FEMA) Flood Insurance Rate Maps identify a 100-year floodplain along Beaver Creek. (**Appendix C,** Map 4).

During construction of the Project, there is the potential for sediment to reach surface waters due to ground disturbances from vegetation clearing, excavation, grading, and construction traffic. Potential impacts to surface water resources from construction of access roads, turbine sites, and collection lines when the ground is disturbed by excavation, grading, trenching, and construction traffic could include erosion from increased surface water runoff, sedimentation, discharges from groundwater dewatering, and diversion of watercourses. However, these impacts will be temporary during construction of the wind farm and will be minimized to the extent possible through the use of BMPs. Impacts to surface waters are expected to be negligible. If access roads cross waterbodies, they will be designed to maintain stream flow by using culverts.

Generic 109.2 MW Wind Farm

The primary source of impacts to surface water from a generic 109.2 MW wind farm would be erosion and runoff during construction. Mitigation strategies would be similar to those of the Project. In areas where a surface water body is identified as impaired, the SWPPP would provide detailed mitigation to prevent or reduce impacts to impaired water bodies.

109.2 MW Solar Farm

Similar to wind farms, potential impacts to surface waters from a solar farm occur during the construction phase; there is the possibility of sediment reaching nearby surface waters and wetlands as the ground is disturbed by excavation, grading and construction traffic. The potential for impacts to surface waters is affected by the solar farm's design and proximity to surface water features.

Maintenance and operation activities for the PV facilities are not expected to have an adverse impacts on surface water quality.

Mitigation

Turbine siting and general site design will reduce impacts to surface waters. Optimal turbine locations are those which are topographically elevated from their surroundings. Ideally, turbines are located on elevated uplands where they are not expected to affect streams or surface water bodies directly. None of the proposed above-ground features (turbines, substation, access roads) are located within a FEMA designated 100-year floodplain (**Appendix C,** Map 4).

Protection of surface waters from construction and operation of the Project is implemented through the NPDES permit and the associated SWPPP. Because construction of both wind farm and solar farm projects generally involve the disturbance of more than one acre of soil, the project developer will need to submit a NPDES permit application to the MPCA for construction activities. The application identifies which BMPs are to be employed during construction of the Project. A SWPPP would be developed prior to construction to identify BMPs such as silt fencing, management of exposed soils and revegetation plans to prevent erosion. In addition to erosion control measures, fueling and lubricating construction equipment away from waterways will ensure that fuel and lubricants do not enter waterways.

Site permits issued by the Commission for wind farms require permits and approvals from the DNR, USFWS and/or Army Corps of Engineers (USACE) for any access roads constructed across streams or drainage ways. If access roads are constructed across streams or drainage ways, roads must be designed to ensure that runoff from the upper portions of the watershed can readily flow to the lower portions of the watershed. If necessary, culverts may be installed within access roads that are constructed in drainage-ways to allow cross drainage and prevent impoundment of water.

A Utility Crossing License would be required by the DNR for any crossings of PWI by roads, or electric feeder and collector lines; this license would specify methods and mitigation requisites.

6.2.5 Wetlands

Wetlands provide a multitude of ecological, economic, and social benefits and vary in type and extent. Some wetlands are dry for much of the year while others are almost always covered by several feet of water. Some wetlands are dominated by grasses and forbs, others by shrubs and trees. Wetlands also vary in size and extent, with some extending for miles, with annual and seasonal variation. They provide important habitat for wildlife and plants and ecological services such as recharging groundwater, reducing floods, and filtering pollutants from surface water. They are also a source of food and fiber and support cultural and recreational activities. It is estimated that Minnesota has lost about 50 percent of its original wetland acreage.[57]

The USFWS is the principal US federal agency tasked with providing information on the status and trends of wetlands. The USFWS National Wetlands Inventory (NWI) is a publicly available resource that provides detailed information on the abundance, characteristics, and distribution of US wetlands. NWI wetlands are based on aerial imagery and are not field verified.

In Minnesota, agencies representing three levels of government (federal, state, and local) regulate certain activities that affect wetlands, lakes, and watercourses. Federal protection of wetlands is found under Section 404 of the Clean Water Act, which regulates the discharge of material to waters of the United States including wetlands. A wetland permit from the USACE is required when discharging dredged or fill material into jurisdictional wetland and/or non-wetland Waters of the United States. Any wetland listed in the PWI is protected, and project proposers must obtain a Public Waters Work Permit from the DNR for work affecting the course, current or cross-section of public waters, including public waters wetlands. Most other wetlands not listed in the PWI are regulated under the Minnesota Wetland Conservation Act of 1991 (WCA). The WCA is administered by the Minnesota Board of Water and Soil Resources (BWSR) and is implemented by local governments. A permit and/or pre-construction notification may also be required by the local watershed district depending upon the location, size and type of impact.

Wetlands can be impacted directly or indirectly from construction activities (i.e., access roads, turbine sites, substation sites, and collection lines) associated with development of wind farms. Direct impacts

[57] DNR. *Wetlands*. http://www.dnr.state.mn.us/wetlands/index.html.

result from disturbances that occur within the wetland. Indirect impacts result from disturbances that occur in areas outside of the wetland, such as uplands or up-stream waterways.

Walleye Wind Project

There are scattered wetlands and wetland complexes associated with watercourses across the site. Most are classified as freshwater emergent with some wetlands associated with rivers, freshwater forested/shrub wetland, and freshwater pond types also represented. Walleye Wind anticipates that all wetlands within the site fall under USACE jurisdiction as Waters of the United States. [58]

According to the USFWS NWI database, the site contains approximately 1,592 acres of mapped NWI wetlands and open water features, comprising 5.3% of the site area (Table 7).

Table 7. NWI Wetland Types within the Project Area

NWI Type	Acres	Percent of Site
Freshwater Emergent Wetland (PEM)	1,367	4.4
Freshwater Forested/Shrub Wetland (PFO/PSS)	36	0.1
Freshwater Pond (Open Waters)	32	0.1
Riverine Waters	220	0.7
Total	1,592	5.3

The Rock County Soil & Water Conservation District administers the WCA in the project area. Generally, a Replacement Plan is required by the WCA for an impact that wholly or partially drains or fills a wetland. A wetland permit from the USACE is required when discharging dredged or fill material into jurisdictional wetland and/or non-wetland Waters of the United States.

Generic 109.2 MW Wind Project

The primary source of impacts to wetlands from a generic 109.2 MW wind farm would be similar to those for the Project (i.e., erosion and runoff, dewatering discharges, direct impacts such as compaction from crossing wetlands during construction). Generally, mitigation strategies would be similar to those of the Project, however the extent and degree of these strategies would be dependent on site specific features of the generic project.

109.2 MW Solar Farm

Construction and maintenance of a solar facility has the potential to result in long-term and temporary loss of wetlands or wetland function. Similar to wind farms, potential impacts to wetlands from a solar farm can occur during the construction phase; there is the possibility of sediment reaching nearby wetlands as the ground is disturbed by excavation, grading and construction traffic, potential introduction of invasive species, and changes in wetland type and function.

[58] *Amended Site Permit Application*, at p. 92

In instances where solar farms are sited in or near wetlands, longer term post-construction impacts may affect the wetland ecosystem. The solar panel itself will decrease the amount of light reaching the soil surface, which may change the plant community, decrease plant productivity and reduce carbon sequestration. As part of maintaining any solar site, vegetation is controlled through mechanical and chemical techniques. Solar farms sited in wet areas make mechanical vegetation control challenging.

Generally, mitigation strategies would be similar to those of the Project, with the extent and degree of these strategies would be dependent on site specific features of the generic project.

Mitigation

For both wind and solar projects, the preferred method for minimizing impacts to wetlands is to avoid disturbance of the wetland through a project's siting and design. In addition to avoidance, implementation of BMPs during construction significantly reduces the potential for wetland impacts due to erosion or runoff.

Walleye Wind has developed the present layout to minimize impacts to wetlands based on completed field surveys of proposed turbine locations, access roads, and the O&M site, and desktop review of NWI data of collection lines and crane path areas associated with the wind farm.

- Turbines and meteorological towers for the wind farm will be sited and built in upland, higher elevation areas to maximize the wind resources and, in doing so, will avoid direct impacts to wetlands and surface waters.
- In some cases, a narrower construction easement may be considered to minimize impact.
- Wetlands near areas of construction activity will be marked to ensure that construction crews avoid these areas.
- Walleye may use directional drilling of collector and communication lines to avoid or reduce the amount of acreage where wetland impacts occur.
- Walleye Wind will implement MPCA Stormwater BMPs to protect topsoil, minimize soil erosion, and protect wetland resources from direct and indirect impacts. The SWPPP prepared prior to construction will specify the BMPs, but potential mitigation measures may include seasonal temporary timber matting, erosion control blankets, mulch, straw bales, temporary seeding, hydromulch or sediment fencing.
- Walleye Wind indicates that it received concurrence with the wetland boundaries from the Board of Soil and Water Resources and the Rock County Soil and Water Conservation District on March 15, 2021.[59]

[59] Response to Data Request 5, **Appendix E**

6.3 Solid and Hazardous Wastes

Large electric generation facilities have the potential to generate solid and hazardous wastes. Solid and hazardous wastes, if not properly handled, can contaminate surface and ground waters. This contamination can cause a variety of human and environmental health impacts depending on the type and amount of contamination.

Walleye Wind Project

Potential hazardous materials within the site are typical of agricultural uses and may include contamination from petroleum products (diesel fuel, gasoline, natural gas, heating oil, lubricants, and maintenance chemicals), pesticides and herbicides. Older farmsteads may also contain lead-based paint, asbestos-containing building materials (e.g. shingles and siding), and polychlorinated biphenyls ("PCBs") in electrical transformers. Unmarked farmstead waste dumps which may contain various types of wastes are also commonly found in rural settings.

Construction of the Project will generate solid waste including construction debris such as scrap wood, plastics, cardboard and scrap metals. Petroleum products would also be present on site, such as oil and fuel. Operation of the wind farm is not expected to generate significant quantities of solid and hazardous waste materials. Small quantities of hydraulic oil, lube oil, grease, and cleaning flush will be maintained and stored at the O&M building, and as these fluids are replaced the waste products will be handled and disposed of through an approved disposal firm as required by regulations.

Prior to the application, Walleye Wind reviewed MPCA's *What's in My Neighborhood?* database to identify known and potential sources of soil and groundwater contamination.[60] The MPCA database indicated that a total of 123 sites are listed within the Site, 84 of which are listed as active. Of these sites, there are 91 feedlots; eight construction stormwater sites; seven hazardous waste sites, three industrial stormwater sites, two multiple program sites, one solid waste site (Janet Faber Property), one air quality site (U of M – AURI Wind Bio-Diesel Project); three sites with aboveground tanks; and four sites with underground tanks.[61]

In July 2019 a Phase I Environmental Site Assessment was conducted for the portion of the site purchased from RES. Walleye Wind will update the Phase I Environmental Assessment prior to construction. Information from the assessments will be used to avoid potential hazards where possible and to verify the presence or absence of contamination.

As discussed in Section 6.2.4 of this document, there is a potential for spills and leaks of hazardous materials to occur during construction and operation of the Project.

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm sited in an agricultural setting would have solid and hazardous waste impacts similar to the Project.

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[60] MPCA. *What's in My Neighborhood* https://www.pca.state.mn.us/data/whats-my-neighborhood

[61] *Amended Site Permit Application*, at p. 73

109.2 MW Solar Farm

As with a wind farm, a solar farm will generate solid waste during construction (e.g., scrap wood, plastics, cardboard and wire). Small amounts of hazardous wastes would be generated during operation, (e.g., oils, grease, hydraulic fluids and solvents). The small quantities of hazardous materials would be stored within the O&M facilities.

Mitigation

Hazardous wastes will need to be handled and stored appropriately; hydraulic fluid, lubrication oil and grease would be disposed of through an approved waste disposal firm. Leaks or spills could be mitigated using appropriate clean up techniques. A listing of all potentially hazardous materials related to the operation of the wind farm will be maintained at the O&M facility.

It is not anticipated that the wind farm would require a hazardous waste generators license. Hazardous waste generation would likely fall below the quantity required for a very small quantity generator license (220 pounds per month).

Walleye Wind will use the Phase I ESA to identify and avoid potential hazardous waste sites within the site.[62]

6.4 Natural Resources

Large electric generation facilities have the potential to impact natural resources, including flora, fauna, habitat, soils and water. This section discusses potential impacts to natural resources from the operation of a generation facility.

6.4.1 Ecological Setting

The DNR and the U.S. Forest Service have developed an Ecological Classification System (ECS) for ecological mapping and landscape classification in Minnesota[63]

Ecological land classifications are used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. The system uses associations of biotic and environmental factors, including climate, geology, topography, soils, hydrology, and vegetation. The ECS enables resource managers to consider ecological patterns for areas as large as North America or as small as a single timber stand and identify areas with similar management opportunities or constraints relative to that scale. There are eight levels of ECS units in the United States. Map units for six of these levels occur in Minnesota: Provinces, Sections, Subsections, Land Type Associations, Land Types, and Land Type Phases. **Figure 4** represents the Ecological Subsections in Minnesota.

[62] *Amended Site Permit Application*, at p. 73

[63] DNR *Ecological Classification System*, http://www.dnr.state.mn.us/ecs/index.html

Walleye Wind Project

The site is located within the Inner Coteau Subsection (251Bc) of the North Central Glaciated Plains (251B) section of the Prairie Parkland Province. The Prairie Parkland Province covers over 16 million acres between Oklahoma and Manitoba, extending into southwestern and west-central Minnesota, and then northward along the Red River Valley.

The Inner Coteau Subsection crosses the southwestern corner of Minnesota (**Figure 4**). Historically, dry tallgrass prairies dominated the region. Frequent fires re-energized the native prairie. Today, most of this subsection is farmed, and little of the native vegetation remains.[64]

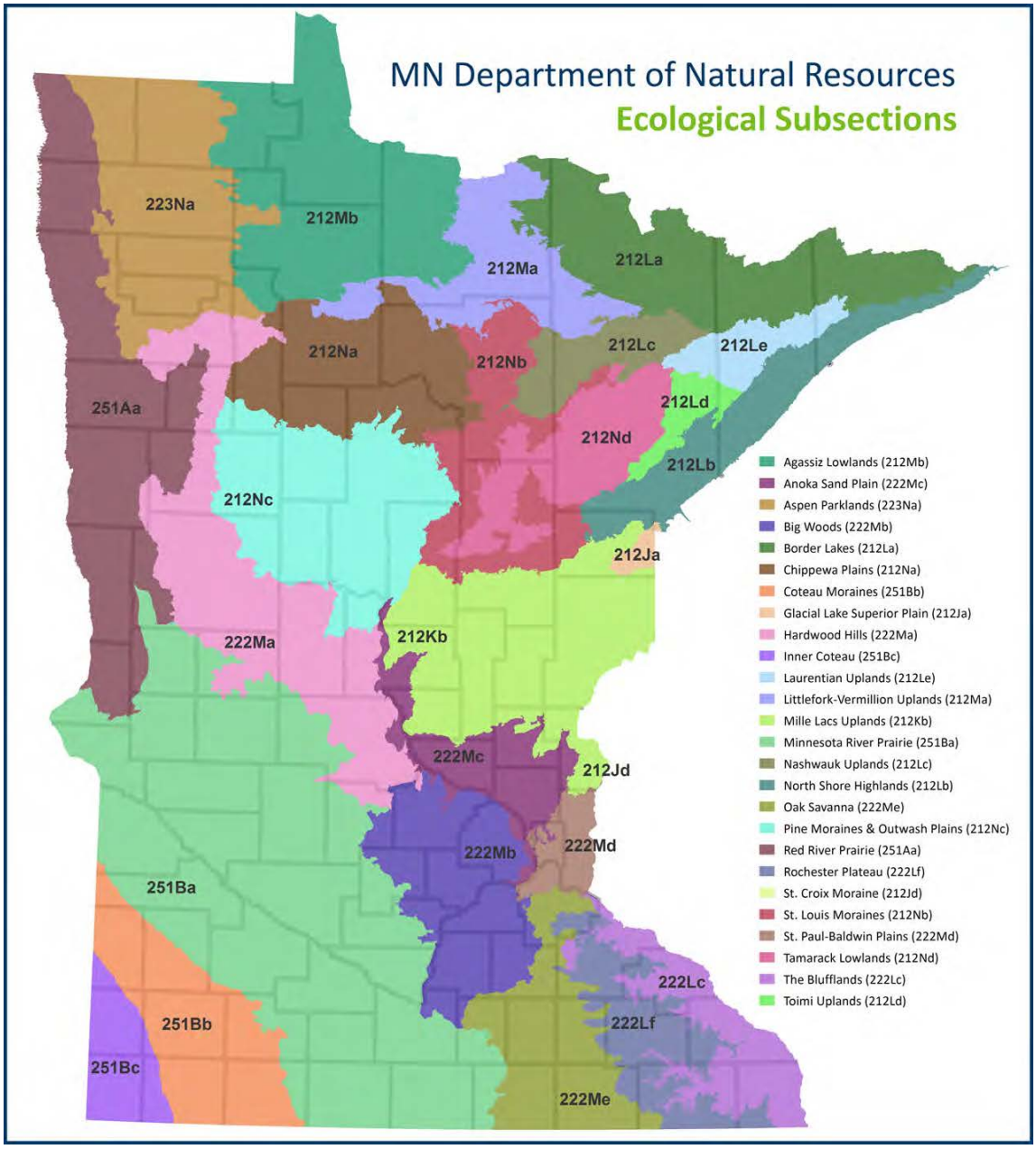
The subection is characterized by loamy well-drained soils, primarily Mollisols.[65] Within the site, there are 41 soil types, the soils at the site can be generally characterized as well-drained silty loams.[66]

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm located elsewhere in Minnesota may have different ecological and environmental features (setting) compared to the Project. However, wind farms are most often sited in areas of the state that provide the greatest wind resources (**Figure 2**), which also tend to be in agricultural areas of the state with similar ecological features.

[64] DNR *Ecological Classification System, Inner Coteau Subsection* (https://www.dnr.state.mn.us/ecs/251Bc/index.html)
[65] Ibid.
[66] Site Permit Application, at p 87.

Figure 4. Minnesota Ecological Subsections



109.2 MW Solar Farm

While the site selection criteria for wind farms and solar farms share some common prerequisites (i.e., point of interconnect, adequate roadways and stakeholder concerns), there are sufficient contrasts to expect different siting outcomes (environmental setting).

Site suitability analysis for solar farms may include such factors as:

- Quality of terrain – Sloped land, excessively rocky or sandy terrain, uneven land etc., can all

significantly add to the cost of installing a solar farm. Degree of forest clearing or tree removal must be low.

- Conservation and Environmental Impact Issues – Large tracts of undeveloped land may coincide with sensitive or protected areas or protected species. Often the presence of a single protected species of plant or animal can halt or completely alter the development plans for a solar farm.
- Local Regulations and Ownership – Objections from the stakeholders, conflicts with current land use and zoning, and removal of agriculturally productive land.
- Flood Risk Assessment – The desire to avoid conflicts with agriculture may result in low lying sites subject to flooding concerns.

6.4.2 Wildlife

Wildlife can potentially be impacted by large energy projects. Wildlife such as birds, mammals, fish, reptiles, amphibians, and insects, can be permanent or migratory. Many species utilize the available habitat in and adjacent to the project area for forage, breeding, and shelter.

In highly fragmented landscapes or those with few intact natural communities, public lands (state or federal) and private lands under permanent conservation easement provide wildlife habitat that has long-term protections from development and encroachment.

Walleye Wind Project

Historically, the site and surrounding region contained a variety of natural communities and habitat that supported diverse species of wildlife. As the historic vegetation has been converted to agricultural use, the wildlife species that occupy the landscape reflect the changes in habitat type and availability. The most common species within the site tend to be generalists able to utilize rural, urban or agricultural habitats. Based on the general distribution of wildlife in the region and their habitat preferences, a variety of common and widespread species have the potential to occur within the site at some time during the year. The majority of migratory wildlife species are birds, including raptors and songbirds and migratory bat species.

Local and migratory species use the grasslands, farm woodlots, wetlands and other areas for food and cover. Mammals common to this landscape include white tail deer, racoon, coyote, fox, opossum, skunk, squirrels, badger, and weasel. Reptiles and amphibians are associated with wetlands, waterways and forested stretches throughout the project area. Reptiles and amphibians include snakes, turtles and frogs. Several species of birds and bats are also known to occur in this landscape, including grassland birds, migratory birds, raptors and waterfowl.[67]

The potential for habitat fragmentation impacts as a result of the wind farm is low because the Project is sited in an agricultural landscape and much of the remaining habitat is disturbed. The wind farm is

[67] *Amended Site Permit Application*, at pp. 104-107

designed to avoid placing turbines and access roads in wetlands, native plant communities, and MBS sites of biodiversity significance.

There are no federally owned or managed lands within one mile of the site. There two small state-managed Wildlife Management Areas (WMAs) within and adjacent to the site (Appendix C, Maps 3 and 7).

- The Rooster Ridge WMA – approximately 93 acres of planted prairie habitat is located within the site, approximately two miles southwest of Beaver Creek.[68]
- The Springwater WMA – approximately 152 acres comprised of grasslands, fens, wetlands, cropland, and woodlands recently acquired by the DNR. The DNR plans to restore cropland at this site to native prairie.[69]

As the WMAs are non-participating landowners, wind buffer setbacks from turbines and associated facilities. At a minimum, wind turbines will be placed at least five rotor diameters or three rotor diameters, depending on wind direction and property location, from identified management areas within and adjacent to the Project.[70]

In addition to the state-managed areas, Walleye Wind has identified approximately 61.3 acres of conservation easements within the site.[71]

Birds

Studies have shown that placement of turbines and auxiliary structures can result in decreased densities of songbirds and other species. Species of grassland birds, such as various grouse species, are particularly susceptible to displacement due to their high site fidelity.[72] The potential for habitat avoidance by wildlife in response to wind turbines and associated infrastructure is highly variable depending on the species, seasonal and annual variation in weather, migration patterns, and individual behavior patterns.

The Project has the potential to cause displacement of some bird species from the site due to increased human activity or the presence of tall structures, though clearing of habitat will be minimal. Many of the most-observed bird species within the site are common, disturbance-tolerant species, similar to the results of surveys at other wind energy facilities in the region.

Studies of bird fatalities near wind farms indicate that fatalities will occur and that they will vary with bird type (e.g., raptor, waterfowl, passerine), habitat availability, and other resources available within the site The operation of the wind farm may result in avian fatalities from collision with the turbines or

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[68] Minnesota DNR, Beaver Creek WMP https://www.dnr.state.mn.us/wmas/detail_report.html?id=WMA0138900

[69] Minnesota DNR, *Springwater WMA* *https://www.dnr.state.mn.us/wmas/detail_report.html?id=WMA0139100*

[70] *Amended Site Permit Application*, at Table 2.

[71] *Amended Site Permit Application*, at pp.27-29

[72] National Wind Coordinating Committee.2010. *Wind Turbine Interactions with Birds, Bats, and their Habitats*, https://www1.eere.energy.gov/wind/pdfs/birds_and_bats_fact_sheet.pdf

other structures. Based on the results of post-construction monitoring at other wind farms, migratory birds and passerines comprise the largest portion of avian fatalities in Minnesota. Differences in study designs, statistical methods, and site-specific characteristics make direct comparisons between wind projects difficult. However, based on similarities in species composition and land cover, estimated bird carcass rates at the Project would be expected to be within the range reported from studies at other wind facilities in the region (Table 8).

At this time it is unclear how these fatalities will impact avian populations on a broader scale. Studies looking at avian fatalities caused by wind turbines throughout the United States estimated a fatality range of between 140,000 to 500,000 birds per year.[73]

Table 8. Estimated Avian Fatality Rates in Southern Minnestota[74]

Project Name	Study Year(s)	County	Estimated Bird Carcasses/ Megawatt/Year	Source
Buffalo Ridge	1996-1999	Pipestone	1.46-5.93	Johnson et al., 2000
Elm Creek	2009-2010	Jackson, Martin	1.55	Derby et al., 2010
Elm Creek II	2011-2012	Jackson, Martin	3.64	Derby et al., 2012
Moraine II	2009	Pipestone, Murray	5.59	Derby et al., 2010c
Lakefield	2012	Jackson	2.75	Westwood, 2013
Lakefield	2014	Jackson	1.07	Westwood, 2015
Odell	2016-2017	Cottonwood, Jackson, Martin, Watonwan	6.14	Chodachek & Gusafson, 2018
Prairie Rose	2014	Rock, Pipestone	0.44	Chodachek et. al, 2015
Big Blue	2014	Faribault	0.2	Chodachek et. al, 2015
Grand Meadow/ Wapsipinicon	2014	Mower	0	Chodachek et. al, 2015
Oak Glen	2014	Steele	0.57	Chodachek et. al, 2015

[73] USFWS. *Migratory Birds Program. Wind Turbines*, https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds/collisions/wind-turbines.php

[74] Stucker, J., J. Lombardi, J. Pickle, and N. O'Neil. 2020. *2019 Post-Construction Monitoring Study, Black Oak Getty Wind Project, Stearns County, Minnesota, April 2 – September 30, 2019*. Prepared for Black Oak Wind, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. March 15, 2020. eDocket ID: 20203-161362-01

Developed jointly by the Cornell Lab of Ornithology and Audubon, *eBird* is an online database of bird observations across the world. The open-source online program for birders to enter siting and for the researchers and the general public to search and track birds. A search of Rock County in *eBird* identifies records for 258 species, with the Common Grackle (Quiscalus quiscula), Red Winged Blackbird (Agelaius phoeniceus), and Snow Goose (Anser caerulescens), being the most frequently cited species.[75] Breeding Bird Survey data from the nearby Ash Creek BBS route (located approximately three miles east of the site) documented a total of 115 species.

The 2018 Avian Use Survey conducted by WEST in 2018 documented 1,608 individual birds. No federally-listed threatened or endangered species were identified, however 16 sensitive species were documented including one threatened species, the loggerhead shrike (Lanius lodovivianus) and five species designated as a Minnesota species of special concern: greater prairie-chicken (*Tympanuchus cupido*), American white pelican (*Pelicanus erythrorhynchos*) , Franklin's gull (*Leucophaeus pipixcan*), peregrine falcon (*Falco peregrinus*), lark sparrow (*Chondestes grammacus*), and short-eared owl (*Asio flammeus*).[76]

Both bald and golden eagles were observed within the site. Bald eagle collisions with wind turbines are of additional concern as bald eagle populations continues to grow and expand throughout Minnesota. Bald eagles are afforded additional protections under the Bald and Golden Eagle Protection Act, which is administered by the USFWS. Wind energy facilities are eligible to apply for Incidental Take Permits and Nest Removal Permits issued by the USFWS, which will allow for the non-intentional take of bald eagles and the removal of bald eagle nests, respectively. Bald eagle incidental take permits and nest removal permits are considered to be voluntary permits, meaning a project proposer must make the determination to pursue a permit based on the respective risk of their project's potential to take a bald eagle.

Eagle and raptor nest surveys were conducted for the Project in 2016, 2018, and 2020 for the site and a 10-mile buffer around the site. Together, the surveys identified 88 total nest structures within the site, including red-tailed hawk and great horned owl nests. None of the nest surveys identified bald eagle nests within the site. The 2020 survey identified a total of 10 active bald eagle nests within 10 miles of the site.[77]

Bats

Bat fatality studies indicate a broad range of fatalities across the United States as a result of wind development. Fatality rates are highest for migrating-tree roosting bat species, with the majority of fatalities occurring during the late summer and early fall migration (roughly July-October). Documented bat fatalities are highest in the eastern United States, while those in the Midwest

[75] Cornell Lab of Ornithology, *eBird*, search for Rock County, Minnesota https://ebird.org/region/US-MN-133?yr=all

[76] *Amended Site Permit Application*, at p. 104, Appendix G

[77] *Amended Site Permit Application*, at p. 105

represent a wide range of fatality rates. Post-construction fatality studies completed in Iowa, Minnesota and Wisconsin show bat fatality estimates ranging from 1 to 24 bats/MW/year.[78]

The site is within the range of several bat species including northern long-eared bat (Myotis septentrionalis), evening bat (Nycticeius heralis), eastern red bat (*Lasiurus borealis*), little brown bat (*Myotis lucifugus*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), tri-colored bat (formerly known as the eastern pipistrelle (*Perimyotis subflavus*)), and the big brown bat (*Eptesicus fuscus*). Although many of these species are fairly common within Minnesota and the range of these bats overlaps the general vicinity of the site, the preferred habitat of these species is not abundant within and in the vicinity of the Project site. The little brown and big brown bats utilize lakes and streams for foraging, and caves, and human structures for roosting. Silver-haired, eastern red and hoary bats are forest-dwelling species. Relatively little of these habitats are present within the site. Other species, such as tricolor bat and the evening bat (with only one siting reported in Minnesota in 2016) are rarely found in Minnesota.[79] The northern long-eared bat is federally listed threatened and state listed as special concern. The big brown bat, little brown bat, and tri-colored bat are also listed as special concern species in Minnesota.

It is presumed that wind projects in areas with similar habitat and cover types would have similar fatality rates, depending on migration patterns, known roosting and foraging areas, and hibernacula. However, bat migration routes and behavioral patterns are poorly understood and there is a lack of comparative studies of bat fatalities from wind facilities, making it difficult to determine fatality rates at regional levels much less at broader scales. Estimated bat carcass rates at the Project would be expected to be within the range reported from studies at other wind facilities in the region (Table 9). Activity of both groups decreased as wind speeds at the site increased, and as temperatures at the site decreased.

Generic 109.2 MW Wind Farm

Because impacts to wildlife would depend upon specific site characteristics, it is difficult to assess wildlife impacts for a generic 109.2 MW wind farm located elsewhere in Minnesota. As discussed above, impacts to birds and bats are the primary concern with wind projects. Information about local bird and bat populations within Minnesota is incomplete and different sites provide varying habitat and foraging areas for different species of birds and bats.

[78] National Wind Coordinating Committee. *Wind Turbine Interactions with Birds, Bats, and their Habitats*, (2010) https://www1.eere.energy.gov/wind/pdfs/birds_and_bats_fact_sheet.pdf
[79] DNR. *Bats*. https://www.dnr.state.mn.us/mammals/bats.html

Table 9. Bat Fatality Estimates from Post-Construction Monitoring Studies in Minnesota

Wind Energy Facility	Year(s)	Estimated fatalities/ MW/year	Source	Total MW
Black Oak-Getty	2017, 2018, 2019	26.05	Pickle et al. 2018	78.00
Lakefield,	2012, 2014	19.87 - 20.19	Westwood 2013	205.50
Big Blue	2013	6.33	Fagen Engineering 2014	36.00
Buffalo Ridge - Phase I	1999	0.74	Johnson et al. 2000	25.00
Buffalo Ridge- Phase II (Lake Benton I)	1998, 1999, 2002	1.64 – 2.59	Johnson et al. 2004	107.25
Buffalo Ridge- Phase III (Lake Benton II)	1999, 2001, 2002	1.81 - 3.71	Johnson et al. 2004	103.50
Grand Meadow/ Wapsipinicon,	2013	3.11	Chodachek et al. 2014	100.50
Oak Glen	2013	3.09	Chodachek et al. 2014	44.00
Elm Creek II	2011, 2012	2.81	Derby et al. 2012	148.80
Moraine II	2009	2.42	Derby et al. 2010b	49.50
Elm Creek	2009, 2010	1.49	(Derby et al. 2010a)	100

109.2 MW Solar Farm

As with wind farms, impacts to wildlife from solar farm development depends upon specific site characteristics, it is difficult to assess wildlife impacts for a solar farm without detailed knowledge of the proposed site's environmental setting.

Based on utility-scale solar farms sited in Minnesota to date, a 109.2 MW solar farm would likely be sited on agricultural land used by wildlife common to disturbed areas. It is assumed that these species' use of agricultural lands is largely limited to occasional foraging in the fields and shelter within wooded areas that may surround the fields.

Wildlife that resides within the construction zone would likely be temporarily displaced to adjacent habitats during the construction process. Because the wildlife species found near these agricultural lands do not generally require specialized habitats and are able to find suitable habitat nearby, any displacement is likely to be at a short distance and for a limited time (during construction activity).

The majority of the potential impacts to wildlife are due to the relatively large footprint of a solar farm and the corresponding changes to the habitat (i.e., loss and fragmentation). Once restoration of the facilities is established after construction, the existing agricultural landscape that is used by habitat generalists will be replaced by a modified habitat that may be attractive to some species and less attractive to species that use the open farm and pasturelands.

The solar farm is typically enclosed by a fence, limiting movement by animals. Solar facilities permitting by the Commission typically have fences designed to allow small animals to enter the property. Although a variety of birds, small mammals, reptiles and amphibians are likely to still be able to gain access to the property to use the habitats under and around the solar arrays, access will be limited for larger wildlife. Fencing around facilities may also disturb wildlife movement corridors. With or without openings, the habitat of the land changes significantly. Hiding spots, preying strategy, food availability will all be affected.

A generic 109.2 MW solar farm would have fewer impacts on avian and bat species than a wind farm due to its low profile and near-static nature of the component parts. A National Fish and Wildlife Forensics Laboratory report[80] has identified some avian risks associated with PV facilities. Some birds in the study suffered impact trauma, and related predation. Preliminary findings, based on limited data, suspect the danger is the possible appearance of the facility as a large body of water. Migrating birds may attempt to land, consequently incurring the trauma.

Mitigation

Wildlife mitigation strategies for wind farm sites generally incorporate a combination of micro-siting and best management practices. Walleye Wind will implement the following measures for the Project:[81]

- Implement the Project's Wildlife Conservation Strategy/Avian and Bat Protection Plan (WCS/ABPP) to minimize impacts to avian and bat species during construction and operation of the Project
- Prepare a Prairie Protection and Management Plan in consultation with DNR
- Maintain, at a minimum, the three by five times the rotor-diameter setback from WMAs and WPAs to reduce the risk to waterfowl/waterbirds and grassland-associated birds
- All contractors, sub-contractors, and operation staff will be required to attend wildlife awareness training
- Avoid or minimize placement of turbines in high quality grassland or pasture areas that may act as native grasslands for breeding grassland bird species
- Avoid or minimize placement of turbines in previously undisturbed shrub/scrub vegetation types that may provide additional habitat for breeding birds
- Protect existing trees and shrubs by avoiding tree removal for turbines, access roads, and underground collector lines
- Avoid or minimize disturbance of individual wetlands or drainage systems during construction.

[80] Kagan et al. 2014. *Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis*. USFWS Forensics Lab., https://www.ourenergypolicy.org/wp-content/uploads/2014/04/avian-mortality.pdf

[81] *AmendedSite Permit Application*. At pp. 111-113

Wetland delineations and micro-siting of turbines will be conducted prior to construction to identify limits of wetland boundaries and to avoid placement of turbines in sensitive wildlife habitat;

- Maintain sound water and soil conservation practices during construction and operation of the Project to protect topsoil and adjacent resources and minimize soil erosion. To minimize soil erosion during and after construction, BMPs for erosion and sediment control should be used. These practices include, but are not limited to, silt fencing, temporary seeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways, and sod stabilization
- Construct wind turbines using tubular monopole towers
- Light turbines in accordance with FAA requirements
- Avoid siting turbines within 1.6 miles of known bald eagle nests
- Coordinate with DNR regarding potential minimization measures, such as the feathering of turbine blades up to the manufacturer set cut-in speed at night between April 1 and October 31 to minimize fatality risks to bat species
- Conduct Tier 4 post-construction monitoring to better understand bird and bat impacts that are attributable to the Project operation and adjust operations as appropriate based on the level of mortality observed
- Inspect and control noxious weeds in areas disturbed by the construction and operation of the Project

High wind conditions reduce bird and bat flight activity. Wind turbines require a minimum wind speed (cut-in speed) for operation. Impacts to birds and bats could be mitigated by "feathering" or locking the turbine blades up to the manufacture's designated cut-in speed, or by increasing the cut-in speed during periods of high activity. Curtailment of turbines has been found to effectively reduce bat fatalities by a minimum of 50 percent by raising operational cut-in speeds.[82]Recently issued site permits Commission issued site permits for wind farms include curtailment provisions (**Appendix B,** at Section 7.5.4).

Early trials of acoustic deterrents to minimize bat fatalities show potential to reduce bat fatalities at wind projects where curtailment presents operational or economic challenges. AEP is implementing a trial of acoustic deterrents at its Black Oak-Getty Wind Project in Stearns County, Minnesota.[83]

Avoiding the use of photodegradable erosion-control materials where possible and using biodegradable materials (typically made from natural fibers) instead, preferably those that will

[82] Arnett et al. *Effectiveness of Changing Wind Turbine Cut-In Speeds to Reduce Bat Fatalities at Wind Facilities*. 2009. http://www.batsandwind.org/pdf/Curtailment_2008_Final_Report.pdf

[83] Black Oak Wind, LLC. *Annual Audit.* March 25, 2021. eDocket ID: 20213-171884-01

biodegrade under a variety of conditions, can minimize the impact to wildlife. Checking open trenches and removing trapped turtles before filling trenches can minimize impacts to turtles.

6.4.3 Vegetation

Construction and operation of large energy projects may cause short-term and long-term impacts to vegetation. Short-term impacts are associated with construction; once the construction activity (e.g., temporary lay-down areas, grading and excavation of soils, trenching for electric feeder/collector lines, etc.) is completed the disturbed area can be returned to pre-construction conditions. Long-term impacts include those which are permanent in nature and are usually associated with the construction site of individual wind turbines and associated facilities, such as collector and feeder lines, access roads, and O&M building.

Construction activities could potentially lead to introduction of noxious weeds and invasive species through ground disturbance, extended periods of exposed soils, the introduction of topsoil contaminated with weed seeds, vehicles importing weed seed from a contaminated site to an uncontaminated site, and conversion of land cover types, particularly from forested to open settings. Invasive species and noxious weeds out-compete native plants, alter species composition and natural communities, and diminish ecosystem functions.

Maintenance and emergency repair activities could also result in direct impacts to vegetation from removal of vegetation, localized physical disturbance, and soil compaction caused by the use of equipment. Such impacts on vegetation would be short-term and more localized than construction-related impacts.

Walleye Wind Project

Based on the United States Geological Society's National Land Cover Database, land cover in the project area is primarily cultivated crops, which account for approximately 87 percent of the land cover within the site (Table 10). For the most part, pasture and grassland areas are fragmented across the project area and forested areas appear limited to stream corridor and around homesteads.

Table 10. Land Cover Type in the Project Area[84]

Land Cover	Sum of Area (Acres)	Percent of Project Area
Cultivated Crops	27,060	87.0%
Hay/Pasture	1,800	5.8%
Disturbed/Developed	1,476	4.7%
Grassland	385	1.2%
Wetlands	249	0.8%
Barren Land	32	0.1%
Deciduous Forest	87	0.3%
Open Water	18	< 0.1%
Shrub/Scrub	10	<0.1%
TOTAL	31,117	100%

Construction and operation of the Project would result in direct and indirect impacts to vegetation communities. Direct effects to vegetation would occur from disturbance or removal of vegetation at the wind turbine generator pad sites, along access roads, and in association with the 34.5-kV underground electrical collection system. Changes to land cover type is often used as a proxy for other effects. Changes in land cover type may indicate a loss of agriculturally productive lands, habitat fragmentation, and damage to ecological function.

The vast majority of the wind farm infrastructure will be located in agricultural fields. Less than one percent of the total area within the site will be permanently converted to wind turbines or other Project infrastructure (Table 11).[85]

Temporary vegetation impacts will occur during the construction of access roads, crane walks, turning radii, equipment laydown areas, construction easements around turbines, and collection line installation (Table 12).

[84] Dewitz, J., 2019, National Land Cover Database (NLCD) 2016 Products (ver. 2.0, July 2020): U.S. Geological Survey data release, https://doi.org/10.5066/P96HHBIE.

[85] Impacts associated with alternate locations are included in Response to Data Request 4 (Appendix E). Impacts associated with use of alternate turbine locations are not included in impact calculations presented in Tables 11 and 12, as use of alternate turbine locations would replace, not add, to total impacts. As with the primary locations, impacts associated with alternate turbine locations are primarily associated with cultivated crops.

Table 11. Estimated Permanent Impacts to Vegetation

Land Cover Type	Turbines	Access Roads	Substation and O&M Facility	Met Tower and ADLS	Total
Cultivated Crops	10.0	23.3	7.5	0.2	42.4
Disturbed/Developed	-	0.8	0.1	-	1.0
Grassland/Herbaceous	-	-	-	-	0.0
Emergent Herbaceous Wetlands	-	-	-	-	0.0
Deciduous Forest	-	< 0.1	-	-	< 0.1
Hay/Pasture	-	0.6	-	-	0.2
Sites of Biodiversity (Below)	-	0.2	-	-	0.2
Total	10.0	24.9	7.6	0.2	42.7

Table 12. Estimated Temporary Impacts to Vegetation

Land Cover	Turbines	Roads	Collectors	Crane Paths	Laydown Yard	Met Tower and ADLS	Intersections	Total
Cultivated Crops	255.3	73.2	82.1	219.0	37.9	12.9	11.5	718.1
Disturbed/Developed	0.2	2.9	2.3	4.9	0.2	-	23.5	34.0
Grassland/Herbaceous	-	-	0.1	< 0.1	-	-	0.4	0.5
Emergent Herbaceous Wetlands	-	-	-	-	-	-	-	0.0
Deciduous Forest	-	0.1	0.1	0.2	-	-		0.3
Hay/Pasture	1.6	1.7	1.3	2.4	-	-	1.3	8.3
Sites of Biodiversity (Below)	0.2	0.6	3.1	0.5	-	-	1.0	5.4
Total	257.3	78.5	89.0	227.0	38.1	12.9	37.7	740.5

Walleye Wind has sited Infrastructure required for the wind farm to avoid MCBS sites ranked as moderate, high, or outstanding. Impacts to these features would result in a greater impact than to cropland as they contain the highest quality natural vegetation and potential habitat for species within an ecologically fragmented region. At the time this report was prepared, the proposed Project layout anticipates approximately 5.4 acres of MCBS sites ranked as “below” will be temporarily impact and 0.2 acres will be permanently impacted.

Generic 109.2 MW Wind Farm

The potential impacts to vegetation, including native prairie, native plant communities, and sites of biodiversity significance, are difficult to assess for a generic 109.2 MW wind farm located elsewhere in Minnesota without a full understanding of the specific project's environmental setting and site specific information.

109.2 MW Solar Farm

As with a wind farm impacts to vegetation from solar farm development depend upon site-specific characteristics; it is difficult to assess the degree and ecological significance of vegetative impacts for a solar farm without knowledge of the land cover types, topography, and general environmental setting of a hypothetical project site. During the site preparation phase for utility-scale solar facilities, developers often grade land (cut and fill) and remove all vegetation to minimize installation and operational costs, prevent plants (including crops) from shading panels, and minimize potential fire or wildlife risks.

Ground-mounted PV solar farms require approximately 7 to 10 acres per MW; the North Star 100 MW solar farm project occupies approximately 800 acres, of which approximately 109.2 acres required grading (i.e., cut and fill).[86] Given the larger footprint required for solar farms, it would be expected that the impacts to vegetation would be greater than that for a comparable capacity wind farm.

Mitigation

In both wind farm wind farm and solar farm projects the potential impacts to vegetation can be mitigated by using BMPs and standard construction practices to minimize soil erosion (including the prompt revegetation of disturbed soils) and micro siting of the various project components and infrastructure to avoid sensitive plants and plant communities. If sensitive plants or communities are identified during plant surveys, layout adjustments and other minimization measures (e.g. flagging, environmental monitoring, or additional training for construction staff) would be evaluated by the appropriate resource agencies.

Continuing mitigation measures to reduce the spread of nonnative plant species during construction should be employed and include: regular, frequent cleaning of construction equipment and vehicles; minimization of ground disturbance to the greatest degree practicable and rapid revegetation of disturbed areas with native or appropriately certified weed-free seed mixes; conducting field surveys prior to construction to identify areas that currently contain noxious weed; attending to new infestations of noxious weed within the project areas by identifying and eradication as soon as practicable in conjunction with property owners input.

Solar farms permitted by the Commission are required to development of a Vegetation Management Plan in consultation with resources agencies, and to implement that plan throughout the facility's operating life. The impacts arising from the common site preparation practice of removing vegetation

[86] North Star Solar EA

from solar farm sites can be minimized in certain circumstances by co-locating solar farms with agricultural operations (i.e., harvestable crops, grazing, and apiary). There have been successful examples where solar facilities are co-located with these type of agricultural operations.

6.4.4 Rare and Unique Natural Resources

There are various governmental programs and agencies which provide resources to effectively evaluate potential environmental impacts of proposed activities.

The MBS and the Minnesota Natural Heritage Information System (NHIS) provide information on federal and state listed species, Species of Greatest Conservation Need and unique or rare habitat types in Minnesota. The MBS systematically collects, interprets, and provides baseline data on the distribution and ecology of rare plants, rare animals and native plant communities.[87] The NHIS database provides information on Minnesota's rare plants, animals, native plant communities and other rare features. The NHIS is continually updated and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities and other natural features.[88]

The USFWS provides information for use in National Environmental Policy Act (NEPA) documents, and reviews and provides comments on these documents. Through this process, the USFWS seeks to ensure that impacts to plant and animal resources are adequately described and necessary mitigation is provided. One such resource is the distribution lists of federally-listed threatened, endangered, and candidate species by county.

Walleye Wind Project

The USFWS county lists indicate that Rock County and Minnehaha County (adjacent to the site boundary in South Dakota) are within the range (*i.e.*, has documented records and/or has the potential to harbor critical habitat for the designated species) of the federally endangered Topeka Shiner (*Notropis topeka*)and five federally threatened species: northern long-eared bat (*Myotis septentrionalis*); red know (*Calidris canutus rufa*); Dakota skipper (*Hesperia dacotae*); prairie bush clover (*Lespedeza leptostachya*) and western praire fringed orchid (*platanthera praeclara*).[89]

The NHIS database identifies three species of special concern: short-eared owl ((Asio fammeus); Mudwort (Limosella aquatica), and Topeka shiner.[90]

Northern long-eared bat

The northern long-eared bat is listed as a threatened species under the federal Endangered Species Act. Northern long-eared bats have a broad geographic range that encompasses much of the eastern

[87] DNR. *Minnesota County Biological Surveys*, http://www.dnr.state.mn.us/eco/mcbs/index.html
[88] DNR. *Minnesota Natural Heritage Information System Database*, http://www.dnr.state.mn.us/eco/nhnrp/nhis.html
[89] *Amended Site Permit Application*, at pp. 113-116
[90] *Amended Site Permit Application*, at pp. 116-118

and northern portions of the United States, but the species' has declined extensively largely due to white nose syndrome, a fungal disease that has affected several bat populations.

Northern long-eared bats spend winter hibernating in caves and mines (hibernacula). They use areas in various sized caves or mines with constant temperatures, high humidity, and no air currents. During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and dead trees. Males and non-reproductive females may also roost in cooler places, like caves and mines.

Northern long-eared bats migrate regionally between hibernacula and summer habitat. Studies have reported northern long-eared bat migration movements range between 30 to 60 miles. Once northern long-eared bats arrive at summer habitat, forested areas greater than 1,000 feet from contiguous suitable habitat are not commonly utilized. According to the USFWS Resource Equivalency Model, a minimum of 46 acres of forested habitat is required to support a female northern long-eared bat during summer roosting activities.

A review of USFWS records and DNR databases indicated that there are no known northern long-eared bat summer roost trees or hibernaculum within Rock County. The nearest documented northern long-eared bat hibernacula is located are located in LeSueur County, approximately 120 miles northeast of the site.[91]

Prairie bush clover

Prairie bush clover is federally protected under the Endangered Species Act as a threatened species. It is a plant in the pea family and is native to tallgrass prairies of the upper Mississippi River Valley. Prairie bush clover possesses a unique genetic and chemical makeup, different from that of any other species. This genetic information has an unknown potential value. For example, cultivated crops such as wheat and corn have been developed and improved by using wild relatives as breeding stock. Native and imported bush clovers are important fodder in the southern states. Prairie bush clover and round headed bush clover provide the only potential native genetic stock for breeding of cold tolerant bush clovers suitable for the Midwest.

Today, it is only known to occur in less than 100 locations across Iowa, Illinois, Minnesota, and Wisconsin, with the largest population occurring in southwestern Minnesota and northwestern Iowa. In Minnesota, prairie bush clover populations are found in southwestern portion of the state near the Des Moise River Valley.[92]

Red Knot

The red knot (*Calidris canutus rufa*) is a species of shorebird typically found along tidal flats shores of large water bodies during migratory and winter periods.. Red knots breed in the Arctic and are rare within the state of Minnesota. They are most commonly seen near Duluth, Minnesota approximately 300 miles northeast of the Site. In southern Minnesota, although some red knots have been known to

[91] *Amended Site Permit Application*, at pp. 114-115

[92] *Amended Site Permit Application*, at p 116

use sewage treatment plants in the southern portion of the state. In South Dakota, this species is considered uncommon and sporadic, with observations mainly known from LaCreek NWR in southwestern South Dakota and Lake Preston in eastern South Dakota located approximately 60 to 260 miles east of the site. Large lakes with mudflats preferred by the red knot are not present within the site and it is unlikely that the red knot would be found within the site.[93]

Topeka Shiner

The Topeka shiner (*notropis topeka*) is a small minnow found in river systems of the central prairie region of the United States, including Minnesota and South Dakota. The species is typically found in small prairie streams in pools containing clear, clean water (Berg et al. 2004).[94] The Topeka shiner critical habitat final rule was designated by USFWS on July 27, 2004 and encompasses streams within the entirety of the project area. Portions of the Springwater Creek, Beaver Creek, Little Beaver Creek, and Mud Creek lying within and adjacent to the site have been designated as critical habitat for the Topeka Shiner. Walleye Wind has sited turbines and access roads to avoid stream crossings and collection lines will be bored under streams to avoid direct impact to Topeka shiner. There is a potential for temporary impacts from crane walks and collection line installation.[95]

Dakota Skipper

The Dakota skipper is a federally listed threatened species and state-listed endangered species in Minnesota. The Dakota skipper prefers native drier prairie, where medium grasses are a major element of the vegetation. Final critical habitat was designated by USFWS for the Dakota skipper on October 1, 2015, including about 19,900 acres in Minnesota, North Dakota, and South Dakota. Designated critical habitat unit for the Dakota skipper is not located within or near the site; the closest designated critical habitat is located near Holland, Minnesota in Pipestone County, approximately 23 miles north of the site. Surveys conducted in 2019 and 2020 indicate that the grassland habitat within the site is mostly grazed and unsuitable habitat for the Dakota skipper.[96]

Western Prairie Fringed Orchid

The western prairie fringed orchid is a federally listed threatened and state-listed endangered species in Minnesota. Western prairie fringed orchids are very local in their distribution and are largely restricted to remnant native prairies or sedge meadows as well as along old fields and unmowed roadside ditches. These sites typically occur in full sunlight on moist till or sandy soils. There are very few remaining suitable sites for this orchid within its range as this species is excluded by cattle grazing and limited by mowing for wild hay. However, populations of prairie fringed orchids are known

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[93] *Amended Site Permit Application*, at p. 115, p. 122

[94] USFWS *Topeka Shiner (Notropis topeka)* https://www.fws.gov/midwest/endangered/fishes/topekashiner/index.html ; USFWS Questions about the Topeka Shiner in Minnesota https://www.fws.gov/midwest/endangered/fishes/topekashiner/index.html

[95] *Amended Site Permit Application*, at p. 115

[96] *Amended Site Permit Application*, at p.115, 122

to occur in Rock County and adjoining counties. Suitable habitat for the species is likely limited to small areas with WMAs and prairie remnants along railroad rights-of-way.[97]

Blanding's Turtle

Blanding's turtle (*Emydoidea blandingii*) is listed as a Minnesota threatened species. The turtle needs both wetland and upland habitat to complete its life cycle. There are no NHIS records of Blanding's turtles within or adjacent to the site, however the DNR has indicated there are reports of the turtles moving into many of the same creeks as the Topeka shiner.[98]

MBS Sites

The Minnesota Biological Survey (MBS) is an ongoing effort by the DNR to systematically collect, interpret, and monitor data on plant and animal distribution, native plant communities, and ecosystems. At the conclusion of the survey work in a geographic region, ecologists assign a biodiversity significance rank to each survey site. These ranks are used to communicate the statewide native biological diversity significance of each site to natural resource professionals, state and local government officials, and the public, and to help prioritize and guide conservation and management of these important resources. A site's biodiversity significance rank is based on the presence of rare species populations, the size and condition of native plant communities within the site, and the landscape context of the site (for example, whether the site is isolated in a landscape dominated by cropland or developed land, or whether it is connected or close to other areas with intact native plant communities). The MBS uses four classifications denoting the level of biological diversity to rank sites:[99]

- Below. Sites lack occurrences of rare species and natural features or do not meet MBS standards for outstanding, high, or moderate rank. These sites may 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.
- Moderate. Sites contain occurrences of rare species, moderately disturbed native plant communities, and/or landscapes that have strong potential for recovery of native plant communities and characteristic ecological processes.
- High. Sites contain very good quality occurrences of the rarest species, high-quality examples of rare native plant communities, and/or important functional landscapes.
- Outstanding. Sites contain the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most ecologically intact

[97] Amended Site Permit Application, at p. 116, 123. DNR Western Prairie Fringed Orchid (*Platanthera praeclara*) in Minnesota https://www.dnr.state.mn.us/wildflowers/western_prairie_fringed_orchid.html
[98] DNR Comment Letter, January 26, 2021. eDocket ID: 20211-170291-01
[99] DNR, *Minnesota Biological Survey*, MBS Site Biodiversity Significance Ranks, https://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html.

or functional landscapes.

The MBS identifies 27 Sites of Biodiversity Significance that are located completely within or partially within the site (**Appendix C**, Maps 2 and 7). Of the MBS-ranked sites, 24 sites (totaling 1,156 acres) have a "below" ranking, and three sites (totaling 296 acres) are ranked as "moderate." None of the MBS Sites of Biodiversity Significance have a "high" or "outstanding" ranking.[100]

The DNR also applies a conservation status rank to native plant communities that reflects their relative rarity and endangerment in Minnesota and globally. A native plant community is a group of native plants that interact with each other and with their environment in ways not greatly altered by modern human activity or by introduced organisms. These groups of native plant species form recognizable units, such as oak savannas, pine forests, or marshes, that tend to repeat over space and time. Native plant communities are classified and described by considering vegetation, hydrology, landforms, soils, and natural disturbance regimes.[101]

There are many kinds of vegetated areas that are not native plant communities. These include places where native species have largely been replaced by exotic or invasive species such as smooth brome grass, buckthorn, and purple loosestrife, and planted areas such as orchards, pine plantations, golf courses, and lawns. Other areas not considered to be native plant communities include areas where modern human activities such as farming, overgrazing, non-sustainable logging, and development have destroyed or greatly altered the vegetation.

DNR Natural Heritage Information System (NHIS) identifies approximately 1.4 acres of Dry Hill Prairie (Southern) (UPs13d) along E County Road 4 near Beaver Creek in southern portions of the Site. DNR has assigned a moderate biodiversity rank to the Dry Hill Prairie Site. Like other upland prairie communities, dry hill prairie communities are typically dominated by grass species such as little bluestem (*Schizachyrium scoparium*), often accompanied by other midheight grasses such as side-oats grama (*Bouteloua curtipendula*) and prairie dropseed (*Sporobolus heterolepis*). Forb cover is somewhat richer within the dry hill prairie communities than upland prairies generally, with heart-leaved alexanders (*Zizia aptera*), alumroot (Heuchera richardsonii), northern bedstraw (Galium boreale), white aster-like goldenrod (Solidago ptarmicoides), prairie phlox (Phlox pilosa), and silverleaf scurfpea

In addition to the Dry Hill Prairie within the site, a Seepage Meadow/Carr Sedge Subtype community (WMs83a1) is identified within the Springwater WMA, which abuts the northern boundary of the Site.

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm sited elsewhere in Minnesota could have potentially very different unique and rare natural resources depending on location. Mitigation techniques would be site specific and would likely include avoidance as the primary mitigation technique.

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[100] *Amended Site Permit Application*, at pp. 95-96.

[101] DNR, *Native Plant Community Classification*, https://www.dnr.state.mn.us/npc/classification.html.

109.2 MW Solar Farm

As with wind farms, impacts to rare and unique natural resources from solar farm development depends upon site-specific characteristics.

Mitigation

The preferred mitigation measures are to avoid known areas of rare and unique plant or animal communities. The following generic measures would help prevent potential impacts to rare and unique natural resources in both wind farm and solar farm sites.

- Conduct a pre-construction inventory of existing biological resources (including existing WMAs, WPAs, WIAs, other recreation areas, native prairie, native plant communities, and forests) in the proposed project area to inform micro-siting;
- Avoid or minimize disturbance of individual wetlands or drainage systems during construction; and
- Avoid or minimize placement of the project's components in high quality native prairie and MBS "Sites of Biodiversity Significance" ranked as "Outstanding," "High" or "Medium."
- In addition to the mitigation measures to minimize impacts to wildlife outlined in Section 6.4.2, Walleye Wind has committed to the following mitigation measures intended to minimize impacts to rare and unique natural resources.[102]
- Walleye Wind will prepare a prairie protection and management plan in coordination with the DNR
- Avoid and minimize siting turbines in mapped native prairie, native plant communities, and MBS sites of biodiversity significance ranked moderate, high or outstanding
- Walleye Wind and its contractors will employ BMP measures near streams to minimize potential impacts to Topeka shiner
- Tree removal will be limited. If tree removal is unavoidable, it will be conducted in accordance with USFWS guidance to avoid impacts to listed bat species.
- Control the introduction of invasive species, as designated by the Minnesota Department of Agriculture through the implementation of BMPs:
    - These BMPs include limiting invasive species spread *via* maintenance equipment and vehicles *via* early detection of invasive species;
    - Cleaning mowers and bladed equipment;
    - Minimizing disturbance to native areas;
    - Limiting traffic through weed-infested areas;
    - Frequently inspecting equipment storage areas for weeds; and

[102] *Amended Site Permit Application*, at pp. 121-126

  - In the event that invasive weeds are detected in areas where Project disturbance occurs, control through properly timing, cutting and using targeted herbicide consistent with the herbicide BMPs published by the MnDOT and Minnesota Department of Agriculture.

- All turbines are sited at least 1.6 miles from known bald eagle nests

6.5 Human and Social Environment

Large energy projects have the potential for effects real or perceived on a local area, including impacts to human, community, and social environments. The human setting into which the Project is being proposed is rural and predominately agricultural. From a larger landscape perspective there are already commercial wind turbines operating to the north and south of the site, and development of the Project will require removal of seven MinWind turbines.

6.5.1 Demographics

Broadly defined, demography is the study of the characteristics of populations through statistical data. It provides a description of a population and how those characteristics change over time. Where there are foreseeable impacts, the incorporation of demographic data into environmental review may be useful in the evaluation of these potential impacts to the host community. These impacts may be beneficial or adverse. The discussion should address whether any social group is disproportionally impacted and identify possible mitigation measures to avoid or minimize any adverse impacts.

Walleye Wind Project

The wind farm site is located in a rural agricultural region of Rock County in southwestern Minnesota. While the population of Minnesota grew by approximately 7.1 percent, Rock County has lost approximately 3.4 percent of its population between 2010 and 2019. The townships where the site is located have also lost population (Table 13).

Table 13. 2019 Population and Economic Characteristics[103]

Characteristic	Minnesota	Rock County	City of Beaver Creek	Townships			
				Martin	Luverne	Beaver Creek	Springwater
Population							
2010 Population	5,303,925	9,687	297	382	479	386	252
2019 Population	5,680,337	9359	280	360	453	364	240
% Change	7.1%	-3.4%	-5.7%	-5.8%	-5.4%	-6.0%	-4.8%
Population Demographics							
White	82.1%	96.4%	92.3	95.7	99.8	89.8	100
Black or African American	6.6%	0.9%	6.7	3.0	-	2.5	-
American Indian or Alaska Native	1.0%	0.3%	-	-	-	-	-
Asian or Pacific Islander	5.1%	1.1%	-	1.4	0.2	0.7	-
Some Other Race	1.9%	0.2%	-	-	-	0.9	-
Two or More Races	3.3%	1.0%	1.0	-	-	6.1	-
Economic Characteristics							
Median Household Income	$74,593	$63,005	$67,813	$81,429	$86,607	$63,542	$88,125
Poverty Rate	9.0%	9.0%	1.9%	2.4%	0.0%	16.6%	6.8%

Generic 109.2 MW Wind Farm

The potential impacts on the host community of a generic 109.2 MW wind farm, located elsewhere in Minnesota, is dependent on the social and economic characteristics that make up the specific population. It is anticipated, given the set-back requirements for wind farms, that a wind farm of similar capacity would have similar land requirements as the Project. This large, unobstructed land requirement dictates a rural, agricultural setting, similar to the location of the Project.

109.2 MW Solar Farm

As with a wind farm, impacts on the host community of a 109.2 MW solar farm would be dependent on the social and economic characteristics of the local population and surrounding area.

[103] Minnesota State Demographic Center. *Our Estimates* https://mn.gov/admin/demography/data-by-topic/population-data/our-estimates (population estimates); US Census Bureau. *2019 American Community Survey 5-year Estimates*. https://www.census.gov/programs-surveys/acs/ (demographic data)

Mitigation

No mitigation measures are proposed for the Project; the Project is compatible with current land uses and the socioeconomic impacts associated with the Project are generally expected to be positive.

6.5.2 Environmental Justice

Environmental justice is the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to environmental law and policies. Environmental justice is intended to ensure that all people benefit from equal levels of environmental protection and have the same opportunities to participate in decisions that may affect their environment or health. Environmental justice concerns are raised when a proposed project differentially impacts specific communities, e.g., placing a project that releases pollutants in a low-income neighborhood.

Walleye Wind Project

There is no indication that any minority or low-income population is concentrated in any one area of the wind farm, or that the wind turbines will be placed in an area occupied primarily by any minority population. As shown in Table 9, the project area is less diverse than Minnesota as a whole. Rock County, as well as the townships hosting the Project, has more residents identifying as "white" than Minnesota as a whole. Rock County median household incomes are slightly lower than in the state of Minnesota, but several of the townships hosting the Project have higher median incomes. Negative differential impacts to communities in the project area are not anticipated as a result of the Project.

In addition to the existing demographic and economic character of the area surrounding the Project, the construction and operation of the Project also has the potential to impact resources that have importance to American Indian Tribes with ties to the region. Resources of traditional cultural value to American Indian Tribes associated with this area are not well defined in available literature. Siting of large energy facilities in a manner that respects historic and cultural ties to the land requires coordination with tribes.

Walleye Wind conducted tribal outreach by providing detailed Project information to various American Indian Tribes with ancestral ties to the area. Walleye Wind contacted American Indian Tribes with expected ancestral ties to the project area and received responses from 13 tribes. Tribes were invited to participate in micrositing and subsequent archaeological surveys to identify sites of cultural and religious significance to be avoided during design of the Project. Participating tribes included the Yankton Sioux, Sisseton Wahpeton Oyate, Rosebud Sioux, Lower Sioux, and Cheyenne River Sioux.[104]

Blue Mounds State Park is located approximately four miles northeast of the site. The park is in an area that has importance to American Indian Tribes with ties to the region. The nearest of the Project's proposed turbines is approximately 6.7-miles southwest of Blue Mounds State Park. Several of the Prairie Rose I turbines are visible from northern portions of the park, the nearest is located approximately 3.7-miles northwest of the park. While these turbines are visible from portions of Blue

[104] *Amended Site Permit Application*, at p. 61

Mounds State Park, the rolling topography of the region and wooded areas within the park obscure the turbines in other portions of the park. There are other visual intrusions in the area as well, including a water tower just west of the park. Tribal respondents did not identify concern with contemporary resources in proximity to the Project location.[105]

Generic 109 MW LWECS

Environmental justice impacts for a generic 109 MW LWECS would depend on the location of the project. As most LWECS in Minnesota have, to date, been located in rural, agricultural communities, environmental justice impacts are anticipated to be similar to those of the Project. Impacts to resources important to American Indian Tribes will vary by location.

109.2 MW Solar Farm

Environmental justice impacts for a 109 MW solar farm would depend on the location of the project. As most solar farms in Minnesota have, to date, been sited in rural, agricultural communities, environmental justice impacts are anticipated to be similar to those of the Project. Impacts to resources important to American Indian Tribes will vary by location.

6.5.3 Local Economy

Utility scale wind development provides economic benefits to the local economy through economic activity during the construction phase, and in the operating phase local tax revenues and permanent operations personnel (the number of permanent operations personnel is a fraction of the temporary construction personnel).

Because utility scale wind developments are usually located in rural areas, they can provide noticeable economic impacts on the smaller, rural communities that host them. At the local level, wind energy projects provide short-term construction wages to workers and increased spending in the local economy for food, lodging, fuel, and incidental expenditures. Over the long-term, the project owner pays production tax revenues to local government and lease payments to landowners during the length of a project's operation. The project also provides long-term jobs for a small number of permanent operation and maintenance workers.

The local economic benefit of construction-period wages is difficult to quantify, and the conclusions drawn can vary depending on the assumptions made to conduct the economic model. Site-specific variables are also relevant, including the availability of local labor and the extent to which the construction contractor recruits and hires the local labor that is available.

This section provides an overview of the regional economy based on available data, a summary of several potentially relevant studies that examine the economic impacts of energy projects on local economies, including the impact of the local and non-local labor, and a discussion of the potential short-term and long-term economic impacts of the Project.

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[105] *Amended Site Permit Application*, at p. 43

Labor Impacts and Regional Economies

Wind Farm Construction Labor

Construction of the Project will require different types of skilled and non-skilled construction workers. In 2010, the US Bureau of Labor and Statistics profiled careers in the wind energy industry. The profiles include job types, education and training requirements, and wages. Typical types of labor for construction of wind farms includes construction laborers, equipment operators and electricians. Education for these jobs can be a combination of on-the-job training, certifications, apprenticeships, and post-secondary education.[106] Types of construction jobs, median wages, and training are included in Table 14.

Table 14: General Types of Labor, Wages, and Education[107]

Labor Type/Occupation	National Median Annual Wage	MN Prevailing Wage	Education and Training
Construction Laborers	$29.1	25.74	On the job training and apprenticeships
Operating Engineers and other construction equipment operators	$39,530	$36.34	On-the-job training, apprenticeships, union instruction
Crane and Tower Operators	$47,109.2	Not specified	On-the-job training, apprenticeships, union instruction
Electricians	$49,800	$35.61	Apprenticeship programs that combine on-the-job training with related classroom instruction
Project Managers	$82,000-$100,000+	Not specified	Direct experience, undergraduate degree in related field, business degree

Impact of Wind Farms on Local Economies

Several case studies have examined the economic impact of utility-scale wind power development on local economies.[108] These studies have used a variety of methodologies (modeling, observation, post-construction data). The research on the impacts of wind farms on local economies is evolving, but

[106] Hamilton, James, Liming, Drew. 2010. *Careers in Green Energy*. US Bureau of Labor and Statistics. https://www.bls.gov/green/wind_energy/wind_energy.pdf

[107] Hamilton, James, Liming, Drew. 2010. *Careers in Green Energy*. US Bureau of Labor and Statistics. https://www.bls.gov/green/wind_energy/wind_energy.pdf (National Median Wages); Hatt, Katie; Franco, Lucas. *Catching the Wind: The impact of Local vs. Non-Local Hiring Practices in Construction of Minnesota Wind Farms.* North Star Policy Institute. 2018. http://northstarpolicy.org/wp-content/uploads/2018/06/Catching-the-Wind-North-Star.pdf

[108] See references section for full citations on Brown et al (2011), Slattery et al (2011), Constani (2004), Lantz (2009), Hatt and Franco, 2018, Kildegaard (2013)

based on the studies to date, several key factors appear to influence the overall impact a project has on the local economy:

- the remoteness of a project and its proximity to population centers
- the ownership structure of the project (locally developed and owned, compared to non-local or "absentee" ownership)
- access to a skilled labor pool

Local economies that are “well-linked” are those that are nearer other communities, more diversified in terms of types of businesses, and tend to be more stable.[109] As a result, they also tend to have access to a larger, more diverse labor pool. This was also evident in a case study from Texas, which found that in areas where nearby businesses and services are lacking, there is "leakage" outside the project area to areas where those services can be acquired.[110] The same study did find overall economic benefits to rural communities because of utility scale wind development.

Most of these studies use standardized input/output models such as IMPLAN or NREL’s wind-project specific JEDI model to estimate local economic impacts. All models have limitations, however, based on one comparison study, these economic models do appear to provide a reasonable estimate of real world impacts. The study Ex *Post Analysis of Economic Impacts from Wind Power Development in U.S. Counties* compared data from a range of constructed wind projects to modeling results and found that the results were similar to those of the common input/output models when using default assumptions and developer projections. Given the similarities between post construction data and modeled projections, the common input/output models such as IMPLAN and JEDI appear to provide reasonable projections regarding the economic impacts of a project.

Construction Period Impacts

Depending on the size of the development and the duration of construction activities, the total number of jobs created varies. A recent study in Minnesota, compared Jedi model predictions and developer projections to determine the number of construction workers hired. The study found an average of between 150 and 200 construction workers for Minnesota wind projects during the approximately six month construction period. The study estimates that a generic 150-megawatt project in Minnesota would provide about $12 million in local wages in benefits—about $60,000 per worker.[111]

When local economies are well linked and diversified, there is a greater likelihood that a local labor pool is present. Generally the more that a contractor uses local labor to construct the project, the greater the local economic impact for the community because a greater proportion of money earned is circulated back into the local economy. In areas where the local economy is not as well developed or

[109] Constani, 2004.

[110] Slattery et al., 2011.

[111] Hatt, Katie; Franco, Lucas. *Catching the Wind: The impact of Local vs. Non-Local Hiring Practices in Construction of Minnesota Wind Farms.* North Star Policy Institute. at pp. 9 -10

linked, outside inputs are necessary, and the economic benefits "leak" to areas that can provide the necessary labor, goods, and services. However, to hire local labor, not only must the right labor pool exist in the project area, but it must be available. Estimating the economic benefit of local labor to the local community would require detailed cost information from the construction contractor by cost category, the availability of local skilled and non-skilled labor, and information about the capacity of local restaurants, hotels, and other local businesses to accommodate non-local labor spending.

Educational and training opportunities for those seeking careers in wind energy and other trades are offered through Minnesota State Colleges and Universities, the North American Building Trades Union, and local unions. These programs train the next generation of tradespeople in energy and other fields including: energy technologies and natural resources, architecture and construction, and various certification programs.[112]

Operation and Maintenance Impacts

Lease payments to landowners and energy production taxes to local units of government where wind projects are located provide additional benefits from wind development. Landowners negotiate leases with project developers for the life of a project. Assuming the landowner lives in the project area, lease payments provide a direct benefit to the local economy.

In addition, in Minnesota, local units of government receive an energy production tax of $1.20 per megawatt hour (Mwh) from operating wind projects.[113] In addition to tax revenue, project owners pay annual lease payments to landowners. These payments can have a significant impact on rural economies during the life of the project.

Statewide, wind projects generate approximately $15.5 million in annual state and local tax payments and approximately $10 - $15 million in annual lease payments.[114]

Walleye Wind Project

According to the DEED 2018 estimates, health care, and social assistance accounted for 25.8 percent of jobs in Rock County, followed by retail trade at 11.6 percent, and finance and insurance at 9.4 percent. Construction and extraction accounted for about 4.3 percent of jobs in 2019.[115]

More than a quarter of Rock County workers, 27.2 percent, report working out of state. For comparison, approximately 2.5 workers in Minnesota as a whole report working out of state.[116] While

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[112] Minnesota State Colleges and Universities (https://www.minnstate.edu/campusesprograms/index.html) and the North American Building Trades Union (https://nabtu.org/school-resources/).

[113] Minnesota Department of Revenue: Wind Energy Production Tax *https://www.revenue.state.mn.us/wind-energy-production-tax* . The tax rate varies by the size of the project's nameplate capacity, $1.20 per mwh is the rate for projects with a nameplate capacity of 12 MW or greater.

[114] Hatt, Katie; Franco, Lucas. *Catching the Wind: The impact of Local vs. Non-Local Hiring Practices in Construction of Minnesota Wind Farms* at pp. 9 10

[115] DEED 2020. *County Profile: Rock County* https://mn.gov/deed/assets/100920_rockco_tcm1045-407671.pdf .

[116] DEED. 2020. County Profile: Rock County *https://mn.gov/deed/assets/100920_rockco_tcm1045-407671.pdf*

Rock County borders both South Dakota and Iowa, Sioux Falls, South Dakota, located less than 30 minutes west of Beaver Creek, is the major economic center in the area.

During construction, the Project will require approximately 150- 185 temporary construction workers over a construction period spanning five to seven months. Table 15 summarizes the approximate breakout of labor by type at the peak of construction:[117]

Table 15 Estimated Construction Job Breakdown[118]

Labor Type	Approximate Head Count		Anticipated Local and Non-Local Breakdown	
	Average	Peak	Non-Local	Local
Laborers	50-60	65	50%	50%
Equipment Operators	30-35	41	20%	80%
Crane Operators	5-10	12	20%	80%
Electricians	40-50	52	25%	75%
Supervision/Management	25-30	30	80%	20%

The total projected construction cost is approximately $150 million.[119] Walleye Wind estimates approximately 12% of the construction cost($15-$19 million) will be for labor, 75% ($105-$110 million) for material, 5% for permitting ($5-$10 million), 3% for land acquisition ($4 -$5 million), and 4% ($5 - $8 million) to connect the Project to the grid. [120]

The median hourly wages shown in Table 14, are greater than the median wage of $17.91 in southwestern Minnesota and the Twin Cities ($23.30). At the higher end of the wage scale, the median hourly income is on par with occupations requiring technical skills and advanced degrees in the region.[121]

While some of these workers will be from the local area (within 150 miles), some portion is likely to be from outside the region and will only remain in the project area over the duration of construction (approximately 5-7 months). It is anticipated that most of the wages earned by local workers will circulate through the local economy. Non-local workers will also inject money into the local economy for food, lodging, fuel, and incidental expenditures. Local contractors and suppliers will be used for portions of the construction. Additional income will be generated for the county and state economy through the circulation and recirculation of dollars paid out by the developer for business

[117] *Amended Site Permit Application*, at pp. 80-81

[118] Adapted from *Amended Site Permit Application,* Table 32, at p. 81. Walleye Wind describes local workers as resident of Minnesota, or within 150 miles of the Minnesota border

[119] *Amended Site Permit Application*, at p. 139

[120] Response to Data Request 7b (**Appendix E**)

[121] Minnesota DEED. Economic Development Region 8 (Southwest): 2020 Regional Profile. *https://mn.gov/deed/assets/rp_edr8_2020_tcm1045-133260.pdf*

expenditures and for state and local taxes. Payments for equipment, fuel, operating supplies, and other products and services benefit local and regional businesses.

Once operational, the wind farm will need approximately four (4) permanent operations and maintenance staff.[122]

During operations Walleye Wind will make lease payments to local landowners as well as production tax payments to local government. Each turbine requires approximately one acre of land for the turbine foundation and access road. Annual lease payments compensate for potential financial losses due to small of land being removed from agricultural production and the inconvenience of farming around the new obstacles in the farm fields. In addition to land leases, Walleye Wind will also acquire wind easements to meet setback requirements.

The energy production tax payment is $1.20 per MWh of electricity produced. Based on the projected average annual output of approximately 432,000 MWh,[123] the annual wind energy production tax payment is estimated to be approximately $518,000.

Generic 109.2 MW Wind Farm

The economic benefits of a generic 109.2 MW wind farm would be similar to those of the Project.

109.2 MW Solar Farm

During construction, a 109.2 MW Solar Farm would be expected to have similar socioeconomic impacts to that of a generic wind farm due to the influx of wages and expenditures made at local businesses during the construction and increased tax revenue for the life of the project.

For example, the North Star Solar Project developer anticipated that approximately 250-300 jobs would be directly created during the construction phase of the project, and once operational, would require up to 12 permanent employees.[124]

The solar farm would also pay property taxes and production taxes. Solar projects, like large wind projects, pay production tax of $1.20 per MWh. Solar farms are expected to have a lower capacity factor than wind farms. Based on the North Star Solar Project's estimated annual electricity production of approximately 200,000 MWh, a similarly sized project would produce approximately $240,000 annually in production tax revenues for local governments.[125]

6.5.4 Agriculture

Large generation facilities in agricultural areas will have impacts on cropland and potentially on livestock operations.

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[122] *Amended Site Permit Application*, at pp. 80-81
[123] *Amended Site Permit Application*, at p. 139
[124] North Star Solar EA
[125] North Star Solar EA

6.5.4.1 Cropland

Wind farms placed in cultivated areas do take a limited amount of acreage out of production for turbine placement as well as associated facilities such as access roads, substations. And O&M facilities. However, agricultural cropping and "wind farming" are generally compatible uses.

Walleye Wind Project

Land use within the site is primarily agricultural and is the use that accounts for approximately 27,000 acres, or approximately 87 percent of the site (**Table 9**). Additionally, approximately 2,200 acres (seven percent of land) is indicated as hay/pasture/herbaceous land cover, much of which is used for livestock grazing.

According to the 2017 USDA Agricultural Census Report, over 80 percent of the land in Rock County was used for agriculture on approximately 621 farms. Corn, soybeans, and forage are the primary crops grown in terms of acreage. Rock county is ranked first in the market value of cattle in Minnesota and also has a large swine production. The market value of agricultural products sold in the county for 2017 was approximately $419.1 million, with crop markets at approximately $143.2 million and livestock markets at approximately $275.9 million.[126]

The Project is in an area of rich agricultural soils. Approximately 50 percent of the total site is classified as prime farmland, while approximately 15 percent is classified as prime farmland, if drained, and approximately 23 percent is considered farmland of statewide importance Approximately seven percent of land within the Project Area is not prime farmland and.[127]

The Project is not expected to significantly impact agricultural land use or the general character of the area. While approximately one acre of land per turbine will be taken out of agricultural production for the life of the Project to accommodate the turbine pad, access roads, Walleye Wind Substation, O&M facility, and ancillary facilities, landowners may continue to plant crops near, and graze livestock up to the gravel roadway around each turbine pad.

This estimate is based on an 80-foot diameter area of permanent impact at each turbine location (including the concrete foundation and gravel ring around the foundation), 16-foot wide permanent access roads, approximately two acres for the O&M facility, and one acre for the substation. The primary permanent impact to active agricultural land will be the reduction of crop production on a total of approximately 42 acres of cultivated crop land. Collector lines will not result in permanent impacts as they will be installed entirely underground below the plow zone. Large-scale impacts to agriculture or agricultural lands are not anticipated with the placement of turbines, access roads, and ancillary facilities in agricultural fields.

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[126] United States Department of Agriculture (USDA). *2017 Census of Agriculture: Rock County, Minnesota* https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Minnesota/cp27133.pdf

[127] *Amended Site Permit Application*, at p. 74

Generic 109.2 MW Wind Farm

Impacts to farming at a generic 109.2 MW wind farm would be similar to those of the Project if placed in a predominantly agricultural area.

109.2 MW Solar Farm

Ground-mounted PV solar farms require approximately 7 to 10 acres per MW; the North Star 100 MW solar farm project occupies approximately 800 acres, of which approximately 109.2 acres required grading (i.e., cut and fill).[128] Given the larger footprint required for solar farms, it would be expected that the impacts to croplands would be significantly greater, in the neighborhood of 760 to 1,100 acres, than a wind farm with an equivalent nameplate capacity (approximately 42.7 acres in the case of the Project) .

Mitigation

Farming activities will continue on the land surrounding turbines and access roads. Although impacts to drain tile from construction of the Project are not anticipated, any damages sustained as a result of construction would be repaired according to agreement with the landowner. Areas temporarily removed from agricultural crops production during construction will be restored back to farmable conditions after construction is complete. Additionally, landowners will be reimbursed, by the project developer for any crop damages and losses that occur during construction or maintenance activities during operation.

6.5.4.2 Livestock

Large electric generation facilities have the potential to impact domesticated animals and livestock indirectly through environmental impacts.

Livestock health depends on ecosystem health (clean water, fresh air, healthy soils and crops). Generation facilities that impair ecosystem functions can also negatively impact livestock health, such as through emissions of hazardous air pollutants or through the contamination of water systems. Potential ecosystem impacts due to generation facilities are discussed elsewhere in this report.

Other potential impacts to livestock health include annoyance or stress. Stress may result from a variety of impacts related to generation facility operations, such as lights, noise, and stray voltage.

The primary concern with stray voltage has been its potential effect on farm animals that are confined in areas where electrical distribution systems supply the farm. A great deal of research on the effects of stray voltage (neutral to earth voltage) on dairy cows has been conducted over the past 40 years.[129]

With respect to agriculture, stray voltage is defined by the U.S. Department of Agriculture (USDA) as a small voltage (less than 10 volts) measured between two points that can be contacted simultaneously

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[128] North Star Solar EA

[129] Reinemann, Douglas. *Literature Review and Synthesis of Research Findings on the Impact of Stray Voltage on Farm Operations. Ontario Energy Board. 2*008 https://www.oeb.ca/oeb/_Documents/EB-2007-0709/report_Reinemann_20080530.pdf

by an animal.[130] For example, this effect is experienced when livestock come into contact with two metal objects between which a voltage exists, such as feeders, water troughs, or stalls, thereby causing a small current to flow through the livestock. The fact that both objects are grounded to the same place (earth) would seem to prevent any voltage from existing between the objects. However, this is not the case—a number of factors determine whether an object is, in fact, grounded. Factors that could influence the intensity of stray voltage include wire size and length, the quality of connections, the number and resistance of ground rods, and the current being grounded.

The direct effect of animal contact with electrical voltage can range from mild behavioral reactions indicative of sensation, to involuntary muscle contraction (or twitching), to behavioral responses indicative of pain. The indirect effects of these behaviors can vary considerably depending on the specifics of the contact location, level of current flow, body pathway, frequency of occurrence, and other factors related to the daily activities of the animals. Common situations of concern in animal environments include the following:

- Animals avoiding certain exposure locations that may result in reduced water or feed intake if painful exposure occurs while accessing watering or feeding devices or locations.
- Difficulty of moving or handling animals in areas of annoying voltage/current exposure.
- Release of stress hormones produced by contact with painful stimuli.

Studies have been conducted to investigate the potential direct physiological effects that may produce behavioral changes. Research has also been conducted to describe the potential effects that may result from the animal's exposure to voltages less than those which produce sensation and behavioral responses. A literature review and synthesis of research findings on the impact of stray voltage on farm operations. Through different controlled and field experiments, these studies have found that sensitive dairy cows may experience mild behavioral modifications at current levels exceeding 2 milliamps and voltages exceeding 1 to 2 volts.[131]

Walleye Wind Project

Livestock in and adjacent to the site would be exposed to noise and shadow flicker created by wind turbines. Exposure levels would depend on factors such as grazing, housing, and the distance between livestock and the turbines. Health impacts from turbine noise and shadow flicker are uncertain. Information about impacts to livestock is anecdotal and indicates that livestock are not impacted by turbine operations. Animals do graze near, under and up to turbine towers.

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[130] Wisconsin Public Service. *Answers to Your Stray Voltage Questions: Backed by Research*. 2011. http://www.wisconsinpublicservice.com/business/pdf/farm_voltage.pdf

[131] Reinemann, Douglas. *Literature Review and Synthesis of Research Findings on the Impact of Stray Voltage on Farm Operations. Ontario Energy Board. 2*008 https://www.oeb.ca/oeb/_Documents/EB-2007-0709/report_Reinemann_20080530.pdf.

The MPCA is the state agency charged with regulating animal feedlots in Minnesota. Based on a review of MPCA records, 91 of the 209 registered feedlots in Rock County are located within the site.[132]

The electrical collection system proposed for the Project is designed to be a separately derived system as defined in the NESC. The system would have no direct electrical connection (including grounded circuit conductors) to conductors originating in another system. The wind farm collection system would have its own substation and transformers.[133]

Potential impacts to livestock can arise during construction, or during O&M activities. Gates restricting livestock can inadvertently be left open, and livestock fences can be damaged. Cattle can be at risk of walking on to a public roadway and being struck by a vehicle if gates are left open or fences are damaged.

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm located elsewhere in Minnesota would have impacts to livestock similar to the Project.

109.2 MW Solar Farm

While offering some siting and design challenges, solar farms can be compatible with livestock operations. Cattle and other large livestock would require physical barriers to separate the livestock from the solar farm arrays; the panels are fixed relatively low to the ground, so cattle cannot graze beneath them. Sheep have been used to manage vegetation at some solar facilities in Minnesota.

Mitigation

Mitigation of potential stray voltage impacts would include that all safety requirements are met during the construction and operation of the Project. There are a number of strategies for mitigating stray voltage, including improved grounding.[134]Good electrical connections and choosing proper wiring materials for wet and corrosive locations will improve grounding and reduce stray voltage levels.

The Draft Site Permit (**Appendix B**) has specific conditions requiring the protection of livestock during all phases of the proposed Project, and also requires the immediate repair of any fences or gates damaged during Project construction or O&M activities

6.5.5 Aesthetic Impact and Visibility Impairment

Large energy projects can pose an impact aesthetically or on visual resources. Aesthetic, or visual resources, are generally defined as the natural and built features of a landscape that may be viewed by the public and contribute to the visual quality and character of an area. Aesthetic resources form the overall impression that an observer has of an area or its landscape character. Distinctive

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[132] *Amended Site Permit Application*, at pp. 74-75

[133] *Amended Site Permit*, at p 70

[134] Wisconsin Public Service. *Answers to Your Stray Voltage Questions: Backed by Research*. 2011. http://www.wisconsinpublicservice.com/business/pdf/farm_voltage.pdf

landforms, water bodies, vegetation, and human-made features that contribute to an area's aesthetic qualities are elements that contribute to an area's visual character. Visual quality is generally defined as the visual significance or appeal of a landscape based on cultural values and the landscape's intrinsic physical elements.

Visual sensitivity is a measure of viewer interest and concern for the visual quality of the landscape and potential changes to it, which is determined based on a combination of viewer sensitivity and viewer exposure. Viewer sensitivity varies for individuals and groups depending on the activities viewers are engaged in, their values and expectations related to the appearance and character of the landscape, and their potential level of concern for changes to the landscape. High viewer sensitivity is typically assigned to viewer groups engaged in: recreational or leisure activities; traveling on scenic routes for pleasure or to and from recreational or scenic areas; experiencing or traveling to or from protected, natural, cultural, or historic areas; or experiencing views from resort areas or their residences. Low viewer sensitivity is typically assigned to viewer groups engaged in work activities or commuting to or from work.

Viewer exposure varies for any particular view location or travel route depending on the number of viewers and the frequency and duration of their views. Viewer exposure would typically be highest for views experienced by high numbers of people, frequently, and for long periods. Other factors, such as viewing angle and viewer position relative to a feature or area, can also be contributing factors to viewer exposure.

Potential visual impacts from shadow flicker and Project lighting are discussed in **Sections 6.5.6 and 6.5.7**.

Walleye Wind Project

The wind farm would alter the current landscape through the introduction of large wind turbines and, to a lesser extent, the Walleye Wind Substation and O&M facility. Many factors influence how a wind energy facility is perceived. Factors may include levels of visual sensitivity of individuals, viewing conditions, visual settings, and individual ideas and experiences. Distance from a turbine(s) and activities within and near the project area, landscape features such as hills and tree cover, as well an individual's personal feelings about wind energy technology can all contribute to how a wind energy facility is perceived. The wind farm would be located in a predominantly rural, agricultural area characterized by flat to gently undulating topography.

Developing a method to assess the impacts to aesthetics of wind projects is difficult. Current methods of assessing visual impacts include viewshed mapping, photographic simulations, and video animation. All of these methods depend, to some extent, on assessing the current aesthetic resources of the project area, i.e., the aesthetics of the area before construction of a wind farm. Such assessments can be subjective; however, state and federal agencies often perform such assessments in the development of parks that have valuable aesthetic resources.

Three commercial wind farms (Prairie Rose Wind Farm, MinWind I, and MinWind II) (**Appendix C,** Map 1) are located and currently operating within ten miles of the site and contain turbines of various heights and rotor diameters. The Prairie Rose Wind Farm is located four miles northeast of the Project

and contains 119 1.6 MW turbines. The MinWind I and MinWind II projects, located approximately 0.6 miles south of the site each contain two 0.95 MW turbines. In addition to the three operating projects described above, seven 1.65 MW turbines comprising the Perch Wind Project are no longer operating and will be decommissioned in 2021 by Walleye Wind.[135]

In addition to the turbines, the Project includes a new Walleye Wind Substation with a graveled footprint anticipated to be approximately 20,000 square feet (0.5 acres). The Walleye Wind Substation will include 34.55 kV and 161 kV buses, transformers, circuit breakers, reactive equipment, steel structures, a control building, metering units, and air break disconnect switches. A 161 kV generation tie line of approximately 500 feet will connect the Walleye Wind Substation with NSP's Rock County Substation, located adjacent to the Walleye Wind Substation. In addition to the existing Rock County Substation, farmsteads, overhead transmission lines, distribution lines, wind turbines, and county roads are located in the vicinity of the proposed Walleye Wind Substation. Collection lines bringing the power from the turbine strings to the Walleye Wind Substation will be buried 36-48 inches below the surface.[136]

The O&M facility will provide office space for the crews, as well as a shop/storage area for spare parts and vehicles. It will also house the central monitoring equipment for the wind farm. The footprint of the facility is anticipated to be approximately 2 acres and will include an access road, parking lot and O&M building. The O&M building will be a one-story structure with an attached garage for vehicle storage and maintenance. Similar to the substation, residents located near the O&M facility are expected to have a higher sensitivity to the potential aesthetics impacts than temporary observers.

Blue Mounds State Park is located approximately four miles northeast of the site. The park is in an area that has importance to Native American tribes with ties to the region and potential impacts to resources that have importance to Native American tribes with ties to the region is discussed in Section 6.5.2.

The nearest proposed turbine for the Project is approximately 6.7-miles southwest of Blue Mounds State Park. Several of the Prairie Rose I turbines are visible from northern portions of the park, the closest being approximately 3.7 miles northwest of the park. While these turbines are visible from portions of Blue Mounds State Park, the rolling topography of the region and wooded areas within the park obscure the turbines in other portions of the park. There are other visual intrusions in the area as well, including a water tower just west of the park.

109.2 MW Generic Wind Farm

The potential impacts of a generic 109.2 MW wind farm located elsewhere in Minnesota would have similar impacts if sited in an agricultural setting with other wind farms, such as the Walleye Wind Project. The impacts could vary in other settings or be perceived as more impactful, such as in a more populated area.

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[135] *Amended Site Permit Application*, at p. 39

[136] *Amended Site Permit Application*, at p 18

109.2 MW Solar Farm

Because they are generally large facilities with numerous highly geometric and sometimes highly reflective surfaces, solar energy facilities may create visual impacts; however, being visible is not necessarily the same as being intrusive. The installation of a solar farm will result in visible landscape changes and given that the foot print is larger than that for wind farm (800 acres for the 100 MW North Star Solar Project) more land surface would be converted in a solar farm application. However, due to their relatively low profile, PV solar facilities will not be visible from great distance; the aesthetic impacts will be experienced primarily by nearby residents and people using the roads adjacent facilities. Perimeter fencing for solar farms in Minnesota are typically eight foot wood pole and woven wire fence (i.e. "deer fence" or an "agricultural fence").

Mitigation

Mitigation of impacts to aesthetic and visual resources is best accomplished through micrositing of wind turbines and maintaining designated setbacks from participating and non-participating landowners. In general, siting wind projects in rural areas minimizes human impacts. Aesthetic impacts to public lands can be mitigated by siting wind projects outside of these areas, and utilizing natural features such as topography and vegetation to reduce visual intrusions.

Setbacks for individual turbines assist in mitigating visibility impacts. Wind turbines must be set back from non-participating property lines a minimum distance of 5 rotor diameters (RD) on the prevailing wind direction and 3 RD on the non-prevailing wind direction. Turbines are designed to be a uniform off-white color to blend in with the horizon and reduce visibility impacts.

Specific to the Project, and in addition to the above measures, Walleye Wind has stated that it will incorporate the following measures:[137]

- Turbines will be uniform in color.
- Turbines will not be located in biologically sensitive areas such as public parks, WMAs, Scientific and Natural Areas (“SNAs”), and WPAs.
- Turbines will meet the minimum FAA requirements for obstruction lighting of wind turbine farms (e.g. reduce number of lights on turbines and synchronized red strobe lights).
- Collector lines will be buried to minimize aboveground structures within the turbine array.
- Existing roads will be used for construction and maintenance where possible to minimize the amount of new roads constructed.
- Access roads created for the Project will be located on gentle grades to minimize erosion, visible cuts and fills.
- Temporarily disturbed areas will be converted back to cropland or otherwise reseeded with native seed mixes appropriate for the region.

[137] *Amended Site Permit Application*, at pp 47-48.

The primary strategy for minimizing aesthetic impacts associated with solar farm development is choosing a site where the solar facilities are compatible with the existing landscape, separated as far as possible from existing homes or shielded from view by terrain or existing vegetation. Landscaping plans can be developed to identify site-specific landscaping techniques including vegetation screening, berms or fencing to minimize visual impacts to adjacent land uses.

6.5.6 Shadow Flicker

Wind turbines are known to create shadow flicker. Shadow flicker is the intermittent change in light intensity due to rotating wind turbine blades casting shadows on the ground. Three conditions must be present for shadow flicker to occur:

- the sun must be shining with no clouds to obscure it
- the rotor blades must be spinning and located between the receptor and the light source; and
- the receptor must be close enough to the turbine to be able to distinguish the shadow created by the turbine.

Shadow intensity, or how "light" or "dark" a shadow appears at a specific receptor, will vary with distance from the turbine. The closer a receptor is to a turbine, the more turbine blades block out the sun's rays, and shadows will be wider and darker. Receptors located farther away from a turbine experience thinner and less distinct shadows since the blades block out less sunlight. Shadow flicker is reduced or eliminated when buildings, trees, blinds, or curtains are located between the turbine and receptor.

While there are no rules for a Minnesota "light standard" defining the amount of shadow flicker that is acceptable for a commercial wind project, the default industry standard is for no occupied residence to receive more than 30 hours per year of shadow flicker. No other states have adopted a standard for shadow flicker however, other countries have examined the issue and have adopted standards. Standards depend on assumptions about how flicker impacts are to be calculated:[138]

- Germany has established a "norm" for shadow flicker that does not exceed 30 hours/yr. or 30 minutes/day at a receptor. It is unclear whether this is a worst-case scenario (e.g., clear skies every day) or a real-case scenario (e.g., weather representative of the Project area).
- Belgium has adopted the German norm, adding a requirement for modeling of electromagnetic interference.
- Denmark recommends a maximum of 10 hours/yr. assuming average cloud cover in the Project area.

[138] Haugen, Katherine M.B. 2011. International Review of Policies and Recommendations for Wind Turbine Setbacks from Residences: Setbacks, Noise, Shadow Flicker, and Other Concerns. Minnesota Department of Commerce. https://mn.gov/eera/web/project-file?legacyPath=/opt/documents/International_Review_of_Wind_Policies_and_Recommendations.pdf

- France has adopted no standard but requires shadow flicker modeling.
- The Netherlands have adopted a yearly maximum of 5 hours and 40 minutes assuming clear skies.
- The State of Victoria, Australia, has adopted a shadow flicker standard of 30 hours/yr.

Walleye Wind Project

Walleye Wind modeled maximum shadow flicker under both worst case (constant sun with no clouds during daytime hours, turbines running continually, windows on all sides, no buildings or vegetation that would serve as obstructions) and expected (incorporating sunshine probabilities and expected turbine operational hours per wind direction) for 665 receptors. The expected maximum estimates are conservative in that they assume windows on all sides of the receptor and no buildings or vegetation to obstruct the flicker. The Shadow Flicker Report provides details regarding the methodology (WindPRO modeling) and results of the assessment.[139]

The maximum expected shadow flicker of 45 hours, 49 minutes per year occurs at receptor #331, a participating receptor. The maximum expected annual duration of shadow flicker at a non-participating location (#84) is 38 hours, 36 minutes per year. As shown in Table 16, nearly two-thirds of receptors are expected to experience no shadow flicker. Eleven receptors, including four receptors that are not participating in the Project, are expected to experience more than 30 hours of shadow flicker per year. Map 8 in Appendix C shows the results of the shadow flicker modeling.

Table 16: Predicted Shadow Flicker - Expected Case

Hours per Day	Number of Receptors			Percentage
	Minnesota	South Dakota	Total	
None	227	203	430	64.7
0-10	152	19	171	25.7
10 – 30	53	0	53	8.0
More than 30	11	0	11	1.6
	443	222	665	100

Introduction of turbines may introduce shadow flicker to motorists. Even without turbines, it is not uncommon for drivers or passengers to move in and out of shadows as they pass by trees, utility poles, and other structures and the vehicle moves in and out of sunlight and shadows. As shown in the modeling, shadow flicker along Interstate 90 is estimated to occur less than 10 hours per year.[140]

[139] *Amended Site Permit Application*, at pp. 43-48 and Attachment C

[140] Walleye Wind. *Response to Minnesota Department of Transportation Office of Land Management*. February 24, 2021. eDocket ID: 20212-171310-02

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm would have similar shadow flicker modeling results; depending on the surrounding landscape (relative receptor locations, availability of natural shielding, etc.) and topography, the potential impacts and mitigation may vary. Shadow flicker could be reduced in an area with greater variation in topography and vegetation, such as a landscape with hills and greater tree cover.

109.2 MW Solar Farm

Shadow flicker is not produced by solar panels and is not applicable.

Mitigation

Computer modeling of the proposed layout can be used to minimize shadow flicker at receptors within and adjacent to the project area by using micrositing of wind turbines and maintaining designated setbacks from participating and non-participating landowners.

A number of mitigation options are available and have been proposed by Walleye Wind to reduce the potential for shadow flicker impacts:

- Meet with the homeowner to determine the specifics of their complaint;
- investigate the cause of the complaint; and
- provide the homeowner with mitigation alternatives including shades, blinds, awnings or plantings (vegetation buffers).[141]

Other mitigation includes utilizing operational software adjustments (brief, temporary shutdown of specific turbines), although this has not been suggested by Walleye Wind.

It is important to note that the proposed turbine models being considered for the Project do not pose a health risk to photosensitive individuals, including those with epilepsy. The frequency of shadow flicker anticipated to be generated by the proposed turbine models is expected to be no greater than 1.5 flashes per second. According to the Epilepsy Foundation it is generally thought that a flashing light must have a frequency of between 5 and 30 flashes per second to trigger seizures.[142]

6.5.7 Facility and Turbine lighting

Large electric generating facilities would generally have some type of lighting at the facility to ensure safe operation of the facility. The Federal Aviation Administration (FAA) requires that all structures more than 200 feet above the ground have proper lighting or marking to allow for safe air

[141] *Amended Site Permit Application*, at p 48.

[142] *Amended Site Permit Application: Attachment C: Shadow Flicker Modeling Report*. October 30, 2020. eDocket ID: 202011-168046-09 , at p. 2-1

navigation.[143] To meet this requirement wind turbines are typically lighted with red flashing lights, which can create an undesirable nighttime view in a rural setting for some individuals.

Walleye Wind Project

Lighting of the wind turbines will be consistent with FAA guidelines and is similar to that for other tall structures in rural areas, such as communication towers. In addition to turbine lighting some non-turbine facilities (e.g. O&M facility and Walleye Wind Substation) which must be lit at times to allow for worker safety.

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm located elsewhere in Minnesota would have lighting impacts similar to the Project.

109.2 MW Solar Farm

Because of the relatively low profile of PV solar farms FAA lighting requirements are not applicable to solar farms.

Temporary lighting would be expected during the construction phase of any solar farm project. After construction, any temporary service poles/lights would be removed. Permanent motion-activated lighting is anticipated to be installed near O&M areas, security gates and in perimeter areas.

Mitigation

All non-turbine facilities should only be lit when workers are present, or at other times when lighting is absolutely necessary. Additionally, downward facing lights should be used at non-turbine facilities, such as the Project substation and O&M facility.

Walleye Wind must submit and receive FAA approval of lighting plan. A lighting plan will be provided prior to construction. To minimize the impacts of the turbine lighting, Walleye Wind will use an aircraft detection system (ADLS) or Lighting Intensity Dimming Solution (LIDS) system. ADLS surveys airspace around the wind farm to detect approaching aircraft. Once approaching aircraft is detected, the system automatically activates the Project's obstruction lighting. Obstruction lighting is automatically turned off lighting when aircraft have cleared the project area or achieved altitude above regulatory minimums.

For both wind and solar facilities, standard downward lighting at substations, O&M buildings, and entrances should be utilized to minimize impacts to adjacent land uses.

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[143] Federal Aviation Administration. 2000. *Proposed construction or alteration of objects that may affect the navigable airspace. FAA Advisory Circular AC 70/7460-2KI.*, http://rgl.faa.gov/REGULATORY_AND_GUIDANCE_LIBRARY/RGADVISORYCIRCULAR.NSF/0/22990146db0931f186256c2a00721867/$FILE/ac70-7460-2K.pdf

6.5.8 Noise

Large electric generation facilities produce noise. Potential human impacts due to noise include hearing loss, stress, annoyance, and sleep disturbance. Noise can be defined as unwanted or inappropriate sound. Sound has multiple characteristics which determine whether a sound is too loud or otherwise inappropriate. Sound travels in a wave motion and produces a sound pressure level. This sound pressure level is commonly measured in decibels (dB). Sounds also consists of frequencies, e.g., the high frequency (or pitch) of a whistle. Most sounds are not a single frequency but a mixture of frequencies. Finally, sounds can be constant or intermittent. The perceived loudness of a sound depends on all of these characteristics.

A sound meter is used to measure loudness. The meter sums up the sound pressure levels for all frequencies of a sound and calculates a single loudness reading. This loudness reading is reported in decibels, with a suffix indicating the type of calculation used. The A-weighted decibel scale (dBA) is commonly used to measure the selective sensitivity of human hearing. This scales the physical sound levels that are measured as a pressure wave to match an equivalent “loudness” level across the audible spectrum that more closely resembles what a human ear would perceive. The A-weighted scale effectively puts more relative weight on the range of frequencies that the average human ear perceives clearly (e.g., mid-level frequencies) and less weight on those that humans do not perceive as well (e.g., very high and lower frequencies).

Noise levels depend on the distance from the noise source and the attenuation of the surrounding environment. Table 17 below provides an estimate of decibel levels of common noise sources.

Table 17. Common Noise Sources and Levels (A-weighted Decibels)[144]

Sound Pressure Level (dBA)	Common Indoor and Outdoor Noise Sources
100-110	Rock band (at 16.4 ft [5 m]) Jet flyover (at 984.3 ft [300 m])
90-100	Gas lawnmower (at 3.28 ft [1 m])
80-90	Food blender (at 3.28 ft [1 m])
70-80	Shouting (at 3.28 ft [1 m]) Vacuum cleaner (at 9.84 ft [3 m])
60-70	Normal speech (at 3.28 ft [1 m])
50-60	Large business office Dishwasher next room, quiet urban daytime
40-50	Library, quiet urban nighttime
30-40	Quiet suburban nighttime
20-30	Bedroom at night
10-20	Quiet rural nighttime Broadcast recording studio
0	Threshold of hearing

The State of Minnesota has promulgated noise standards designed to ensure public health and minimize citizen exposure to inappropriate sounds. The rules for permissible noise vary according to land use, i.e., according to their noise area classification (NAC).

In a residential setting, for example, noise restrictions are more stringent than in an industrial setting. Rural residential homes are considered NAC 1 (residential), while agricultural land and agricultural activities are classified as NAC 3 (industrial). The rules also distinguish between nighttime and daytime noise; less noise is permitted at night. Sound levels are not to be exceeded for 10 percent and 50 percent of the time in a one-hour survey (L_{10} and L_{50}) for each noise area classification. Table 18 lists Minnesota's noise standards by area classification.

[144] MPCA. 2015. *A Guide to Noise Control in Minnesota: Acoustical Properties, Measurement, Analysis and Regulation*. https://www.pca.state.mn.us/sites/default/files/p-gen6-01.pdf

Table 18. MPCA Noise Standards - Hourly A-Weighted Decibels

Noise Area Classification	Daytime		Nighttime	
	L50	L10	L50	L10
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

The C-weighted scale (dBC) is used to measure human sensitivity at louder levels. C-weighted decibels are often used as a proxy to estimate the impact of low frequency noise. This scale puts more weight on the lower frequencies than the A-weighted scale.[145]

The G-Weighted scale (dBG) is designed for sound or noise whose spectrum lies partly or wholly within the frequency band of 1 Hz to 20 Hz.[146]

The numerical value of the results will, in general, differ between the A-weightings, C-weightings and G-weightings. Numerical values across weightings should be compared with caution, since the respective results relate to different frequencies of the noise spectrum. Measurement programs for wind turbine noise have documented a significant correlation between dBA and dBC levels. Additionally, measurements comparing A-weighted noise levels and G-weighted noise levels show a significant correlation between the dBA and dBG as well.[147]

Low frequency noise is considered audible but only at high amplitudes. Low frequency noise is commonly considered to be in the range of 20-200 Hz. Infrasound occurs in even lower frequency ranges (less than 20 Hz), and is generally inaudible to the human ear. However, it may still interact with the body and may be felt as vibrations. Studies have shown that pain from infrasound can result when sound levels are 165 dB or above at 2 Hz and 145 dB or above at 20 Hz. The magnitude of existing background low frequency noise/infrasound levels vary, but can be of sufficient strength to mask the low frequency noise and infrasound contributions from wind turbines. Common background sound sources of low frequency noise and infrasound include wind interacting with vegetation, agricultural machinery and roadway noise.[148]

Walleye Wind Project

The operation of wind turbines will produce noise. Turbines produce mechanical noise (noise due to the gearbox and generator in the nacelle) and aerodynamic noise (noise due to wind passing over the

[145] *A Guide to Noise Control in Minnesota: Acoustical Properties, Measurement, Analysis and Regulation.*
[146] State Government of Victoria Department of Health. 2013. *Wind Farms, Sound, and Health: Technical Information.* https://www2.health.vic.gov.au/public-health/environmental-health/environmental-health-in-the-community/wind-farms-sound-and-health
[147] *Wind Farms, Sound and Health: Technical Information*
[148] *Wind Farms, Sound and Health: Technical Information*

turbine blades).[149] Perceived sound characteristics would depend on the type/size of turbine, the speed of the turbine (if turning), and the distance of the listener from the turbine.

Wind turbines produce audible, low frequency sound and sub-audible sound (infrasound). These sounds can have a rhythmic modulation due to the spinning of the turbine blades. Impacts due to these sound characteristics are subjective, i.e., human sensitivity, especially to low frequency sound, is variable. However, low frequency sounds may cause annoyance and sleep disturbance for more sensitive individuals.

The Project is located in a predominately rural agricultural landscape. The ground cover is primarily farmland and open fields, with residential dwellings interspersed throughout the area. Typical agricultural noise pollution sources include farm machinery, agricultural vehicle operations, recreational activities, (such as hunting and all-terrain vehicles), motor vehicle traffic, and road construction activities.

In addition to the proposed Walleye Wind Project, there are two other windfarms operating nearby – the Prairie Rose Wind farm (a 200 MW LWECS comprised of 119 turbines located approximately four miles north of the Walleye Wind site) and MinWind I and II (a locally permitted project comprised of 950 kilowatt (kW) turbines located approximately 1.5 miles south of the southeastern site boundary).[150]

Walleye Wind's design of the Project incorporates two design and operation features intended to reduce the aerodynamic noise that results from air flowing over the turbine blades. Walleye Wind will construct all turbines with Noise Trailing Edge (LNTE) serrations along the blades. to reduce aerodynamic noise and the use of Noise Restricted Operation (NRO). Turbines equipped with NRO software allow the operator to lower the rotor speed, and consequently the tip speed, and optimize blade pitch angle to lower the noise produced as wind passes over the rotors. The NRO offers four (4) levels (or "modes") of implementation.

Walleye Wind conducted a preliminary noise assessment of the Project, which models (Cadna/A sound level calculation software) the anticipated sound levels that will be experienced at noise-sensitive receptors throughout the project area. The predicted worst-case L50 sound level from the Project wind turbines is below the 50 dBA limit at all modeled NAC 1 receptors. Modeled sound level isolines are shown in Map 9 in Appendix C. The predicted worst-case L50 sound level is 47 dBA at nine receptors[151] The highest predicted worst-case L50 sound level of 47 dBA remains below the most

[149] Minnesota Department of Health, *Public Health Impacts of Wind Turbines*. 2009, https://mn.gov/eera/web/project-file?legacyPath=/opt/documents/Public%20Health%20Impacts%20of%20Wind%20Turbines,%205.22.09%20Revised.pdf

[150] Amended Site Permit Application, Attachment C (Part 1 -Noise Assessment), figure 6-2

[151] Amended Site Permit Application, at p. 35 and Attachment C (Part 1-Noise Assessment). Although the Minnesota Noise Rules apply equally to all residences, whether or not they are participating in the project, Walleye Wind identifies six of the receptors as "participating" and three of the receptors as "targeted for participation."

restrictive MPCA sound limit of 50 dBA. EERA staff was unable to identify noise standards in South Dakota or in Minnehaha County, South Dakota.[152]

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm would have noise impacts and mitigation similar to the Project. Depending on location, surrounding vegetation, topography, and turbine selection, impacts from noise could be more or less than those expected of the Project.

109.2 MW Solar Farm

Noise concerns for a generic 100 MW PV solar farm are related primarily to the construction phase as the result of heavy equipment operation and increased vehicle traffic associated with the transport of construction materials and personnel to and from the work area. As in the North Star Solar Project it is anticipated that construction activities will only occur during daylight hours.

During operation of the PV solar farm, the primary source of noise will be from the inverters, and to a lesser extent from the transformers and rotation of tracking systems, located at each facility. All electrical equipment would be designed to National Electrical Manufacturer Association standards; anticipated inverter noise for the North Star Solar Project was predicted to produce 65 dBA at the source.[153]

Noise from the PV solar farm's electric collection system would not be expected to be perceptible. Because the solar facilities do not generate electricity at night, the tracking systems would not be rotating and noise from inverters would be at less than peak levels.

Mitigation

The primary means of mitigating sound (noise) produced by wind turbines is siting. Turbines must be sited to comply with noise standards in Minnesota Rule 7030.[154] For rural residential of the area, this means sound levels must meet an L_{50} standard of 50 dBA.

Walleye Wind has incorporated turbine setbacks from homes into the Project design. Most turbines, 38 of the 40, will be placed at least 1,400 feet from the nearest home, and two turbines will be placed between 1,325 and 1,355 from homes.[155]

Setback requirements are enforced by the Site Permit issued by the Commission. The Commission continuously reviews setbacks related to wind farms to determine if they remain appropriate and reasonable.

In addition to siting turbines away from homes, Walleye Wind will use LNTE blades on all turbines and will include NRO on six turbines.

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[152] Steinhauer, Suzanne. Personal Communication with David Heinold, Minnehaha County Planning and Zoning January 21, 2021,

[153] North Star Solar EA

[154] Minn. Rules 7030.0040, Noise Standards, https://www.revisor.leg.state.mn.us/rules/?id=7030.0040

[155] Amended SPA, at p. 38

For both wind and solar facilities, scheduling construction and maintenance activities during the daytime will minimize noise issues for nearby residents.

6.5.9 Property values

Large electric generation facilities have the potential to impact property values. Because property values are influenced by a complex interaction between factors specific to each individual piece of real estate as well as local and national market conditions, the effect of one particular project on the value of one particular property is difficult to determine.

The placement of infrastructure near human settlements has the potential to impact property values. The impacts can be positive and negative. The type and extent of impacts depends on the relative location of the infrastructure and existing land uses in the project area. For example, a new highway may increase the value of properties anticipated to be used for commercial purposes but decrease the value of nearby residential properties.

Potential impacts to property values due to large energy facilities are related to three main concerns:

- potential aesthetic impacts of the facility,
- concern over potential health effects from emissions (e.g,.air emissions, wastewater discharges, electric and magnetic fields, etc.),
- noise concerns, and
- potential interference with agriculture or other land uses.

Walleye Wind Project

The impacts on property values due to the development of the Walleye Wind Project are difficult to quantify. Many factors influence a property's market value, including acreage, schools, parks, neighborhood characteristics and improvements. The overall status of the housing/land market at the time of sale is an important factor on the value of a property.

In December 2009, the United States Department of Energy Lawrence Berkeley National Laboratory released a technical analysis of wind energy facilities' impacts on the property values of nearby residences. Using a variety of different analytic approaches, the report found no evidence that sales price of homes surrounding wind facilities were measurably affected by either the view of wind facilities or the distance of the home to those facilities. Though the analysis acknowledged the possibility that individual homes or small numbers of homes may be negatively impacted, it concluded that if these impacts do exist, their frequency is too small to result in any widespread, statistically observable impact.[156]

Southern and southwestern Minnesota have experienced the greatest development of wind energy facilities in the state and have the greatest number of turbines in the state. There are three projects

[156] Hoen et al. 2009. *The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis*. https://emp.lbl.gov/publications/impact-wind-power-projects

(the Prairie Rose and MinnWind I and II projects, representing 123 turbines) within 10 miles of the site.

Six counties in southern Minnesota (Dodge, Jackson, Lincoln, Martin, Mower and Murray counties) with large wind energy conversion systems responded to a Stearns County survey asking about impacts on property values resulting from wind farms. That survey showed that neither properties hosting turbines nor those adjacent to those properties in the counties listed, have been negatively impacted by the presence of wind farms. In its 2010 consideration of whether to issue a moratorium on Large Wind Energy Conversion Systems, the Stearns County Board of Commissioners found that wind farms are likely to have a negligible effect on property values.[157]

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm would have property value impacts similar to that of the Project. If a generic 109.2 MW wind farm were constructed and operated in an area of the state with minimal or no wind energy facilities present on the landscape there may be more noticeable impacts on property values, but this impact is difficult to quantify or estimate for comparison purposes.

109.2 MW Solar Farm

A solar farm would have no emissions and essentially no noise impacts to adjacent land uses during operation of the facility. The installation of PV facilities would create a visual impact, but lacking the height of smokestacks or wind turbines, the visual impact at ground level, or within a neighboring building, would be more limited.

A review of the literature found no research specifically aimed at quantifying impacts to property values based solely on proximity to utility-scale PV facilities. As the recently permitted Aurora Distributed Solar and North Star Projects involve the first utility-scale PV facilities across Minnesota, comparable sales data are just becoming available. Very initial results from Chisago County (North Star) show no impact.

As the industry continues to develop comparable data should become available.

Mitigation

Negative impacts to property value due to the development of the Walleye Wind Project are not anticipated. In unique situations it is possible that specific, individual property values may be negatively impacted. Such impacts may be mitigated by siting turbines away from residences. Impacts to property values can be mitigated by reducing aesthetic impacts (i.e., micro-siting turbines, education concerning the perceived health risks, and reducing encumbrances to future land use).

For PV solar facilities, property values can also be mitigated through proper siting, BMPs (restoration and vegetation management) and screening the site (berms, deer fencing, and vegetation).

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[157] Stearns County Board of Commissioners. *2010.Stearns County Resolution No. 10-46: Resolution Adopting Findings of Fact for the Proposed Stearns County Interim Ordinance No. 444 Imposing a Moratorium on Large Wind Energy Conversion Systems (LWECS) for Projects 5 MW or Greater*. eDockets ID: 20106-52067-01

6.6 Public Health and Safety

Construction and operation of large energy facilities may have the potential to impact human health and safety. This section discusses potential health and safety concerns.

6.6.1 Electromagnetic Fields

Electromagnetic fields (EMF) are invisible regions of force resulting from the presence of electricity. EMF is often raised as a concern with electric transmission facilities. Naturally occurring EMF are caused by the earth's weather and geomagnetic field. Man-made EMF are caused by any electrical device and found wherever people use electricity.

- Electric fields are created by the electric charge (i.e., voltage) on a transmission line. Electric fields are solely dependent upon the voltage of a line (volts), not the current (amps). Electric field strength is measured in kilovolts per meter (kV/m). The strength of an electric field decreases rapidly as the distance from the source increases. Electric fields are easily shielded or weakened by most objects and materials, such as trees and buildings.
- Magnetic fields are created by the electrical current moving through a transmission line. The magnetic field strength is proportional to the electrical current (amps). Magnetic field strength is typically 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 by objects or materials.

Although EMF is often raised as a concern with electrical transmission projects, the Commission has consistently found that there is insufficient evidence to demonstrate a causal relationship between EMF exposure and human health effects.

Walleye Wind Project

EMF from underground electrical collection lines dissipates close to the lines because they are installed below ground, geometrically close to each other, and wound with copper wires in their jackets. The electrical fields around these lines are negligible and the small magnetic field directly above the lines dissipates within 20 feet on either side of the installed cable, based on engineering analysis. Collection lines will be buried underground to a depth of at least 36 inches. EMF associated with the transformers within the nacelle dissipates within 5 feet, so the minimum 1,325-foot turbine setback from residences (1,400 feet in most cases) will be adequate to avoid any EMF exposure to homes.

Generic 109.20 MW Wind Farm

A generic 109.2 MW wind farm will generally require transmission facilities to an interconnection point, similar to those of the Project. EMF impacts from collector and feeder lines located within the wind farm are expected to be negligible.

Any transmission lines and substation associated with the generic 109.2 MW wind farm would likely be similar to those of the Walleye Wind Project. Depending on the size of the transmission line, it is likely that the associated transmission line would be subject to permitting by the Commission.

109.2 MW Solar Farm

As with wind farm, a generic 109.2 MW PV solar farm would also require the installation of similar infrastructure (transmission lines and substation) beyond on-site facilities (i.e., PV arrays, including electrical cables and conduit, electrical cabinets, step-up transformers, SCADA systems and metering equipment, and access roads) to deliver the generated power to the overall grid.

Mitigation

Walleye Wind will design, construct, and operate all electrical equipment, including turbines, transformers, and collection lines in accordance with applicable codes, manufacturer specifications, and required setbacks. Because no impacts due to EMF are anticipated, no mitigation is warranted.

6.6.2 Stray Voltage

Stray voltage is sometimes raised as an issue associated with electric transmission. Stray voltage (also referred to as neutral to earth voltage) is an extraneous voltage that appears on metal surfaces in buildings, barns and other structures, which are grounded to earth. Stray voltage is typically experienced by livestock who simultaneously come into contact with two metal objects (i.e. feeders, waterers, stalls). If there is a voltage between these objects, a small current will flow through the livestock.

The fact that both objects are grounded to the same place (earth) would seem to prevent any voltage from existing between the objects. However, this is not the case – a number of factors determine whether an object is, in fact, grounded. These include wire size and length, the quality of connections, the number and resistance of ground rods, and the current being grounded. Thus, stray voltage can exist at any house or farm which uses electricity, independent of whether there is a transmission line nearby.

Stray voltage is more commonly associated with small electrical distribution lines, which connect homes to larger transmission lines, and provide electricity to individual residences, farms, businesses, etc. Data analysis has determined that there does not appear to be any link between the distance between a farm (residence) and substation, or the electrical magnitude of the primary power line, leading to increased risk of stray voltage impacts.[158]

Walleye Wind Project

Potential impacts from stray voltage can result from a person or animal coming in contact with neutral-to-earth voltage. Stray voltage does not cause electrocution and is not related to ground current, EMF, or earth currents. Where distribution lines have been shown to contribute to the

[158] Wisconsin Public Service. *Answers to Your Stray Voltage Questions: Backed by Research*. 2011. http://www.wisconsinpublicservice.com/business/pdf/farm_voltage.pdf

propagation of stray voltage on farm facilities, the distribution system was either directly under or parallel to an existing transmission line. These factors are considered in design and installation of transmission lines and can be readily mitigated. Potential impacts to animal agriculture are discussed in Section 6.5.4.

Problems related to distribution lines are also readily managed by correctly connecting and grounding electrical equipment. To address stray voltage, electrical systems, including farm systems and utility distribution systems, must be adequately grounded to the earth to ensure continuous safety and reliability, and to minimize this current flow. Wind energy collection systems mitigate any such issue by running a continuous bare ground conductor from the furthest turbine to the substation.

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm will generally require transmission facilities to an interconnection point, similar to those indicated for Project. Stray voltage concerns from collector and feeder lines located within the wind farm are addressed in the design of these systems.

109.2 MW Solar Farm

As with wind farm, a generic 109.2 MW PV solar farm would also require the installation of similar on-site facilities (i.e., PV arrays, including electrical cables and conduit, electrical cabinets, step-up transformers, SCADA systems and metering equipment, and access roads) to gather the power produced from the individual components (PV arrays, turbines).

As with wind farm, stray voltage concerns from collector and feeder lines located within the solar farm are addressed through project design of these systems.

Mitigation

Due to low risk, mitigation measures are not proposed.

6.7 Associated Electrical Facilities

Electric generation facilities (fossil fuel power plants, wind farms, and solar farms) typically require construction of electrical facilities beyond the project boundaries, such as transmission lines and substations to deliver the generated power to the overall grid.

Impacts associated with construction of new transmission lines and substations can include impacts to plants and animals due to the loss of vegetation, habitat fragmentation, potential migratory bird collisions with the transmission line, visual impacts due to placement of poles or structures, and additional impacts to farmland.

Walleye Wind Project

All facilities required to interconnect the Project to the electrical grid are located within the site. Walleye Wind will construct a substation for the Project and interconnect the Walleye Wind Substation to NSP's existing Rock County Substation through a 500-foot gen-tie line.

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm may require construction of transmission facilities to an interconnection point or may require new transmission infrastructure at existing facilities.

109.2 MW Solar Farm

As with wind farm, a generic 109.2 MW PV solar farm would also require the installation of similar transmission infrastructure beyond on-site facilities to deliver the generated power to the overall grid.

Mitigation

The primary measures to reduce the potential impacts from the construction and operation of these associated facilities is avoidance. This is accomplished largely through siting and routing, to the extent practicable, followed by the implementation of BMPs to minimize potential impacts and finally, the mitigation (e.g. restoration, direct compensation, wetland banking) of those impacts which are unavoidable.

Potential impacts and mitigation strategies would be similar to those for any energy project. The extent of impacts would be determined by the length and voltage of the transmission line required to connect the electric generating facility to the transmission grid. A relatively longer line or higher voltage would increase the potential construction and operation impacts.

6.8 Infrastructure

The Project is located in rural southwestern Minnesota. A network of roads and utilities provide access, electricity, water supply, and telephone service to rural residences, farmsteads, small industry, and unincorporated areas. Two railroad tracks owned by Ellis and Eastern, a former Chicago and Northwestern Railroad track in the southern portion of the site along East County Road 4, and a former Great Northern railroad crosses the southwestern corner of the site. Water wells and septic systems are typically used within the Project Area to provide household needs.

6.8.1 Roads

Electric generation facilities (fossil fuel power plants, wind farm, and solar farms) typically require that the existing transportation infrastructure to be adequate, or improvable, to handle heavy loads and oversized vehicles delivering large equipment or structures (turbine generators, tower segments, blades, etc.) to the site. Delivery of such equipment may require roadways to be upgraded or repaired post-delivery.

Walleye Wind Project

Rock County has an established transportation network of federal, state, county, and township roads. Interstate 90 crosses generally east west through the southern portion of the site. Minnesota State Highway 23 runs north south through the western portion of the site. Although outside of the actual site, U.S. Highway 75 serves as a major access road into the region from the north and south. The County State Aid Highways (CSAHs) are two-lane paved roads. County and township roads generally follow section lines. Private roads, mostly used for agricultural purposes, are also common.

Predictably traffic counts, as measured in the Average Annual Daily Traffic (AADT), are highest along Interstate 90 (AADT of 10,500), with State Highway 23 and CSAH 4 also having AADT over 1,000 vehicles per day. Off these major roads, traffic counts reduce substantially. Within the site, the county and township roads, from which the Project's roads will access the turbines, are a mixture of two-lane paved and gravel roads.[159]

Construction traffic would use the existing county and state roadway system to access the project area and deliver construction materials and personnel. During construction peak, Walleye Wind estimates there will be an additional 700 vehicle trips per day. Although the additional construction traffic will be below the functional roadway capacity of 5,000 vehicles per day estimated for a two-lane paved rural road, minor short-term delays may occur.[160]

During operations, only the maintenance crew workers will utilize roads within the site for regular inspections and maintenance. With an operations staff of approximately four persons, traffic is not expected to noticeably increase during the operations phase of the wind farm.

Impacts to traffic will be short-term, intermittent, and occur during the construction phase of the Project. Impacts will be from the transport of Project components to the site and from the movements of construction workers. Traffic disruptions are most likely to occur when turbines or other equipment is delivered to the site. Transport of equipment and materials used in construction of wind farms will result in heavy and/or oversized loads, potentially resulting in increased wear and tear of local roads. Possible weight related impacts to roads include physical damage to the structure of the road itself and/or damage to culverts and bridges.

Depending on final turbine location and established haul routes, intersections may be temporarily widened to accommodate oversize loads and accommodate a larger turning radii. Any improvements to existing roads would consist of re-grading and filling of gravel surfaces. Any temporary modifications to the existing road system would be restored following construction. In addition to

Walleye Wind will construct approximately 12 miles of gravel roads to provide access to turbines for construction and operation of the facility. Depending upon soil conditions, geotechnical fabric and cement may underlay the aggregate surface The roads will initially be up to 50 feet wind to accommodate large equipment the permanent access road will be approximately 16 feet wide with a low profile to allow cross travel by farm equipment.[161]

In addition to access roads, construction of the Project will require temporary roads (often referred to as "crane walks") to move oversized crane machinery between turbine assembly points.

MnDOT requires permits for oversized and overweight use of state highways and driveway access from Minnesota Roads. Rock County will require permits for installations or modification of road

[159] *Amended Site Permit Application*, at p.49
[160] *Amended Site Permit Application*, at p. 50
[161] *Amended Site Permit Application*, at pp 135-136

approaches, overweight and over-dimension loads to transport equipment and materials over county highways.[162]

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm will generally require similar utilization of regional roadways to those identified for the Project. Impacts and mitigations associated with the use of available roadways for the generic 109.2 MW wind farm would be similar to those identified for the Project.

109.2 MW Solar Farm

As with wind farm, a generic 109.2 MW PV solar farm would also require utilization of regional roadways for delivery of employees, materials and equipment to the solar farm site.

Mitigation

Walleye Wind will coordinate with the applicable local and state jurisdictions to ensure that the weights being introduced to area roads are acceptable. Walleye Wind must obtain, file and submit all required MnDOT permits, including permits to complete the necessary work in MnDOT's right-of-way, such as transportation of turbines and equipment to and from the site.

Walleye Wind has committed to not accessing the Project from Interstate 90 or State Highway 23.[163]

6.8.2 Airports and Aviation

Airports are valuable transport, tourism, employment, and business assets for the local and national economy. Siting of large energy projects should consider the potential impacts to air service and operations (airports, landing strips, crop spraying activities, etc.) in the project area. Developments around airports and under flight-paths can constrain operations, either directly where they conflict with safety/operational requirements, or indirectly where they interfere with radar or other navigational aids.

The aviation industry is concerned that the growth of wind energy development will endanger agricultural aviators and restrict the business opportunities for aerial application of seeds, fertilizers, and crop protection chemicals. A wind turbine in a farm field subject to aerial spraying represents an obstacle for the pilot; agricultural aviators fly below the height of turbine blades while distributing (as low as 10 feet above ground level), but need to rise to a higher altitude to turn around for their next pass. This turn can take a half mile to complete. In addition to collision risk, the vortices and the turbulence that the wind turbines generate can also be a concern for agricultural aviators.

According to the National Agricultural Aircraft Association (NAAA), there are about 1,560 aerial agricultural application businesses within the United States.[164] Minnesota has approximately 150

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[162] *Amended Site Permit Application*, at Table 53.

[163] Walleye Wind. *Response to Minnesota Department of Transportation Office of Land Management*. February 24, 2021. eDocket ID: 20212-171310-02

[164] National Agricultural Aviation Association. 2019. *Industry Facts*, https://www.agaviation.org/industryfacts

agricultural aircraft pilots.[165] Fixed-wing aircraft account for 87 percent of the aircraft used by agricultural applicators, helicopters and other rotorcraft account for the rest. Approximately 208 million acres of U.S. croplands are treated with crop protection products; aerial application accounts for about a fifth to a quarter of that acreage.[166]

The NAAA reports that between 2009 and 2019, nine (9) percent of aerial application fatalities were the result of collisions with various types of towers and 13 percent were the result of collisions with wires.[167]

The development of a wind farm provides economic and environmental benefits to both individuals and surrounding communities. At the same time, the presence and spacing of the turbines may impact the ability for area landowners to spray their crops. While aerial applications in the vicinity of wind farms are still possible, the increased complexity and time required results in higher cost (most spray policies charge premiums up to 50 percent above standard costs on fields within a mile of the towers, whether a participating landowner or not) to the farmer.[168]

While ground application can be just as effective as aerial spraying, there are certain circumstances where aerial application is preferred or required, such as specific stages of growth (i.e., height of corn and sunflower), weather conditions (i.e., wet, saturated soils subject to compaction), areas requiring split applications of fertilizer (i.e., for groundwater protection), and where timing is urgent (i.e., emergency pest control). Ground sprayers also have the potential to increase the spread of disease by carrying it through the crop on the sprayer components after it brushes by diseased plants.

A Purdue University study shows ground applicator rigs damage approximately 1.5 to 5 percent of soybean crops.[169] Building on the Purdue study, Russ Gasper (Nebraska Department of Aeronautics) calculated a potential economic loss due to trampling from ground applicator rigs on Nebraska corn harvest of 25 million dollars.[170]

Meteorological towers (MET) used to collect wind data at wind farm sites, can pose a special threat. These towers are typically 197 feet, which fall just under the requirements for FAA lighting and marking.

The type of MET towers that are used in development and siting (pre-construction) typically consist of sections of galvanized tubing that are assembled at the site and raised and supported using guy wires. These towers can be erected or removed in as little as a few hours. The tower may be at one location

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[165] Minnesota Agricultural Aircraft Association. https://mnagaviation.com/

[166] National Agricultural Aviation Association. 2019. *Industry Facts*, https://www.agaviation.org/industryfacts

[167] National Agricultural Aviation Association. 2014. *Fact Sheet on the Dangerous Effects Low Level Obstacles Pose to the Aerial Application Industry.* https://www.agaviation.org/Files/policyinitiatives/Advocacy%20Papers/Tower%20Issue%20Paper%20FINAL.pdf

[168] Illinois Agricultural Aviation Association. 2019. *Wind Farms.* https://agaviation.com/wind-farms/

[169] Hanna et al. 2007. *Managing Fungicide Applications in Soybeans*. Bulletin SPS-103-W. Purdue University Extension Service. https://www.extension.purdue.edu/extmedia/sps/sps-103-w.pdf

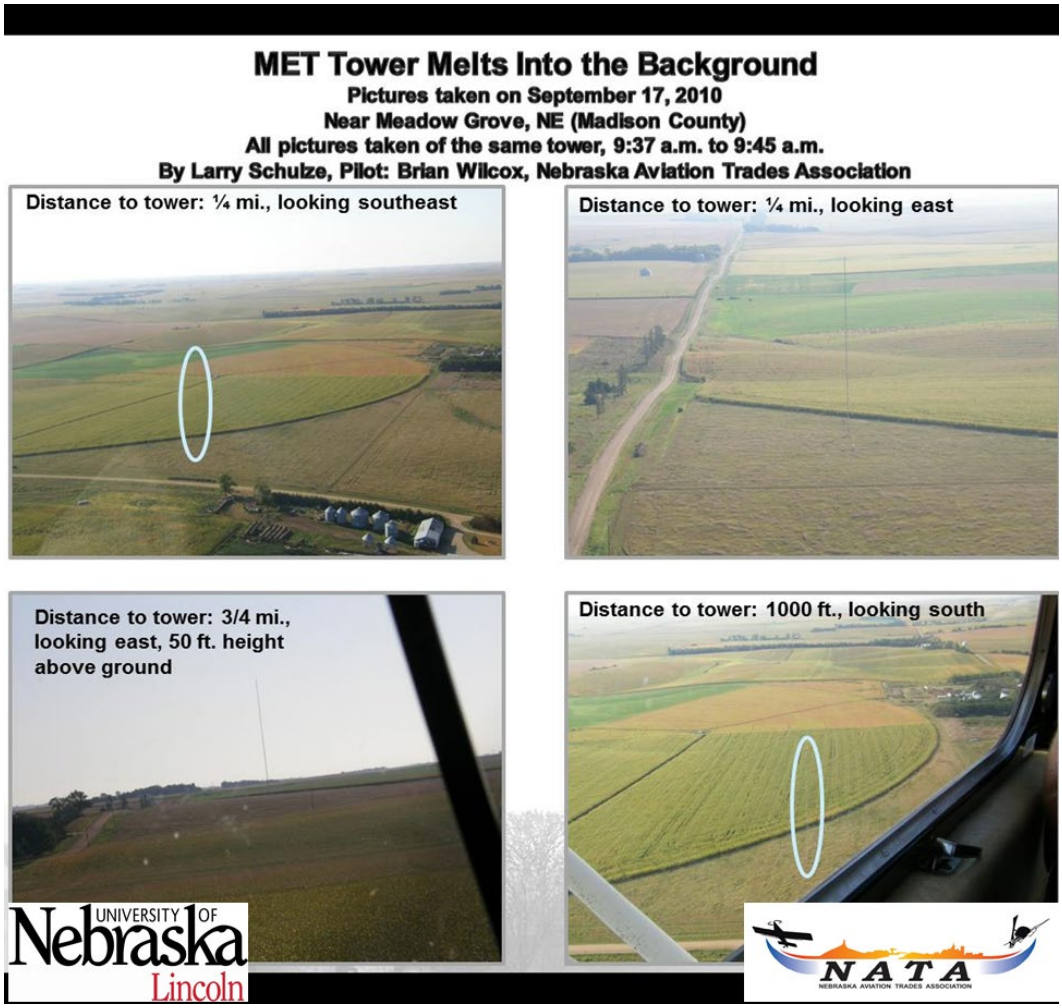
[170] Gaspar, Russ. 2015. *Agriculture, Aerial Applicators, and Airports.* Agricultural Aviation. September-October, 2015. http://www.agaviationmagazine.org/agriculturalaviation/september_october_2015?pg=54#pg54

for a short period of time and then moved to a different location, as the wind developer checks the area for the best wind conditions for the placement of wind turbines. The fact that these towers are narrow, unmarked and grey in color makes for a structure that is nearly invisible under some atmospheric conditions. The temporary and mobile nature of these MET towers makes their location difficult to maintain in a database. In some cases, a wind company may install a temporary met tower to gather information on a potential site without general public knowledge. In some cases, the landowner's contract requires the landowner to keep this information confidential.

Post-construction MET towers are used to transmit to the control center the meteorological situation in the location and it has a principal importance for the management of the site. The type used during the operation of a wind conversion facility is built heavier and may or may not use guy wires; they usually still fall under the height required for FAA lighting and marking.

The major risk factor for pilots is that the dull metal used for the tower, and the supporting guy wires, are difficult to see from the air (Figure 5). The tower and wires easily blend into the surroundings, making them a hazard to pilots of low-flying aircraft.

Figure 5. Met Tower Visibility[171]



Walleye Wind Project

There are no registered public airports located within the site. There are three active registered airports and one active heliport located within 10 miles of the site. The closest registered airport is Quentin Aanenson Field Airport (3.53-miles east of the Site, a public-use airport with one 4,200-foot asphalt runway.[172]

Due to the agricultural use within the region, small private runways associated with crop dusting activities may exist within or near the project area.

Under 14 CFR Part 77.9, all structures exceeding 200 feet above ground level must be submitted to the FAA so that an aeronautical study can be conducted. The purpose of the study is to identify

[171] Nebraska Institute of Agriculture and Natural Resources. *Wind Measurement (MET) Towers.* https://cropwatch.unl.edu/bioenergy/met-towers

[172] *Amended Site Permit Application*, at pp. 70-71

obstacle clearance surfaces that could limit the placement of wind turbines. The end result of the aeronautical study is the issuance of a determination of Hazard or No Hazard.

Additionally, a Tall Towers Permit and approval is likely required by the MnDOT prior to constructing the Project to ensure the safety of airspace within Minnesota.[173]

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm sited elsewhere in Minnesota would also have to comply with FAA and the MnDOT Office of Aeronautics and Aviation requirements, requiring both turbines and meteorological towers to be identified and fitted with the appropriate markings and lights. Pre-screening of potential wind farm sites must take into consideration the potential for conflicts between the use of airspace and project infrastructure.

109.2 MW Solar Farm

Because of the relatively low profile of PV solar farms, FAA lighting requirements would not be anticipated to be necessary; however, appropriate siting of PV solar projects is necessary to ensure they do not cause safety problems for aviation or otherwise interfere with aeronautical and airport activities. Specifically, the FAA wants to ensure solar systems do not create glint or glare conditions (glint is a momentary flash of bright light, and glare is a continuous source of bright light). The FAA has determined that glint and glare from typical ground-mounted solar energy systems, in the vicinity of airports, could result in an ocular impact to pilots and/or air traffic control facilities and compromise the safety of the air transportation system. While the FAA supports PV solar energy systems near, and even on airports grounds, the FAA seeks to ensure safety by eliminating the potential for ocular impact to pilots and/or air traffic control facilities due to glare from such projects.[174]

It is anticipated that an FAA review of a 109.2 MW solar farm, with proper site prescreening, would result in a "No Hazard" determination.

Mitigation

Site permits granted by the Commission contain requirements for the design and siting of meteorological towers (**Appendix B**). Permanent towers for meteorological equipment are required to be free standing (no guy wires). Permanent meteorological towers shall not be placed less than 250 feet from the edge of the nearest public road right-of-way and from the boundary of the Permittee's site control, or in compliance with the county ordinance regulating meteorological towers in the county the tower is built, whichever is more restrictive. Meteorological towers shall be placed on property the Permittee holds the wind or other development rights. Meteorological towers shall be marked as required by the Federal Aviation Administration.

Project planning, construction, and operation will be coordinated with the FAA, local airports and state air traffic agencies to ensure public safety is not negatively impacted by the Project. Walleye Wind will

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[173] MnDOT Scoping Comments, January 26, 20211, eDocket ID 20211-170313-01

[174] Kandt, A; Romero, R. *Implementing Solar Technologies at Airports*. NREL. 2014. https://www.nrel.gov/docs/fy14osti/62349.pdf

follow FAA guidelines for marking towers and implement the necessary safety lighting. Notification of construction and operation of the wind farm will be sent to the FAA and steps will be taken to ensure compliance with FAA requirements.

The proposed 2.82 MW GE turbines will require a Tall Towers permit from MnDOT. Walleye Wind indicates it has begun coordination with MnDOT on this issue.

6.8.3 Communication Systems

Large electric generation facilities have the potential to impact electronic communications (radio, television, internet, cell phone, and microwave). This section discusses potential impacts on communications systems due to the operation of a large electric generation facilities.

Walleye Wind Project

Wind turbines can cause interference with electronic communications by obstructing the reception of communication signals. Wind turbines do not impact digital signals (e.g., digital television, internet, cell phones), unless the turbines directly obstruct the signal, such as being located in the line-of-sight. Analog signals (e.g., amplitude Modulated (AM) and frequency modulated (FM) radio, microwaves) can be interfered with by direct obstruction and by indirect signal interference, resulting in ghosting of television pictures or signal fading.

Radio

Land mobile and radio facilities are wireless communication systems intended for use by users in vehicles, such as those used by emergency first responder organizations, public works organizations or companies with large vehicle fleets or numerous field staff. FM radio is not impacted by wind turbines or transmission facilities; AM radio can be impacted near transmission facilities, e.g., signal fading underneath a transmission line. Potential communications impacts due to the Project are anticipated to be minimal.

Walleye Wind commissioned an Electromagnetic Interference Analysis for the site. No active AM or FM radio towers were identified within the Site. One AM tower (KQAD) and four FM (KLQL, KNWC-FM, KTWB, and KXRB-FM) radio towers are located within 15.5-miles of the Site.[175]

The Electromagnetic Interference Analysis indicated that interference to AM or FM signals are expected to be minimal. Some AM/FM signal loss may occur in close proximity to individual turbines, but most AM/FM radio receptors near residences and residences should have sufficient setback to minimize signal interruptions. Interference to AM towers would be limited to a distance equal to one wavelength from non-directional antennas and 10 wavelengths, or 1.9 miles, from directional antennas. The closest AM tower, KQAD, is located nine miles from the site and has a wavelength of 0.23 miles, placing the AM tower outside of the potential for transmission interference. Interference

[175] *Amended Site Permit Application* at p. 52

to FM towers would be constrained to approximately 2.5 miles from the FM tower. There are no FM towers within 2.5 miles of the site.[176] Impacts to AM and FM radio transmission are not anticipated.

Microwave Beam Paths

Wind turbines can interfere with microwave paths by blocking or partially blocking the line-of-sight path between microwave transmitters and receivers. Microwave bands are a telecommunication system that provides long-distance and local telephone service, backhaul for cellular and personal communication service, data interconnects for mainframe computers and the Internet, network controls for utilities and railroads, and various video services. To prevent disruption of the microwave beam path, turbines should not be sited the centerline of a beam path.

The Electromagnetic Interference Analysis examined microwave beam paths in the vicinity of the Project and identified one microwave tower withn the site and eight microwave beam paths that cross the site.[177]

Radar

A number of federal government agencies operate communication systems that are not part of any public databases. The United States Department of Commerce National Telecommunications and Information Administration (NTIA) coordinates government communication systems for all departments and agencies. NTIA reviewed the Project's layout for concerns with radio frequency transmission blockage and issued a finding "no harmful interference anticipated."[178]

Telephone Service

Telephone service in the project area is provided both through landlines and wireless signals. Telephone services are provided by CenturyLink; there are a number of broadband providers in Rock County including AT&T, CenturyLink, Sprint, T-Mobile, and Verizon.[179]

Operation of the Project will not impact the telephone service in the project area. However, physical damage to underground telephone lines may incidentally occur during Project construction.

Land mobile systems are designed with multiple base transmitter stations; therefore, any signal blockage caused by the wind turbines would not perceptibly degrade their reception. Construction and operation of the Project is not expected to impact telephone service to the area.

Broadcast Facilities

There is a possibility that broadcast facilities (HDTV and digital television) would be impacted by the wind farm. Outdoor antennas pointed through the turbine area, "rabbit ear" antennas or older HDTV receivers would be more likely to experience signal disruption (in the form of pixilation or "freezing" of a picture). Interference would be more likely to occur at the edge of broadcast reception and where

[176] *Amended Site Permit Application*, at p. 52
[177] *Amended Site Permit Application*, at p. 51
[178] Amended Site Permit Application, at p. 51 and Appendix D
[179] *Amended Site Permit Application*, at p 57

there is direct interference with digital broadcast paths of local television stations. Occasionally, multipath interference from one or more turbines can cause video failure in HDTV receivers, especially if the receiver location is in a valley or other place of low elevation.

There are no digital or analog television towers are not located within the site. There are 43 licensed television towers within approximately 62 miles of the site, including nine towers that are within 31 miles of the site and are likely to be broadcasting to the region. Most of the television towers within approximately 62 miles of the site are low power stations or translator stations that have limited range and would not be expected to experience reception interference. Ten full power towers (KTTW, KELO-TV, KSFY-TV, KSMN, KDLT-TV, KCSD-TV, KUSD-TV, KWSD, KWSD, and KWSD) may experience reception interference via line-of-sight between a transmitting tower and a TV receptor.[180]

GPS

Global positioning systems (GPS) use satellite signals to determine locations on the earth's surface and are commonly used to guide agricultural operations. Because GPS uses multiple digital satellite signals, interference with the signals or subsequent uses is not anticipated. Obstruction of any one satellite signal would require direct line-of-sight obstruction due to a wind turbine. Such an obstruction would be temporary (i.e., there is concurrent GPS receiver movement, satellite movement, and wind turbine blade movement such that the obstruction should be resolved).

Wireless Broadband Internet

It is unclear if there are impacts to wireless broadband internet signals due to operation of a wind farm. For a previous wind project, the Department contacted engineers at the local wireless broadband internet service provider (StarCom/StarNet) for further information.[181] StarCom representatives stated that it is possible that a wind turbine operating along the "line of sight" between a broadband signal tower and residential antenna can cause intermittent signal loss, but that such cases were rare.

Generic 109.2 MW Wind Farm

A generic 109.2 MW wind farm would have communications impacts similar to the Project depending on a variety of factors such as the proximity of homes in relation to the project, number of turbines and the number of communication facilities and types in the area. Mitigation efforts at a generic 109.2 MW wind farm for impacts to communication services would also be similar to the mitigation efforts at the Project.

109.2 Solar Farm

Given the relatively low profile of PV solar farms, no impact to digital signals (e.g., digital television, internet, cell phones) or analog signals (e.g., AM and FM radio, microwaves) would be anticipated. However, if O & M building components or associated transmission line towers were to be

[180] *Amended Site Permit Application*, at pp. 54-57

[181] Elm Creek II Wind Project, Environmental Report, P. 30, eDocket ID: 200911-44359-01

constructed within the "line of sight" between a line-of-sight signal and residential antenna, it is possible the customer could experience intermittent signal loss.

Mitigation

Walleye Wind has committed to the following mitigation measures:

- The Project has been designed to avoid placing turbines in microwave beam paths
- Underground telecommunications lines will be located using a utility locate service, and collection line locations will be coordinated with local telecommunications providers to avoid direct impacts to existing telephone lines
- If inadvertent impacts identified during or after construction, Walleye Wind will address these impacts on a case-by-case basis.[182] Potential mitigation measures include:
    - For damage to underground telecommunications lines: immediate repair of damage
    - For television interference: installing a combination of high gain antenna and/or a low noise amplify or providing monetary contribution towards comparable satellite service
    - For AM/FM radio interference: additions to radio transmitters, receivers or amplifiers can be made to address impacts to radio reception

6.9 Fuel Availability

Large electric power generating facilities require some type of fuel. Depending upon the amount and type of fuel required and the location of the fuel relative to a project, the project can create impacts related to harvesting and delivery of the fuel.

Walleye Wind Project

Wind farms rely on wind, a renewable energy source, to generate electricity. Wind turbine blades extract kinetic energy as the wind passes through the blades and creates turbulence downstream. To operate effectively, turbines must be setback from other turbines to compensate for this turbulence known as wake loss.[183]

Wind capacity varies across Minnesota. Extensive wind measurements have been taken and analyzed by the Minnesota Department of Commerce (**Figure 2**). Local data collection suggests the mean annual wind speeds at the turbine locations is approximately 8.25 m/s at hub height, with seasonal variation of 7.00 m/s to 9.09 m/s.[184] Power generation by the Project depends not only on wind speed (how much energy it contains), but also the frequency of attaining optimal wind speeds. Walleye

[182] *Amended Site Permit Application*, at pp. 54-57

[183] Commission. *Order Establishing General Permit Standards*. January 11, 2008. eDocket ID: 4897855

[184] *Amended Site Permit Application*, at p. 127

Wind anticipates a net capacity factor of approximately 41 to 48 percent annually and an average annual output of approximately 432,000 megawatt hours (MWh) is anticipated for the Project.[185]

Generic 109.2 MW Wind Project

To be economically feasible, a 109.2 MW wind farm sited elsewhere in Minnesota would need to be sited in an area with sufficient wind resources to meet generation projections. Although wind farms are sited in many areas of the state, areas with the highest areas of good wind resources are located in southwestern Minnesota (**Figure 2**), making it probable that a generic 109.2 MW wind farm would be sited in southwest Minnesota.

109.2 MW Solar Farm

PV systems convert both direct and indirect solar energy (direct and scattered sunlight) to electrical energy by capitalizing on nature's inherent desire to keep electrical charges in balance. At the most basic level, electrical current is the flow of electrons through a conductor. When solar radiation strikes a PV cell some of it is absorbed exciting electrons within the cell. Some of these electrons move freely between layers from negative to positive. In the process, electrons from the positive layer are disrupted and "flow" back to the negative layer through the external load creating a continuous flow of electrons, or, a continuous flow of electric current. Solar farms of varying sizes are operational and in development throughout many regions of Minnesota.

Mitigation

Renewable energy is energy that is collected from renewable resources (fuel), which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat. Renewable energy plays an important role in reducing greenhouse gas emissions. When renewable energy sources are used, the demand for fossil fuels is reduced. Unlike fossil fuels, non-biomass renewable sources of energy (hydropower, geothermal, wind, and solar) do not directly emit greenhouse gases.

Overall, using wind to produce energy has fewer effects on the environment than many other energy sources. Wind turbines do not release emissions that can pollute the air or water, and they do not require water for cooling.

Solar energy does not produce air or water pollution or greenhouse gases, although present technology requires large areas of land. Solar energy can have a positive, indirect effect on the environment when using solar energy replaces or reduces the use of other energy sources that have larger effects on the environment.

[185] *Amended Site Permit Application*, at p. 139

7 Availability and Feasibility of Alternatives

Having analyzed comparative impacts of alternatives, an Environmental Report is required to offer an assessment of the availability and feasibility of those alternatives (Minn. Rule 7849.1500 subp. 1F). This section describes the feasibility and availability of alternatives to the Walleye Wind Project.

7.1 Walleye Wind Project

The Walleye Wind Project is located in a rural area with a primarily farm-based economy. Wind projects have typically been well integrated into similar settings. Wind resources are among some of the best in the State of Minnesota (**Figure 2**). In addition, convenient access to the grid is available in the area, minimizing the need for new transmission facilities beyond the new Walleye Wind Substation and the 500-foot intertie between the Project substation and NSP's existing Rock County Substation. The Project output will be sold to MMPA under a 30-year power purchase agreement. Walleye Wind has executed a Large Generator Interconnection Agreement with the Midcontinent Independent Transmission System Operator (MISO) to connect the Project to the grid at Northern States Power's Rock County Substation.[186] At the time this report was prepared, Walleye Wind indicated it had secured nearly all of the wind rights necessary for the Project's construction and operation.[187]

The Walleye Wind Project is feasible and available to be implemented once applicable permits are received.

7.2 Generic 109.2 MW Wind Farm

An alternative to the Walleye Wind Project is a large wind energy conversion system sited elsewhere in Minnesota. There are good wind resources in other parts of the state, and wind farms could be placed in these areas. Such a project could be a single 109.2 MW project or a combination of smaller dispersed projects.

In addition to wind resource availability, access to transmission interconnection is also important for a project to be viable; in the past transmission access has been a constraint for the development of wind energy in Minnesota. A generic 109.2 MW wind farm is feasible and available.

7.3 109.2 MW Solar Farm

A 109.2 MW Solar Farm is potentially feasible, however a site with adequate space and interconnection to the grid has not been identified as part of this review process. Recently permitted solar farms include the 100 MW Aurora Distributed Solar Project (eDocket No. 14-515), the 100 MW North Star Solar Project (eDocket No. 15-33), and the 62.25 MW Marshall Solar Project (eDocket 14-1052) and the Elk Creek Solar Project (19-495).

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[186] Interconnection and Land Rights Status Agreement Update, December 21, 2020, eDocket ID: 202012-169202-01

[187] Response to Data Request 6 (**Appendix E**)

In 2013, Minnesota established a Solar Energy Standard that mandates Minnesota's investor-owned electric utilities to generate 1.5 percent of their electric power from solar by the end of 2020. Minnesota Power and Otter Tail Power are planning for additional solar development to reach their solar targets by 2020. In addition, Xcel Energy included a target of 650 MW of solar generation by 2020 and an additional 750 MW by 2030 in its 2016-2030 resource plan approved by the Minnesota Public Utilities Commission in 2016 as a least-cost plan for the utility's system needs.[188]

The cost and reliability of wind power continues to be more favorable than for solar power despite recent substantial decreases in cost for solar. Wind continues to be more cost-effective than solar-powered electricity and remains the lowest-cost new source of renewable energy. The United States Energy Information Administration projects the levelized total system cost for new generation resources entering service in 2026 to be $31.45/MWh (36.6 with tax credit) for onshore wind compared with $48.8/MWh ($37.6/MWh with tax credit)for solar photovoltaic entering service.[189]

From a land-use perspective, a MW of solar requires more land be temporarily used for the life of the project to achieve the same number of MW. Additionally, crop production with the Project will not be significantly impacted, whereas for a solar facility a large area of land would be taken out of production for the life of a solar plant.

Access to transmission interconnection is also important for a project to be viable. A 109.2 MW solar farm is feasible and available.

7.4 No-build Alternative

The no build alternative is feasible and available.

The Project has been proposed to meet growing electric demand in Minnesota and growing demand for additional renewable resources in Minnesota. Minnesota has committed to a renewable energy objective of generating 25 percent of its electricity from eligible renewable sources by the year 2025.[190] Minnesota utilities had approximately 3,700 MW of wind generation in their portfolios at the end of 2017, with an additional 3,000 MW of wind generation planned for the Minnesota Market.[191] In addition to Minnesota's renewable energy objective, there is a regional need and desire for wind energy. It is not clear what the effect of a no-build alternative would be on meeting Minnesota's demand for electric power and for renewable generation.

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[190] Minn. Statute 216B.1691

[191] Minnesota Department of Commerce. 2018. *Minnesota Renewable Energy Update*. https://mn.gov/commerce-stat/pdfs/2017-renewable-energy-update.pdf

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